

*Meridian Township*

INTEGRATED PLAN

*Okemos DDA*



DOWNTOWN SITE PLAN

*March 2009*



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*The Hamilton Building in downtown Okemos.*

## Introduction & Physical Assessment

### Location

Okemos sits at the eastern edge of a large metropolitan area that includes Lansing, East Lansing and a number of smaller surrounding towns. It is less than one-half mile south of Grand River Avenue, a major east-west corridor in the region. This area has numerous businesses lined along each side of the road, including Meridian Mall and Meijer, major draws from around the region.

The unincorporated village itself was originally called Hamilton, founded in 1839, as a trading center. Twenty years later it was renamed Okemos for the chief who used the area as an occasional encampment.

Two and one-half miles to the south of Okemos is I-96, another major east-west vehicular route linking numerous major metropolitan areas across the state. At this exit area, Exit 110, is an expanding commercial district. This is a designated exit for the village of Okemos.

East Lansing is two and one-half miles west of Okemos. This is a strong draw in the area due to the Michigan State University campus. Four miles further west is downtown Lansing, the state's capital. The two cities are highly built out and, though they are bisected by US-127 near the Frandor shopping area, they tend to blend as one large metropolitan area with a mix of scattered commercial and residential districts.

### Small Town Charm in a Large Metro Area

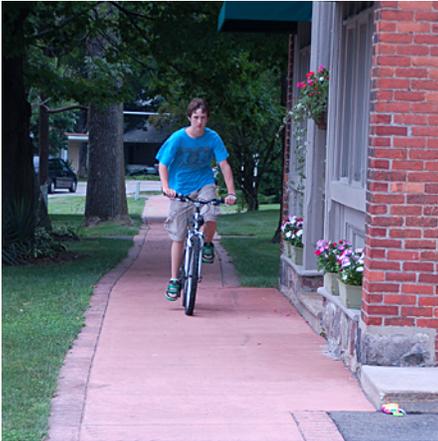
Since Okemos is off the commercial development corridors, it has the potential to shape its future as a unique and charming counterbalance to the usual and somewhat bland strip development taking place elsewhere. Though the downtown is small, it has a number of interesting amenities, including charming, active neighborhoods, the meandering Red Cedar River, historic downtown structures, existing viable businesses, and large adjoining parks.

The commercial area of Okemos is spread out, both within its core and along Okemos Road. This spatial orientation, along with the gaps between businesses, roadways acting as barriers, and a business mix that does not attract browsing, brings little vitality to the downtown. Due to the small scale of the Okemos community, these issues are strongly pronounced. A tighter scale, with a more non-motorized emphasis and a pedestrian friendly environment would help create a place more conducive to spending time rather than passing through.

Opportunities exist for infill that would improve the walkable scale of the village as well as create space for the kinds of businesses that would cater to strolling and spending time.



Chief Okemos or "Little Chief"



*An historic area to restore, maintain and have pride in.*

The downtown core itself is bounded by Methodist, Moore, and Clinton Streets and Ardmore Avenue. The heart of this is crisscrossed by Okemos and Hamilton Roads. Both of these roads are active vehicular routes and both are wide enough and busy enough to make pedestrian crossing a challenge. This divides the community into four basic quadrants rather than one unified downtown. The small scale of the downtown area makes this separation all the more apparent. The lack of sidewalks on some sections of the side streets gives priority to vehicles rather than pedestrians.

Parking is plentiful in and around the downtown. Compared to the number of shops, there seems to be an overabundance of surface parking. Because of the “quadrant” perception for pedestrians, these parking areas tend to serve their own immediate businesses and there are only a small number of on-street parking spaces. A field inventory accounted for approximately 485 parking spaces within an eight block area.

### Walkability

Okemos has great potential as a pleasant, walkable / bikable business district. Recreational walks through the nearby parks and neighborhoods and shopping excursions with a diverse selection of choices are within a 1/2 mile radius. But currently the non-motorized connections are not well defined or developed. For example, a walkability score provided by [www.Walkscore.com](http://www.Walkscore.com) notes that nearby Pawnee Trail has a walkability score of 72 (very walkable) and the intersection of Kent and Kenmore has a score of 83 (very walkable). These scores are determined by measuring the distance to nearby retail, entertainment, cultural, and eating establishments. The Opportunities Plan drawing denotes a 5-minute walking radius from the Okemos Road / Hamilton Road intersection and clearly illustrates the physical accessibility to adjacent residential neighborhoods.



There are existing easements, for example, leading both north and west at the intersection of Methodist Street and Ardmore Avenue that have no clear definition and no paving or signage to make them inviting. These would make excellent pedestrian routes from the adjacent neighborhoods into downtown. These surrounding neighborhoods are in close proximity to downtown, but pedestrian connections are lacking throughout.



Pedestrian access to Meijer is also undefined, though there are informal routes that are clearly taken that lead through the parking lot behind the Okemos Community Church. In contrast to the Okemos downtown business district, which has the character and opportunity to be a pedestrian district, businesses along Grand River Avenue are very vehicular in character and inhospitable to pedestrians. A factor adding to the vehicular character of Grand River Avenue is the expansion parking lots which separate the roadway from the businesses. For example, the distance to the Meijer store entrance from Grand River Avenue is approximately 640 feet and 595 feet from Okemos Road.



*Ferguson Park*



*Wonch Park*

As a result, connections with downtown Okemos should begin with the core area and extend outward into the neighborhoods and eventually into the commercial areas in the northern portion of the DDA district.

### **Parks Close By**

Within close proximity to the downtown is the Red Cedar River. It weaves around the south of town within the DDA boundary through Wonch and Ferguson Parks and Sumbal Nature Preserve. The slopes on the north side of the river along the Nature Preserve are high and steep, minimizing opportunity for access. The river in this area is accessible from the east side of Okemos Road where there is a pedestrian bridge crossing into Ferguson Park. There are opportunities for access into Wonch Park as well, though there are areas of wet lowlands that would require boardwalk access from the western edge of the downtown off Clinton Street.

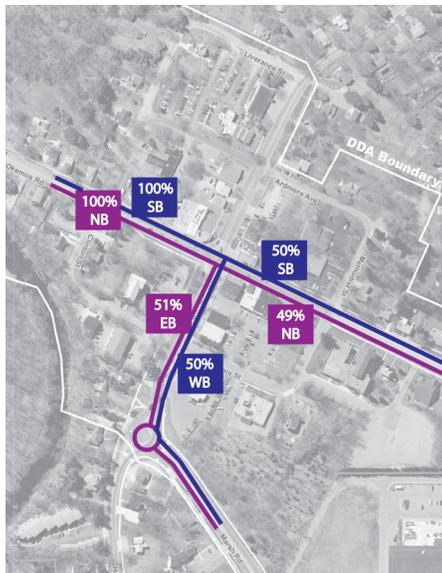
Because they are so close to the downtown area and they are so large and predominant, these parks offer a good opportunity for recreation and community gathering places within a short walk of downtown. Though they are currently removed from the downtown area with their dense massing of vegetation and undefined pedestrian points of access, the opportunity exists to make these a bucolic and connected back yard to the downtown.



*Example of a pedestrian bridge and pathway connecting neighborhoods and parks*

Access to Wonch and Ferguson Parks and Sumbal Nature Preserve is from Okemos Road. Residential neighborhoods north of the Red Cedar River do not have pedestrian access to these facilities unless they use the pathway along Okemos Road. The Opportunities Plan denotes possible linkages to these park and recreation facilities via pedestrian bridges at non-vehicular locations. These pedestrian connections will allow for increased use of the parks and, more importantly, begin to link the parks to the downtown and adjacent residential neighborhoods.

Neighborhood access to and through the parks to downtown provides local businesses exposure to households with disposable income. According to MapInfo Corporation there are 1,700 residents with an average household income of \$85,510 within one-half (1/2) mile of the Okemos Road and Hamilton Road intersection. If the geographic radius is expanded to one-mile there are 4,900 residents with an average household income of \$86,431. In addition to the resident population a daytime work population estimated at 2,005 persons works within one-half (1/2) mile of the downtown. The ability and ease of access to get to downtown will be reflected in added sales and business opportunities.



Traffic flow through the downtown area.  
(Purple is NB/EB; Blue SB/WB)

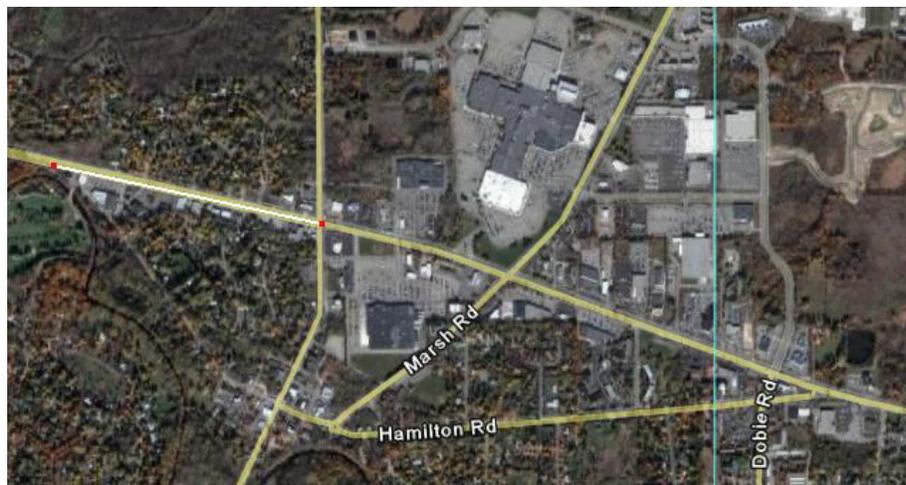


Northbound Okemos Road traffic queing into right-turn lane for Hamilton Road

### Circulation

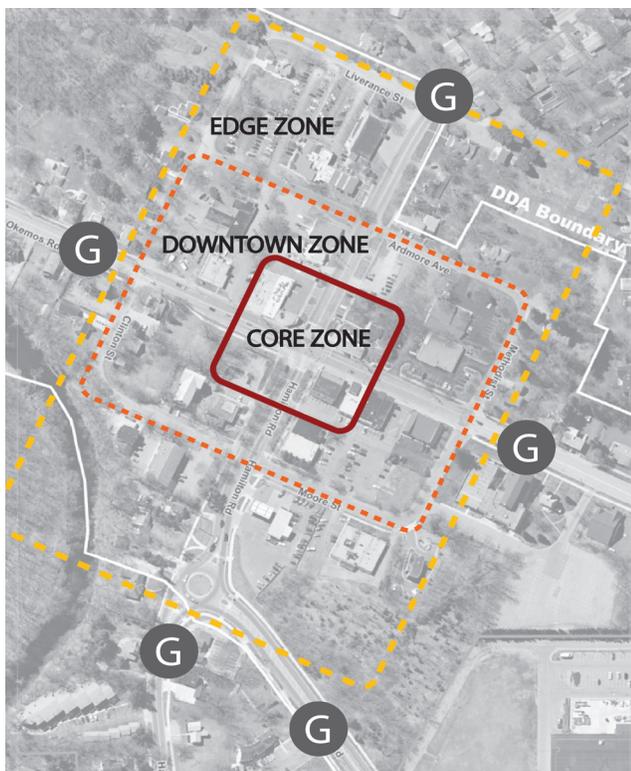
The downtown core intersection of Okemos Road and Hamilton Road are part of a larger regional network connecting Meridian Township and Alaiedon Township. Okemos Road is a major north-south arterial which bisects the downtown area. Approximately eight miles in length, Okemos Road intersects Holt Road, I-96, Mt. Hope Road, Grand River Avenue, Haslett Road and Lake Lansing Road. Hamilton Road is approximately one and three-quarters miles in length and forms an arc intersecting Grand River Avenue about a half-mile west of the Okemos / Grand River Avenue intersection and proceeding through the downtown area ultimately connecting with Grand River Avenue near Dobie Road. Hamilton Road’s unique geometry and penetration through neighborhoods east and west of the downtown position it as a primary pedestrian conduit for the business district.

Okemos Road and Hamilton Road are important components of the downtown area because they facilitate a significant movement of traffic during the morning and evening commute. The travel pattern is balanced between north and eastbound traffic proceeding northbound on Okemos Road with half of the traffic turning right onto Hamilton Road to connect with Marsh Road via the roundabout at the Hamilton / Marsh Road intersection and the other half proceeding north to Grand River Avenue, and south and westbound traffic flow heading southwest down Marsh, west on Hamilton and then southbound on Okemos Road by turning left from Hamilton. This consistent flow of traffic has an affect on connectivity within the downtown area, pedestrian circulation, and the enhancement of public spaces. Another indirect impact with regional traffic through the downtown is the number of lanes and width of the pavement cross-section. As traffic increases and additional lanes are added to handle capacity, the distance between curbs increases making it less desirable for pedestrians. The downtown area is beginning to experience this condition where Okemos Road becomes a physical barrier for pedestrians. Pedestrian counts for the morning and afternoon peak hours accounted for 35 pedestrian crossings in a 6-hour period.



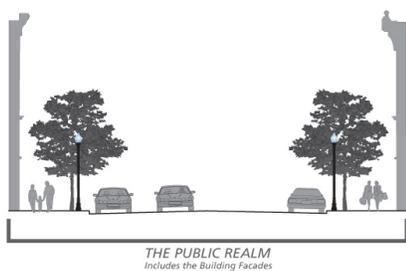
### Context of Downtown Okemos

Successful downtown revitalization needs a committed level of well-designed public investment and a consistent level of maintenance to attract the people needed to support local businesses and create a memorable place. In retail, more people usually means more business. Public investment in the downtown infrastructure spawns private investment and redevelopment in buildings and businesses. There is no “chicken” and “egg” in downtown revitalization - the public sector takes the lead.



Downtown Okemos can be segmented into three functional zones: the Core Zone, Downtown Zone, and the Edge Zone. The Core Zone establishes the image or the “face” of the business district. In this zone private buildings, parking lots, and public spaces need to work together, look pleasing and inviting, and project the image of a successful business district.

In traditional downtowns, the public space is framed from building façade to building façade. The quality of that space is often defined by the quality and character of the private buildings. Although a community may invest substantially in public spaces the investment may not be fully realized if adjacent buildings are in disrepair or poorly maintained. In the Core Zone the concept of the “public realm” has meaning and application. Further, this zone is and will continue to experience the most interaction between vehicular and pedestrian traffic so it will be important that future public realm enhancements equally balance the interests of both user groups.



In Okemos, the Downtown Zone is the area bounded by Clinton, Ardmore, Methodist, and Moore Streets, which form an interior street network around the downtown area. Many businesses are located in this area, as well as opportunities for new infill development. Some of the properties are built on traditional downtown (zero lot line) lots and others are large enough to have attached off-street parking, such as the Meridian Activity Center. Several parcels have informal walkways between buildings accessing rear parking areas. Overall, this zone has the attributes to become a compact downtown but currently lacks the cohesive image and connectivity between properties.



Facades along Okemos Road

The Edge Zone is where the business district ends and the residential neighborhoods begin. It is often called a transition area. This situation is very apparent along Clinton Street west of Ardmore and along Liverance Street where driveways serve business establishments and homes. Opportunities in this area include street reconstruction with curb and gutters, sidewalks, parking lot screening, pedestrian scale lighting, and context sensitive infill development.

### Context of the DDA District

The Meridian / Okemos Downtown Development Authority (DDA) district incorporates the downtown area, portions of the unincorporated limits of Okemos Village and several commercial developments and properties framed by Okemos Road, Marsh Road and Grand River Avenue. The delineations for these boundaries are illustrated on the Opportunities Plan map on the adjacent page. The context of the downtown area is based on the historic development of the village with a grid street network forming blocks containing smaller parcels used for commercial and residential structures. Immediately west of the downtown is the Cedar Bend Heights residential neighborhood and south are Wonch and Ferguson Parks. The east portion of the DDA district which commences at the roundabout includes properties along and between Hamilton Road and Marsh Road. In this area several commercial and residential properties exist, and due to the traffic node resulting from the roundabout, this part of the DDA district becomes a gateway to the downtown. North of the downtown are commercial developments along Okemos Road and Marsh Road, both terminating at Grand River Avenue. Within this area of the DDA district is the Meijer Store development and adjoining out lot commercial buildings.



*Clinton Street in downtown Okemos: compact, multi-story, and pedestrian-oriented*

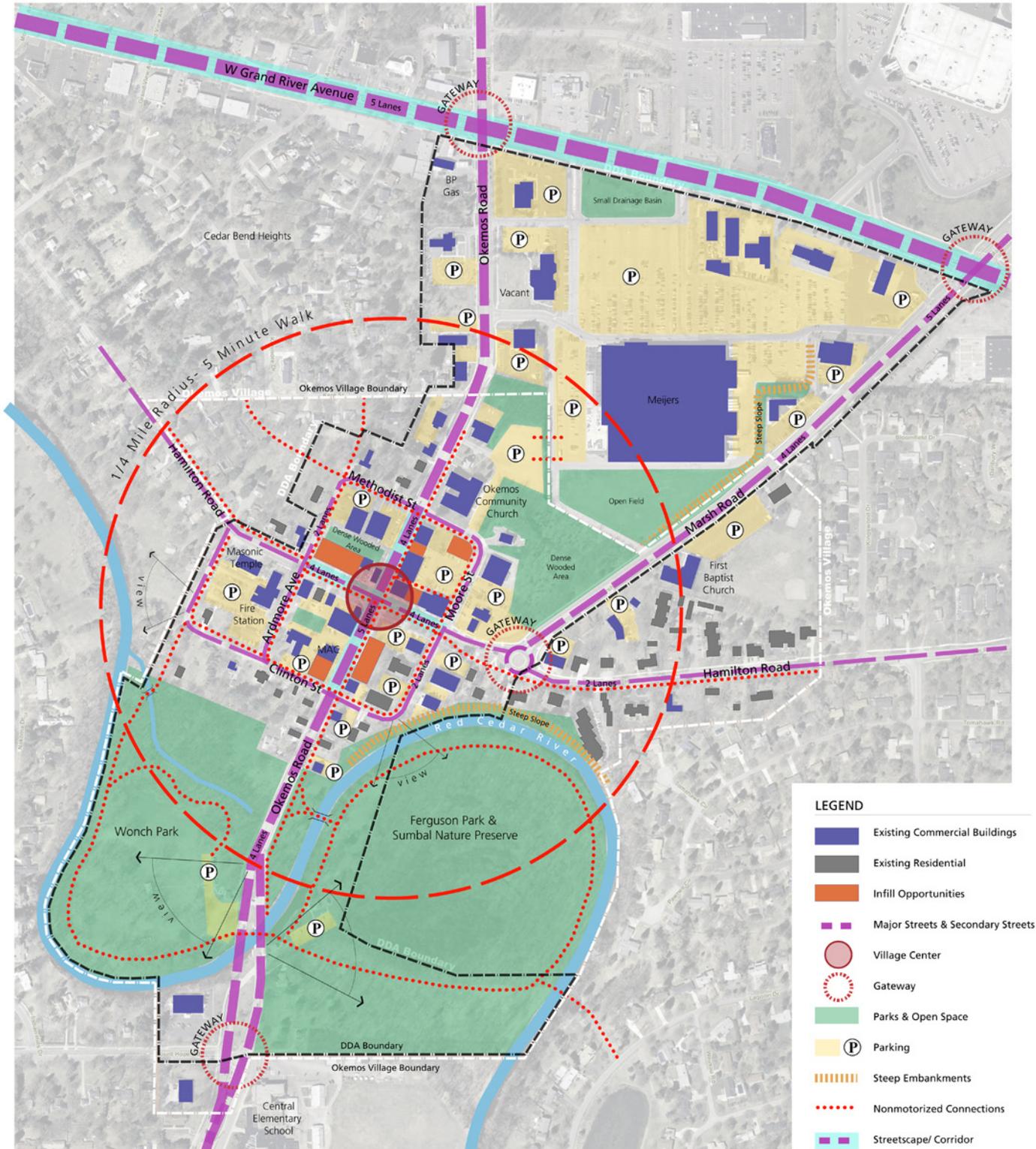
Looking at a broader context of the DDA district, the commercial properties within the Okemos village limits (which includes downtown) are compact, older, multi-story, and have a higher lot coverage, and those outside of the village are expansive, newer, one-story, with a lower percentage of lot coverage. Likewise, the village properties have greater pedestrian orientation and properties outside the village are vehicular-dependent.



*Grand River Avenue DDA Area: expansive, low scale, and vehicular-oriented*

Opportunities for infill development are more prevalent in the village portion of the DDA district than properties outside the village limits. These infill sites, if developed properly and in context to surrounding commercial properties, can help create a cohesive and compact commercial district around the Core Zone of the downtown. Parcels identified as potential infill opportunities are highlighted in orange on the adjacent map. Another area evaluated as a potential development parcel was the wooded parcel along Marsh Road just south the Meijer Store rear service entrance drive.

Because the DDA district is situated on several regional arterial roads several "Gateways" where identified. These included the intersections of Okemos and Grand River Avenue, Marsh Road and Grand River Avenue, the March Road / Hamilton Road roundabout, and Okemos Road and Mt. Hope Road. These gateway intersections offer an opportunity to identify the Okemos DDA district on a regional basis through uniform landscaping, signage, and wayfinding.



*Opportunities Plan*

**Meridian Township  
Okemos DDA Integrated Plan**

July 29, 2008





*Group Sessions - Community Visioning*

## Visions & Expectations



Group Discussion

### Introduction

Public involvement is an inclusive way to identify a community's interests and expectations. Visioning sessions offer community officials, residents and business owners an opportunity to come together and to share ideas in an interactive environment.

The sessions begin with general brainstorming and discussion, followed by a series of small group exercises that bring these ideas into focus. In these particular sessions, events, developments and trends were explored with these topics:

- Land Use and Economic Development
- Business Recruitment
- Appearances and Design
- Image and Promotions
- Transportation / Infrastructure / Traffic Engineering
- Security / Crime

The workshops focused on particular areas of concern in the DDA and Township. The sessions resulted in a series of established priorities agreed upon by the entire group.

### Meridian Township Downtown Development Authority of Okemos June 12, 2008 Public Information Meeting/Vision Session

Approximately forty residents, business owners, community members, and Township officials, all interested in voicing their ideas about the Meridian Township DDA community, participated in the visioning process on June 12, 2008. The session consisted of a series of brainstorming exercises in which small groups of participants worked together to formulate ideas about the future of the community.



During the workshop participants outlined some of the issues concerning the DDA and the adjacent neighborhoods. They focused on particular areas of concern, then recorded their ideas and established priorities by voting for those most important to them. Finally, they shared their results with the entire audience. The ideas that came out of each small group were diverse, but they also had many commonalities.



One Group's Results & Presentation

Preferred Future -  
from June 12 Meeting

| PROJECT / PROGRAM  |  |
|--|--|
| Pedestrian Activity with "Night Life"                            |  |
| Fewer Cars   |  |
| Commercial Variety - Vibrant Mix of Businesses                   |  |
| Dense Housing  |  |
| More Small Businesses  |  |
| Mixed Use Bldgs (75% historic / 25% modern)                      |  |
| Public Library   |  |
| Wide Sidewalks, Parking Connections, and Bridge to Neighborhoods |  |
| People Living Above Storefronts                                  |  |
| Art in Public Places   |  |
| Multiple Transit Options   |  |
| Defined Area for Downtown  |  |
| Pedestrian Access to Riverwalk on the Red Cedar                  |  |



**Collective Priorities**

Three areas of interest stood out in particular for the group: a variety of commercial uses downtown, an emphasis on recreation and activities, and a walkable core that offered a pleasing aesthetic environment. Looking at these collectively, they signify a strong desire to bring vitality to the Okemos downtown area.

In terms of commercial variety, this would include an effort to bring restaurants, cafes, niche businesses, and art galleries into the downtown.

There was also interest in specific building projects, such as bringing the library into the downtown and building a riverwalk along the Red Cedar River. High on the list was a desire for mixed uses within buildings in the commercial core to include office, retail, and residential.

Ideas also include other aesthetic interests, like art in public places, and a signature design feature downtown. This could include sculpture, a fountain, a plaza, a combination of these things or some other distinct feature. This also ties in with an appeal for a defined identity for Okemos, something many communities are doing to increase their brand visibility.

**Preferred Future - Collective Priorities  
from June 12 Meeting**

| PROJECT / PROGRAM  |    |
|--|----|
| Commercial Variety (restaurants, cafes, niche businesses, art galleries) | 19 |
| Activity / Recreational Options  | 13 |
| Walkability, Aesthetic Interest  | 12 |
| Public Library   | 9  |
| Riverwalk on Red Cedar River   | 7  |
| Mixed Use Bldgs (75% historic / 25% modern)                              | 5  |
| Upper Story Development  | 5  |
| Fewer Cars / Less Traffic  | 8  |
| Mixed Uses   | 7  |
| Art in Public Places   | 2  |
| Signature Design Feature (fountain, for example)                         | 2  |
| Defined Identity for Downtown  | 2  |
| Pedestrian Connections   | 1  |
| Sidewalk Food Vendor Carts   | 1  |
| Sustainable Energy Designs   | 1  |
| Multiple Transit Options   | 1  |
| Nice Facades   | 1  |

*Section Three*



## Traffic Assessment

Okemos Road runs north-south through the heart of the DDA District, and is classified as a principal arterial. Hamilton Road runs east-west, and the intersection with Okemos Road forms the center of the study area. Hamilton Road to the east of Okemos Road is a Minor Arterial and to the west is a Collector. The 2007 traffic counts show approximately 41,800 cars entering the intersection on a daily basis, with the majority of the traffic carried by the north and south bound Okemos Road approaches and the westbound Hamilton Road approach.

Peak hour turning movements are included in the appendix of this report. Okemos Road is generally four lanes, with a dedicated right turn lane added northbound at Hamilton Road. Currently, turn restrictions exist on Okemos Road, with no left turns being allowed at Hamilton either northbound or southbound. Hamilton Road is four lanes east and west of Okemos Road. The left lane of westbound Hamilton Road acts as a defacto left turn lane during peak hour travel, although it is a combination left/thru lane. The intersection is currently signalized.

|                |   |      |      |   |      |     |     |     |     |      |     |     |              |
|----------------|---|------|------|---|------|-----|-----|-----|-----|------|-----|-----|--------------|
| <b>5:00 PM</b> | 0 | 204  | 187  | 0 | 160  | 5   | 10  | 28  | 19  | 126  | 6   | 11  | <b>756</b>   |
| <b>5:15 PM</b> | 0 | 212  | 247  | 0 | 150  | 4   | 7   | 39  | 19  | 146  | 19  | 16  | <b>859</b>   |
| <b>5:30 PM</b> | 0 | 180  | 198  | 0 | 147  | 7   | 6   | 33  | 15  | 141  | 23  | 9   | <b>759</b>   |
| <b>5:45 PM</b> | 0 | 202  | 202  | 0 | 142  | 4   | 5   | 22  | 13  | 28   | 26  | 38  | <b>682</b>   |
| <b>Total</b>   | 0 | 3175 | 3140 | 0 | 2937 | 102 | 125 | 400 | 315 | 3003 | 388 | 268 | <b>13853</b> |

A system of local streets surrounds the Okemos / Hamilton intersection. These include Ardmore Avenue, Methodist Street, Moore Street, and Clinton Street. These are all relatively narrow two lane streets with the exception of Moore Street, which is wide enough to accommodate three lanes or two lanes with on-street parking. The study area also included the Okemos Road and Grand River Avenue intersection, the Grand River and Marsh Road intersection, and the existing roundabout at the Hamilton and Marsh Road intersection. These areas were included in the study to determine the extent of the impact made by changes to the Okemos and Hamilton intersection.

This study was centered on the Okemos / Hamilton intersection and potential changes that would allow a reduction in the number of lanes for each approach. The overall goal was to improve pedestrian access in the core area. The main alternatives studied include:



*Okemos Road and Hamilton Road Intersection - Note "No Left Turn" onto westbound Hamilton Road - this configuration limits access to the business district and adjacent neighborhood*

**Option 1** - Changing Hamilton to three lanes on both approaches, with the right lane of westbound Hamilton being a combination left, thru, right lane.

**Option 1A** - Same as Option 1, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street

**Option 2** - Changing the westbound approach Hamilton to two dedicated left turn lanes with one thru lane in each direction, and a three lane approach section for eastbound Hamilton

**Option 2A** - Same as Option 2, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street

**Option 3** - Changing Hamilton to a typical three lane section, both approaches.

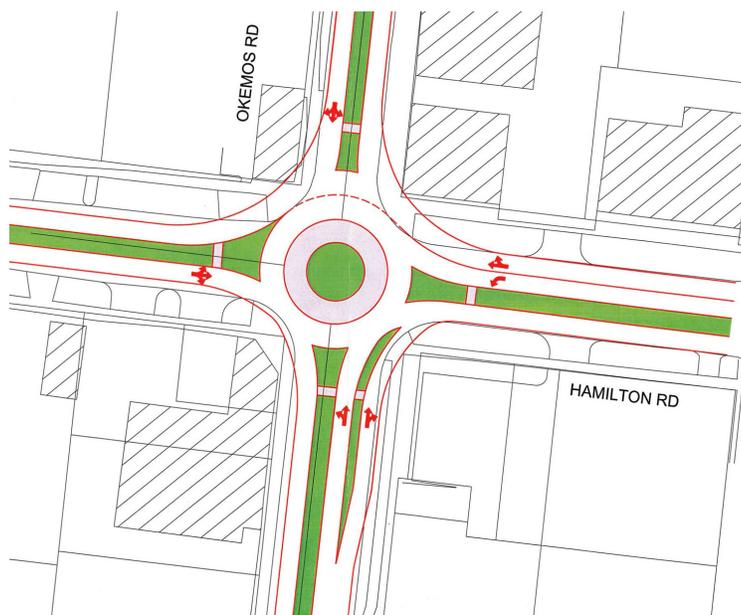
**Option 3A** - Same as Option 3, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street

**Roundabout Option** - Removing the signal from the intersection and creating a roundabout. The roundabout was studied as a one lane roundabout with a dedicated right turn lane for northbound Okemos and a two lane roundabout for the westbound Hamilton approach including the dedicated right turn lane for northbound Okemos.

After analysis, which focused mainly on the peak hour traffic, each option proved to have pros and cons. The existing signalized intersection configuration operates as well as it can under the current traffic loads. None of the other signalized options (numbers 1-3) improved the overall level of service (LOS). The only significant change that can be made to the intersection was reflected in Option 3. This option entailed reducing the Hamilton Road cross section to 3 lanes including a dedicated turn lane. This would allow for a slightly shorter pedestrian crossing distance on Hamilton Road. Option 3 did increase delays for all legs and lowered

the LOS for each approach, due to having to add a protected signal phase to the light timing to provide for the left turn movements on Hamilton. Further operational analysis may be able to improve the option and reduce delays.

Option 1A, 2A, & 3A were ruled out due to the Township's desire not to have heavy traffic loads on Clinton Street and the other ring roads. Historically, prior to the dedicated right turn lane being added to Okemos Road, traffic used this route to avoid congestion at the intersection. This proved detrimental to the residents and businesses along the route. It is noted that none of these options improved the overall LOS of the intersection. The Roundabout Option was determined to be the best alternative if a significant character change to the area was desired. Two different configurations were studied. The most functional design calls for a two lane approach from southbound Okemos and eastbound Hamilton, and a three lane approach from northbound Okemos and westbound Hamilton. A very preliminary design for this configuration is included in the appendix. This design will have a very high level of service and minimal delays. However, right-of-way concerns may make this design difficult or impossible to build, especially when taking into account the necessary pedestrian access. During more detailed design, it may prove possible to adjust the approaches enough to actually construct this design, which is the best case scenario.



*Suggested Configuration of the Okemos Road and Hamilton Road Intersection Roundabout*

The alternative roundabout configuration called for two lanes on all approaches except northbound Okemos Road, which remained at three lanes. This option performs well although the possibility exists for some delays during peak hours. This option is very sensitive to driver error, which produces delay. This option can be built within the existing right-of-way and allow room for sidewalks, and trucks and emergency vehicles will be able to navigate the roundabout using the paved apron. The splitter islands for each roundabout offer safe haven to pedestrians crossing the road, and proper signage will have to be used to warn motorists of the crossings.

In summary, only the Roundabout Options and Option 3 are realistic alternatives for improving or altering the intersection. As design progresses further review will determine the costs associated with each design and an evaluation of value can then be made. For detailed information on each option including schematic diagrams and detailed turning movement counts, please refer to the attachments in the appendix.



## Suggested Framework Plan

The Downtown Development Authority's limited financial resources should be focused on the traditional village area of the district (referred to as downtown Okemos). Based on the assessment of district opportunities the northern portion of the downtown development district is relatively new, suburban in character and vehicular-dependent. Functionally, this area operates as designed with exposure to Grand River Avenue, buildings generously set back from the road, and large surface parking lots. This portion of the district can be integrated into the traditional village area with the introduction of uniform street lighting, signs, and landscaping. The recommendation is similar for that portion of Okemos Road north of Moore and Methodist Streets to Grand River Avenue.



*Corridor lighting fixtures, banners and landscaping*

### The Okemos / Hamilton Roundabout

The traditional village area of the downtown development district has the most potential to become a "downtown" based on its scale, street network, and connection to adjacent residential neighborhoods. The hallmark project in the framework plan is the incorporation of a roundabout at the intersection of Okemos Road and Hamilton Road. This traffic device will assist the movement of peak morning and evening traffic through the intersection. In addition, it will alleviate the need for a traffic signal and provide access to all of the legs within the intersection. This is particularly important to the business district on west Hamilton Road. The proposed design suggests the utilization of medians to help facilitate pedestrian crossings, which is important in creating a pedestrian oriented business district. The proposed roundabout has only been conceptually designed and will need further engineering refinement when the project moves forward.



*Example of an "Urban" downtown roundabout - note the scale of the intersection buildings*

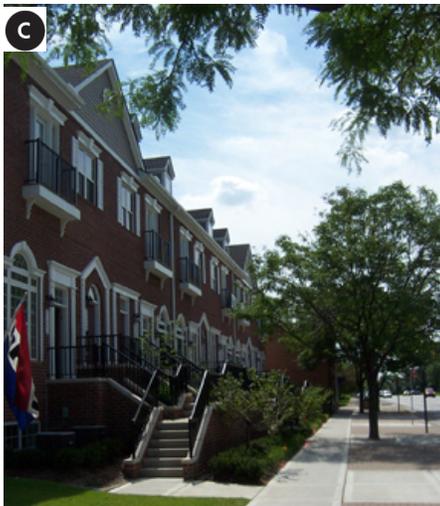




Example of multistory “new” infill development - this building has a ground floor restaurant and professional offices on 2nd and 3rd floor.



Example of “Live-Work” Units suggested along the east side of Okemos Road



Multistory townshomes suggested on the north side of Hamilton Road - another option would be live-work units with professional office / small retail on first floor and residential on upper levels

### Infill Development

Another suggested addition to the traditional village area is infill development. The plan suggests infill development along Okemos and Hamilton Road. Infill development along Okemos Road would be a combination of residential, retail, and office uses. As noted on the plan, residential development is suggested on the east side of Okemos similar in scale and density to the townhouse development along Clinton Street. On the west side of Okemos infill development consisting of a multistory mixed-use office building is suggested for the current Meridian Activity Center property. Along Hamilton Road there is a residential development along the north side between Moore Street and the Meijer Store service drive. This is proposed in an effort to extend the residential neighborhoods into the business district. This mix of activity will aid in making the business district more walkable and pedestrian oriented. On the west section of Hamilton Road it is suggested that infill development focus on mixed-use with the retail on the first floor and offices or residential on the upper stories.





*A parking lot screened from the pedestrian sidewalk*



*Pedestrian walkways connecting rear parking lots with the front streetscape and retail area*



*A pedestrian gateway connecting the business district and the adjacent residential neighborhood*

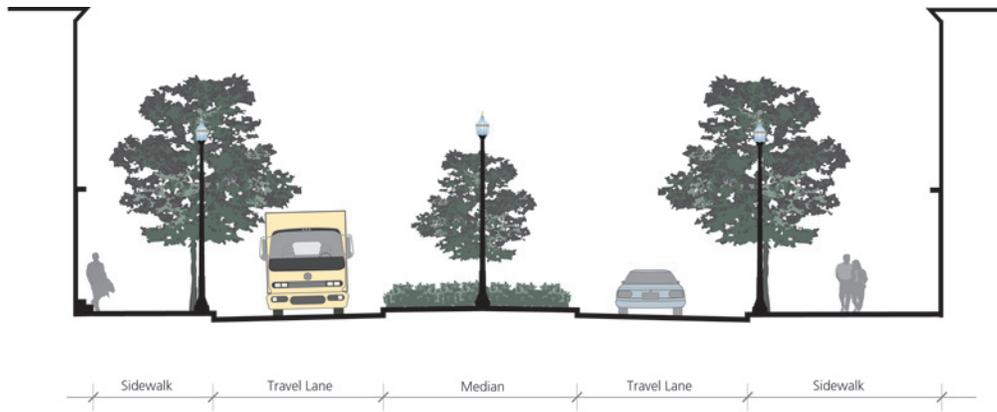
### Streets and Parking Lots

Within the downtown zone and the edge zone of the traditional village the plan calls for the improvement of the street network. It is suggested that all streets have curb and gutter and on-street parking depending on the width of the right-of-way. In addition, all streets would have sidewalks, pedestrian scale lighting, and uniform street landscaping. Where on-street parking lots abut the public right-of-way the plan suggests the use of decorative walls to screen the parking from the pedestrian areas. The illustration entitled, "Sections," graphically depicts the level of improvements proposed for Okemos Road, Hamilton Road, and Ardmore Ave. On Okemos Road, the medians resulting from the introduction of a



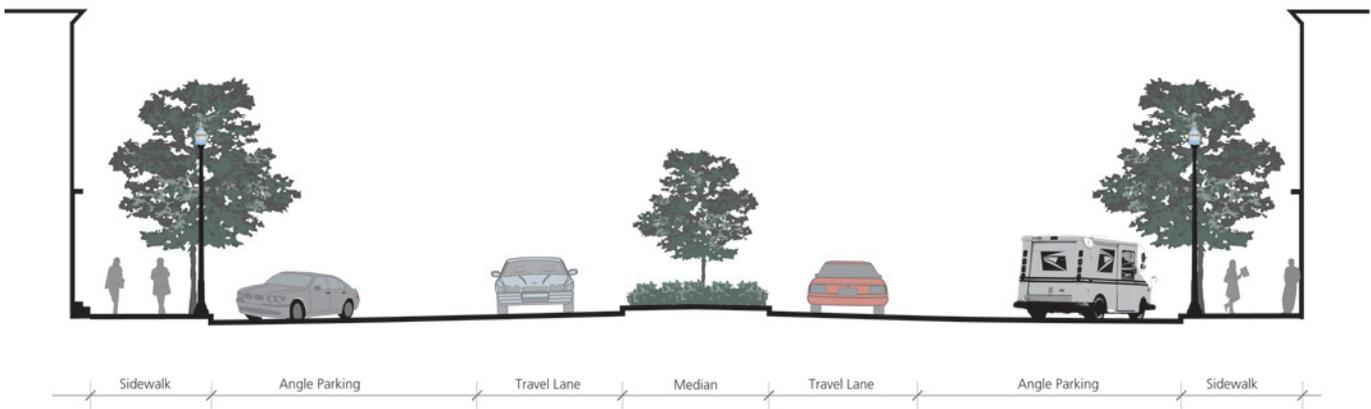
roundabout would be used as pedestrian (safe-haven) crossings and contain landscaping. Along Hamilton Road the right-of-way is sufficient to allow for angle parking within the business district providing convenient customer parking to adjacent businesses. Along Ardmore Avenue the right-of-way is sufficient to accommodate two lanes of traffic, parking on each side of the street, and sidewalks sufficient in size for pedestrian lights and landscaping. Also noted on the Ardmore Avenue cross-section is the treatment of off-street parking lots and the use of decorative walls to screen the parking lot from the pedestrian areas.

Lastly, pedestrian connections to the Cedar Bend Heights neighborhood are recommended by using the unimproved right-of-way of Methodist Street and Ardmore Street.



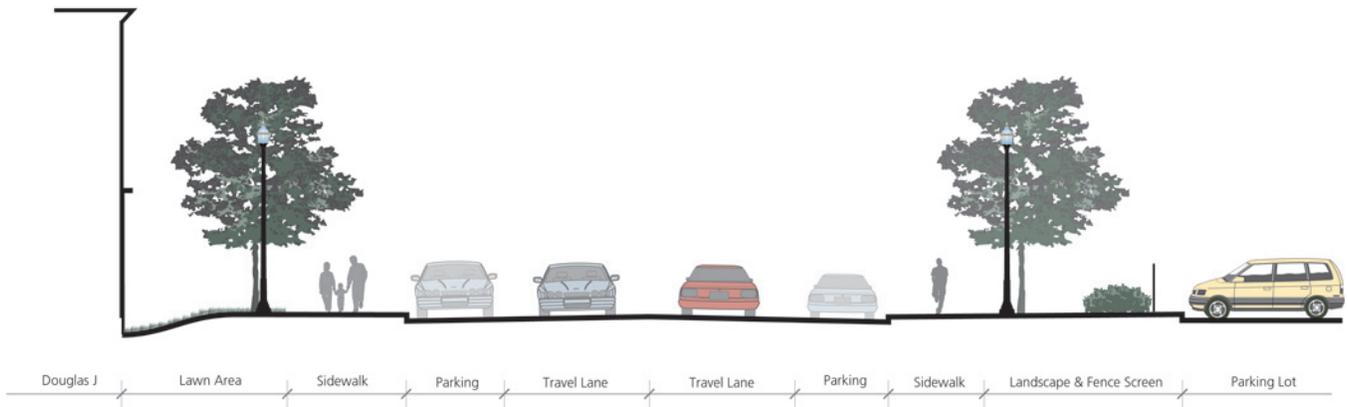
**A**  
ELEVATION

OKEMOS ROAD



**B**  
ELEVATION

HAMILTON ROAD



**C**  
ELEVATION

ARDMORE AVENUE

Sections



The intent of the framework plan is to enhance pedestrian access to the business district, create accessible parking areas, build upon and improve the downtown character, and make the traditional village area a walkable community.



### **Pedestrian Friendly**

Okemos will greatly improve its draw as a destination point by bringing the four quadrants closer together and making the scale of the area feel more usable for pedestrians. This is accomplished by the creation of crossing medians and infill development.

The medians will reduce the trepidation caused by having to cross large expanses of roadway. These pedestrian refuges reduce crossing distances from four lanes to one.

Infill development will draw the community in tighter and improve the sense of enclosure and scale. This is particularly important along the two main roads, Hamilton and Okemos.

Accessible pedestrian ramps at all crossings let users know that the downtown is a place of welcome.



### **Downtown Character**

Trees along the street, in the medians and within the parking areas have the ability to improve both the pedestrian scale and the aesthetic quality of the downtown. Street lighting that echoes the character of the area also brings a sense of care and interest to the surroundings.

The downtown itself has an historic character that needs to be strengthened and maintained. This includes attention toward buildings such as the Hamilton Building, the Masonic Temple, and the Traveler's Club Building. It also should be seen in terms of its overall character in relation to the surrounding neighborhoods and the river. River proximity was often a strong determinant of town development early on.

Any new development should be at a scale that is interesting and inviting from a pedestrian standpoint and in character with the surrounding structures.



### **Bus Stops**

We recommend that the Township coordinate with the Capital Area Transportation Authority (CATA) for the addition of one or more bus stops in the downtown area. The bus stops will enhance Okemos as a destination, increase pedestrian activity and encourage alternative transportation.



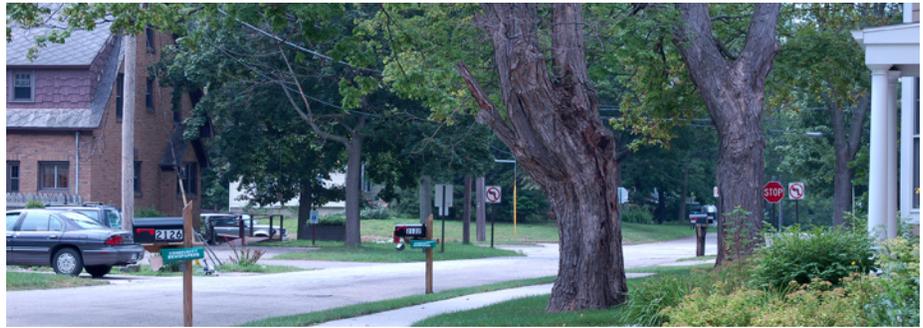
### Parking

Creating easily accessed parking areas with clear flow patterns within the four quadrants, and allowing for on-street parking along Hamilton Road, will improve both the real and perceived concerns about adequate parking. Convenience is always the key with parking, and the Site Plan clearly defines the vehicle flow within the downtown, as well as the walking connections from parking to the surrounding businesses. When possible, on-street angle parking offers another good option for ready connection between shopper and business.

Another major factor, since a majority of the parking areas are at the backs of the businesses, is to create interest in these areas. There should be as much attention paid to the creation of inviting entrances and landscaping in the back as there is in the front.

### Living Downtown

One excellent way to increase use and density is to intersperse residences into the downtown. The area east of Moore Street offers a good opportunity for this to occur. The inclusion of a small park area / playground brings life outdoors.







### Suggested Actions

The list of suggested actions was formulated after a review of the Charter Township of Meridian Master Plan, the Zoning Ordinance, and the DDA Tax Increment and Development Plan. After review of the tax increment financing plan it was determined that the revenues forecasted in the Tax Increment Plan would be in the short-term insufficient for large-scale infrastructure projects and participation in redevelopment projects. As a result, the suggested actions were crafted to encourage the level of redevelopment proposed as a means to increase the captured valuation of the DDA District for long-term reinvestment.



Further, the Charter Township of Meridian Master Plan was consulted to ensure that recommendations advanced by this document were consistent with the plan for the traditional village area. It was noted in the Master Plan that the Okemos Village area should be maintained as a mixed use "village" and that the Smart Growth tenets applied to proposed redevelopment proposals. The Master Plan sets out a list of attributes to consider and these include:

- Mixed-Use, walkable neighborhoods
- Compact development
- Substantial public open space
- Infill development
- Variety in housing opportunities and choices
- Preserved farmland and critical environmental area
- Variety in transportation choices

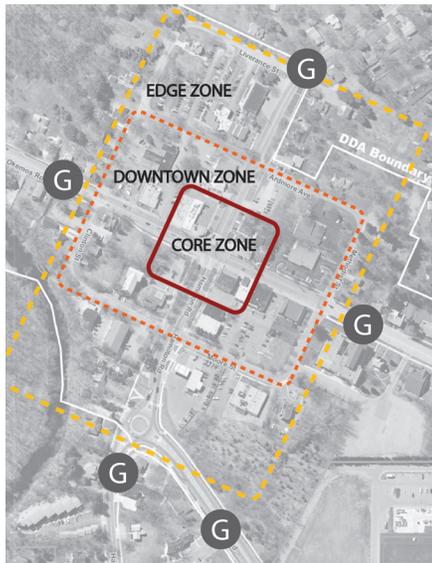
Lastly, the Charter Township of Meridian Zoning Ordinance was reviewed to determine if the suggested Framework Plan could be implemented with the current provisions and regulations. This review included a review of Article IV (District Regulations), Section 86-439; Planned Unit Development, Section 86-440; Mixed Use Planned Unit Development; and Section 86-441; Grand River Avenue Corridor Access Management Overlay District. The C-2, PO, RB and RC zoning districts were reviewed for the type and intensity of permitted uses and associated dimensional requirements.

It was concluded that the recommended Framework Plan was in conformance with the goals and objectives outlined in the Master Plan. As illustrated in the plan many of the Smart Growth tenets were incorporated including the use of infill development, higher density and compact development, design of infrastructure improvements to enhance walkability and connections between different land uses, and creating a variety of venues for housing (i.e single family, townhomes, and upper story residential).

Although the existing zoning will facilitate much of the Framework Plan several revisions are recommended and these include:

**C-2P Zoning District**

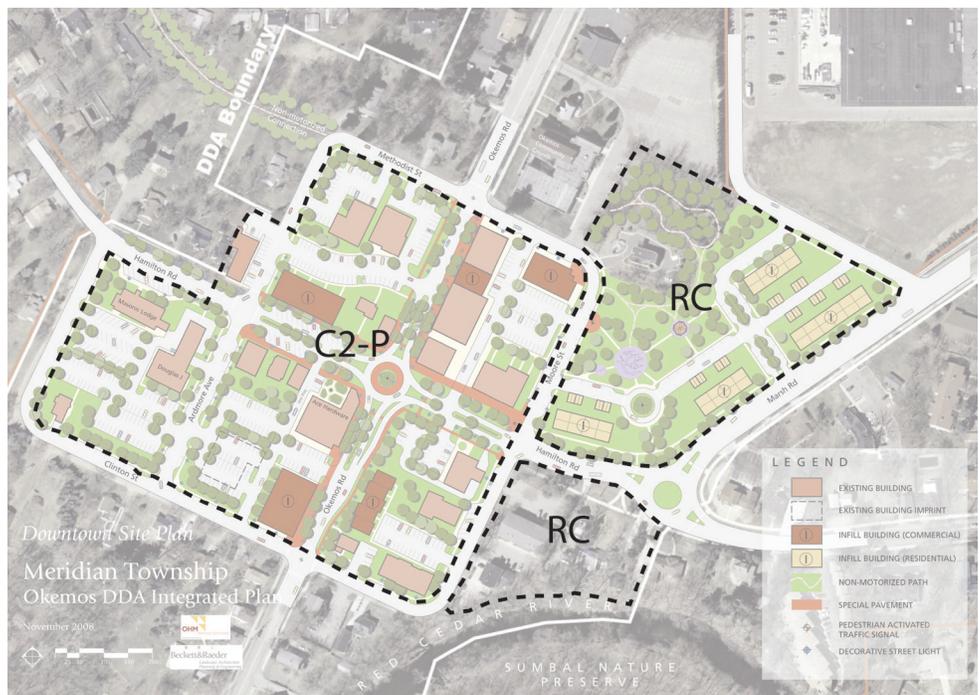
Create a hybrid of the C-2 called the C-2P District (Commercial - Pedestrian) which reorganizes uses by permitted right around pedestrian-oriented businesses and supporting services. For example, this district would allow upper story residential uses, prohibit all forms of vehicular drive-thru facilities, prohibit any type of light industrial use, reduce minimum lot width from 100 feet to 40 feet, and give businesses with conforming on-street property adjacent to thier property credit for these parking spaces. In addition, bars, taverns, lounges, and brewpubs could be located as a permitted use with the core zone and downtown zone of the C-2P district. This new district would be expanded throughout the downtown area as illustrated below.



Building height would be allowed up four stories in the Core Zone of the downtown, three stories in the Downtown Zone, and two-stories in other portions of the Business District.

**RC District**

Properties along the north side of Hamilton Road between Moore Street and the Meijer service drive and the south side of Hamilton Road between Clinton Street and the roundabout should be rezoned from C-2 (Commercial) to RC (Residential) to permit the redevelopment of these properties to higher density residential. The combination of these zoning revisions will create redevelopment opportunities which are consistent with the Framework Plan and the Charter Township of Meridian Master Plan.



### Okemos Village Overlay District

Preparation of an overlay district specifically tailored for the Okemos Village Area. This overlay would include:

- Design standards for off-street parking lots including screening, landscaping and internal lighting standards (illumination requirements, pole type, and luminaire type).
- Materials (buildings)
- Signs (projecting)
- Opportunity to use shared parking facilities

In addition to zoning revisions it is suggested that the following capital infrastructure projects be pursued by the DDA.



Example of projecting sign

### Roundabout

During the plan preparation process representatives from the Ingham County Road Commission were part of the deliberations on the traffic assessment and the conclusions leading to the recommendation of the roundabout. An outcome of the process was support for project financing using several highway funding programs: Congestion and Mitigation of Air Quality (CMAC) and transportation enhancement funding. Both funding sources are authorized under the 2005 Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAF-E TEA-LU). Concurrent with the roundabout it is recommended that the final traffic engineering include the feasibility of installing pedestrian actuated signals at the Okemos / Clinton and Okemos / Moore intersections.

### Okemos / Hamilton Intersection Enhancements

In conjunction with the roundabout it is recommended that the Okemos and Hamilton Road intersection be improved using the SAF-E TEA-LU enhancement program administrated through MDOT. The project area should include one block in each direction.

### Neighborhood Connection

A project within the funding capability of the DDA is the construction of the pedestrian pathways and gaeaways to the Cedar Bend Heights neighborhood using the Ardmore and Methodist right-of-ways. This connections would include wide asphalt or concrete pathway with context sensitive gateway structure at each end.





Chart & Summary Report  
Summary Demographic Benchmark Report  
OHM Traffic Assessment - Documentation

# Chart & Summary Report (%)



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|   | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|---|--------------------------------|-------------------------------|--------------------------------|
| <b>POPULATION</b>                       |                                |                               |                                |
| 1990 Total Population                   | 228                            | 1,935                         | 5,343                          |
| 2000 Total Population                   | 206                            | 1,770                         | 5,052                          |
| 2007 Total Population                   | 201                            | 1,717                         | 4,916                          |
| 2012 Total Population                   | 192                            | 1,645                         | 4,715                          |
| % Population Change 1990-2000           | -9.65%                         | -8.53%                        | -5.45%                         |
| % Population Change 2000-2007           | -2.43%                         | -2.99%                        | -2.69%                         |
| % Population Change 2007-2012           | -4.48%                         | -4.19%                        | -4.09%                         |
| <b>HOUSEHOLDS</b>                       |                                |                               |                                |
| 1990 Total Households                   | 113                            | 901                           | 2,119                          |
| 2000 Total Households                   | 113                            | 913                           | 2,228                          |
| 2007 Total Households                   | 120                            | 954                           | 2,345                          |
| 2012 Total Households                   | 123                            | 976                           | 2,397                          |
| % Households Change 1990-2000           | 0.00%                          | 1.33%                         | 5.14%                          |
| % Households Change 2000-2007           | 6.19%                          | 4.49%                         | 5.25%                          |
| % Households Change 2007-2012           | 2.50%                          | 2.31%                         | 2.22%                          |
| <b>2007 RACE</b>                        |                                |                               |                                |
| % 2007 White Population                 | 79.80%                         | 82.47%                        | 81.87%                         |
| % 2007 Black Population                 | 7.88%                          | 4.66%                         | 4.68%                          |
| % 2007 American Indian/Alaska Native    | 0.49%                          | 0.23%                         | 0.22%                          |
| % 2007 Asian/Hawaiian/Pacific Islander  | 7.39%                          | 9.20%                         | 9.83%                          |
| % 2007 Other Population (Incl 2+ Races) | 4.43%                          | 3.44%                         | 3.40%                          |
| % 2007 Hispanic Population              | 3.96%                          | 2.85%                         | 2.89%                          |
| % 2007 Non-Hispanic Population          | 96.04%                         | 97.15%                        | 97.11%                         |
| <b>INCOME</b>                           |                                |                               |                                |
| 2007 Per Capita Income                  | \$45,372                       | \$47,511                      | \$41,229                       |
| 2007 Median Household Income            | \$58,213                       | \$60,271                      | \$61,109                       |
| 2007 Average Household Income           | \$75,998                       | \$85,510                      | \$86,431                       |

4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

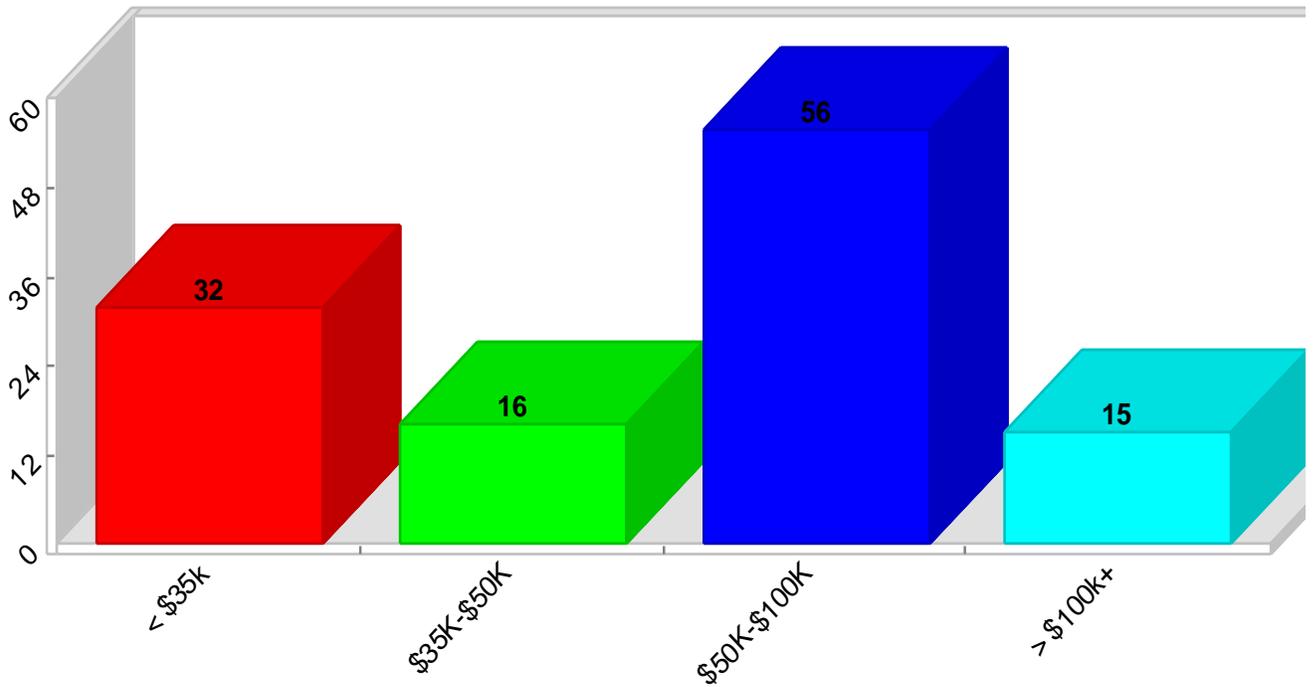
Coordinates Longitude: -84.429120  
Latitude: 42.716900

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|                                |                               |                                |
|--------------------------------|-------------------------------|--------------------------------|
| 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|--------------------------------|-------------------------------|--------------------------------|

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### Household Income



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

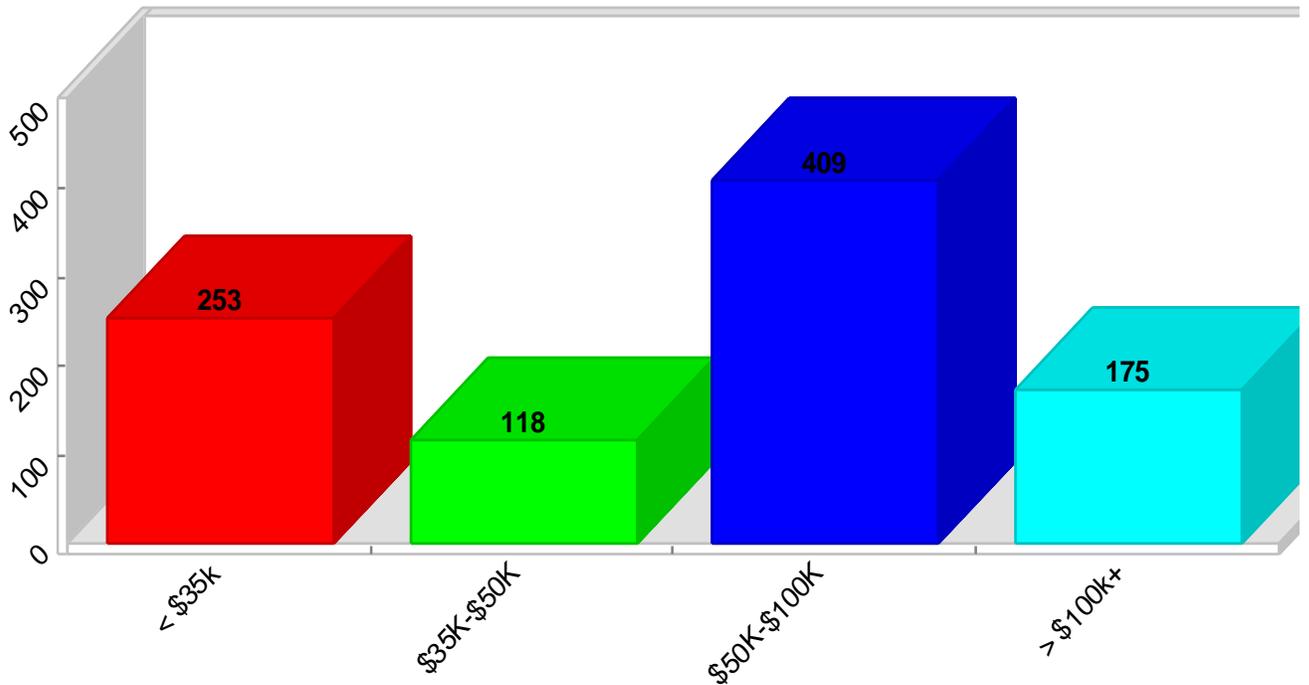
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|                                |                               |                                |
|--------------------------------|-------------------------------|--------------------------------|
| 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|--------------------------------|-------------------------------|--------------------------------|

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### Household Income



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

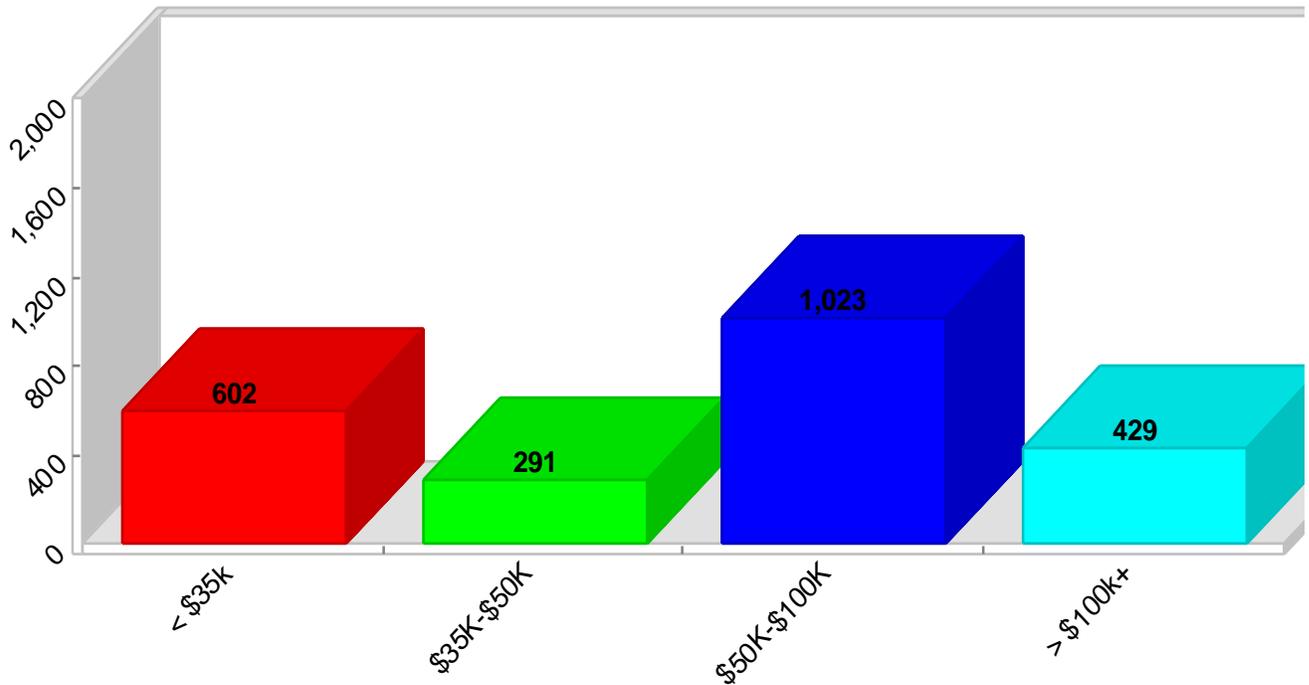
Coordinates Longitude: -84.429120  
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0.25 Mile  
Ring  
.20 sq/mi

0.5 Mile  
Ring  
.79 sq/mi

1.0 Mile  
Ring  
3.14 sq/mi

### Household Income



|   |        |        |        |
|---|--------|--------|--------|
| % 2007 Household Income < \$10,000          | 6.72%  | 5.97%  | 5.76%  |
| % 2007 Household Income \$10,000-\$14,999   | 5.04%  | 3.98%  | 3.84%  |
| % 2007 Household Income \$15,000-\$19,999   | 5.88%  | 5.76%  | 5.42%  |
| % 2007 Household Income \$20,000-\$24,999   | 0.84%  | 1.57%  | 1.71%  |
| % 2007 Household Income \$25,000-\$29,999   | 3.36%  | 4.08%  | 3.97%  |
| % 2007 Household Income \$30,000-\$34,999   | 5.04%  | 5.13%  | 4.99%  |
| % 2007 Household Income \$35,000-\$39,999   | 7.56%  | 5.03%  | 5.03%  |
| % 2007 Household Income \$40,000-\$44,999   | 1.68%  | 2.72%  | 2.86%  |
| % 2007 Household Income \$45,000-\$49,999   | 4.20%  | 4.61%  | 4.52%  |
| % 2007 Household Income \$50,000-\$59,999   | 11.76% | 10.89% | 10.87% |
| % 2007 Household Income \$60,000-\$74,999   | 15.97% | 14.45% | 14.12% |
| % 2007 Household Income \$75,000-\$99,999   | 19.33% | 17.49% | 18.64% |
| % 2007 Household Income \$100,000-\$124,999 | 4.20%  | 5.97%  | 6.10%  |
| % 2007 Household Income \$125,000-\$149,999 | 2.52%  | 4.71%  | 4.48%  |
| % 2007 Household Income \$150,000-\$199,999 | 0.84%  | 3.87%  | 3.80%  |
| % 2007 Household Income \$200,000-\$249,999 | 3.36%  | 1.26%  | 1.24%  |
| % 2007 Household Income \$250,000-\$499,999 | 1.68%  | 2.41%  | 2.60%  |
| % 2007 Household Income \$500,000+          | 0.00%  | 0.10%  | 0.09%  |

# Chart & Summary Report (%)



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

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|                                    | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|------------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 2007 Total Daytime Population      | 448                            | 2,827                         | 9,453                          |
| 2007 Total Daytime Work Population | 338                            | 2,005                         | 6,709                          |

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# Summary Demographic Benchmark Report



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|                                   | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|-----------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 2000 Total Population             | 206                            | 1,770                         | 5,052                          |
| 2007 Total Population             | 201                            | 1,717                         | 4,916                          |
| 2012 Total Population             | 192                            | 1,645                         | 4,715                          |
| 2000 Group Quarters Population    | 0                              | 0                             | 3                              |
| 2007 Group Quarters Population    | 0                              | 0                             | 3                              |
| 2012 Group Quarters Population    | 0                              | 0                             | 3                              |
| 2000 Pop in Family Households     | 149                            | 1,285                         | 3,704                          |
| 2000 Pop in Non-Family Households | 57                             | 485                           | 1,345                          |
| 2000 Total Households             | 113                            | 913                           | 2,228                          |
| 2007 Total Households             | 120                            | 954                           | 2,345                          |
| 2012 Total Households             | 123                            | 976                           | 2,397                          |
| <b>2000 HOUSEHOLDS</b>            |                                |                               |                                |
| 2000 Households 1 Person          | 35                             | 258                           | 627                            |
| 2000 Households 2 Persons         | 45                             | 366                           | 877                            |
| 2000 Households 3 Persons         | 16                             | 135                           | 334                            |
| 2000 Households 4 Persons         | 12                             | 103                           | 262                            |
| 2000 Households 5 Persons         | 4                              | 35                            | 89                             |
| 2000 Households 6 Persons         | 1                              | 13                            | 32                             |
| 2000 Households 7+ Persons        | 0                              | 3                             | 7                              |
| <b>2007 HOUSEHOLDS</b>            |                                |                               |                                |
| 2007 Households 1 Person          | 48                             | 366                           | 896                            |
| 2007 Households 2 Persons         | 41                             | 327                           | 794                            |
| 2007 Households 3 Persons         | 14                             | 120                           | 299                            |
| 2007 Households 4 Persons         | 11                             | 90                            | 227                            |
| 2007 Households 5 Persons         | 4                              | 33                            | 84                             |
| 2007 Households 6 Persons         | 1                              | 14                            | 36                             |
| 2007 Households 7+ Persons        | 0                              | 3                             | 9                              |
| <b>2012 HOUSEHOLDS</b>            |                                |                               |                                |
| 2012 Households 1 Person          | 58                             | 433                           | 1,053                          |
| 2012 Households 2 Persons         | 38                             | 312                           | 762                            |
| 2012 Households 3 Persons         | 12                             | 113                           | 280                            |
| 2012 Households 4 Persons         | 10                             | 75                            | 193                            |
| 2012 Households 5 Persons         | 3                              | 28                            | 72                             |
| 2012 Households 6 Persons         | 1                              | 13                            | 32                             |
| 2012 Households 7+ Persons        | 0                              | 2                             | 7                              |
| <b>2000 RACE AND ETHNICITY</b>    |                                |                               |                                |
| 2000 White Population Alone       | 170                            | 1,499                         | 4,255                          |
| 2000 Black Population Alone       | 15                             | 77                            | 221                            |

# Summary Demographic Benchmark Report



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|  | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|--|--------------------------------|-------------------------------|--------------------------------|
| 2000 American Indian/Alaska Native Alone | 1                              | 9                             | 25                             |
| 2000 Asian/Hawaiian/Pacific Islander     | 12                             | 126                           | 384                            |
| 2000 Other Population (Incl 2+ Races)    | 8                              | 59                            | 166                            |
| 2000 Hispanic Population                 | 7                              | 48                            | 137                            |
| 2000 Non-Hispanic Population             | 199                            | 1,722                         | 4,915                          |
| 2007 RACE AND ETHNICITY                  |                                |                               |                                |
| 2007 White Population                    | 162                            | 1,416                         | 4,024                          |
| 2007 Black Population                    | 16                             | 80                            | 230                            |
| 2007 American Indian/Alaska Native       | 1                              | 4                             | 11                             |
| 2007 Asian/Hawaiian/Pacific Islander     | 15                             | 158                           | 483                            |
| 2007 Other Population (Incl 2+ Races)    | 9                              | 59                            | 167                            |
| 2007 Hispanic Population                 | 8                              | 49                            | 142                            |
| 2007 Non-Hispanic Population             | 194                            | 1,668                         | 4,774                          |
| 2012 RACE AND ETHNICITY                  |                                |                               |                                |
| 2012 White Population                    | 159                            | 1,331                         | 3,833                          |
| 2012 Black Population                    | 15                             | 76                            | 217                            |
| 2012 American Indian/Alaska Native       | 0                              | 5                             | 13                             |
| 2012 Asian/Hawaiian/Pacific Islander     | 13                             | 138                           | 427                            |
| 2012 Other Population (Incl 2+ Races)    | 5                              | 93                            | 225                            |
| 2012 Hispanic Population                 | 5                              | 90                            | 215                            |
| 2012 Non-Hispanic Population             | 187                            | 1,554                         | 4,500                          |
| 2000 POPULATION BY AGE                   |                                |                               |                                |
| 2000 Age 0-5                             | 12                             | 96                            | 278                            |
| 2000 Age 6-13                            | 19                             | 161                           | 480                            |
| 2000 Age 14-17                           | 10                             | 96                            | 286                            |
| 2000 Age 18-20                           | 12                             | 100                           | 276                            |
| 2000 Age 21-24                           | 21                             | 208                           | 583                            |
| 2000 Age 25-29                           | 14                             | 113                           | 329                            |
| 2000 Age 30-34                           | 13                             | 83                            | 241                            |
| 2000 Age 35-39                           | 13                             | 96                            | 282                            |
| 2000 Age 40-44                           | 15                             | 116                           | 340                            |
| 2000 Age 45-49                           | 16                             | 139                           | 406                            |
| 2000 Age 50-54                           | 13                             | 141                           | 401                            |
| 2000 Age 55-59                           | 11                             | 114                           | 311                            |
| 2000 Age 60-64                           | 9                              | 77                            | 212                            |
| 2000 Age 65-69                           | 7                              | 71                            | 197                            |
| 2000 Age 70-74                           | 6                              | 50                            | 137                            |
| 2000 Age 75-79                           | 7                              | 54                            | 144                            |
| 2000 Age 80-84                           | 3                              | 35                            | 92                             |

# Summary Demographic Benchmark Report



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|                                  | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|----------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 2000 Age 85+                     | 2                              | 21                            | 57                             |
| 2000 Median Age Total Population | 34.2                           | 35.5                          | 34.9                           |
| 2000 Median Age Adult Population | 41.7                           | 43.7                          | 43.3                           |
| 2007 POPULATION BY AGE           |                                |                               |                                |
| 2007 Age 0-5                     | 12                             | 88                            | 257                            |
| 2007 Age 6-13                    | 16                             | 139                           | 419                            |
| 2007 Age 14-17                   | 7                              | 57                            | 168                            |
| 2007 Age 18-20                   | 6                              | 43                            | 122                            |
| 2007 Age 21-24                   | 14                             | 122                           | 338                            |
| 2007 Age 25-29                   | 22                             | 175                           | 508                            |
| 2007 Age 30-34                   | 15                             | 94                            | 275                            |
| 2007 Age 35-39                   | 12                             | 93                            | 277                            |
| 2007 Age 40-44                   | 14                             | 108                           | 321                            |
| 2007 Age 45-49                   | 14                             | 128                           | 378                            |
| 2007 Age 50-54                   | 13                             | 142                           | 407                            |
| 2007 Age 55-59                   | 16                             | 164                           | 448                            |
| 2007 Age 60-64                   | 14                             | 120                           | 330                            |
| 2007 Age 65-69                   | 8                              | 77                            | 215                            |
| 2007 Age 70-74                   | 5                              | 44                            | 120                            |
| 2007 Age 75-79                   | 7                              | 52                            | 139                            |
| 2007 Age 80-84                   | 4                              | 41                            | 109                            |
| 2007 Age 85+                     | 4                              | 32                            | 84                             |
| 2007 Median Age Total Population | 38.0                           | 41.2                          | 40.5                           |
| 2007 Median Age Adult Population | 44.4                           | 47.2                          | 46.6                           |
| 2012 POPULATION BY AGE           |                                |                               |                                |
| 2012 Age 0-5                     | 13                             | 106                           | 306                            |
| 2012 Age 6-13                    | 15                             | 122                           | 365                            |
| 2012 Age 14-17                   | 6                              | 54                            | 159                            |
| 2012 Age 18-20                   | 5                              | 43                            | 122                            |
| 2012 Age 21-24                   | 11                             | 106                           | 299                            |
| 2012 Age 25-29                   | 22                             | 202                           | 577                            |
| 2012 Age 30-34                   | 15                             | 100                           | 293                            |
| 2012 Age 35-39                   | 12                             | 84                            | 249                            |
| 2012 Age 40-44                   | 12                             | 92                            | 270                            |
| 2012 Age 45-49                   | 13                             | 101                           | 300                            |
| 2012 Age 50-54                   | 12                             | 115                           | 334                            |
| 2012 Age 55-59                   | 14                             | 142                           | 401                            |
| 2012 Age 60-64                   | 14                             | 130                           | 357                            |
| 2012 Age 65-69                   | 9                              | 84                            | 232                            |
| 2012 Age 70-74                   | 6                              | 52                            | 143                            |
| 2012 Age 75-79                   | 6                              | 44                            | 121                            |

# Summary Demographic Benchmark Report



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|                                  | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|----------------------------------|--------------------------------|-------------------------------|--------------------------------|
| 2012 Age 80-84                   | 4                              | 37                            | 101                            |
| 2012 Age 85+                     | 4                              | 32                            | 85                             |
| 2012 Median Age Total Population | 38.0                           | 39.3                          | 38.7                           |
| 2012 Median Age Adult Population | 45.0                           | 46.7                          | 46.2                           |
| 2000 MALE POPULATION BY AGE      |                                |                               |                                |
| 2000 Male Age 0-17               | 21                             | 185                           | 544                            |
| 2000 Male Age 19-44              | 45                             | 347                           | 988                            |
| 2000 Male Age 45-64              | 22                             | 219                           | 619                            |
| 2000 Male Age 65-84              | 10                             | 96                            | 262                            |
| 2000 Male Age 85+                | 1                              | 9                             | 22                             |
| 2000 Median Age Male Pop         | 31.9                           | 33.6                          | 33.0                           |
| 2000 Median Age Adult Male Pop   | 40.3                           | 43.0                          | 42.7                           |
| 2007 MALE POPULATION BY AGE      |                                |                               |                                |
| 2007 Male Age 0-17               | 18                             | 149                           | 444                            |
| 2007 Male Age 18-44              | 41                             | 310                           | 894                            |
| 2007 Male Age 45-64              | 26                             | 257                           | 728                            |
| 2007 Male Age 65-84              | 12                             | 100                           | 276                            |
| 2007 Male Age 85+                | 1                              | 14                            | 36                             |
| 2007 Median Age Male Pop         | 36.5                           | 39.8                          | 39.2                           |
| 2007 Median Age Adult Male Pop   | 43.3                           | 46.6                          | 46.1                           |
| 2012 MALE POPULATION BY AGE      |                                |                               |                                |
| 2012 Male Age 0-17               | 18                             | 145                           | 429                            |
| 2012 Male Age 18-44              | 39                             | 305                           | 876                            |
| 2012 Male Age 45-64              | 23                             | 229                           | 652                            |
| 2012 Male Age 65-84              | 12                             | 96                            | 269                            |
| 2012 Male Age 85+                | 1                              | 12                            | 32                             |
| 2012 Median Age Male Pop         | 35.3                           | 37.4                          | 37.0                           |
| 2012 Median Age Adult Male Pop   | 42.8                           | 45.7                          | 45.4                           |
| 2000 FEMALE POPULATION BY AGE    |                                |                               |                                |
| 2000 Female Age 0-17             | 20                             | 169                           | 499                            |
| 2000 Female Age 18-44            | 47                             | 369                           | 1,063                          |
| 2000 Female Age 45-64            | 27                             | 253                           | 709                            |
| 2000 Female Age 65-84            | 13                             | 114                           | 308                            |
| 2000 Female Age 85+              | 2                              | 13                            | 34                             |
| 2000 Median Age Female Pop       | 35.8                           | 37.2                          | 36.5                           |
| 2000 Median Age Adult Female Pop | 42.4                           | 44.4                          | 43.8                           |

# Summary Demographic Benchmark Report



4699 OKEMOS RD & 2139 HAMILTON RD OKEMOS MI 48864

1/29/2009

Coordinates Longitude: -84.429120  
Latitude: 42.716900

|  | 0.25 Mile<br>Ring<br>.20 sq/mi | 0.5 Mile<br>Ring<br>.79 sq/mi | 1.0 Mile<br>Ring<br>3.14 sq/mi |
|--|--------------------------------|-------------------------------|--------------------------------|
| <b>2007 FEMALE POPULATION BY AGE</b>     |                                |                               |                                |
| 2007 Female Age 0-17                     | 16                             | 133                           | 399                            |
| 2007 Female Age 18-44                    | 41                             | 326                           | 947                            |
| 2007 Female Age 45-64                    | 31                             | 297                           | 834                            |
| 2007 Female Age 65-84                    | 12                             | 114                           | 308                            |
| 2007 Female Age 85+                      | 2                              | 18                            | 49                             |
| 2007 Median Age Female Pop               | 39.7                           | 42.6                          | 41.7                           |
| 2007 Median Age Adult Female Pop         | 45.4                           | 47.7                          | 47.0                           |
| <b>2012 FEMALE POPULATION BY AGE</b>     |                                |                               |                                |
| 2012 Female Age 0-17                     | 17                             | 137                           | 402                            |
| 2012 Female Age 18-44                    | 38                             | 322                           | 935                            |
| 2012 Female Age 45-64                    | 29                             | 260                           | 741                            |
| 2012 Female Age 65-84                    | 13                             | 119                           | 328                            |
| 2012 Female Age 85+                      | 2                              | 20                            | 54                             |
| 2012 Median Age Female Pop               | 39.8                           | 40.8                          | 40.3                           |
| 2012 Median Age Adult Female Pop         | 46.5                           | 47.4                          | 46.8                           |
| <b>HOUSING</b>                           |                                |                               |                                |
| 2000 Owner Occupied Housing Units        | 72                             | 581                           | 1,441                          |
| 2000 Renter Occupied Housing Units       | 45                             | 299                           | 781                            |
| 2000 Vacant Housing Units                | 1                              | 23                            | 62                             |
| 2007 Total Owner Occupied Housing Units  | 77                             | 634                           | 1,584                          |
| 2007 Total Renter Occupied Housing Units | 41                             | 282                           | 747                            |

## **Okemos Road & Hamilton Road Intersection Improvements Summary of the Analysis of Alternatives**

Okemos Road runs north-south thru the heart of the DDA District, and is classified as a principal arterial. Hamilton Road runs east-west, and the intersection with Okemos Road forms the center of the study area. Hamilton Road to the east of Okemos Road is a Minor Arterial and to the west is a Collector. The 2007 traffic counts show approximately 41,800 cars entering the intersection on a daily basis, with the majority of the traffic carried by the north and south bound Okemos Road approaches and the westbound Hamilton Road approach. Peak hour turning movements are included in the appendix of this report.

Okemos Road is generally four lanes, with a dedicated right turn lane added northbound at Hamilton Road. Currently, turn restrictions exist on Okemos Road, with no left turns being allowed at Hamilton either northbound or southbound. Hamilton Road is four lanes east and west of Okemos Road. The left lane of westbound Hamilton Road acts as a defacto left turn lane during peak hour travel, although it is a combination left/thru lane. The intersection is currently signalized.

A system of local streets surrounds the Okemos / Hamilton intersection. These include Ardmore Avenue, Methodist Street, Moore Street, and Clinton Street. These are all relatively narrow two lane streets with the exception of Moore Street, which is wide enough to accommodate three lanes or two lanes with on-street parking.

The study area also included the Okemos Road and Grand River Avenue intersection, the Grand River and Marsh Road intersection, and the existing roundabout at the Hamilton and Marsh Road intersection. These areas were included in the study to determine the extent of the impact made by changes to the Okemos and Hamilton intersection.

This study was centered around the Okemos / Hamilton intersection and potential changes that would allow a reduction in the number of lanes for each approach. The overall goal was to improve pedestrian access in the core area. The main alternatives studied include:

- **Option 1** - Changing Hamilton to three lanes on both approaches, with the right lane of westbound Hamilton being a combination left, thru, right lane
- **Option 1A** – Same as Option 1, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street
- **Option 2** – Changing the westbound approach Hamilton to two dedicated left turn lanes with one thru lane in each direction, and a three lane approach section for eastbound Hamilton
- **Option 2A** – Same as Option 2, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street
- **Option 3** – Changing Hamilton to a typical three lane section, both approaches.

- **Option 3A** - Same as Option 3, in addition to removing the dedicated right turn lane on Okemos, and forcing turn movements at Clinton Street
- **Roundabout Option** – Removing the signal from the intersection and creating a roundabout. The roundabout was studied as a one lane roundabout with a dedicated right turn lane for northbound Okemos and a two lane roundabout for the westbound Hamilton approach including the dedicated right turn lane for northbound Okemos.

After analysis, which focused mainly on the peak hour traffic, each option proved to have pros and cons. The existing signalized intersection configuration operates as well as it can under the current traffic loads. None of the other signalized options (numbers 1-3) improved the overall level of service (LOS). The only significant change that can be made to the intersection was reflected in Option 3. This option entailed reducing the Hamilton Road cross section to 3 lanes including a dedicated turn lane. This would allow for a slightly shorter pedestrian crossing distance on Hamilton Road. Option 3 did increase delays for all legs and lowered the LOS for each approach, due to having to add a protected signal phase to the light timing to provide for the left turn movements on Hamilton. Further operational analysis may be able to improve the option and reduce delays.

Option 1A, 2A, & 3A were ruled out due to the Township's desire not to have heavy traffic loads on Clinton Street and the other ring roads. Historically, prior to the dedicated right turn lane being added to Okemos Road, traffic used this route to avoid congestion at the intersection. This proved detrimental to the residents and businesses along the route. It is noted that none of these options improved the overall LOS of the intersection.

The Roundabout Option was determined to be the best alternative if a significant character change to the area was desired. Two different configurations were studied. The most functional design calls for a two lane approach from southbound Okemos and eastbound Hamilton, and a three lane approach from northbound Okemos and westbound Hamilton. A very preliminary design for this configuration is included in the appendix. This design will have a very high level of service and minimal delays. However, right-of-way concerns may make this design difficult or impossible to build, especially when taking into account the necessary pedestrian access. During more detailed design, it may prove possible to adjust the approaches enough to actually construct this design, which is the best case scenario.

The alternative roundabout configuration called for two lanes on all approaches except northbound Okemos Road, which remained at three lanes. This option performs well although the possibility exists for some delays during peak hours. This option is very sensitive to driver error, which produces delay. This option can be built within the existing right-of-way and allow room for sidewalks, and trucks and emergency vehicles will be able to navigate the roundabout using the paved apron. The splitter islands for each roundabout offer safe have to pedestrians crossing the road, and proper signage will have to be used to warn motorists of the crossings.

In summary, only the Roundabout Options and Option 3 are realistic alternatives for improving or altering the intersection. As design progresses further review will determine the costs associated with each design and an evaluation of value can then be made. For detailed information on each option including schematic diagrams and detailed turning movement counts, please refer to the attachments in the appendix.

## Appendix



### Turning Movement Count Report - Cars & Trucks

| INT ID | ROAD 1      |  |  |  | ROAD 2    |  |  |  | COMMUNITY    |  |  |  | TMC DATE  |
|--------|-------------|--|--|--|-----------|--|--|--|--------------|--|--|--|-----------|
| 131    | Hamilton Rd |  |  |  | Okemos Rd |  |  |  | Meridian Twp |  |  |  | 9/13/2007 |

| CARS       |      |      |       |     |      |      |       |      |      |      |       |      |      |      |       |      |           |                |   |      |       |
|------------|------|------|-------|-----|------|------|-------|------|------|------|-------|------|------|------|-------|------|-----------|----------------|---|------|-------|
| Start Time | NB   |      |       |     | EB   |      |       |      | SB   |      |       |      | WB   |      |       |      |           |                |   |      |       |
|            | Left | Thru | Right | Ped | Left | Thru | Right | Ped  | Left | Thru | Right | Ped  | Left | Thru | Right | Ped  | App Total | Interval Total |   |      |       |
| 7:00 AM    | 0    | 49   | 39    | 0   | 88   | 1    | 7     | 3    | 0    | 11   | 0     | 51   | 2    | 0    | 53    | 60   | 7         | 4              | 0 | 71   | 223   |
| 7:15 AM    | 0    | 55   | 60    | 0   | 115  | 0    | 3     | 10   | 0    | 13   | 0     | 95   | 1    | 0    | 96    | 97   | 10        | 4              | 1 | 111  | 335   |
| 7:30 AM    | 0    | 58   | 65    | 0   | 123  | 1    | 6     | 20   | 0    | 27   | 0     | 138  | 1    | 0    | 139   | 145  | 8         | 5              | 0 | 158  | 447   |
| 7:45 AM    | 0    | 89   | 80    | 0   | 169  | 3    | 4     | 21   | 1    | 28   | 0     | 184  | 3    | 0    | 187   | 216  | 14        | 14             | 1 | 244  | 628   |
| 8:00 AM    | 0    | 128  | 94    | 0   | 222  | 4    | 2     | 9    | 2    | 15   | 0     | 117  | 1    | 0    | 118   | 207  | 19        | 4              | 0 | 230  | 585   |
| 8:15 AM    | 0    | 83   | 109   | 1   | 192  | 2    | 15    | 12   | 0    | 29   | 0     | 118  | 2    | 0    | 118   | 165  | 20        | 11             | 0 | 196  | 535   |
| 8:30 AM    | 0    | 70   | 117   | 2   | 187  | 1    | 10    | 7    | 0    | 18   | 0     | 119  | 5    | 0    | 124   | 160  | 25        | 12             | 0 | 197  | 526   |
| 8:45 AM    | 0    | 102  | 81    | 0   | 183  | 1    | 6     | 8    | 0    | 15   | 0     | 103  | 2    | 0    | 105   | 168  | 11        | 13             | 1 | 192  | 495   |
| 11:00 AM   | 0    | 118  | 90    | 1   | 208  | 5    | 17    | 10   | 0    | 32   | 0     | 80   | 3    | 0    | 83    | 90   | 11        | 6              | 0 | 107  | 430   |
| 11:15 AM   | 0    | 108  | 109   | 0   | 217  | 6    | 26    | 6    | 0    | 38   | 0     | 82   | 8    | 1    | 90    | 93   | 6         | 9              | 0 | 108  | 453   |
| 11:30 AM   | 0    | 111  | 131   | 0   | 242  | 5    | 6     | 12   | 0    | 23   | 0     | 87   | 4    | 0    | 91    | 94   | 14        | 9              | 0 | 117  | 473   |
| 11:45 AM   | 0    | 125  | 146   | 1   | 271  | 5    | 14    | 8    | 0    | 27   | 0     | 115  | 8    | 0    | 123   | 107  | 14        | 15             | 2 | 136  | 557   |
| 12:00 PM   | 0    | 158  | 138   | 2   | 296  | 11   | 22    | 9    | 1    | 42   | 0     | 121  | 5    | 0    | 126   | 110  | 11        | 11             | 0 | 132  | 596   |
| 12:15 PM   | 0    | 165  | 155   | 1   | 320  | 6    | 16    | 12   | 0    | 34   | 0     | 121  | 1    | 0    | 122   | 88   | 17        | 8              | 0 | 113  | 589   |
| 12:30 PM   | 0    | 148  | 133   | 2   | 281  | 10   | 18    | 16   | 0    | 44   | 0     | 128  | 6    | 0    | 134   | 117  | 27        | 6              | 0 | 150  | 609   |
| 12:45 PM   | 0    | 153  | 96    | 1   | 249  | 9    | 16    | 12   | 0    | 37   | 0     | 154  | 7    | 0    | 161   | 133  | 18        | 8              | 1 | 159  | 606   |
| 4:00 PM    | 0    | 152  | 146   | 1   | 298  | 9    | 14    | 16   | 0    | 39   | 0     | 141  | 6    | 1    | 147   | 138  | 28        | 17             | 0 | 183  | 667   |
| 4:15 PM    | 0    | 172  | 168   | 2   | 340  | 4    | 22    | 19   | 0    | 45   | 0     | 155  | 3    | 0    | 158   | 140  | 11        | 15             | 0 | 166  | 709   |
| 4:30 PM    | 0    | 167  | 158   | 0   | 325  | 8    | 28    | 23   | 0    | 59   | 0     | 124  | 3    | 0    | 127   | 105  | 17        | 9              | 0 | 131  | 642   |
| 4:45 PM    | 0    | 166  | 191   | 1   | 357  | 6    | 26    | 16   | 0    | 48   | 0     | 107  | 11   | 0    | 118   | 129  | 28        | 14             | 0 | 171  | 694   |
| 5:00 PM    | 0    | 204  | 187   | 7   | 391  | 10   | 28    | 19   | 0    | 57   | 0     | 160  | 5    | 0    | 165   | 126  | 6         | 11             | 0 | 143  | 756   |
| 5:15 PM    | 0    | 212  | 247   | 0   | 459  | 7    | 39    | 19   | 0    | 65   | 0     | 150  | 4    | 0    | 154   | 146  | 19        | 16             | 0 | 181  | 859   |
| 5:30 PM    | 0    | 180  | 198   | 0   | 378  | 6    | 33    | 15   | 0    | 54   | 0     | 147  | 7    | 0    | 154   | 141  | 23        | 9              | 0 | 173  | 759   |
| 5:45 PM    | 0    | 202  | 202   | 1   | 404  | 5    | 22    | 13   | 0    | 40   | 0     | 142  | 4    | 0    | 146   | 155  | 28        | 38             | 0 | 221  | 811   |
| Total      | 0    | 3175 | 3140  | 23  | 6315 | 125  | 400   | 315  | 4    | 840  | 0     | 2937 | 102  | 2    | 3039  | 3130 | 392       | 268            | 6 | 3790 | 13984 |
| App %      | 0.0  | 50.3 | 49.7  |     |      | 14.9 | 47.6  | 37.5 |      |      | 0.0   | 96.6 | 3.4  |      |       | 82.6 | 10.3      | 7.1            |   |      |       |
| Total %    | 0.0  | 22.7 | 22.5  |     | 45.2 | 0.9  | 2.9   | 2.3  |      | 6.0  | 0.0   | 21.0 | 0.7  |      | 21.7  | 22.4 | 2.8       | 1.9            |   | 27.1 |       |

| TRUCKS     |      |      |       |     |      |      |       |      |      |      |       |      |      |      |       |      |           |                |   |      |     |
|------------|------|------|-------|-----|------|------|-------|------|------|------|-------|------|------|------|-------|------|-----------|----------------|---|------|-----|
| Start Time | NB   |      |       |     | EB   |      |       |      | SB   |      |       |      | WB   |      |       |      |           |                |   |      |     |
|            | Left | Thru | Right | Ped | Left | Thru | Right | Ped  | Left | Thru | Right | Ped  | Left | Thru | Right | Ped  | App Total | Interval Total |   |      |     |
| 7:00 AM    | 0    | 5    | 4     | 0   | 9    | 0    | 0     | 0    | 0    | 0    | 0     | 0    | 0    | 0    | 0     | 0    | 9         | 9              |   |      |     |
| 7:15 AM    | 0    | 6    | 3     | 0   | 9    | 0    | 0     | 0    | 0    | 0    | 0     | 3    | 0    | 0    | 3     | 1    | 1         | 0              | 0 | 2    | 14  |
| 7:30 AM    | 0    | 3    | 3     | 0   | 6    | 0    | 0     | 0    | 0    | 0    | 0     | 6    | 0    | 0    | 6     | 2    | 0         | 0              | 0 | 2    | 14  |
| 7:45 AM    | 0    | 6    | 2     | 0   | 8    | 0    | 0     | 0    | 0    | 0    | 0     | 7    | 0    | 0    | 7     | 1    | 0         | 0              | 0 | 1    | 16  |
| 8:00 AM    | 0    | 3    | 5     | 0   | 8    | 0    | 0     | 1    | 1    | 1    | 0     | 3    | 0    | 0    | 3     | 1    | 0         | 0              | 0 | 1    | 13  |
| 8:15 AM    | 0    | 9    | 6     | 0   | 15   | 0    | 0     | 1    | 1    | 1    | 0     | 4    | 0    | 0    | 4     | 6    | 1         | 1              | 0 | 8    | 28  |
| 8:30 AM    | 0    | 3    | 2     | 0   | 5    | 0    | 0     | 0    | 0    | 0    | 0     | 1    | 0    | 0    | 1     | 4    | 0         | 0              | 0 | 4    | 10  |
| 8:45 AM    | 0    | 9    | 5     | 0   | 14   | 0    | 0     | 0    | 0    | 0    | 0     | 4    | 0    | 0    | 4     | 2    | 0         | 0              | 0 | 2    | 20  |
| 11:00 AM   | 0    | 6    | 4     | 0   | 10   | 0    | 0     | 0    | 0    | 0    | 0     | 3    | 0    | 0    | 3     | 4    | 0         | 0              | 0 | 4    | 17  |
| 11:15 AM   | 0    | 8    | 4     | 0   | 12   | 0    | 0     | 0    | 0    | 0    | 0     | 2    | 0    | 0    | 2     | 3    | 0         | 0              | 0 | 3    | 17  |
| 11:30 AM   | 0    | 6    | 4     | 0   | 10   | 0    | 1     | 1    | 2    | 2    | 0     | 4    | 0    | 0    | 4     | 3    | 0         | 2              | 0 | 5    | 21  |
| 11:45 AM   | 0    | 5    | 5     | 0   | 10   | 0    | 2     | 0    | 2    | 2    | 0     | 1    | 0    | 0    | 1     | 2    | 0         | 1              | 0 | 3    | 16  |
| 12:00 PM   | 0    | 8    | 4     | 0   | 12   | 1    | 0     | 0    | 1    | 1    | 0     | 5    | 0    | 0    | 5     | 3    | 2         | 0              | 0 | 5    | 23  |
| 12:15 PM   | 0    | 2    | 3     | 0   | 5    | 0    | 1     | 0    | 1    | 1    | 0     | 4    | 0    | 0    | 4     | 4    | 1         | 1              | 0 | 6    | 16  |
| 12:30 PM   | 0    | 8    | 6     | 0   | 14   | 0    | 1     | 0    | 1    | 1    | 0     | 5    | 4    | 0    | 9     | 5    | 0         | 0              | 0 | 5    | 29  |
| 12:45 PM   | 0    | 3    | 3     | 0   | 6    | 1    | 0     | 1    | 2    | 2    | 0     | 4    | 0    | 0    | 4     | 0    | 0         | 1              | 0 | 1    | 13  |
| 4:00 PM    | 0    | 1    | 5     | 0   | 6    | 0    | 0     | 2    | 2    | 2    | 0     | 2    | 0    | 0    | 2     | 3    | 0         | 0              | 0 | 3    | 13  |
| 4:15 PM    | 0    | 1    | 6     | 0   | 7    | 1    | 2     | 1    | 4    | 4    | 0     | 3    | 0    | 0    | 3     | 2    | 2         | 1              | 0 | 5    | 19  |
| 4:30 PM    | 0    | 4    | 3     | 0   | 7    | 0    | 1     | 0    | 1    | 1    | 0     | 2    | 0    | 0    | 2     | 4    | 0         | 0              | 0 | 4    | 14  |
| 4:45 PM    | 0    | 0    | 2     | 0   | 2    | 1    | 0     | 0    | 1    | 1    | 0     | 2    | 0    | 0    | 2     | 6    | 0         | 0              | 0 | 6    | 11  |
| 5:00 PM    | 0    | 6    | 2     | 0   | 8    | 0    | 0     | 0    | 0    | 0    | 0     | 3    | 0    | 0    | 3     | 2    | 0         | 0              | 0 | 2    | 13  |
| 5:15 PM    | 0    | 0    | 0     | 0   | 0    | 0    | 1     | 0    | 1    | 1    | 0     | 1    | 0    | 0    | 1     | 0    | 0         | 0              | 0 | 0    | 2   |
| 5:30 PM    | 0    | 1    | 1     | 0   | 2    | 0    | 1     | 0    | 1    | 1    | 0     | 2    | 0    | 0    | 2     | 4    | 0         | 0              | 0 | 4    | 9   |
| 5:45 PM    | 0    | 1    | 1     | 0   | 2    | 0    | 0     | 0    | 0    | 0    | 0     | 3    | 0    | 0    | 3     | 3    | 0         | 0              | 0 | 3    | 8   |
| Total      | 0    | 104  | 83    | 0   | 187  | 4    | 10    | 7    | 21   | 21   | 0     | 74   | 4    | 0    | 78    | 65   | 7         | 7              | 0 | 79   | 365 |
| App %      | 0.0  | 55.6 | 44.4  |     |      | 19.0 | 47.6  | 33.3 |      |      | 0.0   | 94.9 | 5.1  |      |       | 82.3 | 8.9       | 8.9            |   |      |     |
| Total %    | 0.0  | 28.5 | 22.7  |     | 51.2 | 1.1  | 2.7   | 1.9  | 5.8  | 6.0  | 0.0   | 20.3 | 1.1  |      | 21.4  | 17.8 | 1.9       | 1.9            |   | 21.6 |     |



Hamilton Okemos Intersection

EXISTING

|           |          |
|-----------|----------|
| SCALE     |          |
| H: 1"=40' | V: 1"=4' |
| SHEET     |          |
| ----      |          |
| OF Value  |          |

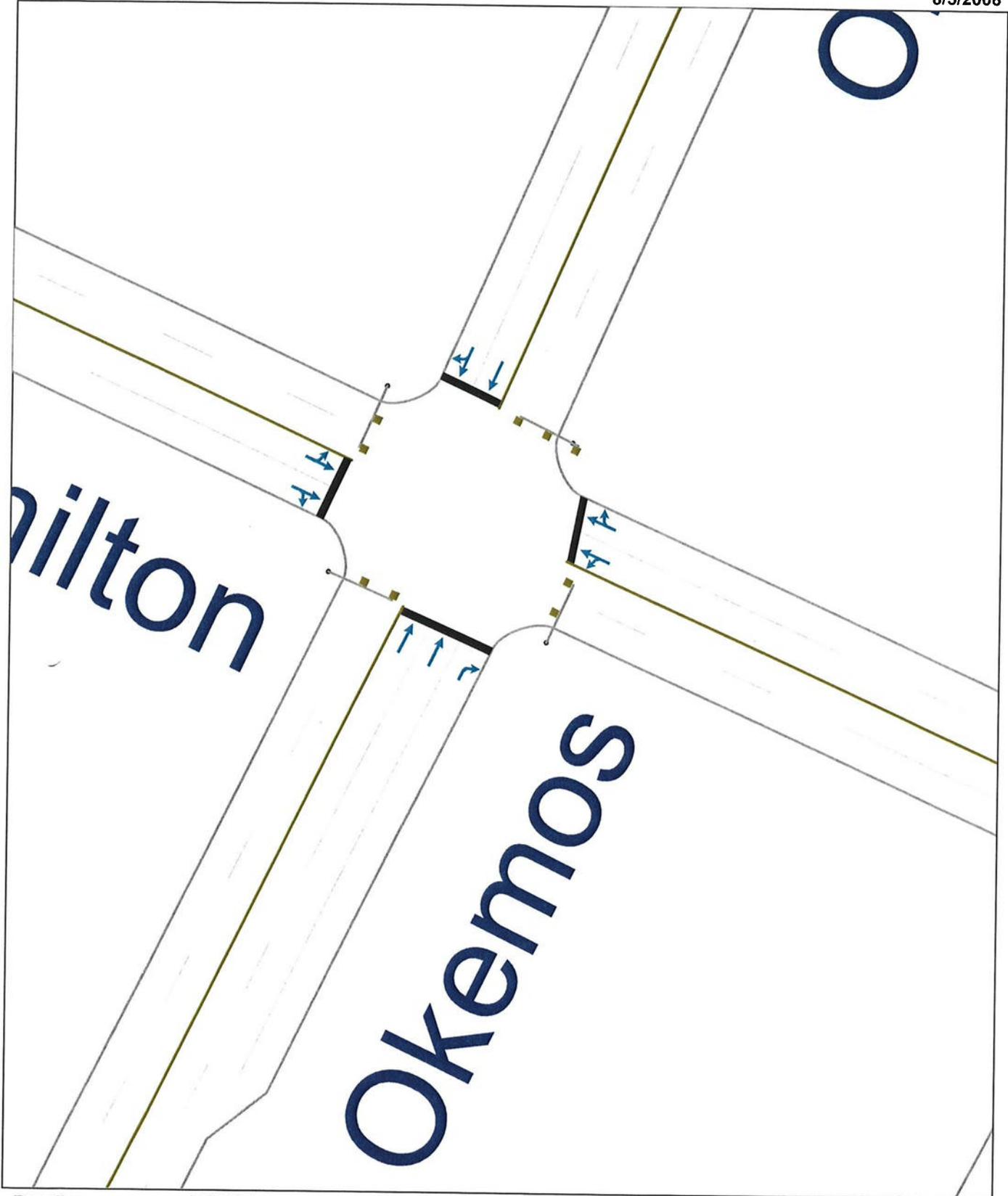
CLIENT:



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HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Existing  
8/5/2008



| Movement               | EBL  | EBT  | EBR  | WBL  | WBT    | WBR  | NBL  | NBT  | NBR   | SBL  | SBT  | SBR  |
|------------------------|------|------|------|------|--------|------|------|------|-------|------|------|------|
| Lane Configurations    |      | ↕↕   |      |      | ↕↕     |      |      | ↕↕   | ↕     |      | ↕↕   |      |
| Volume (vph)           | 28   | 124  | 66   | 577  | 76     | 74   | 0    | 806  | 838   | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900 | 1900 | 1900 | 1900   | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 |
| Total Lost time (s)    |      | 6.0  |      |      | 6.0    |      |      | 6.0  | 6.0   |      | 6.0  |      |
| Lane Util. Factor      |      | 0.95 |      |      | 0.95   |      |      | 0.95 | 1.00  |      | 0.95 |      |
| Frbp, ped/bikes        |      | 1.00 |      |      | 1.00   |      |      | 1.00 | 0.98  |      | 1.00 |      |
| Flpb, ped/bikes        |      | 1.00 |      |      | 1.00   |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Frt                    |      | 0.95 |      |      | 0.98   |      |      | 1.00 | 0.85  |      | 1.00 |      |
| Flt Protected          |      | 0.99 |      |      | 0.96   |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Satd. Flow (prot)      |      | 3385 |      |      | 3366   |      |      | 3574 | 1565  |      | 3524 |      |
| Flt Permitted          |      | 0.78 |      |      | 0.64   |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Satd. Flow (perm)      |      | 2657 |      |      | 2253   |      |      | 3574 | 1565  |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83 | 0.83 | 0.81 | 0.81   | 0.81 | 0.90 | 0.90 | 0.90  | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149  | 80   | 712  | 94     | 91   | 0    | 896  | 931   | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 48   | 0    | 0    | 11     | 0    | 0    | 0    | 373   | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 0    | 215  | 0    | 0    | 886    | 0    | 0    | 896  | 558   | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |      |      |      |        |      |      | 8    | 8     |      | 8    |      |
| Heavy Vehicles (%)     | 0%   | 2%   | 0%   | 2%   | 0%     | 0%   | 0%   | 1%   | 1%    | 0%   | 2%   | 0%   |
| Turn Type              | Perm |      |      | Perm |        |      |      |      | Perm  |      |      |      |
| Protected Phases       |      | 4    |      |      | 8      |      |      | 2    |       |      | 6    |      |
| Permitted Phases       | 4    |      |      | 8    |        |      |      |      | 2     |      |      |      |
| Actuated Green, G (s)  |      | 32.0 |      |      | 32.0   |      |      | 36.0 | 36.0  |      | 36.0 |      |
| Effective Green, g (s) |      | 32.0 |      |      | 32.0   |      |      | 36.0 | 36.0  |      | 36.0 |      |
| Actuated g/C Ratio     |      | 0.40 |      |      | 0.40   |      |      | 0.45 | 0.45  |      | 0.45 |      |
| Clearance Time (s)     |      | 6.0  |      |      | 6.0    |      |      | 6.0  | 6.0   |      | 6.0  |      |
| Lane Grp Cap (vph)     |      | 1063 |      |      | 901    |      |      | 1608 | 704   |      | 1586 |      |
| v/s Ratio Prot         |      |      |      |      |        |      |      | 0.25 |       |      | 0.19 |      |
| v/s Ratio Perm         |      | 0.08 |      |      | c0.39  |      |      |      | c0.36 |      |      |      |
| v/c Ratio              |      | 0.20 |      |      | 1.58dl |      |      | 0.56 | 0.79  |      | 0.42 |      |
| Uniform Delay, d1      |      | 15.7 |      |      | 23.7   |      |      | 16.1 | 18.8  |      | 15.0 |      |
| Progression Factor     |      | 1.00 |      |      | 1.00   |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Incremental Delay, d2  |      | 0.4  |      |      | 26.3   |      |      | 1.4  | 8.9   |      | 0.8  |      |
| Delay (s)              |      | 16.1 |      |      | 50.0   |      |      | 17.5 | 27.7  |      | 15.8 |      |
| Level of Service       |      | B    |      |      | D      |      |      | B    | C     |      | B    |      |
| Approach Delay (s)     |      | 16.1 |      |      | 50.0   |      |      | 22.7 |       |      | 15.8 |      |
| Approach LOS           |      | B    |      |      | D      |      |      | C    |       |      | B    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 27.7  | HCM Level of Service | C    |
| HCM Volume to Capacity ratio      | 0.88  |                      |      |
| Actuated Cycle Length (s)         | 80.0  | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 75.6% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Timing Report, Sorted By Phase  
1002: Hamilton & Okemos

Existing  
8/5/2008



| Phase Number           | 2     | 4     | 6     | 8     |
|------------------------|-------|-------|-------|-------|
| Movement               | NBT   | EBTL  | SBT   | WBTL  |
| Lead/Lag               |       |       |       |       |
| Lead-Lag Optimize      |       |       |       |       |
| Recall Mode            | Max   | Max   | Max   | Max   |
| Maximum Split (s)      | 42    | 38    | 42    | 38    |
| Maximum Split (%)      | 52.5% | 47.5% | 52.5% | 47.5% |
| Minimum Split (s)      | 26    | 26    | 26    | 26    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 5     | 5     | 5     | 5     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 3     | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     | 7     | 7     | 7     |
| Flash Dont Walk (s)    | 13    | 13    | 13    | 13    |
| Dual Entry             | Yes   | Yes   | Yes   | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 42    | 0     | 42    |
| End Time (s)           | 42    | 0     | 42    | 0     |
| Yield/Force Off (s)    | 36    | 74    | 36    | 74    |
| Yield/Force Off 170(s) | 23    | 61    | 23    | 61    |
| Local Start Time (s)   | 0     | 42    | 0     | 42    |
| Local Yield (s)        | 36    | 74    | 36    | 74    |
| Local Yield 170(s)     | 23    | 61    | 23    | 61    |

Intersection Summary

Cycle Length 80  
 Control Type Pretimed  
 Natural Cycle 75  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 1

|              |          |
|--------------|----------|
| SCALE        |          |
| H: 1"=40'    | V: 1"=4' |
| SHEET        |          |
| --- OF Value |          |

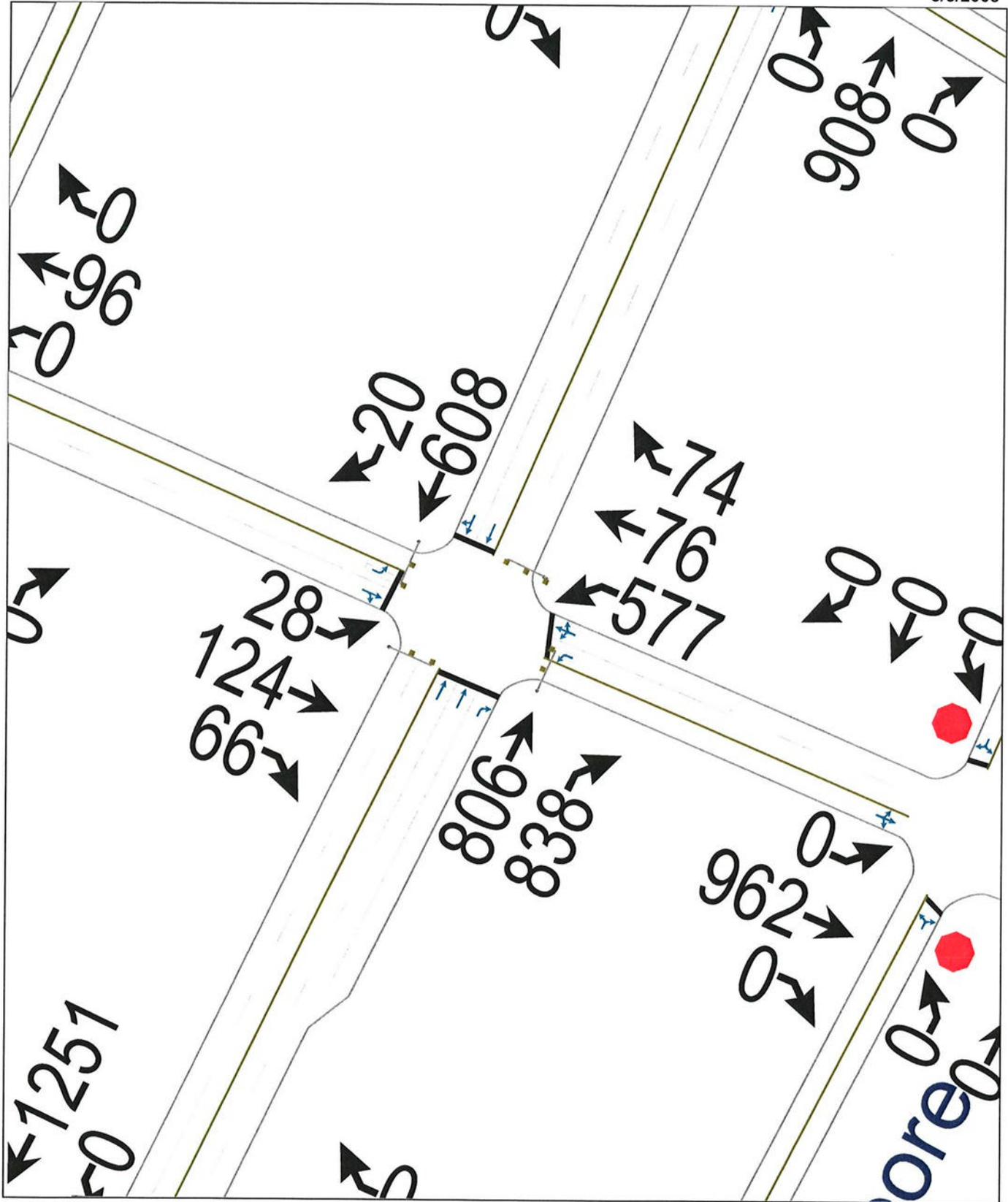
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HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Opt 1  
8/5/2008



| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT   | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|-------|------|------|------|------|
| Lane Configurations    | ↖    | ↗     |      | ↖     | ↕    |      |      | ↕     | ↗    |      | ↗    |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806   | 838  | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   | 6.0  |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 0.95  | 0.95 |      |      | 0.95  | 1.00 |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 0.98 |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Frt                    | 1.00 | 0.95  |      | 1.00  | 0.97 |      |      | 1.00  | 0.85 |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 0.97 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 1681  | 1681 |      |      | 3574  | 1563 |      | 3524 |      |
| Flt Permitted          | 0.31 | 1.00  |      | 0.62  | 0.69 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Satd. Flow (perm)      | 585  | 1777  |      | 1090  | 1194 |      |      | 3574  | 1563 |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90  | 0.90 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896   | 931  | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 21    | 0    | 0     | 10   | 0    | 0    | 0     | 647  | 0    | 2    | 0    |
| Lane Group Flow (vph)  | 34   | 208   | 0    | 434   | 453  | 0    | 0    | 896   | 284  | 0    | 674  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      |       | 8    |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%    | 1%   | 0%   | 2%   | 0%   |
| Turn Type              | Perm |       |      | Perm  |      |      | Perm |       |      | Perm |      |      |
| Protected Phases       |      | 4     |      |       | 8    |      |      | 2     |      |      | 6    |      |
| Permitted Phases       | 4    |       |      | 8     |      |      |      | 2     |      |      |      |      |
| Actuated Green, G (s)  | 13.0 | 13.0  |      | 37.0  | 37.0 |      |      | 22.0  | 22.0 |      | 22.0 |      |
| Effective Green, g (s) | 13.0 | 13.0  |      | 37.0  | 37.0 |      |      | 22.0  | 22.0 |      | 22.0 |      |
| Actuated g/C Ratio     | 0.14 | 0.14  |      | 0.41  | 0.41 |      |      | 0.24  | 0.24 |      | 0.24 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   | 6.0  |      | 6.0  |      |
| Lane Grp Cap (vph)     | 85   | 257   |      | 448   | 491  |      |      | 874   | 382  |      | 861  |      |
| v/s Ratio Prot         |      | c0.12 |      |       |      |      |      | c0.25 |      |      | 0.19 |      |
| v/s Ratio Perm         | 0.06 |       |      | c0.40 | 0.38 |      |      |       | 0.18 |      |      |      |
| v/c Ratio              | 0.40 | 0.81  |      | 0.97  | 0.92 |      |      | 1.03  | 0.74 |      | 0.78 |      |
| Uniform Delay, d1      | 35.0 | 37.3  |      | 25.9  | 25.1 |      |      | 34.0  | 31.4 |      | 31.8 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Incremental Delay, d2  | 13.4 | 23.2  |      | 35.4  | 25.3 |      |      | 37.0  | 12.4 |      | 7.0  |      |
| Delay (s)              | 48.4 | 60.5  |      | 61.3  | 50.4 |      |      | 71.0  | 43.8 |      | 38.8 |      |
| Level of Service       | D    | E     |      | E     | D    |      |      | E     | D    |      | D    |      |
| Approach Delay (s)     |      | 58.9  |      |       | 55.7 |      |      | 57.1  |      |      | 38.8 |      |
| Approach LOS           |      | E     |      |       | E    |      |      | E     |      |      | D    |      |

| Intersection Summary              |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 53.5  | HCM Level of Service | D    |
| HCM Volume to Capacity ratio      | 0.96  |                      |      |
| Actuated Cycle Length (s)         | 90.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 73.3% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

Timing Report, Sorted By Phase  
1002: Hamilton & Okemos

Opt 1  
8/5/2008



| Phase Number           | 2     | 4     | 6     | 8     |
|------------------------|-------|-------|-------|-------|
| Movement               | NBT   | EBTL  | SBT   | WBTL  |
| Lead/Lag               |       | Lead  |       | Lag   |
| Lead-Lag Optimize      |       | Yes   |       | Yes   |
| Recall Mode            | Max   | Max   | Max   | Max   |
| Maximum Split (s)      | 28    | 19    | 28    | 43    |
| Maximum Split (%)      | 31.1% | 21.1% | 31.1% | 47.8% |
| Minimum Split (s)      | 26    | 11    | 26    | 26    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 5     | 5     | 5     | 5     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |
| Dual Entry             | Yes   | Yes   | Yes   | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 28    | 0     | 47    |
| End Time (s)           | 28    | 47    | 28    | 0     |
| Yield/Force Off (s)    | 22    | 41    | 22    | 84    |
| Yield/Force Off 170(s) | 9     | 41    | 9     | 71    |
| Local Start Time (s)   | 0     | 28    | 0     | 47    |
| Local Yield (s)        | 22    | 41    | 22    | 84    |
| Local Yield 170(s)     | 9     | 41    | 9     | 71    |

Intersection Summary

Cycle Length 90  
Control Type Pretimed  
Natural Cycle 90  
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 1A

|              |          |
|--------------|----------|
| SCALE        |          |
| H: 1"=40'    | V: 1"=4' |
| SHEET        |          |
| --- OF Value |          |

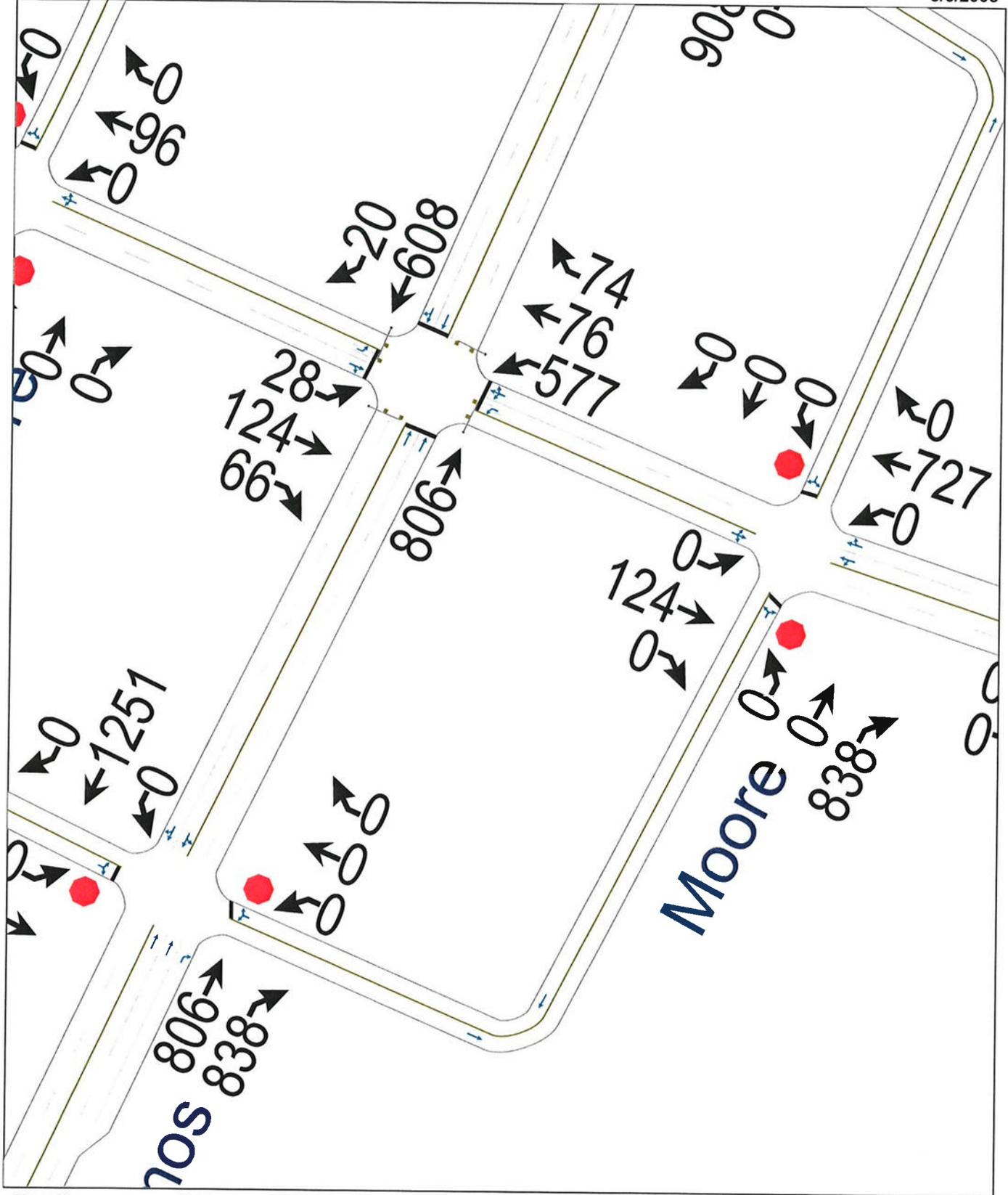
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Baseline  
Loveland

HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Opt 1a  
8/5/2008



| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT   | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|-------|------|------|------|------|
| Lane Configurations    | ↖    | ↗     |      | ↖     | ↕    |      |      | ↕     |      |      | ↕↗   |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806   | 0    | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 0.95  | 0.95 |      |      | 0.95  |      |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Frt                    | 1.00 | 0.95  |      | 1.00  | 0.97 |      |      | 1.00  |      |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 0.97 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 1681  | 1681 |      |      | 3574  |      |      | 3524 |      |
| Flt Permitted          | 0.36 | 1.00  |      | 0.62  | 0.69 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (perm)      | 691  | 1777  |      | 1090  | 1194 |      |      | 3574  |      |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90  | 0.90 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896   | 0    | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 21    | 0    | 0     | 10   | 0    | 0    | 0     | 0    | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 34   | 208   | 0    | 434   | 453  | 0    | 0    | 896   | 0    | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      |       | 8    |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%    | 1%   | 0%   | 2%   | 0%   |
| Turn Type              | Perm |       |      | Perm  |      |      |      |       |      |      |      |      |
| Protected Phases       |      | 4     |      |       | 8    |      |      | 2     |      |      | 6    |      |
| Permitted Phases       | 4    |       |      | 8     |      |      |      |       |      |      |      |      |
| Actuated Green, G (s)  | 11.0 | 11.0  |      | 37.0  | 37.0 |      |      | 24.0  |      |      | 24.0 |      |
| Effective Green, g (s) | 11.0 | 11.0  |      | 37.0  | 37.0 |      |      | 24.0  |      |      | 24.0 |      |
| Actuated g/C Ratio     | 0.12 | 0.12  |      | 0.41  | 0.41 |      |      | 0.27  |      |      | 0.27 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Lane Grp Cap (vph)     | 84   | 217   |      | 448   | 491  |      |      | 953   |      |      | 940  |      |
| v/s Ratio Prot         |      | c0.12 |      |       |      |      |      | c0.25 |      |      | 0.19 |      |
| v/s Ratio Perm         | 0.05 |       |      | c0.40 | 0.38 |      |      |       |      |      |      |      |
| v/c Ratio              | 0.40 | 0.96  |      | 0.97  | 0.92 |      |      | 0.94  |      |      | 0.72 |      |
| Uniform Delay, d1      | 36.5 | 39.3  |      | 25.9  | 25.1 |      |      | 32.3  |      |      | 29.9 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Incremental Delay, d2  | 13.9 | 51.1  |      | 35.4  | 25.3 |      |      | 17.9  |      |      | 4.7  |      |
| Delay (s)              | 50.3 | 90.4  |      | 61.3  | 50.4 |      |      | 50.1  |      |      | 34.6 |      |
| Level of Service       | D    | F     |      | E     | D    |      |      | D     |      |      | C    |      |
| Approach Delay (s)     |      | 85.2  |      |       | 55.7 |      |      | 50.1  |      |      | 34.6 |      |
| Approach LOS           |      | F     |      |       | E    |      |      | D     |      |      | C    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 51.5  | HCM Level of Service | D    |
| HCM Volume to Capacity ratio      | 0.96  |                      |      |
| Actuated Cycle Length (s)         | 90.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 68.1% | ICU Level of Service | C    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

Timing Report, Sorted By Phase  
 1002: Hamilton & Okemos

Opt 1a  
 8/5/2008



| Phase Number           | 2     | 4     | 6     | 8     |
|------------------------|-------|-------|-------|-------|
| Movement               | NBT   | EBTL  | SBT   | WBTL  |
| Lead/Lag               |       | Lead  |       | Lag   |
| Lead-Lag Optimize      |       | Yes   |       | Yes   |
| Recall Mode            | Max   | Max   | Max   | Max   |
| Maximum Split (s)      | 30    | 17    | 30    | 43    |
| Maximum Split (%)      | 33.3% | 18.9% | 33.3% | 47.8% |
| Minimum Split (s)      | 26    | 11    | 26    | 26    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 5     | 5     | 5     | 5     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |
| Dual Entry             | Yes   | Yes   | Yes   | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 30    | 0     | 47    |
| End Time (s)           | 30    | 47    | 30    | 0     |
| Yield/Force Off (s)    | 24    | 41    | 24    | 84    |
| Yield/Force Off 170(s) | 11    | 41    | 11    | 71    |
| Local Start Time (s)   | 0     | 30    | 0     | 47    |
| Local Yield (s)        | 24    | 41    | 24    | 84    |
| Local Yield 170(s)     | 11    | 41    | 11    | 71    |

Intersection Summary

Cycle Length 90  
 Control Type Pretimed  
 Natural Cycle 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 2

|              |          |
|--------------|----------|
| SCALE        |          |
| H: 1"=40'    | V: 1"=4' |
| SHEET        |          |
| --- OF Value |          |

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HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Opt 2  
8/5/2008



| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT  | NBR   | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|------|-------|------|------|------|
| Lane Configurations    |      |       |      |       |      |      |      |      |       |      |      |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806  | 838   | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0  | 6.0   |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 0.97  | 1.00 |      |      | 0.95 | 1.00  |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00 | 0.96  |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Frft                   | 1.00 | 0.95  |      | 1.00  | 0.93 |      |      | 1.00 | 0.85  |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 3433  | 1760 |      |      | 3574 | 1542  |      | 3524 |      |
| Flt Permitted          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Satd. Flow (perm)      | 1805 | 1777  |      | 3433  | 1760 |      |      | 3574 | 1542  |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90 | 0.90  | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896  | 931   | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 25    | 0    | 0     | 43   | 0    | 0    | 0    | 403   | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 34   | 205   | 0    | 712   | 142  | 0    | 0    | 896  | 529   | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      |      | 8     |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%   | 1%    | 0%   | 2%   | 0%   |
| Turn Type              | Prot |       |      | Prot  |      |      |      |      | Perm  |      |      |      |
| Protected Phases       | 7    | 4     |      | 3     | 8    |      |      | 2    |       |      | 6    |      |
| Permitted Phases       |      |       |      |       |      |      |      |      | 2     |      |      |      |
| Actuated Green, G (s)  | 5.0  | 10.0  |      | 18.0  | 23.0 |      |      | 34.0 | 34.0  |      | 34.0 |      |
| Effective Green, g (s) | 5.0  | 10.0  |      | 18.0  | 23.0 |      |      | 34.0 | 34.0  |      | 34.0 |      |
| Actuated g/C Ratio     | 0.06 | 0.12  |      | 0.22  | 0.29 |      |      | 0.42 | 0.42  |      | 0.42 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0  | 6.0   |      | 6.0  |      |
| Vehicle Extension (s)  | 3.0  | 3.0   |      | 3.0   | 3.0  |      |      | 3.0  | 3.0   |      | 3.0  |      |
| Lane Grp Cap (vph)     | 113  | 222   |      | 772   | 506  |      |      | 1519 | 655   |      | 1498 |      |
| v/s Ratio Prot         | 0.02 | c0.12 |      | c0.21 | 0.08 |      |      | 0.25 |       |      | 0.19 |      |
| v/s Ratio Perm         |      |       |      |       |      |      |      |      | c0.34 |      |      |      |
| v/c Ratio              | 0.30 | 0.92  |      | 0.92  | 0.28 |      |      | 0.59 | 0.81  |      | 0.45 |      |
| Uniform Delay, d1      | 35.8 | 34.6  |      | 30.3  | 22.1 |      |      | 17.6 | 20.1  |      | 16.3 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00 | 1.00  |      | 1.00 |      |
| Incremental Delay, d2  | 6.7  | 42.9  |      | 18.2  | 1.4  |      |      | 1.7  | 10.3  |      | 1.0  |      |
| Delay (s)              | 42.5 | 77.5  |      | 48.5  | 23.5 |      |      | 19.3 | 30.4  |      | 17.3 |      |
| Level of Service       | D    | E     |      | D     | C    |      |      | B    | C     |      | B    |      |
| Approach Delay (s)     |      | 73.0  |      |       | 43.3 |      |      | 25.0 |       |      | 17.3 |      |
| Approach LOS           |      | E     |      |       | D    |      |      | C    |       |      | B    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 31.5  | HCM Level of Service | C    |
| HCM Volume to Capacity ratio      | 0.86  |                      |      |
| Actuated Cycle Length (s)         | 80.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 73.3% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

Timing Report, Sorted By Phase  
1002: Hamilton & Okemos

Opt 2  
8/5/2008

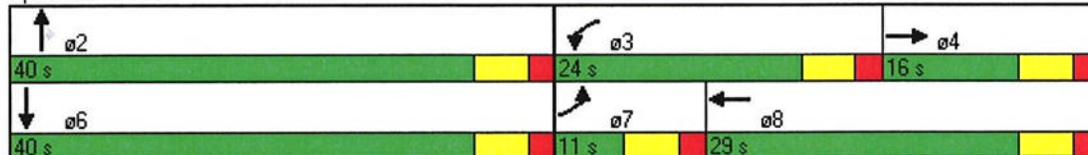


| Phase Number           | 2     | 3     | 4     | 6     | 7     | 8     |
|------------------------|-------|-------|-------|-------|-------|-------|
| Movement               | NBT   | WBL   | EBT   | SBT   | EBL   | WBT   |
| Lead/Lag               |       | Lead  | Lag   |       | Lead  | Lag   |
| Lead-Lag Optimize      |       | Yes   | Yes   |       | Yes   | Yes   |
| Recall Mode            | C-Max | Max   | Max   | C-Max | Max   | Max   |
| Maximum Split (s)      | 40    | 24    | 16    | 40    | 11    | 29    |
| Maximum Split (%)      | 50.0% | 30.0% | 20.0% | 50.0% | 13.8% | 36.3% |
| Minimum Split (s)      | 26    | 13    | 13    | 26    | 11    | 13    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 10    | 7     | 7     | 10    | 5     | 7     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |       | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |       | 13    |
| Dual Entry             | Yes   | No    | Yes   | Yes   | No    | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 40    | 64    | 0     | 40    | 51    |
| End Time (s)           | 40    | 64    | 0     | 40    | 51    | 0     |
| Yield/Force Off (s)    | 34    | 58    | 74    | 34    | 45    | 74    |
| Yield/Force Off 170(s) | 21    | 58    | 61    | 21    | 45    | 61    |
| Local Start Time (s)   | 0     | 40    | 64    | 0     | 40    | 51    |
| Local Yield (s)        | 34    | 58    | 74    | 34    | 45    | 74    |
| Local Yield 170(s)     | 21    | 58    | 61    | 21    | 45    | 61    |

Intersection Summary

Cycle Length 80  
 Control Type Actuated-Coordinated  
 Natural Cycle 75  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 2A

|              |          |
|--------------|----------|
| SCALE        |          |
| H: 1"=40'    | V: 1"=1' |
| SHEET        |          |
| --- OF Value |          |

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HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Opt 2a  
8/5/2008

| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT   | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|-------|------|------|------|------|
| Lane Configurations    |      |       |      |       |      |      |      |       |      |      |      |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806   | 0    | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 0.97  | 1.00 |      |      | 0.95  |      |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Frt                    | 1.00 | 0.95  |      | 1.00  | 0.93 |      |      | 1.00  |      |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 3433  | 1760 |      |      | 3574  |      |      | 3524 |      |
| Flt Permitted          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (perm)      | 1805 | 1777  |      | 3433  | 1760 |      |      | 3574  |      |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90  | 0.90 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896   | 0    | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 24    | 0    | 0     | 43   | 0    | 0    | 0     | 0    | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 34   | 205   | 0    | 712   | 142  | 0    | 0    | 896   | 0    | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      |       | 8    |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%    | 1%   | 0%   | 2%   | 0%   |
| Turn Type              | Prot |       |      | Prot  |      |      |      |       |      |      |      |      |
| Protected Phases       | 7    | 4     |      | 3     | 8    |      |      | 2     |      |      | 6    |      |
| Permitted Phases       |      |       |      |       |      |      |      |       |      |      |      |      |
| Actuated Green, G (s)  | 5.0  | 14.0  |      | 22.0  | 31.0 |      |      | 26.0  |      |      | 26.0 |      |
| Effective Green, g (s) | 5.0  | 14.0  |      | 22.0  | 31.0 |      |      | 26.0  |      |      | 26.0 |      |
| Actuated g/C Ratio     | 0.06 | 0.18  |      | 0.28  | 0.39 |      |      | 0.32  |      |      | 0.32 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Vehicle Extension (s)  | 3.0  | 3.0   |      | 3.0   | 3.0  |      |      | 3.0   |      |      | 3.0  |      |
| Lane Grp Cap (vph)     | 113  | 311   |      | 944   | 682  |      |      | 1162  |      |      | 1145 |      |
| v/s Ratio Prot         | 0.02 | c0.12 |      | c0.21 | 0.08 |      |      | c0.25 |      |      | 0.19 |      |
| v/s Ratio Perm         |      |       |      |       |      |      |      |       |      |      |      |      |
| v/c Ratio              | 0.30 | 0.66  |      | 0.75  | 0.21 |      |      | 0.77  |      |      | 0.59 |      |
| Uniform Delay, d1      | 35.8 | 30.8  |      | 26.5  | 16.3 |      |      | 24.3  |      |      | 22.5 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Incremental Delay, d2  | 6.7  | 10.5  |      | 5.6   | 0.7  |      |      | 5.0   |      |      | 2.2  |      |
| Delay (s)              | 42.5 | 41.3  |      | 32.1  | 17.0 |      |      | 29.3  |      |      | 24.7 |      |
| Level of Service       | D    | D     |      | C     | B    |      |      | C     |      |      | C    |      |
| Approach Delay (s)     |      | 41.4  |      |       | 29.0 |      |      | 29.3  |      |      | 24.7 |      |
| Approach LOS           |      | D     |      |       | C    |      |      | C     |      |      | C    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 29.2  | HCM Level of Service | C    |
| HCM Volume to Capacity ratio      | 0.74  |                      |      |
| Actuated Cycle Length (s)         | 80.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 64.3% | ICU Level of Service | C    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

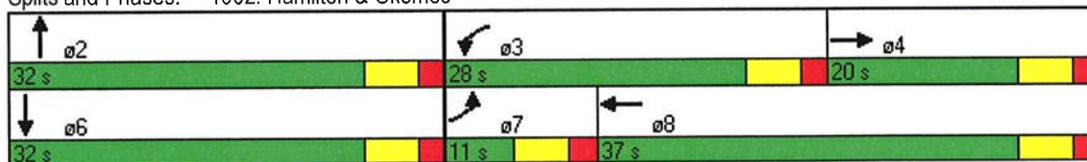


| Phase Number           | 2     | 3     | 4     | 6     | 7     | 8     |
|------------------------|-------|-------|-------|-------|-------|-------|
| Movement               | NBT   | WBL   | EBT   | SBT   | EBL   | WBT   |
| Lead/Lag               |       | Lead  | Lag   |       | Lead  | Lag   |
| Lead-Lag Optimize      |       | Yes   | Yes   |       | Yes   | Yes   |
| Recall Mode            | C-Max | Max   | Max   | C-Max | Max   | Max   |
| Maximum Split (s)      | 32    | 28    | 20    | 32    | 11    | 37    |
| Maximum Split (%)      | 40.0% | 35.0% | 25.0% | 40.0% | 13.8% | 46.3% |
| Minimum Split (s)      | 26    | 13    | 13    | 26    | 11    | 13    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 10    | 7     | 7     | 10    | 5     | 7     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |       | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |       | 13    |
| Dual Entry             | Yes   | No    | Yes   | Yes   | No    | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 32    | 60    | 0     | 32    | 43    |
| End Time (s)           | 32    | 60    | 0     | 32    | 43    | 0     |
| Yield/Force Off (s)    | 26    | 54    | 74    | 26    | 37    | 74    |
| Yield/Force Off 170(s) | 13    | 54    | 61    | 13    | 37    | 61    |
| Local Start Time (s)   | 0     | 32    | 60    | 0     | 32    | 43    |
| Local Yield (s)        | 26    | 54    | 74    | 26    | 37    | 74    |
| Local Yield 170(s)     | 13    | 54    | 61    | 13    | 37    | 61    |

Intersection Summary

Cycle Length 80  
 Control Type Actuated-Coordinated  
 Natural Cycle 60  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 3

|              |          |
|--------------|----------|
| SCALE        |          |
| H: 1"=40'    | V: 1"=4' |
| SHEET        |          |
| --- OF Value |          |

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HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

Opt 3  
8/5/2008



| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT   | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|-------|------|------|------|------|
| Lane Configurations    | ↖    | ↗     |      | ↖     | ↗    |      |      | ↑↑    | ↗    |      | ↑↗   |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806   | 838  | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   | 6.0  |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 0.95  | 1.00 |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 0.96 |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Frt                    | 1.00 | 0.95  |      | 1.00  | 0.93 |      |      | 1.00  | 0.85 |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 1770  | 1760 |      |      | 3574  | 1539 |      | 3524 |      |
| Flt Permitted          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Satd. Flow (perm)      | 1805 | 1777  |      | 1770  | 1760 |      |      | 3574  | 1539 |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90  | 0.90 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896   | 931  | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 21    | 0    | 0     | 39   | 0    | 0    | 0     | 629  | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 34   | 208   | 0    | 712   | 146  | 0    | 0    | 896   | 302  | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      | 8     | 8    |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%    | 1%   | 0%   | 2%   | 0%   |
| Turn Type              | Prot |       |      | Prot  |      |      | Perm |       |      |      |      |      |
| Protected Phases       | 7    | 4     |      | 3     | 8    |      |      | 2     |      |      | 6    |      |
| Permitted Phases       |      |       |      |       |      |      |      |       | 2    |      |      |      |
| Actuated Green, G (s)  | 5.0  | 10.0  |      | 37.0  | 42.0 |      |      | 25.0  | 25.0 |      | 25.0 |      |
| Effective Green, g (s) | 5.0  | 10.0  |      | 37.0  | 42.0 |      |      | 25.0  | 25.0 |      | 25.0 |      |
| Actuated g/C Ratio     | 0.06 | 0.11  |      | 0.41  | 0.47 |      |      | 0.28  | 0.28 |      | 0.28 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   | 6.0  |      | 6.0  |      |
| Vehicle Extension (s)  | 3.0  | 3.0   |      | 3.0   | 3.0  |      |      | 3.0   | 3.0  |      | 3.0  |      |
| Lane Grp Cap (vph)     | 100  | 197   |      | 728   | 821  |      |      | 993   | 428  |      | 979  |      |
| v/s Ratio Prot         | 0.02 | c0.12 |      | c0.40 | 0.08 |      |      | c0.25 |      |      | 0.19 |      |
| v/s Ratio Perm         |      |       |      |       |      |      |      |       | 0.20 |      |      |      |
| v/c Ratio              | 0.34 | 1.05  |      | 0.98  | 0.18 |      |      | 0.90  | 0.71 |      | 0.69 |      |
| Uniform Delay, d1      | 40.9 | 40.0  |      | 26.1  | 14.0 |      |      | 31.3  | 29.2 |      | 29.0 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  | 1.00 |      | 1.00 |      |
| Incremental Delay, d2  | 9.0  | 79.1  |      | 28.4  | 0.5  |      |      | 12.9  | 9.4  |      | 3.9  |      |
| Delay (s)              | 49.9 | 119.1 |      | 54.5  | 14.4 |      |      | 44.3  | 38.6 |      | 32.9 |      |
| Level of Service       | D    | F     |      | D     | B    |      |      | D     | D    |      | C    |      |
| Approach Delay (s)     |      | 110.2 |      |       | 46.2 |      |      | 41.4  |      |      | 32.9 |      |
| Approach LOS           |      | F     |      |       | D    |      |      | D     |      |      | C    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 46.0  | HCM Level of Service | D    |
| HCM Volume to Capacity ratio      | 0.96  |                      |      |
| Actuated Cycle Length (s)         | 90.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 79.8% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

Timing Report, Sorted By Phase  
1002: Hamilton & Okemos

Opt 3  
8/5/2008

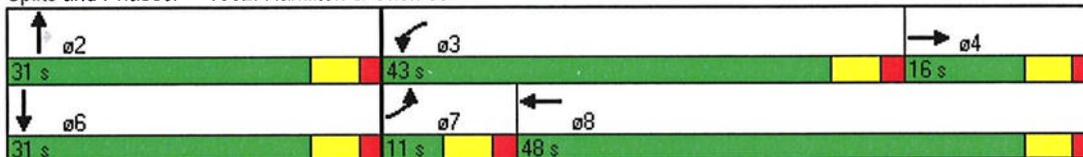


| Phase Number           | 2     | 3     | 4     | 6     | 7     | 8     |
|------------------------|-------|-------|-------|-------|-------|-------|
| Movement               | NBT   | WBL   | EBT   | SBT   | EBL   | WBT   |
| Lead/Lag               |       | Lead  | Lag   |       | Lead  | Lag   |
| Lead-Lag Optimize      |       | Yes   | Yes   |       | Yes   | Yes   |
| Recall Mode            | C-Max | Max   | Max   | C-Max | Max   | Max   |
| Maximum Split (s)      | 31    | 43    | 16    | 31    | 11    | 48    |
| Maximum Split (%)      | 34.4% | 47.8% | 17.8% | 34.4% | 12.2% | 53.3% |
| Minimum Split (s)      | 26    | 13    | 13    | 26    | 11    | 13    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 10    | 7     | 7     | 10    | 5     | 7     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |       | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |       | 13    |
| Dual Entry             | Yes   | No    | Yes   | Yes   | No    | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 31    | 74    | 0     | 31    | 42    |
| End Time (s)           | 31    | 74    | 0     | 31    | 42    | 0     |
| Yield/Force Off (s)    | 25    | 68    | 84    | 25    | 36    | 84    |
| Yield/Force Off 170(s) | 12    | 68    | 71    | 12    | 36    | 71    |
| Local Start Time (s)   | 0     | 31    | 74    | 0     | 31    | 42    |
| Local Yield (s)        | 25    | 68    | 84    | 25    | 36    | 84    |
| Local Yield 170(s)     | 12    | 68    | 71    | 12    | 36    | 71    |

Intersection Summary

Cycle Length 90  
 Control Type Actuated-Coordinated  
 Natural Cycle 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos





Hamilton Okemos Intersection

OPTION 3A

CLIENT:

---

SCALE  
H: 1"=40' V: 1"=4'

SHEET

----  
OF Value



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DRAWING PATH: C:\DOCUME~1\matt\LOCAL S~1\Temp\AsP\Pub\sh\_952\Methodan\_Intersection.dwg Aug 06, 2008 - 2:06pm



HCM Signalized Intersection Capacity Analysis  
1002: Hamilton & Okemos

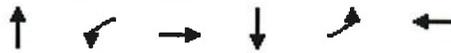
Opt 3a  
8/5/2008



| Movement               | EBL  | EBT   | EBR  | WBL   | WBT  | WBR  | NBL  | NBT   | NBR  | SBL  | SBT  | SBR  |
|------------------------|------|-------|------|-------|------|------|------|-------|------|------|------|------|
| Lane Configurations    |      |       |      |       |      |      |      |       |      |      |      |      |
| Volume (vph)           | 28   | 124   | 66   | 577   | 76   | 74   | 0    | 806   | 0    | 0    | 608  | 20   |
| Ideal Flow (vphpl)     | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 | 1900 | 1900  | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s)    | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Lane Util. Factor      | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 0.95  |      |      | 0.95 |      |
| Frbp, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Flpb, ped/bikes        | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Frt                    | 1.00 | 0.95  |      | 1.00  | 0.93 |      |      | 1.00  |      |      | 1.00 |      |
| Flt Protected          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (prot)      | 1805 | 1777  |      | 1770  | 1760 |      |      | 3574  |      |      | 3524 |      |
| Flt Permitted          | 0.95 | 1.00  |      | 0.95  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Satd. Flow (perm)      | 1805 | 1777  |      | 1770  | 1760 |      |      | 3574  |      |      | 3524 |      |
| Peak-hour factor, PHF  | 0.83 | 0.83  | 0.83 | 0.81  | 0.81 | 0.81 | 0.90 | 0.90  | 0.90 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph)        | 34   | 149   | 80   | 712   | 94   | 91   | 0    | 896   | 0    | 0    | 654  | 22   |
| RTOR Reduction (vph)   | 0    | 21    | 0    | 0     | 39   | 0    | 0    | 0     | 0    | 0    | 3    | 0    |
| Lane Group Flow (vph)  | 34   | 208   | 0    | 712   | 146  | 0    | 0    | 896   | 0    | 0    | 673  | 0    |
| Confl. Peds. (#/hr)    |      |       |      |       |      |      |      |       | 8    |      |      |      |
| Heavy Vehicles (%)     | 0%   | 2%    | 0%   | 2%    | 0%   | 0%   | 0%   | 1%    | 1%   | 0%   | 2%   | 0%   |
| Turn Type              | Prot |       |      | Prot  |      |      |      |       |      |      |      |      |
| Protected Phases       | 7    | 4     |      | 3     | 8    |      |      | 2     |      |      | 6    |      |
| Permitted Phases       |      |       |      |       |      |      |      |       |      |      |      |      |
| Actuated Green, G (s)  | 5.0  | 10.0  |      | 37.0  | 42.0 |      |      | 25.0  |      |      | 25.0 |      |
| Effective Green, g (s) | 5.0  | 10.0  |      | 37.0  | 42.0 |      |      | 25.0  |      |      | 25.0 |      |
| Actuated g/C Ratio     | 0.06 | 0.11  |      | 0.41  | 0.47 |      |      | 0.28  |      |      | 0.28 |      |
| Clearance Time (s)     | 6.0  | 6.0   |      | 6.0   | 6.0  |      |      | 6.0   |      |      | 6.0  |      |
| Vehicle Extension (s)  | 3.0  | 3.0   |      | 3.0   | 3.0  |      |      | 3.0   |      |      | 3.0  |      |
| Lane Grp Cap (vph)     | 100  | 197   |      | 728   | 821  |      |      | 993   |      |      | 979  |      |
| v/s Ratio Prot         | 0.02 | c0.12 |      | c0.40 | 0.08 |      |      | c0.25 |      |      | 0.19 |      |
| v/s Ratio Perm         |      |       |      |       |      |      |      |       |      |      |      |      |
| v/c Ratio              | 0.34 | 1.05  |      | 0.98  | 0.18 |      |      | 0.90  |      |      | 0.69 |      |
| Uniform Delay, d1      | 40.9 | 40.0  |      | 26.1  | 14.0 |      |      | 31.3  |      |      | 29.0 |      |
| Progression Factor     | 1.00 | 1.00  |      | 1.00  | 1.00 |      |      | 1.00  |      |      | 1.00 |      |
| Incremental Delay, d2  | 9.0  | 79.1  |      | 28.4  | 0.5  |      |      | 12.9  |      |      | 3.9  |      |
| Delay (s)              | 49.9 | 119.1 |      | 54.5  | 14.4 |      |      | 44.3  |      |      | 32.9 |      |
| Level of Service       | D    | F     |      | D     | B    |      |      | D     |      |      | C    |      |
| Approach Delay (s)     |      | 110.2 |      |       | 46.2 |      |      | 44.3  |      |      | 32.9 |      |
| Approach LOS           |      | F     |      |       | D    |      |      | D     |      |      | C    |      |

Intersection Summary

|                                   |       |                      |      |
|-----------------------------------|-------|----------------------|------|
| HCM Average Control Delay         | 48.5  | HCM Level of Service | D    |
| HCM Volume to Capacity ratio      | 0.96  |                      |      |
| Actuated Cycle Length (s)         | 90.0  | Sum of lost time (s) | 18.0 |
| Intersection Capacity Utilization | 79.8% | ICU Level of Service | D    |
| Analysis Period (min)             | 15    |                      |      |
| c Critical Lane Group             |       |                      |      |

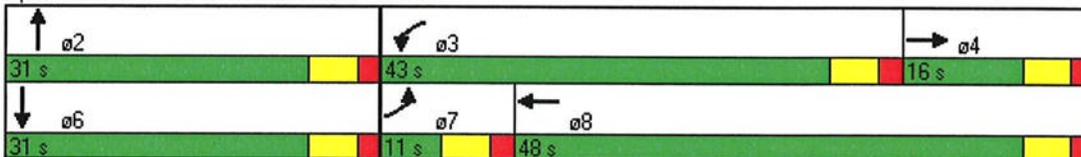


| Phase Number           | 2     | 3     | 4     | 6     | 7     | 8     |
|------------------------|-------|-------|-------|-------|-------|-------|
| Movement               | NBT   | WBL   | EBT   | SBT   | EBL   | WBT   |
| Lead/Lag               |       | Lead  | Lag   |       | Lead  | Lag   |
| Lead-Lag Optimize      |       | Yes   | Yes   |       | Yes   | Yes   |
| Recall Mode            | C-Max | Max   | Max   | C-Max | Max   | Max   |
| Maximum Split (s)      | 31    | 43    | 16    | 31    | 11    | 48    |
| Maximum Split (%)      | 34.4% | 47.8% | 17.8% | 34.4% | 12.2% | 53.3% |
| Minimum Split (s)      | 26    | 13    | 13    | 26    | 11    | 13    |
| Yellow Time (s)        | 4     | 4     | 4     | 4     | 4     | 4     |
| All-Red Time (s)       | 2     | 2     | 2     | 2     | 2     | 2     |
| Minimum Initial (s)    | 10    | 7     | 7     | 10    | 5     | 7     |
| Vehicle Extension (s)  | 3     | 3     | 3     | 3     | 3     | 3     |
| Minimum Gap (s)        | 0.2   | 3     | 3     | 3     | 3     | 3     |
| Time Before Reduce (s) | 0     | 0     | 0     | 0     | 0     | 0     |
| Time To Reduce (s)     | 0     | 0     | 0     | 0     | 0     | 0     |
| Walk Time (s)          | 7     |       | 7     | 7     |       | 7     |
| Flash Dont Walk (s)    | 13    |       | 13    | 13    |       | 13    |
| Dual Entry             | Yes   | No    | Yes   | Yes   | No    | Yes   |
| Inhibit Max            | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Start Time (s)         | 0     | 31    | 74    | 0     | 31    | 42    |
| End Time (s)           | 31    | 74    | 0     | 31    | 42    | 0     |
| Yield/Force Off (s)    | 25    | 68    | 84    | 25    | 36    | 84    |
| Yield/Force Off 170(s) | 12    | 68    | 71    | 12    | 36    | 71    |
| Local Start Time (s)   | 0     | 31    | 74    | 0     | 31    | 42    |
| Local Yield (s)        | 25    | 68    | 84    | 25    | 36    | 84    |
| Local Yield 170(s)     | 12    | 68    | 71    | 12    | 36    | 71    |

**Intersection Summary**

Cycle Length 90  
 Control Type Actuated-Coordinated  
 Natural Cycle 90  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Splits and Phases: 1002: Hamilton & Okemos



```

*****
*
* 13:10:08 HAMILTON + OKEMOS 68
*
*****
*
* E (m) 4.00 8.00 4.00 4.00 * TIME PERIOD min 90 *
* L' (m) 00.00 50.00 00.00 00.00 * TIME SLICE min 15 *
* V (m) 4.00 4.00 4.00 4.00 * RESULTS PERIOD min 15 75 *
* RAD (m) 20.00 20.00 20.00 20.00 * TIME COST $/hr 15.00 *
* PHI (d) 30.00 30.00 30.00 30.00 * FLOW PERIOD min 15 75 *
* DIA (m) 35.35 30.50 35.35 30.50 * FLOW TYPE pcu/veh VEH *
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM *
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*NB OKEMOS *1.02* 000 806 000 0 *1.00*50*0.75 1.125 0.75*15 45 75 *
*WB HAMILT *1.02* 074 076 577 0 *1.00*50*0.75 1.125 0.75*15 45 75 *
*SB OKEMOS *1.02* 020 608 000 0 *1.00*50*0.75 1.125 0.75*15 45 75 *
*EB HAMILT *1.02* 066 124 028 0 *1.00*50*0.75 1.125 0.75*15 45 75 *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*****
*
* FLOW veh 806 727 628 218 *
* CAPACITY veh 1104 1505 828 528 * AVDEL s 12.5 *
* AVE DELAY mins 0.21 0.08 0.36 0.20 * L O S B *
* MAX DELAY mins 0.33 0.11 0.63 0.32 * VEH HRS 8.2 *
* AVE QUEUE veh 3 1 4 1 * COST $ 123.4 *
* MAX QUEUE veh 4 1 6 1 *
*
*****

```

AS SHOWN ON EXHIBIT - ZWB APPROACH LANES,  
NB RT BYPASS

```

*****
*
* 13:10:08 HAMILTON + OKEMOS 1 68
*
*****
*
* E (m) 4.00 4.00 4.00 4.00 * TIME PERIOD min 90
* L' (m) 00.00 00.00 00.00 00.00 * TIME SLICE min 15
* V (m) 4.00 4.00 4.00 4.00 * RESULTS PERIOD min 15 75
* RAD (m) 20.00 20.00 20.00 20.00 * TIME COST $/hr 15.00
* PHI (d) 30.00 30.00 30.00 30.00 * FLOW PERIOD min 15 75
* DIA (m) 30.50 30.50 30.50 30.50 * FLOW TYPE pcu/veh VEH
* GRAD SEP 0 0 0 0 * FLOW PEAK am/op/pm PM
*
*****
* LEG NAME *PCU *FLOWS (1st exit 2nd etc...U)*FLOF*CL* FLOW RATIO *FLOW TIME*
* * * * * * * * * * *
*NB OKEMOS *1.02* 000 806 000 0 *1.00*50*0.75 1.125 0.75*15 45 75
*WB HAMILT *1.02* 074 076 577 0 *1.00*50*0.75 1.125 0.75*15 45 75
*SB OKEMOS *1.02* 020 608 000 0 *1.00*50*0.75 1.125 0.75*15 45 75
*EB HAMILT *1.02* 066 124 028 0 *1.00*50*0.75 1.125 0.75*15 45 75
* * * * *
* * * * *
* * * * *
*****
*
* FLOW veh 806 727 628 218
* CAPACITY veh 1104 724 845 547 * AVDEL s 59.7
* AVE DELAY mins 0.21 2.73 0.27 0.18 * L O S F
* MAX DELAY mins 0.33 5.43 0.43 0.26 * VEH HRS 39.5
* AVE QUEUE veh 3 38 3 1 * COST $ 592.2
* MAX QUEUE veh 4 68 4 1
*
*****

```

OPT 1 - ALL DIRECTIONS 1-LANE PLUS NB  
RT BYPASS



Hamilton Okemos Intersection

ROUNDAABOUT OPTION

|           |          |
|-----------|----------|
| SCALE     |          |
| H: 1"=40' | V: 1"=4' |
| SHEET     |          |
| -----     |          |
| OF Value  |          |

CLIENT:

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DRAWING PATH: C:\DOCLIVE-1\m\res\LOCALS-1\Temp\A\F\Jh\_52\Median\_Intersection.dwg Aug 06, 2008 - 2:08pm