LED Lighting

Okemos Downtown Development Authority

in collaboration with

Michigan State University

Okemos, Michigan

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PREFACE

Practicum is a required course for both undergraduate and graduate students in the Urban and Regional Planning program at Michigan State University. The course is a test of theoretical, practical and communication skills. It is designed to give students of Urban and Regional Planning the opportunity to be involved with the practical and professional side of the field, while allowing them to apply the knowledge and resources they have learned from the program.

At the early stage of the program, students are presented with a list of clients whom they can choose to work with. Depending on their selections, they are assigned into groups and asked to develop a product reflective of the client needs. This project is the result of such a partnership.

ACKNOWLEDGEMENTS

We would like to extend our gratitude to the following individuals for their time, knowledge, guidance and resources in the development and realization of this project.

- Paul Brake, Executive Director DDA of Okemos, Meridian Township, Michigan
- Dr. Zenia Kotval, Urban and Regional Planning, Michigan State University
- Dr. Rex LaMore, Urban and Regional Planning & University Outreach and Engagement, Michigan State University
- Bob Peterson, Village Manager, Elk Rapids, Michigan
- Kellee E. Christensen P.E., Manager, Lansing Board of Water and Light
- Roger L. Adsit, Street Lighting Designer, Lansing Board of Water and Light
- Cindy Cummings, Records Supervisor of Meridian Police Department, Meridian Township, MI

EXECUTIVE SUMMARY

Purpose of study

The intent of this project has been to evaluate the potential impacts of Light Emitting Diode (LED) lighting in downtown Okemos and provide recommendations and conclusions determined by the findings, develop and design a pre and post survey to asses public knowledge on LED technology, and assist in the creation of content on LED technology to be aired on HOM –TV. The methodology used in achieving these goals include site and socio-economic profile analysis of the target area, description of the importance of illumination in commercial districts, presentation of LED advantages and disadvantages, and analysis of case studies in communities which have implemented similar projects in their regions.

Importance of Illumination

Lighting in commercial areas has effects on public safety, traffic safety, sense of community and local aesthetics. The current lighting situation within the project site is not extensive. With four traditional dim streetlights installed in the main intersection, visibility in downtown Okemos is poor. The DDA seeks to improve the appearance and safety of the downtown area by providing improved lights that is appealing and energy efficient.

Background

The Meridian Township DDA will be implementing the LED streetlight project in downtown Okemos within the following boundaries: Ardmore Avenue, Methodist Street, Moore Street, and Clinton Street. The project will be executed to provide better lighting for the selected region, employ energy efficient methods in order to lower greenhouse gas emission across the Township, increase cost savings due to the characteristics of LED lights such as longer life span and low energy consumption, and promote a positive business climate in downtown Okemos.

Meridian Township DDA is working with the Lansing Board of Water and Lights (LBWL) in the realization of this project. Currently, 20 new LED streetlights have been proposed for the development. They will be located along Hamilton Road and Okemos Road. The project, which is estimated to cost $204,000, will be financed through Tax Increment Financing (TIF) and by a $50,000 grant awarded to Meridian Charter Township from the Michigan Department of Energy, Labor and Economic Growth (DELEG) in January, 2010. The project has an estimated

work outline with a start date of January, 2010 and end date of September 2010. In the process, Meridian Township DDA will be involving and informing the public through its cable access channel, HOM-TV.

Case Studies

Case studies were conducted as a part of this study to give the reader a better understanding of the types of things to expect when implementing LED streetlights. Cases in Oakland, CA, Elk Rapids, MI and Lansing, MI were examined. Overall, each case study revealed positive results from LED streetlight installation and implementation. As identified in the Oakland, CA and Elk Rapids, MI and Lansing, MI case studies, each instance has resulted in lower operating costs, reduced maintenance time and costs, and lower energy consumption. While the initial cost of implementing the new LED technology is high with the installation of alternate fixtures, the long-term benefits of the technology outweigh the cost when considering all of the benefits of LED lighting.

Public Involvement

Public involvement for this project includes the development and design of a pre and post survey to assess public knowledge on LED technology, and assisting the Meridian Township DDA in the creation of content on LED technology to be aired on HOM-TV. The surveys have been designed to measure knowledge on LED technology before and after the broadcasting of the HOM-TV LED program. The pre-survey will be distributed before the broadcasting of the LED program, while the post-survey will be distributed following the broadcasting of the program. They will be accessible to the public via survey monkey, an online survey taking and creation tool. With regards to the HOM-TV broadcasting, the Meridian Township DDA will be involving and informing the public by airing a 30 minute educational program on LED technology. The following presents the list of content to be covered on the HOM-TV public educational piece:

- LED Project Introduction (Reason/Scope/Light Placement/ Funding/Length)
- Importance of Lighting (Safety/Sense of Community & Walkability/Public Aesthetics)
- LED Advantages and Disadvantages
- Comparable Case Studies

Conclusion

The LED streetlight project provides the downtown Okemos area with an opportunity to increase safety, and walkability within the community. Similar communities have experienced success with the implementation of LED streetlights in the form of decreased energy consumption and operating costs, which can also be expected within downtown Okemos.

The following recommendations for the placement of the LED streetlights in downtown Okemos has been provided as a part of the report conclusion. The list was formulated after careful review of the current conditions of the site, the possible effects lighting has on commercial districts, and analysis of the presented case studies. They are proposed as elements to be considered in the implementation and installation of the LED fixtures.

1. Emphasis should be placed on Okemos Road in relationship to the number of LED streetlights. This vehicular route has a greater width and carries a larger number of vehicles compared to Hamilton Road. More LED streetlights might be needed along this road in order to have efficient lighting across downtown Okemos..

2. An LED streetlight should be placed in the North-East corner of Douglas J. Salon & Spa. Currently, the proposed plan does not include any fixtures in this area. The scale and importance this commercial unit has toward downtown Okemos, makes it an important element that requires better illumination during dark hours.

3. Commercial signage should be taken into consideration when deciding the location of the LED streetlights. The fixtures should be located in close proximities to the signs in order to assist and facilitate the advertisement of these businesses during dark hours.

PROJECT INTRODUCTION

Working with Paul Brake, Executive Director of the Meridian Township Downtown Development Authority (DDA), the Michigan State University Urban Planning group assists with evaluating the effectiveness of Light Emitting Diode (LED) streetlights and produce a recommended content for a proposed public educational program on LED technology. This project is conducted according to the approved grant award submitted to the State of Michigan, through the Energy Efficiency and Conservation Block Grant Program, for the funding of 20 installed LED streetlights in downtown Okemos.

In order to evaluate the streetlights, research on the impacts of LED lighting and case studies of similar communities with LED technology were conducted. There were three case studies completed in Oakland California, Elk Rapids Michigan, and Lansing Michigan. The outline for the case studies includes the following:

- Background of Site
- Reason for Implementation
- Scope of Implementation
- Funding for Project
- Duration of Implementation
- Evaluation of Project
- Public Input/Educational Efforts
- Conclusion

An educational program on LED technology will be produced for Haslett Okemos Meridian Television (HOM-TV) to educate the public. Also a pre- and post- survey effort will be conducted before and after the HOM-TV program airs to evaluate the effectiveness of the public education initiative on the impact of the LED streetlights in the community.

CLIENT INTRODUCTION

The clients for this project are Meridian Township and the Meridian Township Downtown Development Authority (DDA). The main contact for this project is Paul Brake, Executive Director for the Meridian Township DDA. The Meridian Township DDA was founded in December 2005 through the adoption of the Ordinance 2005-12 by the Meridian Township Board. Its creation is the result of the recommendation from the Meridian Township Economic Development Corporation (EDC). The DDA is governed by a ten-member board that is in charge of developing programs and projects aimed at improving the area known as "downtown Okemos" or the "Okemos Village area". Its original intent is to stop the deterioration of property value and increase property tax valuation where possible in the business district. Previous projects involving the DDA area include the Design Meridian Project, which explores the potential of streetscape improvements, and the Small Town Design Initiative Project which generated ideas on the possible transformation and improvement of the township's core commercial areas. Funding for the Meridian Township DDA is provided through tax increment financing.[1]

The following is a list of the DDA Board Members:

- **Chair:** Will Tyler White
- **Vice-Chair:** Renee Korrey
- Georgia Carpenter
- Sherry Fisher
- James Raynak
- Jim Spanos
- Douglas J. Weaver
- Brian G. Dale
- John Wood
- Susan McGillicuddy

[1] The Downtown Development Authority of The Charter Township of Meridian, History and Organization, provided by Paul Brake

CHAPTER 1: BACKGROUND

1.1 PROJECT DETAILS

Introduction

This project has stemmed from the Energy Efficiency and Conservation Block Grant from the Michigan Department of Energy, Labor, and Economic Growth (DELEG) which will provide the Meridian Township Downtown Development Authority (DDA) with funding to install 20 Light Emitting Diode (LED) streetlights in the downtown area.

The LED Demonstration Grant Application was submitted on November 5, 2009 with Mr. Paul Brake, Executive Director of the Meridian Township DDA, as planned project manager. As of January 25, 2010, under an announcement from Governor Jennifer M. Granholm and with the aim to create and retain jobs, conserve energy and reduce greenhouse gas emissions, it was made known that $17.5 million in grants were awarded to 125 communities across Michigan. Included in the list was Meridian Charter Township with its request of $50,000 to support the implementation and installation of 20 LED streetlights in downtown Okemos.[2]

Reason for Implementation

In June 2008, the Meridian Township DDA held a community vision forum where citizens of the region expressed their views and opinions on the future developments of downtown Okemos. Among the comments stated, priority was conveyed on a pedestrian and environmental friendly design to be implemented in the downtown area. Streetlight installation in the downtown core was identified as a method to achieve these priorities.[3]

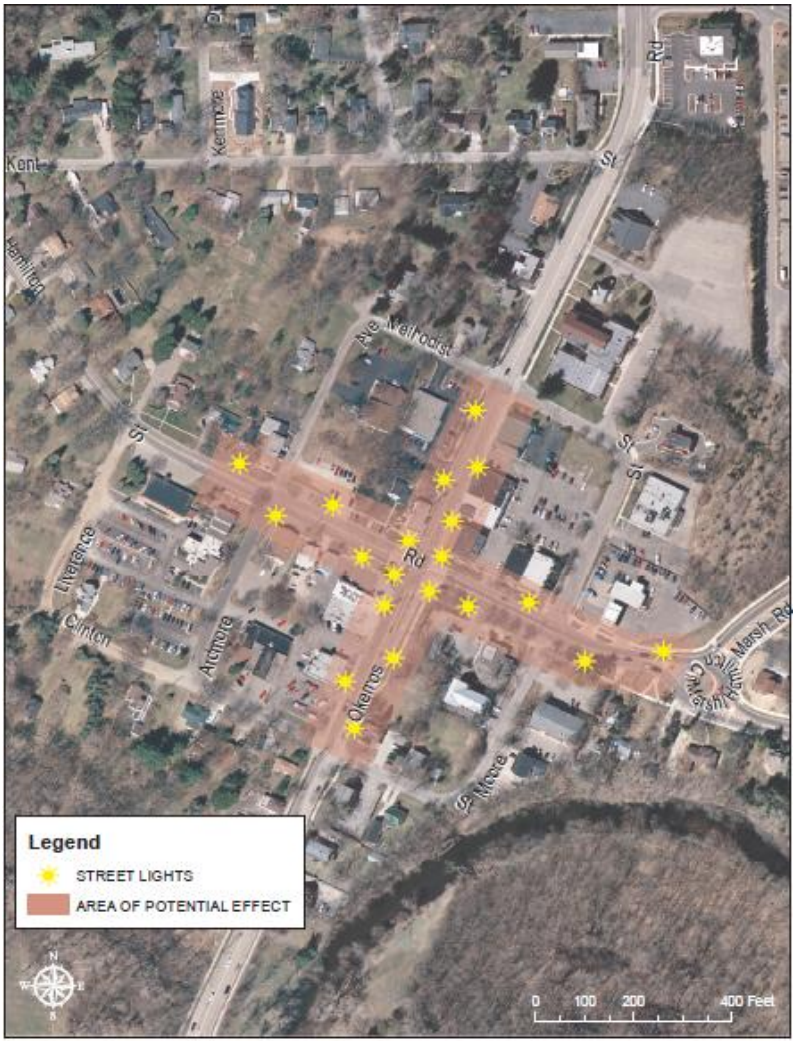
Meridian Township is planning to install 20 LED streetlights to provide better lighting in the DDA targeted area. By doing so, the Township is also hoping to put into practice its goal of implementing energy efficient projects in the region such as reduced greenhouse gas emissions and increased cost savings due to the LED's longer life span and low energy consumption. The municipality hopes that this project will support job creation and retention in downtown Okemos, by making the area more pleasing and inviting for potential businesses and customers in the district.

[2] Michigan DELEG news release, Granholm announces energy efficient grants to communities, (January 25, 2010); 1
[3] Meridian Township DDA LED Demonstration Grant Application, Statement of the Problem, (November, 2009); 2

Scope of Implementation

The municipality is working with the Lansing Board of Water and Light (LBWL) in implementing the proposed project.

FIGURE 1.1: Proposed LED Placement

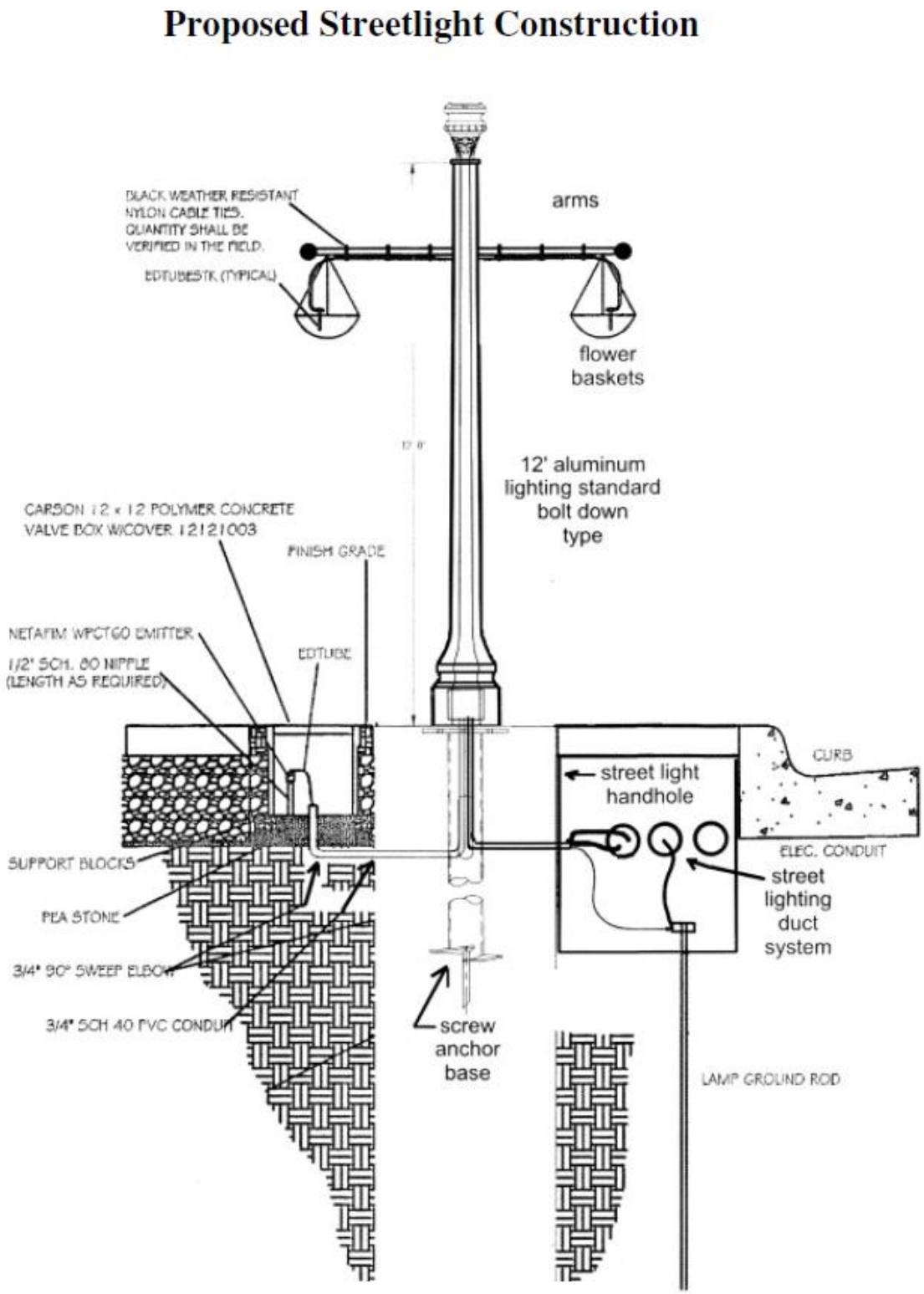


The 20 proposed LED streetlights will be located along the major roadways in the downtown Okemos area. **FIGURE 1.1** shows the proposed placement of the lights. Their positions will be distributed evenly across both Hamilton Road and Okemos Road. Four streetlights will be placed in the four corners of the downtown's main intersection (Hamilton & Okemos); while on the four sides of the juncture, pairs of four streetlights will be staggered following a "Z" design path. It should be noted that this pattern was devised by the LBWL to maximize the area covered by the LED lights relative to their number, and in the process minimize the amount of dark spots along the streetscape.

Source: Meridian Township DDA, 2008

The proposed LED streetlight design (**FIGURE 1.2**), closely resembles the historical streetlamps of the surrounding area including those in East Lansing and others in Meridian Township. One single LED lamp is to be located in the middle of the lamp pole at the top of the fixture. Arms extend on both sides of the streetlight holding decorative flower baskets. The baskets are an extra feature that is being considered by the Meridian Township DDA in the final design to improve the aesthetics of the streetlights and of the downtown area. Reasons behind their implementation at this initial stage are due to cost savings included with the irrigation needed for the flower baskets during the initial installation phase of the streetlights. It is important to note that the addition of irrigation features for the streetlights will result in higher cost per LED fixture for the project.

FIGURE 1.2: Proposed LED Streetlight Design



Source: DELEG LED Demonstration Grant Application

Funding

Meridian Township's LED streetlight project is estimated at $204,000. This cost estimate includes labor, equipment, supplies and materials, and installation. **TABLE 1.1** shows the necessary expenditures needed and funds to be used to complete the project.[4]

TABLE 1.1: Funding Information

Line Item	State	Applicant	Total
Contractual Services	0	92,000	92,000
Equipment	0	12,000	12,000
Supplies/Materials	50,000	50,000	100,000
Total	50,000	154,000	204,000

Source: DELEG LED Demonstration Grant Application

As presented in **TABLE 1.1**, out of the $204,000 total projected cost of the LED streetlight initiative, $50,000 will be supplied from the Michigan Department of Energy, Labor and Economic Growth (DELEG) grant which Meridian Township was settled to receive as of January 25, 2010. The remaining $154,000 will be provided by Meridian Township Downtown Development Authority. The latter has been able to secure such funds through Tax Increment Financing (TIF) applied in the DDA service area.

[4] Meridian Township DDA LED Demonstration Grant Application, Budget Consideration, (November 2009); 12

Duration of implementation

In order to implement the LED streetlight project in a timely and efficient manner, the Lansing Board of Water and Light has devised a preliminary work outline which divides the project into five separate actions. The proposed action plan, as seen in **FIGURE 1.3**, is expected to last from January 2010 to September 2010.[5]

FIGURE 1.3: Proposed Work Outline

	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
Action #1 Design Plan Review Cost Estimate									
Action #2 Financing in Place									
Action #3 Construction/Project Implementation									
Action #4 Develop and Implement Public Education Program									
Action #5 Program Evaluation									

Source: DELEG LED Demonstration Grant Application

Action #1 is the Design Plan Review Cost Estimate. This action marks the beginning of the work outline with a start date in January 2010 until March 2010. During this period, the streetlight layout will be developed and electrical blueprints will be reviewed.

Action #2 involves finalizing finances to complement the project's cost. It has a start date of February 2010 and it lasts until April 2010.

Action #3 includes the construction and implementation of the project. Throughout this phase, streetlights along with other necessary features such as wiring, fitting of LED lamps etc. are to be installed in their respective location. This action lasts from April 2010 until June 2010.

Action #4 forecasts the development and implementation of the public education program through Meridian Township's cable channel (HOM-TV). The program's goal is to educate the

[5] Meridian Township DDA LED Demonstration Grant Application, Time Frame, (November 2009); 11

region's community on LED technology and it is planned to be employed from July 2010 to September 2010.

Action #5 includes the program evaluation and preparation of the project's final report, which entails the gathering of feedback from the implemented LED streetlight project. This will be a joint effort between Meridian Township and Michigan State University (to be represented by students from the Social studies and Urban and Regional Planning programs). The last action in the work plan will occur from August 2010 until September 2010.[6]

As of April 2010, the Meridian Township DDA is in the financing step of the proposed work outline, Action #2.

Public Input/Education Efforts

Meridian Township DDA plans to involve and inform the public through its cable access channel, HOM-TV. A 30 minute program describing the project and providing valuable information on LED technology and sustainable energy is proposed. The content development for the broadcasting will be a joint effort between the Meridian Township DDA, the HOM – TV staff, and Michigan State University's Practicum team. The latter will be responsible for the design of a pre and post survey to evaluate the public knowledge before and after the airing of the educational program which can be found in the Appendix A, and Appendix B of this study. Additionally, the proposed LED educational program will be available as a three-minute format to be accessible on the internet.

Recommendations for HOM-TV Content

Haslett Okemos Meridian Television is putting together an educational show based on our report for the public's benefit in regards to the Meridian Township DDA's LED streetlight project. The following list includes our recommendations for what should be included in the video.

- Project Background
    - Project Details (page 16)
        - Meridian Township DDA in collaboration with the Lansing Board of Water and Light (LBWL)

[6] Meridian Township DDA LED Demonstration Grant Application, Work Plan, (November 2009); 6-9

        - 20 proposed LED streetlights in downtown Okemos
        - Streetlights will be placed along Hamilton Road and Okemos Road
        - Funded through the Energy Efficiency and Conservation Block Grant and Tax Increment Financing from Meridian Township DDA
        - Aims to improve lighting, implement green energy and cost savings technology, and promote and foster the creation of a good business climate in downtown Okemos
    - Existing Conditions (page 23)
        - Downtown Okemos is zoned Community Commercial – established for the accommodation of commercial and business services activities that serve a communities level trade area
        - LED streetlights enhance the permitted uses in the Community Commercial District
- Importance of Illumination
    - Why Lighting is Important for Commercial Areas (page 56)
        - Crimes & accidents occur more often in poorly lit or unlit areas
        - Current Illumination of project site and safety disadvantages
        - Adequate lighting can make downtown Okemos a safer community
        - Increasing walkability / sense of community, local aesthetics
- LED Advantages and Disadvantages (page 64)
    - Advantages:
        - Reduce night sky light pollution
        - Reduced energy consumption
        - Can be recycled, and are made of non-toxic materials
        - Reduced maintenance costs
        - Does not produce radiation, ultraviolet, or infrared emissions
        - Brighter and covers a greater area
        - Longer lifespan than traditional lighting
    - Disadvantages:
        - Higher initial cost
        - Dangerous to the naked eye
        - Sensitive to extreme hot or cold temperatures
- Case Studies
    - Oakland, California (page 68)
        - Annual electrical costs are estimated to be cut by approximately 36% in Phase II and 52% in Phase III from the metered HPS luminaires
        - The LED streetlights used in phase II and phase III reduce over-lighting which also improves the visibility and safety for drivers and pedestrians

- Because LED lights have a longer lifespan, the maintenance cost for the new lights is assumed to be nearly zero, giving the energy consumption 100% of the annual cost

- Elk Rapids, Michigan (page 76)
  - The Village will save an estimated $4,000 annually in energy costs
  - The addition of LED technology will give the Village a 60% reduction in energy consumption for streetlights
  - New streetlight housing will reduce the amount of light pollution given off in the downtown area
- Lansing, Michigan (page 81)
  - The LBWL saves an estimated $10,000 in energy costs alone per year from implementing LED technology (246 lights)
  - This project is similar to that of the downtown Okemos project with regards to geographical location, and the number of lights installed initially
  - The Lansing Board of Water and Light which carried out the street lighting project in Lansing is also working with the Meridan Township DDA on the design and location of the streetlights for the project in downtown Okemos

1.2 EXISTING CONDITIONS AND ZONING

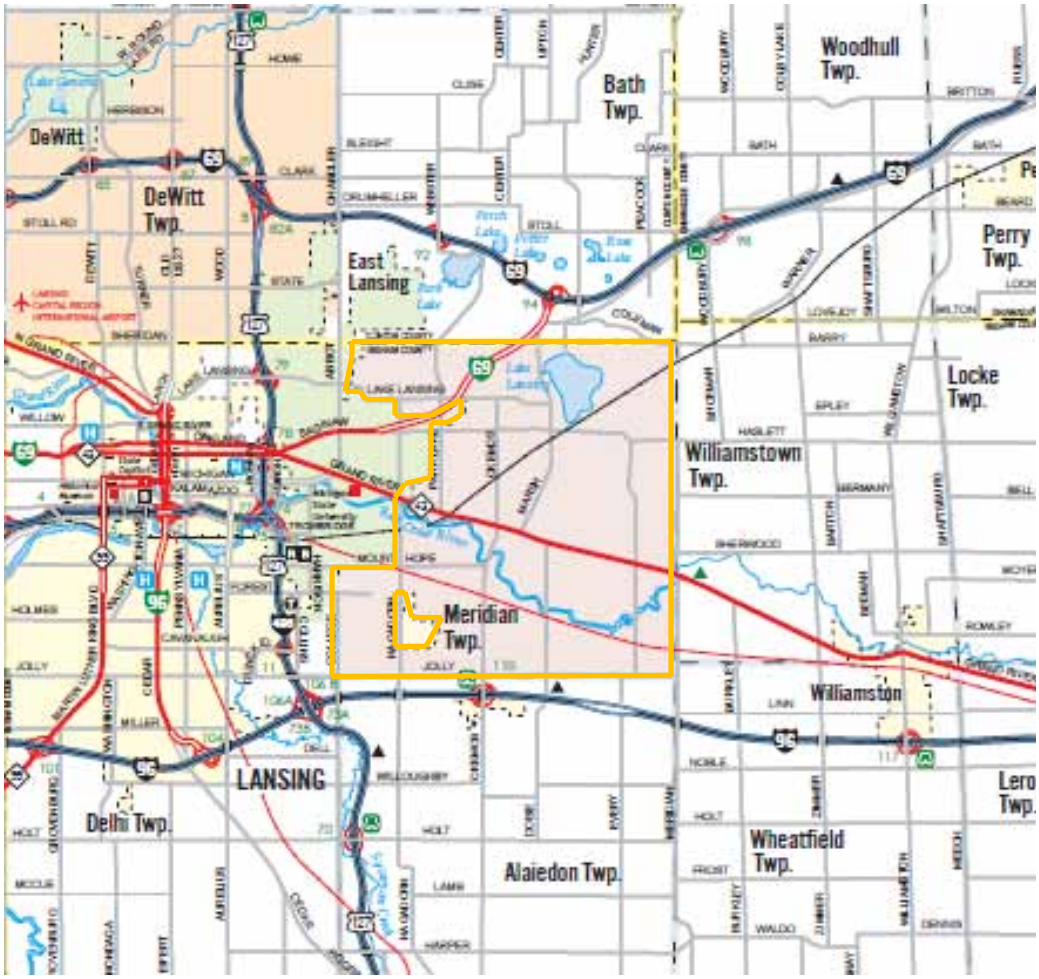
Introduction

Analysis on the existing conditions and details of zoning uses in an area are essential to gain the necessary knowledge required to complete a thorough and comprehensive study. The following section provides such elements.

Location

Meridian Charter Township is located in Ingham County, in central Michigan. The Township consists of a total area of 31.8 square miles, 31 square miles of which is land and the other 0.8 square miles is water. To the west, the Township is bordered by two major cities, Lansing (Michigan's state capital) and East Lansing (home of Michigan State University), four and two and a half miles respectively; On the east, north and south side, the Township shares borders with Williamstown, Bath, and Alaeidon Township. The region is further cornered by three main highways: US 127 to the west, interstate highway 69 (I-69) to the north and interstate highway 96 (I-96) to its south. Consequently, the arrangement of these major routes around Meridian Township provides the region with a very strategic geographic position (See **FIGURE 1.4**).

FIGURE 1.4: Meridian Township Map



Source: MDOT – State Map

Okemos and Downtown Okemos Overview

Included in the Meridian Charter Township is the unincorporated village of Okemos, founded in 1839 as a trading center, previously known as Hamilton. This community which holds a large residential and commercial base is characterized by major vehicular routes. Grand River Road. passes north of the area, while 2 ½ miles south of Okemos is Interstate 96 (I-96) which acts as a major link connecting various urban regions throughout the state.[7](See **FIGURE 1.5**)

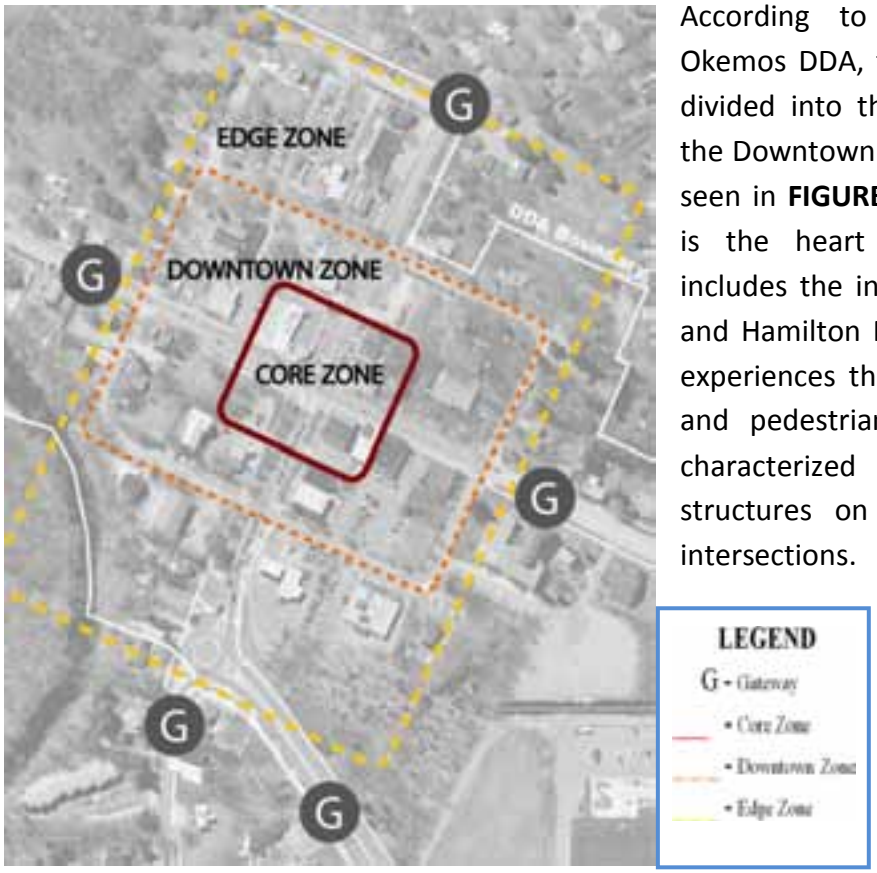
FIGURE 1.5: Downtown Okemos Map

Source: MDOT – State Map

[7] Meridian Township Integrated Plan Okemos DDA, Introduction, (March 2009); 3.

FIGURE 1.5 illustrates the village of Okemos or downtown Okemos area. This region, which also is the site where the LED streetlights are to be implemented, is bordered by Ardmore Avenue and Methodist, Moore and Clinton Street. The downtown covers approximately a quarter mile radius in all directions from its center. At its core, Hamilton Road and Okemos Road intersect each other. Both roads act as major arteries with Hamilton Road cutting through neighborhoods in the east and west direction of the site, while Okemos Road divides the downtown area north-south for roughly eight miles in length. The grid design of this two roadways results in the separation of the downtown area into four separate quadrants, also known as the four corners. Furthermore, due to their strategic geographical location, Okemos Road and Hamilton Road tend to act as major facilitators of traffic flow during the peak morning and evening commute; with Okemos road hosting the largest influx of automobile movement due to I-96 located to the south of the area. In comparison, pedestrian movement in downtown Okemos is much less frequent, a number that becomes smaller during peak traffic hours.[8]

FIGURE 1.6: Downtown Okemos Zones



Source: Meridian Township DDA

According to the Integrated Plan of Okemos DDA, the downtown area itself is divided into three zones: the Core Zone, the Downtown Zone and the Edge Zone, as seen in **FIGURE 1.6**. The Core Zone, which is the heart of the business district, includes the intersection of Okemos Road and Hamilton Road. As a result, this Zone experiences the most level of automobile and pedestrian movement. The area is characterized strictly by commercial structures on the four corners of the intersections.

[8] Meridian Township Integrated Plan Okemos DDA, Circulation, (March 2009); 6

The Downtown Zone is the area cornered by Ardmore Avenue, Methodist, Moore and Clinton Streets. The site is distinguished by many commercial buildings including a music store, barber shop, the Meridian Activity Center, and many others. Parking for these structures is located next to them in the shape of surface parking lots with little on-street parking available. Accessibility to these sites is either directly from the streets intersecting them or through walkways between buildings. In this respect, this feature gives the downtown a somewhat compact image.[9]

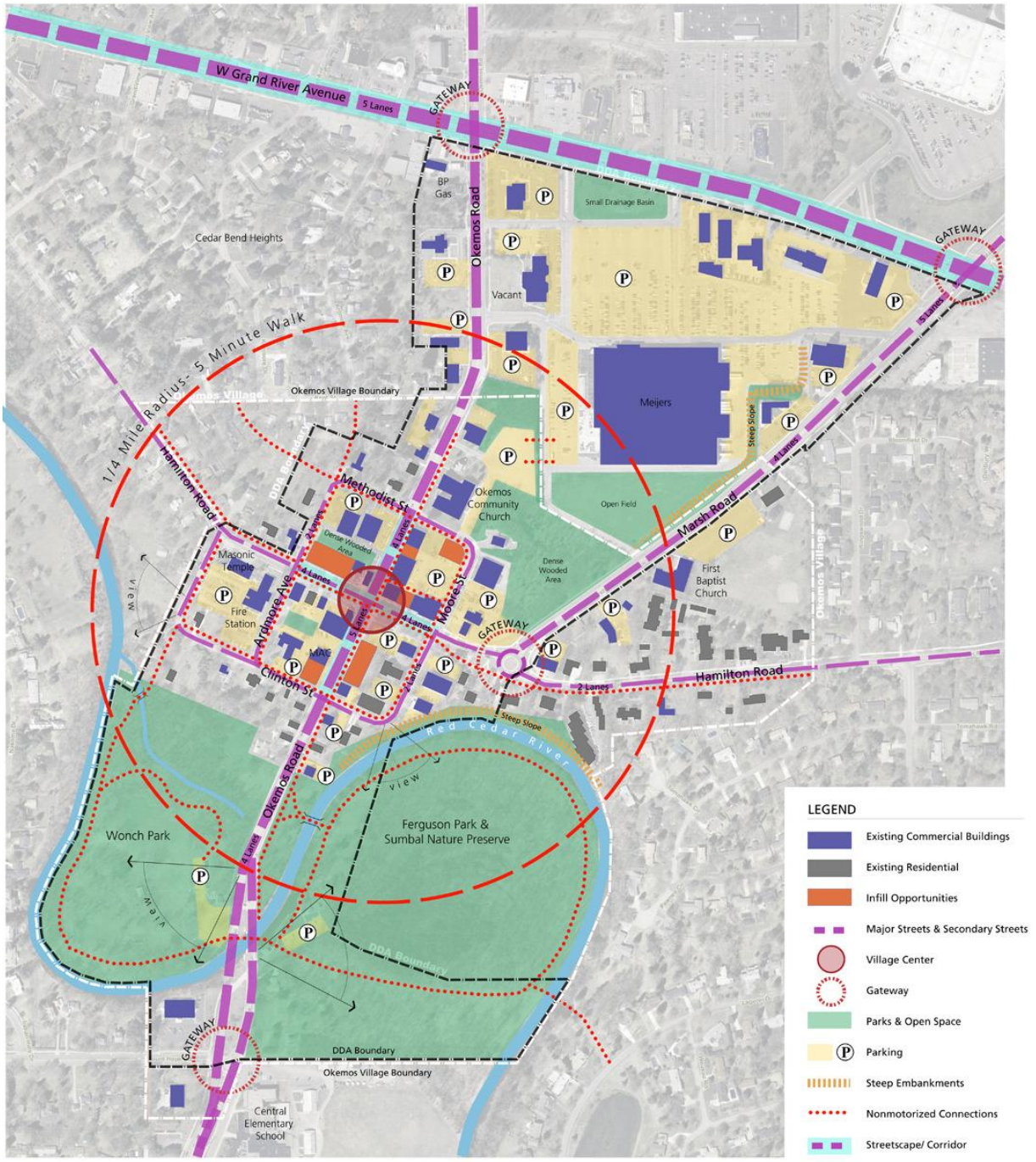
The last assigned zone, the Edge Zone, marks the end of the business district of the downtown area, on the other side of which lie residential neighborhoods. Due to this factor, the Edge Zone acts as a transitional area between these two regions.[10]

[9] Meridian Township Integrated Plan Okemos DDA, Context of Downtown Okemos, (March 2009); 7
[10] Meridian Township Integrated Plan Okemos DDA, Context of Downtown Okemos, (March 2009); 7

Existing Uses – Okemos DDA District

FIGURE 1.7 below, shows the existing uses and possible future uses illustrated as infill development in downtown Okemos and regions pertaining to Okemos's Downtown Development Authority District as of June 2008.

FIGURE 1.7: Existing and Future Uses – Okemos DDA

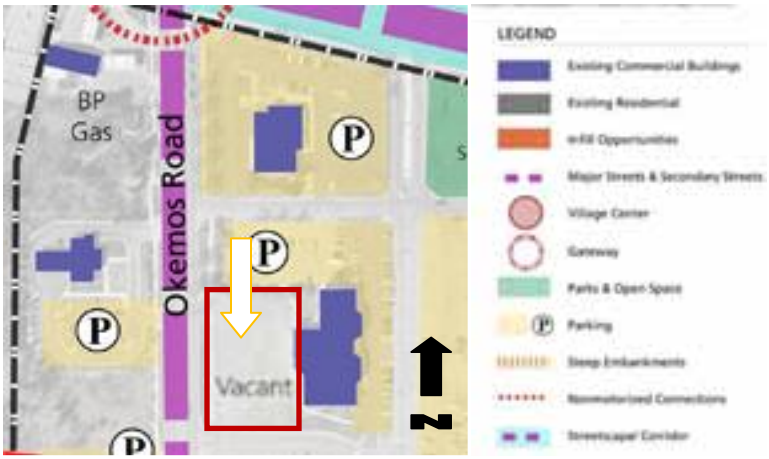


Source: Paul Brake, Executive Director DDA of Okemos

The Okemos DDA District boundaries extend from Grand River Avenue to the north, to the Central Elementary School to the south. Horizontally, the DDA's District borders run along Marsh Road to the east side; while on the west direction the boundaries follow a path that includes Wonch Park southwest of the site and land sections of approximately 0.07 miles west of Okemos Road. This outline based mainly on street patterns results in the creation of three gateways or main entrances to the DDA District. Two of them are located north, on the intersection of Okemos Road and Grand River Avenue, and Marsh Road and Grand River Avenue. The third gateway is located south where Okemos Road meets Ferguson Park & Sumbal Nature Preserve south borderline.

The Okemos DDA District, excluding the village of Okemos (Downtown Okemos), contains four main uses: Commercial, Residential, Park & Open Space, and Parking. Starting north of the site, the predominant utilization of land is for parking which takes the shape of surface parking lots. This space is designed in such manner to accommodate the commercial structures dispersed in this area, most significantly a Meijer store located between Okemos Road and Marsh Road. The remaining commercial buildings in the north section of the Okemos DDA District are concentrated on major vehicular routes. The majority of them are located south of Grand River Avenue, as well as on both sides of Okemos Road. For the latter case, it is important to note that among the commercial parcels on the east side of Okemos Road, a vacant unit with considerable parking space can be found. **FIGURE 1.8** below contains a visual representation of this vacant structure.

FIGURE 1.8: Vacant Unit East of Okemos Road



Source: Paul Brake, Executive Director DDA of Okemos

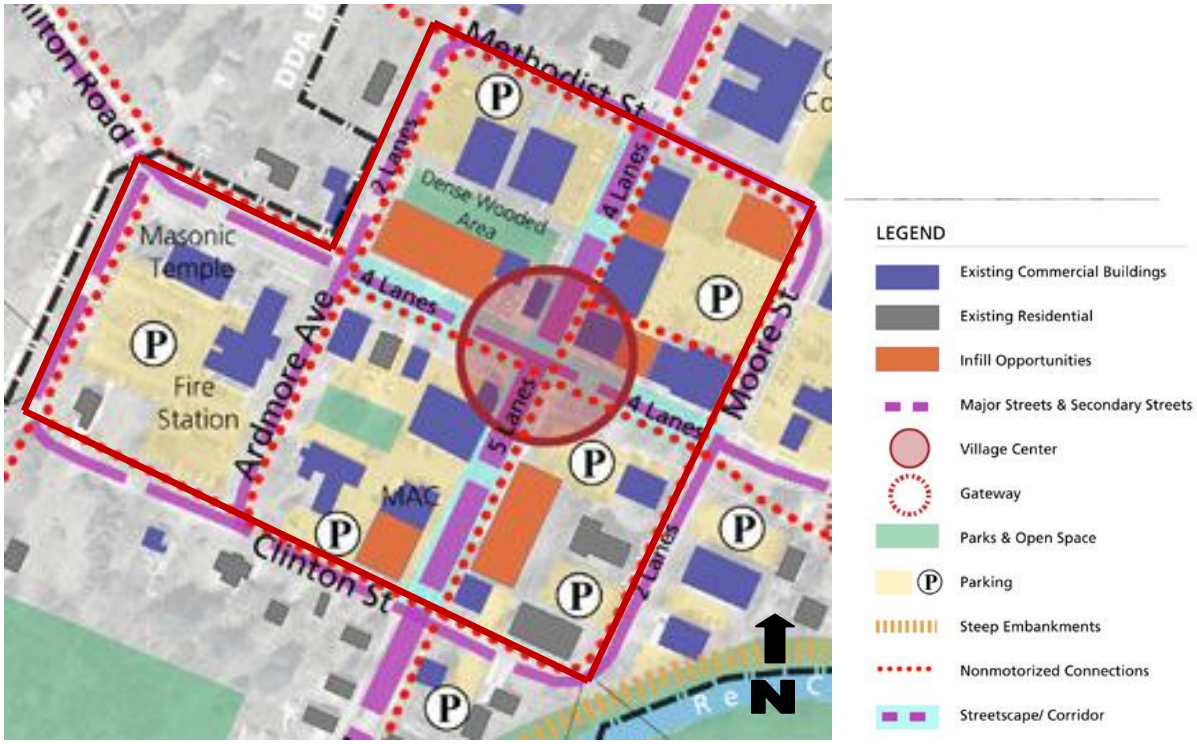
Moving south, along the commercial and parking uses, Park and Open Space lots act as a transition between the Okemos DDA District and the downtown Okemos area. Few residential units are located around Methodist Street. Additional residential buildings are to be found

around Clinton Street and Moore Street (south of Hamilton Road). The positioning of such structures around these sites serves to strengthen the transition line between the Central Business District (CBD) and the neighborhoods surrounding it. Moving further south of the DDA District along Okemos Road, residential units as well as commercial and parking uses tend to become uncommon if not absent. Instead, Park and Open Space uses cover most of the south side of the region, Wonch Park to the west of Okemos Road and Ferguson Park & Sumbal Nature Preserve to the east of Okemos Road.

Existing Uses – Downtown Okemos

FIGURE 1.9 illustrates the village of Okemos/downtown Okemos area. Compared to the rest of the Okemos DDA District, this site is denser and more compact in terms of structure positioning relative to land.

FIGURE 1.9: Village of Okemos 2008



Source: Paul Brake, Executive Director DDA of Okemos

The streetscape in the downtown area contains the design of a grid system. Roads run strictly in east-west and north-south directions. The result is the separation of the downtown into rectangular blocks, also known as the four corners. Such separation is not very evident on land parcels on both sides of Ardmore Avenue. However, at the heart of the village of Okemos (the intersection of Hamilton Road and Okemos Road), the division is more apparent due to vehicular routes containing four lanes each.

Development in this site is mainly dominated by commercial units. Residential buildings are relatively fewer in number with only four individual structures to be found. Furthermore, the Meridian Township DDA predicts the number of commercial structures to increase in the future. These are presented as infill opportunity sites illustrated by the orange units in **FIGURE 1.9**. Additionally, each commercial unit contains surface parking with some individual buildings facilitating supplementary on-site parking. Entry ways to the businesses structures in the CBD are located in close proximities of nearby vehicular routes. The detachment between the main entrances of the commercial units and the streets vary in distance with each individual unit. Some structures contain a parking lot in front that separates the building from the street and sidewalks, such as the White Bros Music structure in the northwest block of Okemos Road and Hamilton Road (See **FIGURE 1.10**); while buildings such as the Hamilton Building, north of Hamilton Road, are connected to the roadways via pedestrian walkways (See **FIGURE 1.11**). The sidewalks themselves are continuous throughout the downtown area. All structures, whether commercial or residential, are linked by sidewalks that vary in width depending on their location, allowing pedestrian movement between downtown Okemos and regions surrounding it. With regards to the current conditions, the sidewalks are characterized by rough and irregular surfaces which vary with each sidewalk block.

FIGURE 1.10: White Bros Music

Source: Yuguang Li, MSU Practicum

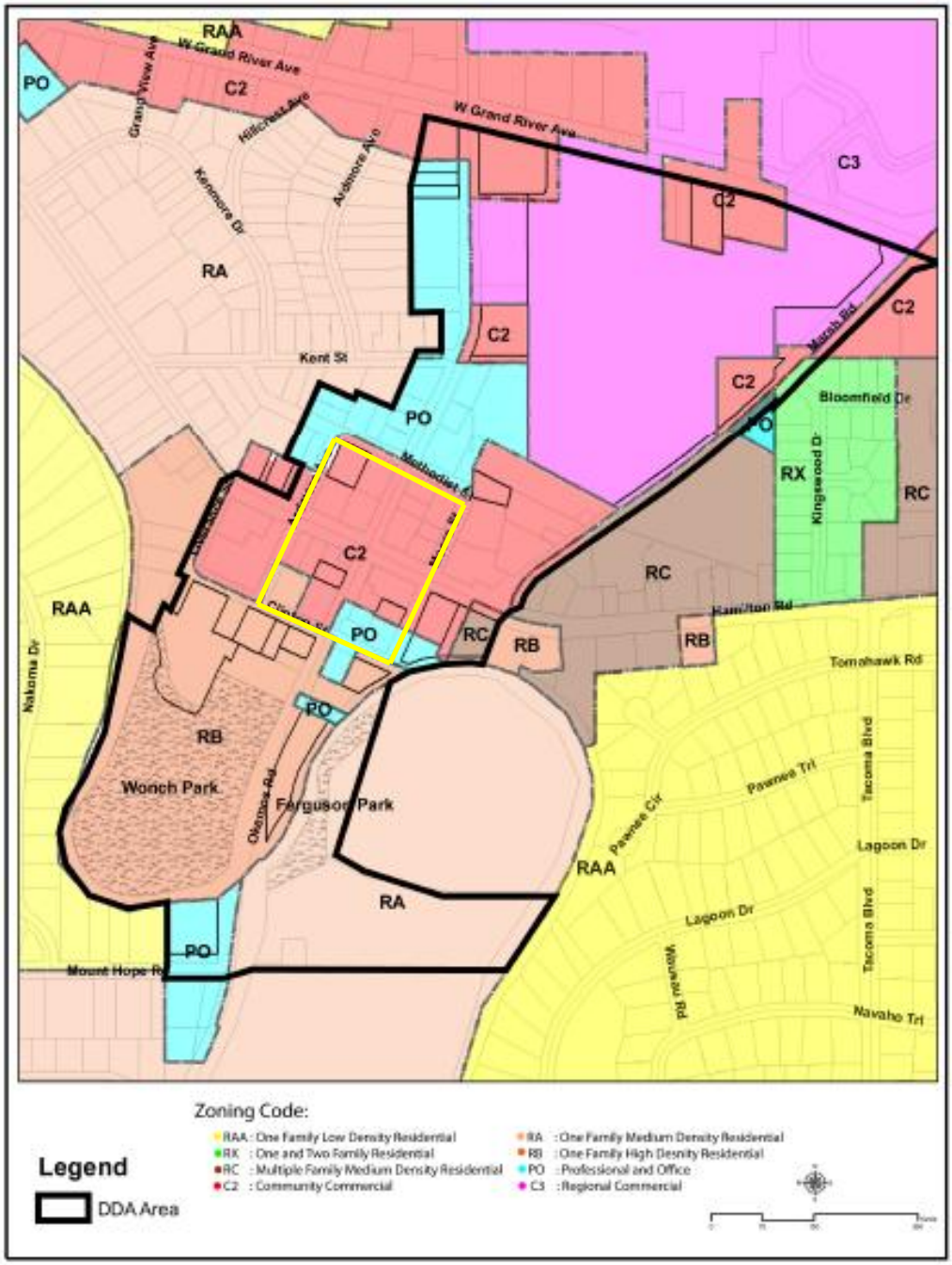
FIGURE 1.11: The Hamilton Building

Source: Yuguang Li, MSU Practicum

Zoning – Okemos DDA District

FIGURE 1.12 shows the current zoning map of the Okemos Downtown Development Authority District and its surrounding areas.

FIGURE 1.12: Zoning Map – Okemos DDA



Source: Paul Brake, Executive Director DDA of Okemos

According to the map, the land uses in the Okemos DDA District and the nearby surrounding areas are categorized into the following zones:

- RAA :One Family Low Density Residential
- RA :One Family Medium Density Residential
- RX :One and Two Family Residential
- RB :One Family High Density Residential
- RC :Multiple Family Medium Density Residential
- PO :Professional and Office
- C2 :Community Commercial
- C3 :Regional Commercial

Out of these zones, RAA is the only zone not found inside the DDA District boundaries; while RC and RX cover a very small portion of the surface area in the Okemos DDA District.

In terms of commercial versus residential, commercial uses inside the DDA boundaries dominate the landscape of the region. These uses are concentrated in the center (zoned mainly Community Commercial) and north side (zoned mainly Regional Commercial) of the DDA District. Residential uses are found only south in the DDA District, zoned RB and RA. In comparison, regions surrounding the DDA District, with the exception of the Grand River corridor, are mainly residential with RAA and RA being the dominating zones.

With regards to downtown Okemos, the site is zoned Community Commercial (C2), Professional and Office (PO), and One Family High Density Residential (RB). Out of these zones, C2 covers most of the downtown's surface area, with PO and RB zones covering only small blocks south of the site.

In relationship to the C2 zone in downtown Okemos, Meridian Charter Township provides the following definition for Community Commercial:

"The C2 commercial district is established for the accommodation of those commercial and business service activities that serve a community level trade area. Patrons would have the option of walking or using private or public transportation to reach the destination. Such activities require land and structure uses that are typically compact and densely grouped generating a larger volume of pedestrian and vehicular traffic than expected in C1 district. It is

the purpose of these regulations to permit the establishment of a wide variety of business enterprise types in this district. " [11]

From this definition it can be summarized that the C2 Community Commercial district is zoned and supports mainly business structures which contain the characteristics and create the design and feel of a central business district. The LED streetlight project in the C2 zone is being implemented to assist these commercial units, and provide safety for pedestrians and automobiles in this region. Under these terms, it can be noted that the LED streetlights are enhancing the permitted uses in this designated C2 Community Commercial District.

[11] Charter Township of Meridian Code, Sec.86-404. C-2 commercial district, CD86:121

Parcel Map Analysis

FIGURE 1.13 illustrates the parcel map of the downtown Okemos area and the proposed LED streetlight locations. The Parcel Map is shown with the purpose of presenting a description of the existing land uses in the downtown Okemos area through photographs of the parcels. This analysis provides critical information for assessing both the placement and potential impact of the LED lighting proposed. Photographs are provided by Yuguang Li, MSU Practicum member. The analysis will mainly revolve on structures that have the largest probability of being affected by the proposed LED streetlight locations. Each parcel is numbered and its shape closely corresponds to the parcel divisions illustrated in the zoning map of Meridian Township.

FIGURE 1.13: Parcel Map

FIGURE 1.14: Parcel 1

Located in Parcel 1 (**FIGURE 1.14**) is the Hamilton Building. Four individual businesses are found in this structure. The unit is historical in nature and is located in the south-east corner of the parcel. Sidewalks run east-west next to the main entrance of the unit to facilitate pedestrian use. Currently there are no existing streetlights situated in close proximities to the building, therefore visibility at night is greatly reduced. The LED streetlight project has one proposed streetlight to reverse the current lighting condition for the businesses in this building

FIGURE 1.15: Parcel 2

Parcel 2 consists of empty space which is currently used as parking for the businesses nearby. The parcel has no structures located in it and is designed as future infill development in the Meridian Township Integrated Plan Okemos DDA. The LED streetlight project has one proposed streetlight for this area. It is to be located in the close proximities to the car entrance as shown in **FIGURE 1.15**

FIGURE 1.16: Parcel 4

FIGURE 1.16 represents Parcel 4. In this site the White Brothers Music store covers the area. Surface parking surrounds the structure and interrupts the sidewalk connection from Okemos Road and the music store. The building is visible from the main street however no streetlights are found in close proximities to the unit. The LED streetlight project has two proposed streetlights located near this parcel. They are located east of the unit and south-east at the Okemos Road main entrance of the store.

FIGURE 1.17: Parcel 5

FIGURE 1.17 represents Parcel 5. Two individual businesses are located in this area, the Triple Goddess Bookstore and the Traveler's Club Restaurant. The two buildings are located in the north-west corner of the Hamilton Road and Okemos Road intersection. Both units are accessible via sidewalks for pedestrians and facilitate a few on-spot parking for car users. Some lighting can be found for the Traveler's Club Restaurant which is used strictly to illuminate the restaurant's sign during night time. The LED streetlight project proposes one streetlight to be located in close proximities to the Traveler's Club entrance.

FIGURE 1.18: Parcel 6

FIGURE 1.18 illustrates Parcel 6. The Mid-Michigan Academy can be found in this area. It is located in the north-east corner of the Hamilton Road and Okemos Road intersection. Sidewalks are continuous on both sides of the structure's faces pointing out toward the main streets. Parking for this structure is available behind the unit in the form of surface parking. There is no existing lighting found in this parcel. The LED streetlight project has two streetlights proposed in close proximities of the store. One is to be located north-west of the building, while the second one is proposed in the south-west corner of the building.

FIGURE 1.19: Parcel 7

FIGURE 1.19 illustrates Parcel 7 which consists of the Art Unlimited Store. The unit is surrounded by wide sidewalk and its main entrance directly faces Okemos Road. Parking for the unit is available behind it in the form of surface parking. Currently there is no existing lighting in close proximities to this building. The LED streetlight project has two streetlights proposed nearby this parcel. One is to be located south-west and the other north-west of the store.

FIGURE 1.20: Parcel 8

FIGURE 1.20 represents Parcel 8. The CC Greenery store is found here. Like most buildings along Okemos Road this unit's main entrance is connected via sidewalks to facilitate pedestrian usage. Surface parking in the back of the unit makes the structure accessible to vehicles as well. No existing lighting can be found in this parcel. The LED streetlight project has proposed one streetlight nearby CC Greenery. It is to be located in the south-west corner of the unit, in close proximities of its main entrance.

FIGURE 1.21: Parcel 10

FIGURE 1.21 illustrates Parcel 10. This parcel is characterized by three individual businesses, Essential Hair & Body Lotion, Sandie Tailoring, and Bodies in Motion. All three businesses are connected via sidewalks along their main entrances to facilitate pedestrian usage. Behind the structures surface parking can also be found. Currently this parcel is lacking any form of exterior lighting. The LED streetlight project proposes one streetlight to be located in this parcel. It is found in the south-east corner of the parcel in close proximities of Sandie Tailoring.

FIGURE 1.22: Parcel 11

FIGURE 1.22 represents Parcel 11. Wood's Okemos Marathon gas station fills most of the land in this parcel. Sidewalks run by the main entrance of the unit, while its other sides are surrounded by surface parking. Currently, one existing streetlight can be found in close proximities of this unit. It is located in the Hamilton roundabout south-east of the parcel. The LED streetlight project further proposes one additional streetlight nearby this area. It is also to be located south-east of the parcel.

FIGURE 1.23: Parcel 13

FIGURE 1.23 represents Parcel 13. Douglas J Salon & Spa is located on this parcel. Sidewalks are located along its main entrance on Hamilton Road with no pedestrian connection on its other sides. This type of streetscape design results in a detachment of the parcel from the rest of the downtown area relative to pedestrian use. South of the unit, the parcel is mainly characterized by surface parking. Currently, there is no existing lighting in this area. The LED streetlight project proposes no additional streetlights in close proximities of this site.

FIGURE 1.24: Parcel 14

FIGURE 1.24 illustrates Parcel 14. In this location the Okemos Cleaners can be found. Sidewalks run continuous next to the building consequently facilitating pedestrian movement in the area. Parking for this unit is available in the shape of surface parking located east of the structure. Some lighting can be currently found in the area. It is mainly used to illuminate and increase visibility for the store's main entrance during night hours. The LED streetlight project proposes one streetlight for this parcel. It is found in the north-west corner of the structure.

FIGURE 1.25: Parcel 16

FIGURE 1.25 illustrates Parcel 16. This parcel comprises the densest cluster of business units in the downtown Okemos area. Five individual businesses can be found here: Okemos Hardware, ACE Hardware, Bottoms Up, Domino's Pizza, and Special A Fare Catering. All structures main entrances are linked via sidewalks to facilitate pedestrian usage. Surface parking can be found between Okemos Hardware and the cluster of the remaining four businesses to the left. Furthermore, back entrances accessible to customers in some of the units provide the area with the vision of a somewhat compact CBD. Currently, this parcel does not have existing lighting. The LED streetlight project proposes three streetlights to be located in close proximities of the businesses. They are to be located north, north-east, and east of the parcel.

FIGURE 1.26: Parcel 17

FIGURE 1.26 represents Parcel 17. The Meridian Activities Center is located here. Sidewalks run through the Okemos Road entrance of the structure, with surface parking surrounding the unit in the remaining sides. Lighting is currently existent in this parcel. It is located in the north-east corner of the Meridian Activities Center. The LED Streetlight project proposes an additional streetlight in this area. It will be found in close proximities of the entrance of the building.

Figure 1.27: Parcel 18

FIGURE 1.27 illustrates Parcel 18. The land in this parcel is mostly dedicated to the Independent Bank located here. Surface parking is located mainly south of the structure while sidewalks connect the unit to the rest of the downtown area through its main entrance north of the parcel. An art sculpture is located north-east of the area which serves to beautify the region. Currently one existing streetlight is located on Parcel 18. The LED streetlight project proposes three additional streetlights for this area. They are to be found in the north, north-west, and south-west of the parcel.

FIGURE 1.28: Parcel 19

FIGURE 1.28 represents Parcel 19. In comparisons to the other parcels in the downtown Okemos area, this site is partially zoned Professional & Office. As a result a number office structures are located along Okemos Road. Their main entrances are linked via sidewalks while surface parking is found east of the units. The parcel currently holds no existing lighting. The LED streetlight project proposes the addition of two streetlights in close proximities of the site. They are to be located north-west and south-west of the parcel.

From the presented analysis of the Parcel Map in downtown Okemos, the following summary can be made in relationship to the existing conditions of the parcels.

- The commercial units are accessible to pedestrians via sidewalks.
- The commercial units facilitate adequate parking for vehicles.
- Most units are not located in close proximities to exterior lighting.
- The proposed LED streetlight project will affect all commercial units with the exception of Douglas J. Salon & Spa.

Existing Illumination

In terms of street lighting, only four lights are situated in downtown Okemos and the surrounding area where the new LED streetlights are to be placed. These fixtures are High Pressure Sodium (HPS) lights. They are located on the intersection of Hamilton Road and Okemos Road, on the north-east corner of the Meridian Activity Center, on the north-east corner of the Independent Bank, and the Hamilton Roundabout (See **FIGURE 1.29**).

FIGURE 1.29: Existing Lights in downtown Okemos

FIGURE 1.30 Existing Traditional Streetlight at the Hamilton Roundabout

Source: Yuguang Li, MSU Practicum

These lights, with the exception of the one located in the Hamilton Roundabout, are simple overhang lights primarily used to illuminate the vehicular routes found next to them. The fixture found on the Hamilton Roundabout, it provides the only example of a traditional streetlight approximately resembling the ones to be installed in the LED streetlight project (**FIGURE 1.30**). This streetlight is characterized by a 12' aluminum pole with two overhead lamps positioned on top of it.

Other lighting found in downtown Okemos includes lights used to illuminate business signs. The lack of sufficient traditional streetlights in the region has resulted in some business owners providing their own illumination. This occurrence is illustrated in **FIGURE 1.31** with the Travelers Club restaurant provided as an example. The restaurant, located in the north-west corner of Hamilton Road and Okemos Road, has installed three separate lights to increase visibility for their business sign during dark hours.

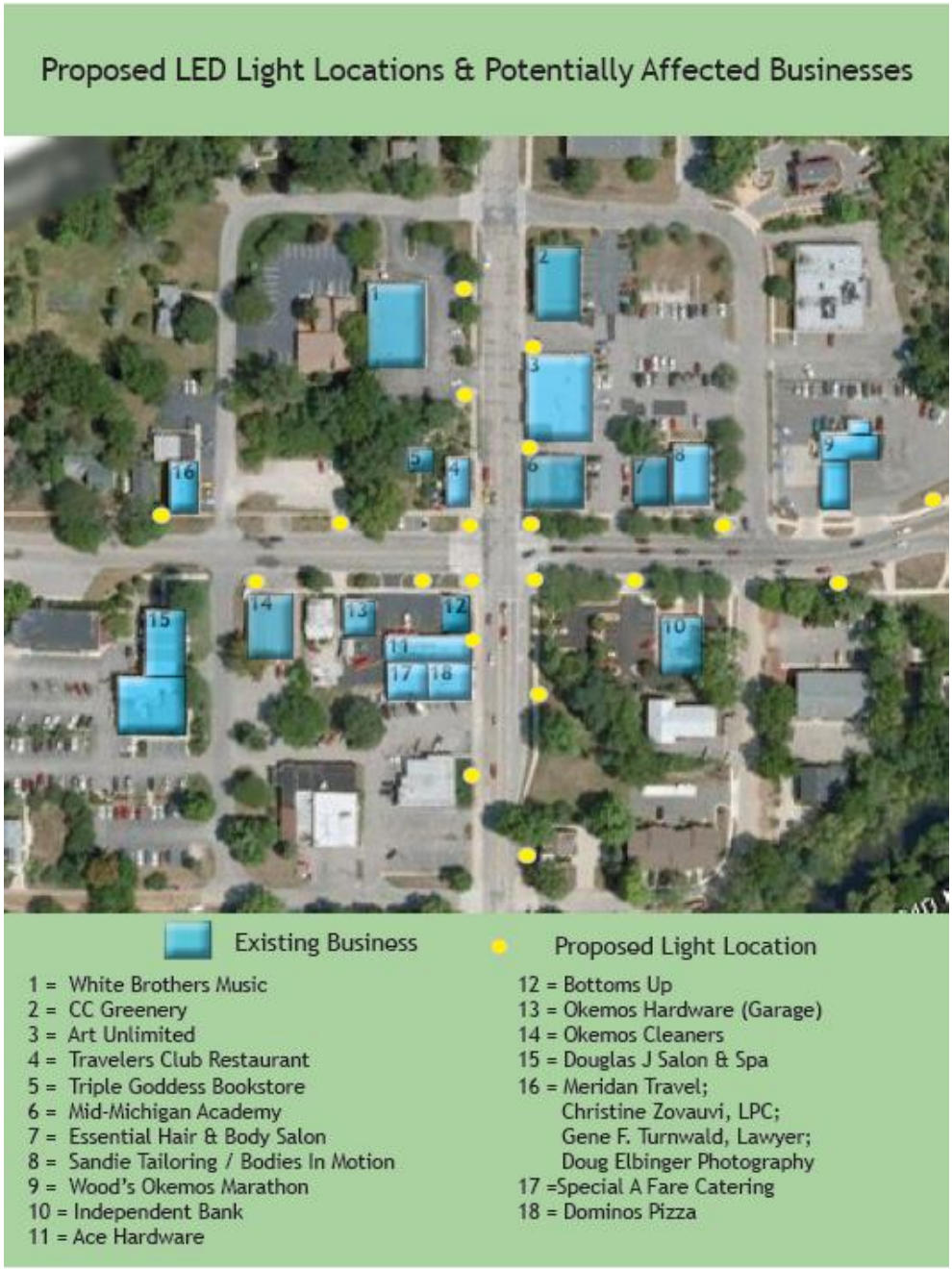
FIGURE 1.31: Travelers Club Lights

Source: Yuguan Li, MSU Practicum

Proposed LED Light Locations & Potentially Affected Businesses

It is expected that the LED streetlight project to be implemented in downtown Okemos will change the streetscape with regards to illumination, as well as the current lack of traditional streetlights in the CBD. **FIGURE 1.32** presents a visual representation of the placement of the LED's and the immediate commercial units to be affected by the lighting.

FIGURE 1.32: Proposed LED Light Locations & Potentially Affected Businesses



On the northern side of Okemos Road the LED streetlights will have the following location:

- North – West corner of Mid-Michigan Academy
- North – West corner of Art Unlimited
- Southern surface parking entrance of White Brothers Music
- Across and parallel to CC Greenery

On the southern side of Okemos Road the LED streetlights will have the following location:

- North – West edge of Special A Fare Catering
- Close proximities to Meridian Activity Center
- Across and parallel to Dominos Pizza
- Across and parallel to Meridian Activity Center southern parking lot

On the western side of Hamilton Road the LED streetlights will have the following location:

- North – West corner of Bottoms Up
- South – East corner of Hamilton Road and Ardmore Avenue
- South of the Hamilton Building
- South – West of Triple Goddess Bookstore

On the Eastern side of Hamilton Road the LED streetlights will have the following location in:

- Entrance to the Independent Bank
- Across and parallel to Wood's Okemos Marathon
- South – East corner of Wood's Okemos Marathon
- South – East corner of Sandie Tailoring/ Bodies In Motion

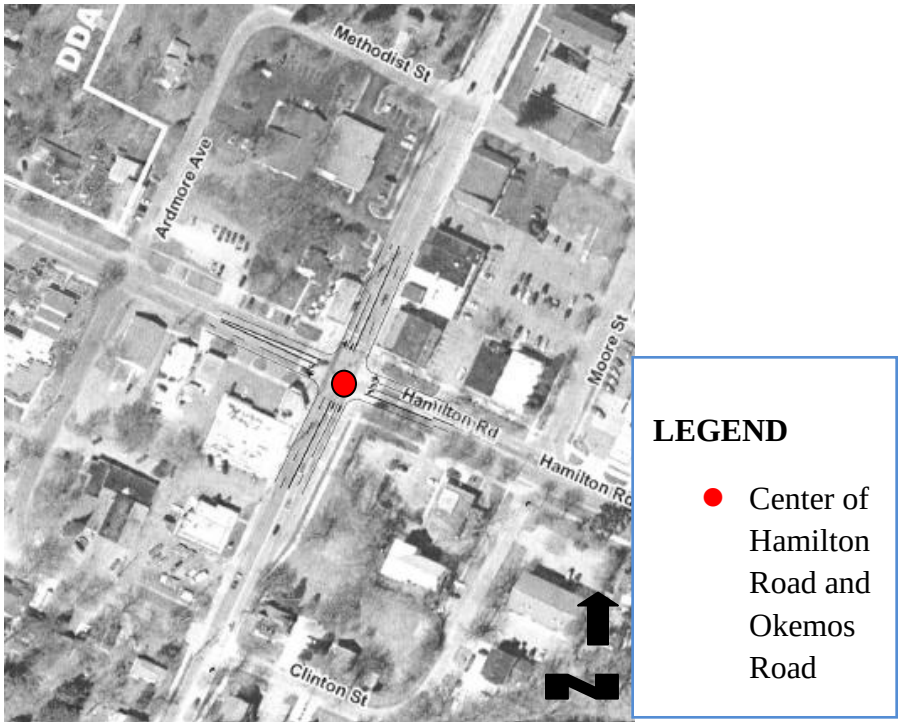
1.3 SOCIO ECONOMIC INFORMATION

Introduction

The following data has been assembled from the U.S. Census Bureau and MapInfo Corporation as presented in the Meridian Township Integrated Plan Okemos DDA. Data for Ingham County and Meridian Charter Township was collected from the U.S. Census Bureau, while data for the downtown Okemos area at a 0.5 mile radius was gathered from the MapInfo Corporation socio-economic research.

In the case of downtown Okemos, a "0.5 mile ring", denotes a circular area with a radius of 0.5 miles. The center for this region is the intersection of Hamilton and Okemos road with the following coordinates (**FIGURE 1.33**):

FIGURE 1.33: Center of Hamilton Road & Okemos Road



Source: Meridian Township Integrated Plan Okemos DDA

This data is examined in order to find and/or predict any relationship between socio-economical characteristics such as population, age distribution, income, housing, and the potential impacts of LED streetlights to be implemented at the site. The information provided will act as a precursor for studies done after the completion of the LED project to asses to the extent feasible if LED lighting has a measurable effect in some of the presented socio-economic characteristics.

Population – Downtown Okemos, Trends & Comparisons

Population trends and comparisons are an important tool in analyzing the resident attraction a successful, vibrant and compact place has upon its community. The following data are presented to show population information focused on downtown Okemos 0.5 mile radius.

TABLE 1.2: Population figures and percent change

	Ingham County		Meridian Township		Downtown Okemos 0.5 Mile Ring	
Year	Population	Change	Population	Change	Population	Change
1990	281,912	N/A	35,644	N/A	1,935	N/A
2000	279,320	-0.92%	39,116	9.75%	1,770	-8.53%
2007	280,097	0.28%	39,036	-0.20%	1,717	-2.99%

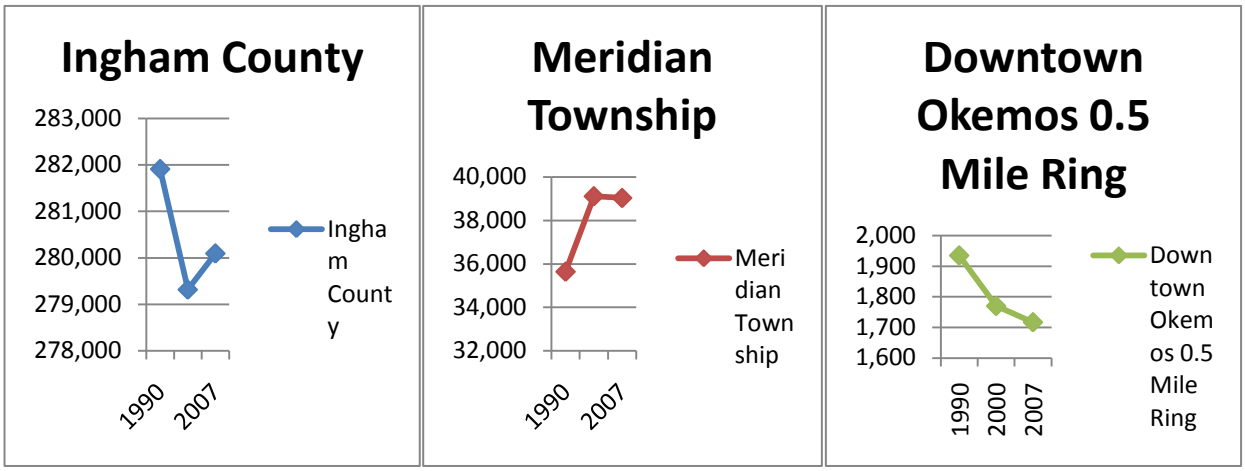
Source: U.S. Census Bureau/MapInfo Corporation 1990 Census, 2000 Census, 2007 estimates

According to **TABLE 1.2**, the 0.5 mile region surrounding downtown Okemos has had a population of 1,717 as of 2007. This number has decreased from its 1990 population of 1,935. From 1990 to 2000 the area experienced a loss of 8.53%. The rate of decline from 2000 to 2007 was 2.99 %. During the course of 17 years, downtown Okemos has experienced a population loss of approximately 218 residents.

When compared with Meridian Township and Ingham County as a whole, the data shows that downtown Okemos has seen the largest decrease in terms of population changes. With respect to net gain or losses, Meridian Township is the only one to experience population growth with about 9.65% increase from its 1990 population numbers, while Ingham County has seen a net decline of its residents. Although the County as a whole, has experienced a reduction in its population, its 0.54% populace decline from 1990 to 2007 is much lower than the rate of the 0.5 mile area surrounding the heart of downtown Okemos.

FIGURE 1.34 shows population changes in Ingham County, Meridian Township, and the 0.5 mile ring on downtown Okemos. Out of the three described locations, downtown Okemos is the only site to experience population decline from 1990 to 2007.

FIGURE 1.34: Population Changes



Source: U.S. Census Bureau/MapInfo Corporation

From the analysis of the presented data, it can be observed that residents surrounding downtown Okemos have been moving out of the area. Although reasons behind such mobility maybe numerous, the presence of a strong or weak downtown setting may also be a contributing factor. A compact and vibrant Central Business District can result in population attraction.[12] Currently the site lacks such uniformity. However, the implementation of the LED streetlight project in this area is a step in creating a vibrant and desirable district as well as a welcoming image for the community. By measuring population trends after the implementation of the LED project, one may be able to see the effects such development can have on population attraction.

[12] "10 Reasons Why Our Downtowns Are Important", TRMaintStreet, 2005.

Age Distribution – Downtown Okemos, Trends

The age distribution of a community influences and reflects the form of services they require. Regions with high percentage of elderly population and families with young dependants may require a safe, serene, and easy pedestrian flowing environment, such as wide sidewalks and a well lit streetscape. In comparison, a young to adult population may want a more vibrant and active locale.

TABLE 1.3: Age Distribution, Downtown Okemos

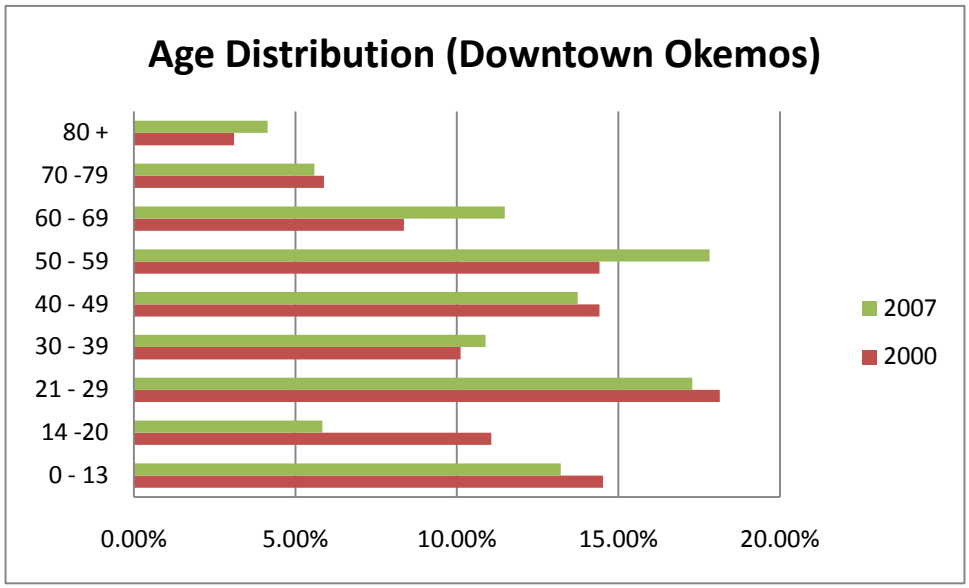
Downtown Okemos 0.5 Mile Ring	2000		2007	
Age	Estimate	Percent	Estimate	Percent
0 - 13	257	14.52%	227	13.22%
14 -20	196	11.07%	100	5.83%
21 - 29	321	18.14%	297	17.29%
30 - 39	179	10.11%	187	10.89%
40 - 49	255	14.41%	236	13.74%
50 - 59	255	14.41%	306	17.82%
60 - 69	148	8.36%	197	11.48%
70 -79	104	5.88%	96	5.59%
80 +	56	3.10%	71	4.14%
Total	1,770	100%	1,717	100%

Source: MapInfo Corporation, 2000 -2007

TABLE 1.3 shows the age distribution in the 0.5 mile ring around downtown Okemos from 2000 to 2007, with **FIGURE 1.35** presenting the comparisons between the two periods more vividly.

As it can be seen from the information provided, from 2000 to 2007, age distribution in the 0.5 mile ring surrounding downtown Okemos has saw the greatest percent change, especially for the age groups of 50 – 70. In 2000, the bracket of 21 – 29 year old residents comprised the largest percentage of the population. People between the ages of 0-13, and 40 – 59 were second, with an average of 14% for each age group. However, 2007 has seen a decrease of the young population and a large increase of old age residents, with the age group between 50 – 59 experiencing the largest growth with 3.41%.

FIGURE 1.35: Age Distribution



Source: MapInfo Corporation, 2000 -2007

It should be noted that some of the age distribution change is simply a result of aging during the period between 2000 to 2007. When analyzing the data it is evident that a small portion of the young adult population, especially the age group of 14 to 20, has decreased in downtown Okemos; meanwhile the elderly percentage, specifically between the ages of 50 to 70, has increased.

With respect to the LED streetlight project, its implementation could affect the age distribution of downtown Okemos. The streetlights will create a well lit and more welcoming environment that can appeal to both elderly and young residents alike. A more balanced age distribution might therefore be attained by the project. However, to see factual information as a result of the implementation of the LED streetlights, data must be gathered and compared after the project is completed.

Housing Characteristics – Downtown Okemos, Comparisons

Vacancy rates are an important marker of a region's economic status. A high vacancy rate entails the existence of a housing surplus. In comparison, a housing vacancy rate decline means that the economy of a district is improving, consequently increasing housing demand. In the latter instance, existing vacant units are occupied and undesired units are renovated for futures uses.[13]

TABLE 1.4: Housing characteristics – Ingham, Meridian, Downtown Okemos

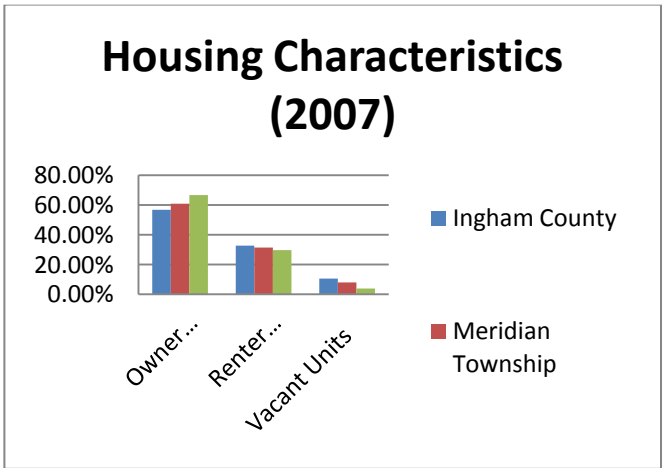
2007	Ingham County		Meridian Township		Downtown Okemos 0.5 Mile Ring	
Housing	Estimate	Percent	Estimate	Percent	Estimate	Percent
Total Units	120,606	100%	17,961	100%	953	100%
Owner Occupied Unit	68,557	56.84%	10,912	60.75%	634	66.53%
Renter Occupied Unit	39,372	32.64%	5,620	31.29%	282	29.59%
Vacant Units	12,677	10.52%	1,429	7.96%	37	3.88%

Source: U.S. Census Bureau/MapInfo Corporation, 2007

TABLE 1.4 shows occupied units and vacant units in Ingham County, Meridian Township and the 0.5 mile ring surrounding the center of downtown Okemos as of 2007, with **FIGURE 1.36** presenting the comparisons of the three. The data shows Ingham County to have the highest vacancy rate with 10.52% of the housing stock. Next in line is Meridian Township with 7.96% of its housing stock; while downtown Okemos appears to have the lowest vacancy rate, with only 3.88% or 37 housing units being unoccupied.

The information shows downtown Okemos to contain a better housing market. A more compact CBD could lower the vacancy rate furthermore for structures in close proximities simply due to the attraction of new development resulting from a desirable business center. The LED streetlight project can assist in the creation of such a region, therefore indirectly affecting vacancy rates of housing units in downtown Okemos.

FIGURE 1.36: Housing Characteristics



Source: U.S. Census Bureau/MapInfo Corporation,

[13] Dow, James P., Neighborhood Factors Affecting Apartment Vacancy Rates in Los Angeles, California State University; 36

Income Characteristics – Downtown Okemos, Comparisons

Household income is an indicator of wealth. It can impact a variety of fields from the ability of residents to supply their basic needs such as healthcare and nutrition to education and quality housing. Accordingly, a region containing a high household income level tends to suggest the existence of greater disposable income and larger consumer markets.

TABLE 1.5: Income Characteristics – Ingham, Meridian, Downtown Okemos

2007	Ingham County		Meridian Township		Downtown Okemos 0.5 Mile Ring	
Income	Estimate	Percent	Estimate	Percent	Estimate	Percent
Total households	107,929	(x)	16,532	(x)	954	(x)
Less than $10,000	12,902	12.00%	1,864	11.30%	57	5.97%
$10,000 to $14,999	5,735	5.30%	724	4.40%	38	3.98%
$15,000 to $24,999	128,588	11.90%	1,188	7.20%	70	7.33%
$25,000 to $34,999	11,687	10.80%	1,192	7.20%	88	9.21%
$35,000 to $49,999	15,660	14.50%	1,551	9.40%	118	12.36%
$50,000 to $74,999	19,527	18.10%	2,751	16.60%	242	25.34%
$75,000 to $99,999	12,832	11.90%	2,512	15.20%	167	17.49%
$100,000 to $149,999	11,257	10.40%	2,612	15.80%	102	10.68%
$150,000 to $199,999	2,858	2.60%	1,094	6.60%	37	3.87%
$200,000 or more	2,613	2.40%	1,044	6.30%	24	2.51%
Median income	45,313	(x)	66,836	(x)	60,271	(x)

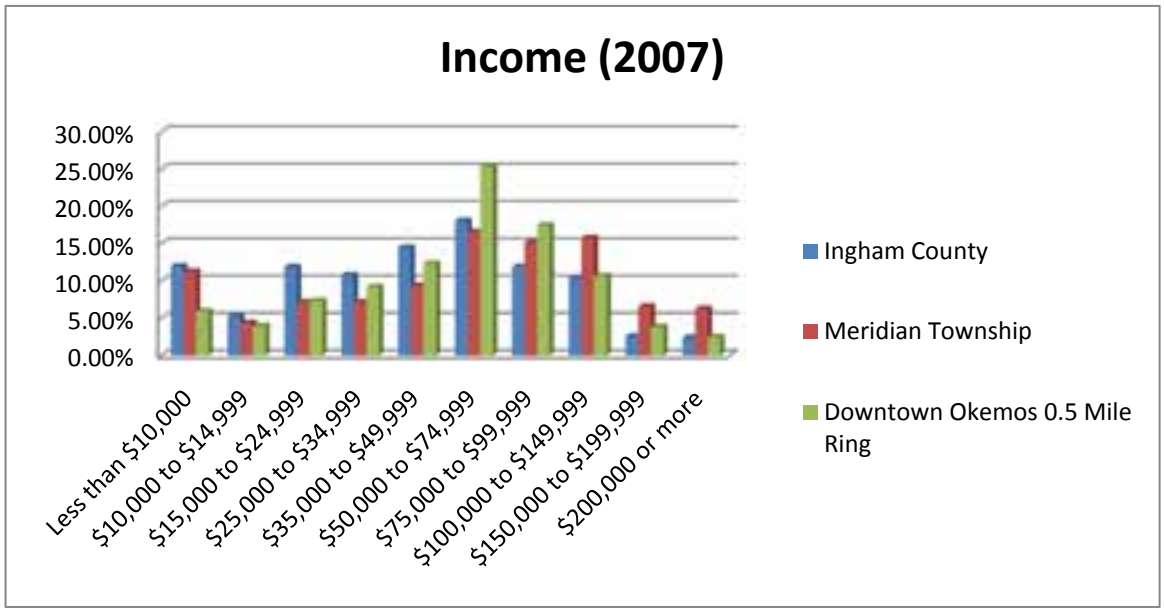
Source: U.S. Census Bureau/MapInfo Corporation, 2007

TABLE 1.5 represents household income as of 2007 for Ingham County, Meridian Township, and a 0.5 mile ring surrounding downtown Okemos, while **FIGURE 1.37** exemplifies the data in a comparative point of view.

The data shows downtown Okemos to have the lowest percentage of households under the poverty level with about 10% of the total households, while Meridian Township and Ingham County have a much higher percentage with roughly 15.7% and 17.3% respectively. It is important to state that the percentage of households in close proximity to downtown Okemos which enjoy a high level of income ($100,000 +) is much less than that of Meridian Township. The latter appears to have the highest numbers of such households with as much as 11% more of their total households. The median income for the three localities further enhances these differences. More specifically, households in downtown Okemos have a median income of $60,271, while Meridian Township enjoys a median income of $66,836, a 10% higher figure.

Ingham County appears to be the least wealthy out of three comparisons with a median income of $45,313.

FIGURE 1.37: Household Income Characteristics



Source: U.S. Census Bureau/MapInfo

From the analysis, it is observed that the household incomes for the three geographic locations vary greatly. Meridian Township enjoys the highest median income and therefore its residents in these households are likely to have a greater disposable income level. Although downtown Okemos has the lowest percentage of households under the poverty level, its median income is 10% lower than that of Meridian Township.

In order to raise the median income level of downtown Okemos and balance it with that of Meridian Township, new development or redevelopment in the CBD could be a beneficial step in its accomplishment. With regards to the LED streetlight project, it is still unknown whether there exists a direct correlation between LED streetlights and economic activity due to the technology being fairly new. If there is indeed a relationship between the two, a comparison of income data after the implementation of the project and data of previous years would hint on whether LED streetlights bring forth a better overall economic environment.

Summary

The following is a summation of the socio-economic trends and/or comparisons for the downtown Okemos 0.5 mile ring. This summary is presented to provide a brief view of the socio-economic characteristics of the designated region.

Population – On a comparison viewpoint between Ingham County, Meridian Township, and downtown Okemos 0.5 mile ring, the data shows downtown Okemos to be the only region losing population from 1990 to 2007. In addition, downtown Okemos has also experienced the highest decline in population percentage through this time frame.

Age Distribution – From 2000 to 2007, elderly population has increased in the downtown Okemos 0.5 mile ring; while young population numbers have decreased.

Housing Characteristics – Downtown Okemos 0.5 mile ring contains the lowest vacancy rate compared to Ingham County and Meridian Township.

Income Characteristics – Downtown Okemos 0.5 mile ring contains a median income that closely resembles the median Income of Meridian Township, $60,271 vs. $66,836. Furthermore, the 0.5 mile region surrounding down Okemos contains the lowest poverty rate relative to the two additional subjects analyzed, Ingham County and Meridian Township.

CHAPTER 2: IMPORTANCE OF ILLUMINATION

2.1 WHY LIGHTING IS IMPORTANT FOR COMMERCIAL AREAS

Introduction

Illumination can be very important to a commercial area. It casts large effects on a region or community's image at night. Moreover, the light is also related with many other important elements of the community. This chapter will be a detailed discussion on the importance of lighting from the aspects of safety, transportation, sense of community and local aesthetics.

Safety

One of the most important aspects of commercial illumination is that of safety. Studies have shown that the majority of crimes like assaults and burglaries are committed in poorly lit or unlit areas. **TABLE 2.1** below from the 2008 British Crime Survey indicates a much larger percentage of crimes occur in the darkness. From this survey, we can infer that criminals are more likely to commit a crime where it is dark.

TABLE 2.1: Type of Crimes at Different Time Periods

	% in daylight	% in darkness	% at dawn or dusk
Burglary (n = 548)	34	62	4
Theft of car (n = 266)	29	67	5
Robbery, theft from person (n = 91)	49	45	7
Assault (n = 225)	34	58	8
Theft from car (n = 1,205)	25	72	3
Theft of bike (n = 210)	53	43	4
Vandalism (n = 563)	30	65	6
Other household theft (n = 525)	37	56	7
AVERAGE (n = 3,633)	32	53	4

Source: British Crime Survey, 2008

The Second Islington (an inner-city district in London) Crime Survey in the United Kingdom is one of many which highlight the public's faith in street lighting in terms of crime prevention. A questionnaire was distributed, asking respondents to identify ways in which to reduce attack and harassment of women. "Better street lighting" was the second most popular response. (Crawford and others, 1990).

Nearly half of the 1600 people interviewed indicated that poor lighting is a "big problem" or at least "a bit of one". The survey reveals that people pay considerable attention to lighting conditions for the prevention of crimes.

From a psychological point of view, psychologists have pointed out that most people do not walk in areas that have poor illumination at night, due simply to a fear of the dark. Good street lighting at night may psychologically reduce the fear of crime for pedestrians, resulting in increased foot traffic.[14]

The benefits of improved street lighting on safety can be seen in Nara City, Japan. Three years ago, Nara City installed blue LED street lights around city blocks where burglary incidents used to occur. After the installation, the crime rate suddenly dropped by 25% according to the local police office. The positive results in reducing crime led the cities of Tokyo, Hiroshima, and Osaka to conduct similar improvements in their current street lighting.[15]

In November 2007, the city government of Tokyo replaced the white lights on the Street 6, Adachi-District with blue LED streetlights. The previous lighting made it difficult to identify peoples faces unless they were standing directly under the streetlight. This type of lighting left areas that were poorly illuminated, making it dangerous if criminals were near. After replacing the previous lighting with new blue LED lights, individuals noted that they were able to see each other even after they left the streetlights. Local police stated that the crime rate had declined by a considerable amount in the Adachi-District since the new lights were installed.[15]

Increased Sense of Community and Walkability

In the design and building of the physical environment of a downtown area, one essential element for success is the creation of space that is walkable. People will often choose to walk if the pathways and sidewalks are comfortable, safe, interesting and enjoyable[16]. Effective pedestrian lighting helps people feel safe and comfortable while walking in neighborhoods and to transit stops, stores, and other destinations[17]. Economically, the more a person is enticed to

[14] The Effect of Better Street Lighting on Crime and Fear: A Review by Malcolm Ramsay, Crime Prevention Unit Paper NO. 29, London: home office.
[15] "Blue Streetlights Might Help Stem Crime, Suicides." The Yomiuri Shimbun, December 23, 2008
[16] Burayidi, Michael. *Downtowns: Revitalizing the Centers of Small Urban Communities (Garland Reference Library of Social Science. Contemporary Urban Affairs,)*. 1 ed. New York: Routledge, 2001. Print.
[17] *Salt Lake City Street Lighting Master Plan and Policy, May, 2006.*

walk, the more store fronts he/she will come across, thereby increasing the pool of potential customers for businesses to draw from[18].

Street lighting can also help create a strong sense of community. For example, in 2000, the community of Hampton, England allied with local businesses in the downtown area to propose a plan to the local government to install solar powered street lamps along the town's main street. Even though the economy in England was in a downturn, the results of new street lighting proved to create a stronger sense of community, despite a decline in local business.[19]

[18] Burayidi, Michael. *Downtowns: Revitalizing the Centers of Small Urban Communities (Garland Reference Library of Social Science. Contemporary Urban Affairs,)*. 1 ed. New York: Routledge, 2001. Print.
[19] Czaplyski, Vincent. "Solar Street Lights Help Revitalize Downdown." *Public Works* 125 (1994): 4. Print.

2.2 CURRENT ILLUMINATION OF PROJECT SITE AND SAFETY DISADVANTAGES

The study area includes the intersection of Hamilton and Okemos Roads, and the surrounding area which currently has only four streetlights. There are several safety disadvantages associated with the lack of adequate illumination at the site as seen below in **FIGURE 2.1**, and discussed in the following paragraphs.

FIGURE 2.1: Hamilton Road and Okemos Road Intersection at Night.

Source: Alex Wisney

Safety Disadvantages include:

1 – Public Safety: Customers of restaurants and shops must take a short walk in the darkness to reach nearby parking lots. Newest local crime data from police office of Meridian Township

showed that it is very dangerous for pedestrians, as offenders or robbers can easily pose a threat to them at this time.

TABLE 2.2: Meridian Township Crime & Accident Report for 2009 Fourth Quarter

Meridian Township Police Department
2009 Fourth Quarter Report
Part 1 Offenses and OUIL/OUID Arrests & Traffic Accidents

	4th Quarter 2009	4th Quarter 2008	Current Quarter % Change	Year-to-Date 2009	Year-to-Date 2008	Year-to-Date % Change
PART 1 OFFENSES:						
Murder/Non-Negligent Manslaughter	0	1	*	0	1	*
Rape and Attempt Rape	4	7	-43	24	44	-45
Robbery	6	7	-14	22	23	-4
Aggravated/Felonious Assault	9	10	-10	51	58	-12
Total Part 1 Violent Crimes	19	25	-24	97	126	-23
Burglary (incl. Forcible, Unlawful, Attempt Entry)	43	49	-12	203	218	-7
Larceny (incl. Retail Fraud Theft)	243	292	-17	1058	1024	3
Motor Vehicle Theft	3	5	-40	26	39	-33
Arson	2	1	100	10	17	-41
Total Part 1 Property Crimes	291	347	-16	1297	1298	0
Total Part 1 Offenses	310	372	-17	1394	1424	-2
OUIL/OUID & TRAFFIC ACCIDENTS:						
OUIL/OUID	35	29	21	123	152	-19
Traffic Accidents	332	337	-1	892	992	-10

Source: Meridian Township Police Office. *OUIL/OUID: Operating Under the Influence of Liquor/Drugs

Table 2.1 shows some seasonal crime data for all the Meridian Township; the theft and burglary crimes accounted for a significant proportion of Meridian Township's crime cases. Dim lighting in downtown Okemos could provide good cover for thieves to hide and flee. Such a dark area makes it difficult to track down perpetrators. As seen from the data in **Table 2.1**, dark streets make it more convenient for offenders to commit an assault. In the project area at the intersection of Okemos Road and Hamilton Road, four crimes were committed in 2009 including one threat and three larcenies. None of them happened in daytime[20].

2 – Traffic Safety: The intersection of Hamilton Road and Okemos Road is an important transportation node in the downtown Okemos area. Large volumes of traffic from Interstate 96 (I-96) flow through this intersection daily.

[20] Crimes Data from Cindy Cummings, Records Supervisor of Meridian Police Department

TABLE 2.3: Traffic flow on Okemos Road and Hamilton Road, October 2008

Traffic Okemos South		Traffic Okemos North		Traffic Hamilton East		Traffic Hamilton West	
Interval: 60 mins		Interval: 60 mins		Interval: 60 mins		Interval: 60 mins	
Time	Hourly Count	Time	Hourly Count	Time	Hourly Count	Time	Hourly Count
00:00 - 01:00	71	00:00 - 01:00	31	00:00 - 01:00	22	00:00 - 01:00	2
01:00 - 02:00	29	01:00 - 02:00	34	01:00 - 02:00	14	01:00 - 02:00	1
02:00 - 03:00	32	02:00 - 03:00	7	02:00 - 03:00	15	02:00 - 03:00	3
03:00 - 04:00	38	03:00 - 04:00	12	03:00 - 04:00	30	03:00 - 04:00	2
04:00 - 05:00	45	04:00 - 05:00	10	04:00 - 05:00	24	04:00 - 05:00	1
05:00 - 06:00	75	05:00 - 06:00	48	05:00 - 06:00	70	05:00 - 06:00	3
06:00 - 07:00	184	06:00 - 07:00	139	06:00 - 07:00	234	06:00 - 07:00	22
07:00 - 08:00	540	07:00 - 08:00	402	07:00 - 08:00	527	07:00 - 08:00	70
08:00 - 09:00	769	08:00 - 09:00	440	08:00 - 09:00	464	08:00 - 09:00	58
09:00 - 10:00	716	09:00 - 10:00	290	09:00 - 10:00	466	09:00 - 10:00	58
10:00 - 11:00	777	10:00 - 11:00	335	10:00 - 11:00	519	10:00 - 11:00	52
11:00 - 12:00	976	11:00 - 12:00	395	11:00 - 12:00	742	11:00 - 12:00	84
12:00 - 13:00	1118	12:00 - 13:00	468	12:00 - 13:00	666	12:00 - 13:00	80
13:00 - 14:00	897	13:00 - 14:00	508	13:00 - 14:00	554	13:00 - 14:00	80
14:00 - 15:00	926	14:00 - 15:00	506	14:00 - 15:00	708	14:00 - 15:00	74
15:00 - 16:00	1230	15:00 - 16:00	520	15:00 - 16:00	888	15:00 - 16:00	96
16:00 - 17:00	1348	16:00 - 17:00	502	16:00 - 17:00	1098	16:00 - 17:00	64
17:00 - 18:00	1581	17:00 - 18:00	612	17:00 - 18:00	895	17:00 - 18:00	88
18:00 - 19:00	1142	18:00 - 19:00	508	18:00 - 19:00	689	18:00 - 19:00	78
19:00 - 20:00	806	19:00 - 20:00	442	19:00 - 20:00	512	19:00 - 20:00	34
20:00 - 21:00	510	20:00 - 21:00	366	20:00 - 21:00	375	20:00 - 21:00	40
21:00 - 22:00	408	21:00 - 22:00	271	21:00 - 22:00	200	21:00 - 22:00	21
22:00 - 23:00	204	22:00 - 23:00	138	22:00 - 23:00	112	22:00 - 23:00	11
23:00 - 24:00	146	23:00 - 24:00	54	23:00 - 24:00	48	23:00 - 24:00	4
TOTAL	14568	TOTAL	7038	TOTAL	9872	TOTAL	1026

Source: Ingham County Road Commission

As seen in **Table 2.3**, major traffic hours for the intersection of Hamilton Road and Okemos Road occur from 3:00PM to 7:00PM every day. Within this time period, an increase in vehicle flow coupled with limited illumination may pose a safety threat to both drivers and pedestrians in the area.

In 2009, there were 14 accidents at the intersection of Hamilton Road and Okemos Road. Out of the 14, four were reported to the state due to damage.[21] 10 out of these 14 accidents occurred at night.

FIGURE 2.2 shows the intersection during the daytime, and the lack of streetlights present.

FIGURE 2.2: Hamilton Road and Okemos Road Intersection in Daylight

Source: Yuguang Li

Public Aesthetics

In addition to concerns of safety and sense of community, the aesthetics of the district can also be stimulated by adequate lighting. The complete darkness along the road in **FIGURE 2.1** limits the aesthetic potential of the buildings in the district.

Meridian Township had placed some modern art sculptures along the streets, which were designed to help the whole neighborhood look more beautiful and dynamic, as shown in **FIGURE 2.3.** These pieces of artworks can be found along Okemos Road and Hamilton Road, in the area where the project lights are to be installed.

[21] Accidents Data from Cindy Cummings, Records Supervisor of Meridian Police Department.

FIGURE 2.3: Fish and Butterfly Statues in Study Area along Okemos Rd and Hamilton Rd

Source: Yuguang Li

During the daytime when there is adequate natural lighting, these sculptures can be easily observed by passengers; while the evening, these sculptures are not visible. Adequate lighting allows passengers to easily observe these artistic symbols which can enrich the neighborhood's sense of community at night.

Conclusion

In summary, from the standpoints of safety, sense of community, and public aesthetics, the installation of new street lights in downtown Okemos can provide improvement to the district. Appropriate light in this commercial area at night can bring pedestrians a feeling of safety, a sense of belonging to the community, and visual pleasure brought by the aesthetics of the local area.

2.3 LED ADVANTAGES AND DISADVANTAGES

Street light usage in commercial areas has potentially beneficial impacts for downtown Okemos, one which being safety. The usage of LED lights has advantages such as increased sense of community, and walkability, when compared to other types of street lighting or no lighting at all.

LED advantages:

1. LED lights if properly installed can reduce light pollution in the night sky

2. LED lights reduce energy consumption more than other forms of lighting. LED circuits can operate at 80% efficiency, which means 80% of the electricity is converted into light energy and only 20% is lost to heat. Incandescent lights operate at 20% efficiency

3. LED lights are made of non-toxic materials and can be recycled

4. LED streetlights provide safety for drivers and pedestrians

5. LED lights have a smaller bulb, don't use breakable filaments, and don't attract insects

6. LED lights only produce light in the visible spectrum, meaning no radiation, no ultraviolet, and no infrared emissions

7. LED lighting is more intense and covers a larger area because they can produce as much as two times the light output of high pressure sodium lights[22]

8. LED lights are economically friendly because of their longer lifespan. LED streetlights can last up to 50,000 hours, where the average high pressure sodium streetlight lasts 10,000 hours[23]

[22] "LED Street Lights Life-cycle Cost Analysis." Web. 21 Feb. 2010. <http://www.u-tron.com>.
[23] "Why LED Street Lights Are Better Than HPS Street Lights." *LED Lights, Industrial Lighting, LED Lighting - Lighting Orient*. Admin, 26 Aug. 2009. Web. 21 Feb. 2010. <http://www.ledlightsorient.com/watch/why-led-street-lights-are-better-than-hps-street-lights.html>.

LED disadvantages:

1. The initial cost for LED light installation is higher than that of the average streetlight[24]

2. The light that a LED bulb gives off is an intense low light, consequently it can be dangerous for one's eyes if looked directly upon [25]

3. LEDs are very heat responsive, excessive heat or inappropriate applications dramatically reduce both light output and lifespan of the light. They operate best in temperatures ranging from -40°C to +50°C (-40°F to 122°F) which limits their use to areas with like temperatures[26]

[24] "Led Lighting System Installation Tips." *External Lighting, Backyard Lighting, Pool Lighting and More*. Web. 21 Feb. 2010. <http://www.externallights.com/externallights-articles/led-lighting-system.php>.
[25] "LED Lighting." *Home building technical information resources builders construction remodeling innovations*. Web. 21 Feb. 2010. <http://www.toolbase.org/Technology-Inventory/Electrical-Electronics/white-LED-lighting>.
[26] "LEDs for outdoor lighting applications." *Lumec :: Outdoor Lighting*. Lumec. Web. 21 Feb. 2010. <http://www.lumec.com>.

CHAPTER 3: CASE STUDIES

3.1 CASE STUDY INTRODUCTION

The case studies give a better understanding of the types of things to expect when implementing LED technologies. The following cases should give an example of things that are "generally" true in such projects as the Meridian LED streetlight project. The case studies can also provide valuable data that can be compared to Meridian Township.

The Oakland, California case study was chosen because we wanted to provide project examples of different sizes and locations. Oakland is a much larger city, but the first test phase only included replacing three blocks worth of streetlights. The size of the test site gives the study a comparable amount of streetlights to Meridian Township in a much more heavily populated area.

The Elk Rapids, Michigan case was chosen because of its geographical proximity to Meridian Township, both project sites are in the State of Michigan, and have similar downtown areas. The population of Meridian Township is much higher than that of Elk Rapids; however the size of the area of implementation is similar to the area chosen in Meridian Township.

The Lansing, Michigan case study was very important to the research conducted for the project, because of the close geographic location. The distance between the two project sites is less than 10 miles apart. The two projects share the same streetlight designer (Roger Adsit with the LBWL) and have similar streetlight designs. Also the number of lights installed for the first pilot group in Lansing is 20, which matches the number that will be installed for Meridian Township.

The outline for the case studies is:

- Background of Site
- Reason for Implementation
- Scope of Implementation
- Funding for Project
- Duration of Implementation
- Evaluation of Project
- Public Input/Educational Efforts
- Conclusion

3.2 CASE STUDY: OAKLAND CA.

Background

Based on United States Census Bureau estimates for 2008, Oakland, California, is the eighth-largest city in U.S. with a population of 404, 155.[27] Ranked as the fourth greenest city in the United States by the Nature Resources Defense Council, Oakland is ensuring a green, safe, healthy environment by increasing energy efficiency. [28]

Oakland was a host city for the Department of Energy (DOE) solid-state lighting (SSL) GATEWAY Demonstrations[29] projects, which applied the high-performance Light Emitting Diode (LED) products for general illumination in public areas. This demonstration allowed the U.S. Department of Energy to provide real-world experience and data on LED product performance and cost effectiveness. These results connect DOE technology procurement efforts with large-volume purchasers and provide buyers with reliable data on product performance.

Reason for implementation

Oakland was chosen as a demonstration site because of the city's large number of outdoor lights and its history as a leader in energy efficiency. Oakland currently has 36,219[30] streetlights, which is consuming 22 million kilowatt-hours of energy annually, nearly one-third of the municipality's electrical costs. According to Oakland's Public Works Agency director Raul Godinez II, the city has long been an early adopter of cutting-edge technologies; it was quick to adopt red LED traffic signals in 1999 and green ones in 2001, as soon as the luminaries were approved for use. In addition, he says, a streetlight system that creates safety and security at the lowest energy cost while minimizing greenhouse gas emissions is the major goal for the city of Oakland.[31]

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[27] United States Census Bureau, http://www.census.gov/.
[28] City of Oakland-official website, http://www2.oaklandnet.com/GreenOakland/index.htm.
[29] DOE's SSL Technology Demonstration GATEWAY program features high-performance SSL products for general illumination in a variety of exterior and interior applications. Eligible products are installed at demonstration host sites, where their performance can be evaluated. Performance measures include energy consumption, light output/distribution, and installation/interface/control issues. Qualitative performance is investigated via feedback surveys of the relevant user communities. U.S. Department of Energy, http://www1.eere.energy.gov/buildings/ssl/gatewaydemos_faq.html.
[30] Oakland Street Light Facts, from the Electrical Division of the Department of Infrastructure and Operations of the Public Works Agency, last updated on Friday June 26, 2009, http://www.oaklandpw.com/Page246.aspx.
[31] James Brodrick, Testing 1, 2, LD+A Magazine, December 2007.

Scope of implementation

The city of Oakland, California tested THE EDGE (**FIGURE 3.1**) streetlights in a three-block area to assess the benefits of replacing 100-watt high-pressure sodium (HPS) Cobra heads. Beta-lighting-Edge Series offer excellent uniformity and are designed for lighting walkways, roadways, parking lots and other general applications.[32]

FIGURE 3.1: The EDGE Luminaire

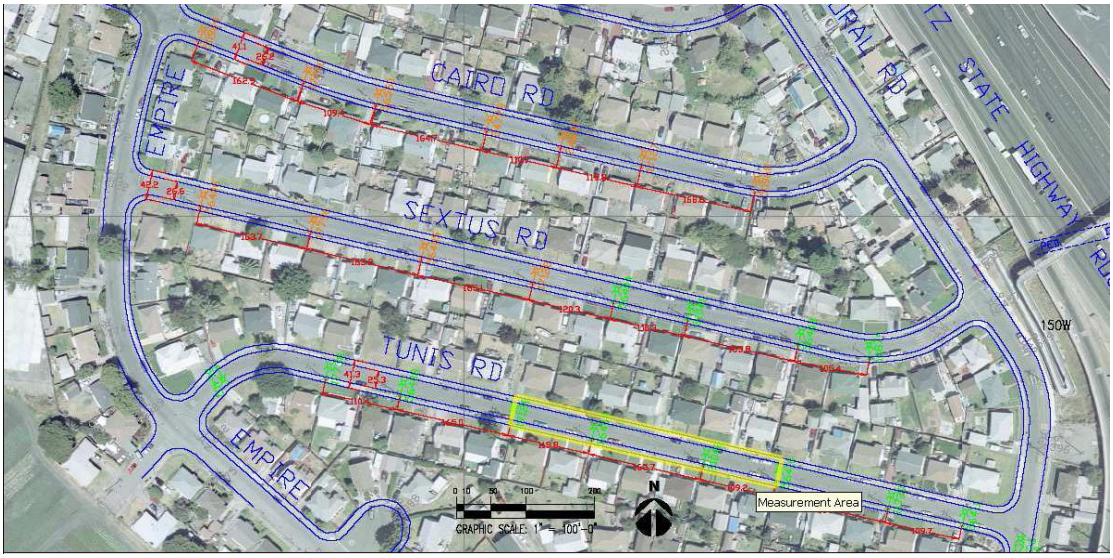
Sources: Beta LED

This project was conducted in three phases. The first phase was to test for excess glare or any inadequacy in the LED light distribution (dark spots or lack of uniformity) that could pose problems for drivers. After a week, the measurement results showed that the average luminance provided by the LEDs where higher than that of the high-pressure sodium (HPS) lamps, while providing no observable increase in glare.[33]

The second phase involved the installation of the EDGE streetlights on active public roadways. Fifteen (78 watt) LED luminaries replaced 121 watt HPS luminaries on Sextus and Tunis roads between Empire Road and Coral Road in a residential area which near the Oakland International Airport.
To allow a variety of comparisons, Sextus Road was illuminated with HPS luminaires on the eastern half and LED luminaires on the western half. Tunis Road was illuminated exclusively with LED luminaires, while the adjacent Cairo Road was entirely relamped with new HPS lamps (**FIGURE 3.2, FIGURE 3.3**).

[32] Night Sky Friendly Outdoor Lighting, http://store.starrynightlights.com/beta-edge.html.
[33] James Brodrick, Testing 1, 2, LD+A Magazine, December 2007.

FIGURE 3.2: Project Layout



City standard 100W HPS COBRA Head Street light

LED Street light

Measurement Area of Phase III

Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.

FIGURE 3.3: Street View of LED lights

Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.

In the third phase, four of the LED luminaires installed in the second phase were replaced by the next generation LED luminaires (58 watts) from the same manufacturer.[34]

Funding

The City of Oakland received a majority of the funding through the Emerging Technologies Program of Pacific Gas and Electric Company (PG&E). The Projected Program Budget for Emerging Technologies is $11,790,141.[35] The utilities company PG&E as a leader in energy efficiency is working with lighting manufacturers, the Department of Energy, and state and local customers to help bring this LED technology to the market. They carried out the LED Street Light Program in May 2009, which offers two types of incentives for customers interested in replacing traditional streetlights billed at a fixed lower rate. First, customers who have installed or replaced existing streetlight after May 1st, 2009 with LED will be able to enjoy a lower billing rate as well as a rebate for every qualified LED fixture purchased and installed. Second, PG&E also provides a LED Streetlight replacement Service, which involves a one-stop solution for customers who are willing to apply the new technology in order to minimize costs.[36] Additional support was provided to monitor data collection, and data analysis for an LED Street Lighting Assessment project from the Emerging Technologies Program of Pacific Gas and Electric Company. Finally, the Pacific Northwest National Laboratory (representing the United States Department of Energy) was involved to find solutions to help curb the City's annual $4 million energy and maintenance bill for streetlights.[37]

Project Evaluation

(1) Electrical Demand and Energy Savings

Measured electrical results from the second and third phase can be examined in **TABLE 3.1**. The metered LED luminaire drew an average of 77.7 watts in Phase II and 58.3 watts in Phase III.

[34] Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.
[35] Market Integrated Demand Side Management Program Descriptions, Pacific Gas and Electric Company, February, 2006.
[36] Emerging Technologies Program of Pacific Gas and Electric Company, http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/streetlightprogram.shtml,2006-2008.
[37] RUDD LED case studies, www.ruudled.net/files/docs/RuudLED-City%20of%20Oakland.pdf

With an estimated 4,100 annual hours of operation, annual electrical costs are estimated to be cut by approximately 36% in Phase II and 52% in Phase III from the metered HPS luminaires.[38]

TABLE 3.1: Potential Demand and Energy Savings

Luminaire Type	Average Power (W)	Power Savings (W)	Annual Energy Savings (kWh)
High-Pressure Sodium Luminaire	**121.0**	**-**	**-**
Phase II LED Luminaire (78 watts)	**77.7**	**43.3 (36%)**	**178**
Phase III LED Luminaire (58 watts)	**58.3**	**62.7(52%)**	**257**

Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase II, Host site: City of Oakland, California, January 2008.

(2) Lighting Performance

Illuminance

HPS lamps are large point sources; the area below the luminaire tends to have more luminance than points further away causing over-lighted areas. In comparison with the LEDs used in phase II and phase III, reduce over-lighting which also improves the visibility for drivers and pedestrians as well as the overall neighborhood's appearance and nighttime safety. [12]

Photographs

To qualitatively analyze color rendition, photos of each luminaire type were taken under the same camera settings (**FIGURE 3.4**).

[38] Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.

FIGURE3.4: HPS vs. LED Photograph

Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.

(3) Economic Performance

The economic performance was evaluated primarily by payback period (period of time required for the return on an investment) of the LED luminaires versus the HPS luminaires. Maintenance and energy costs were calculated, assuming the current energy and materials costs (**TABLE 3.2**).

TABLE 3.2: Annual Luminaire Costs

Luminaire Type	Annual Maintenance Cost (per Luminaire)	Annual Energy Cost (per Luminaire)	Total Annual Cost (per Luminaire)
HPS (with Spot Replacement)*	$20	$64	$84
HPS (with Group Replacement)**	$11	$64	$75
Phase II LED	$0	$42	$42
Phase III LED	$0	$32	$32

***Spot Replacement = one lamp replacement**

****** Group Replacement = 25 lamps replacements**

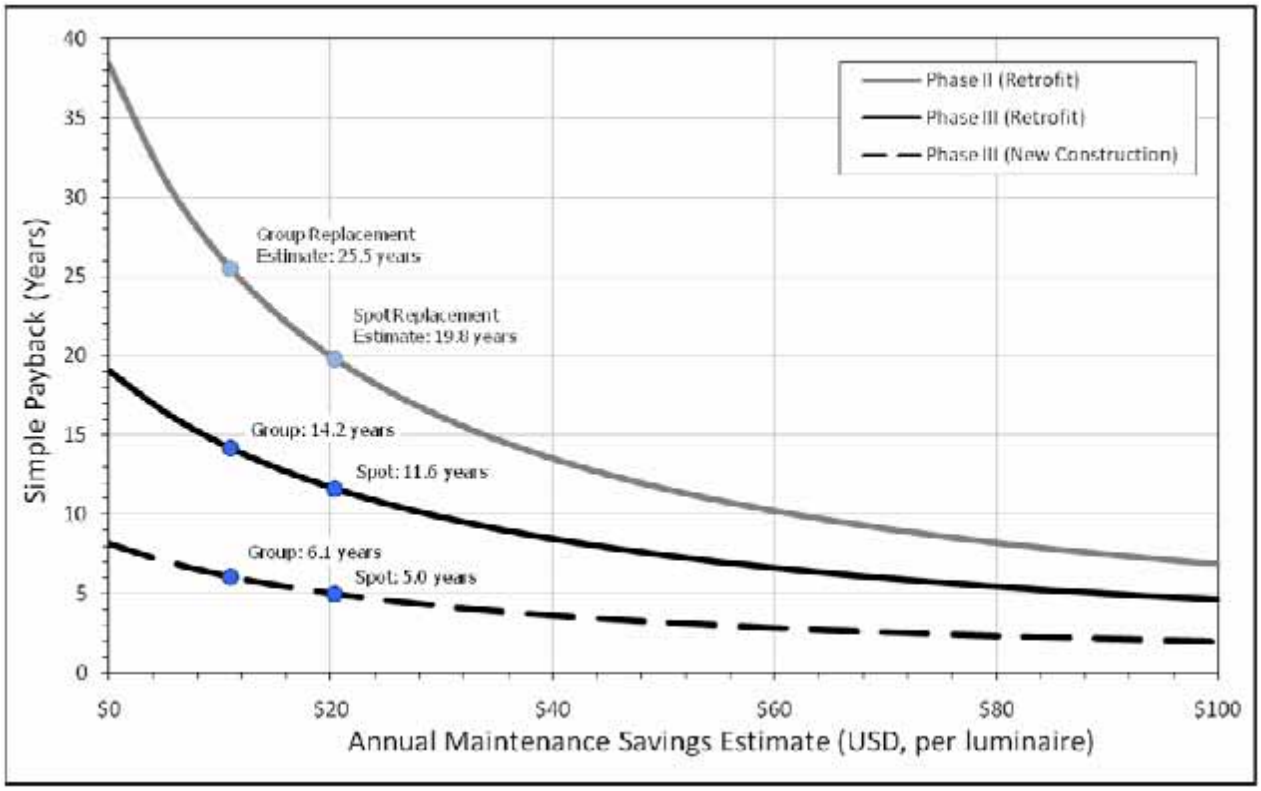
Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008.

For the HPS luminaires, maintenance accounted for roughly 25% and 15% the total annual cost under the spot replacement and group replacement scheme. Since the maintenance cost for LED

luminaires were assumed to be zero, the energy costs accounted for 100% of the annual cost.

Since payback period was affected mainly by installation costs and electrical costs, a chart (**FIGURE 3.5**) was constructed which shows payback period as a function of annual maintenance savings. The payback period approaches zero as maintenance savings increases for both 'new construction' and 'retrofit' scenarios.

FIGURE 3.5: Payback Periods for Various Maintenance Scenarios



Source: Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase III Continuation, Host site: City of Oakland, California, November 2008

The Phase III retrofitted luminaries were paid back in 12-14 years, while the payback period of Phase II was found to be 20-25 years. This shorter payback period is the result of reduced energy consumption by the Phase III luminaries, and reduced initial investments.

Phase III Results compared to Phase II:

- Energy savings of 26% (LED luminaire wattage dropped from 78W to 58W)
- Luminaire cost decreased by 34% (From $610 to $400)
- Lighting performance maintained

Public Acceptance

In the second phase of the project, the Pacific Northwest National Laboratory conducted a customer opinion survey. A public opinion research firm, Fairbank, Maslin, Maullin & Associates, contacted residents of the neighborhood by telephone to obtain their feedback on the new lights. Phone numbers were obtained for 106 households within the general area, 49 of which lived on streets with new lights. Roughly 60 households of the 106 were reached for feedback. All respondents that had noticed the new streetlights felt that the new streetlights at least maintained or improved their neighborhood's overall appearance, nighttime safety and nighttime visibility.[39]

A sample of the survey distributed can be found in **Appendix F.**

Conclusion

This program showcases LED products for general illumination in a variety of residential applications. Demonstration results provide real-life experience and data on state-of-the-art SSL product performance and cost effectiveness. These results connect DOE technology with large-volume purchasers and provide buyers with reliable data on product performance.

Despite electrical savings, the present high upfront cost of LED streetlighting luminaires may be a barrier to their current adoption. The payback numbers do not match other reports and case studies, which tend to point to a payback period of two or three years for LED streetlights. The report assumes a fixed energy cost, while a rising energy cost over time would be favorable for the more energy-efficient LEDs. Also notable are the annual maintenance costs, assumed to be $20 per year for HPS luminaires when the lamps are replaced on an individual basis, or $10 per year for group replacement every six years. A significantly higher maintenance cost for the HPS luminaires would reduce the payback period for the LED alternatives.

[39] Demonstration Assessment of Light Emitting Diode (LED) Street Lighting, Phase II, Host site: City of Oakland, California, January 2008.

3.3 CASE STUDY: ELK RAPIDS

Background of Site

The Village of Elk Rapids is located in Antrim County on the northwest coast of Michigan's Lower Peninsula. The Village is about two (2) square miles in area and divided in two by the Elk River, which connects the Grand Traverse Bay and Elk Lake. (See **FIGURE 3.6** Below) Elk Rapids is located about eighteen miles to the north-east of Traverse City, the largest economic center in the region.

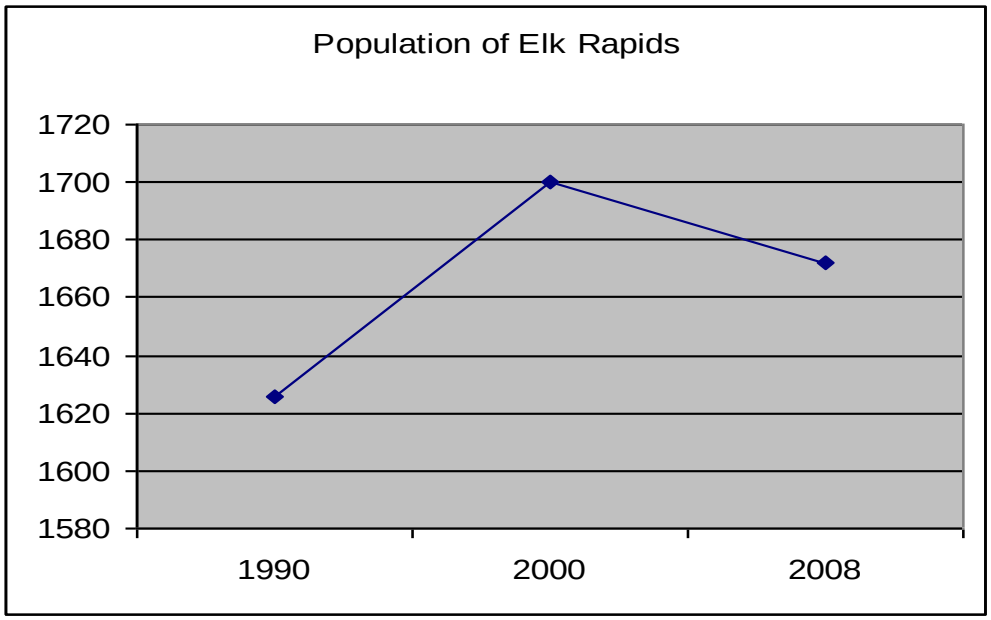
FIGURE 3.6: Map of Elk Rapids

Source: U.S. Census Bureau

Elk Rapids started as a logging establishment and port on Lake Michigan. The Village is located on the Grand Traverse Bay, with access to Lake Michigan, which once gave the sawmills prime location for shipping lumber to other major cities on the Great Lakes. Economic hardship hit Elk Rapids until the Village rebuilt the harbor and focused more on tourism and agriculture. US Highway 31, which runs along Michigan's West Coast, cuts through the Village giving it good access for travelers. Tourists travel to Elk Rapids because of its position on Grand Traverse Bay and Elk Lake, part of a chain of lakes that extend for 78 miles.[40]

[40] Village of Elk Rapids Website www.elkrapids.com

FIGURE 3.7: Elk Rapids Population (1990-2008)



Source: U.S. Census Bureau

TABLE 3.3: Elk Rapids Population (1990-2008)

Year	1990	2000	2008
Population	1626	1700	1672

Source: U.S. Census Bureau

The Village of Elk Rapids had a population of 1,700 people in the 2000 Census. This was an increase of 74 people from the 1990 Census, however the 2008 population experienced a decrease to 1,672 people. (See **FIGURE 3.7 & TABLE 3.3** Above).[41]

Reason for Implementation

Elk Rapids has made an effort to be a "Greener" community, and one of the ways the Village worked to meet this goal was by installing Light Emitting Diode (LED) streetlights. The new LED lights were retrofitted to the old light posts that previously housed High Pressure Sodium (HPS) 150 watt streetlights. Other reasons for switching to LED lights were to reduce energy costs, reduce streetlight maintenance costs, and to reduce light pollution. Elk Rapids experiences a high level of tourism in the summer months and along with the residents, the tourists like to

[41] United States Census Bureau www.census.gov

stargaze at night. The new LED lights reduce the amount of light given off into the night sky and allow people to better view the stars. Before the new lights were installed they operated at 55,179 kilowatts, but after the LED lights were implemented they now operate at 7,043 kilowatts per year, giving the Village an estimated annual cost savings of $4,043.[42]

FIGURE 3.8: LED StreetLight in Elk Rapids

Source: Paul Brake, Executive Director DDA of Okemos

Scope of Implementation

This project was a large undertaking for the small village of Elk Rapids, but one they felt was necessary. The cost of the project was estimated at around $90,000 and retrofitted 96 old streetlight posts with new LED lights. The first lights were installed in the downtown area. During the spring of 2009 the rest of the lights were installed throughout the Village.[43] **FIGURE 3.8** shows the streetlights that were installed.

Funding

The funding for the LED project came from the Downtown Development Authority (DDA) through Tax Increment Financing (TIF) and promise of a reduction in energy consumption. As mentioned previously, the Village estimates they will save $4,043 per year with the implementation of the new lights.[44]

Duration of Implementation

Once the project was finalized and the streetlights were ordered, the process of switching the lights was completed quickly. The retrofitting process

[42] Interview with Bob Peterson – Elk Rapids Village Manager
[43] Interview with Bob Peterson – Elk Rapids Village Manager
[44] Interview with Bob Peterson – Elk Rapids Village Manager

took about a week once the lights were received.

Evaluation

The new LED lights create an estimated 60+ percent reduction in electricity over the old HPS lights. The new lights also give a reduction in glare to the night sky. The only disadvantage associated with the project is that the new metal cages that house the lights create dark spots on the streets and sidewalks. **FIGURES 3.9 & 3.10** below show the metal cage which creates dark spots on the sidewalks and streets.[45]

FIGURE 3.9 & 3.10: LED Street Light Design

Source: Paul Brake, Executive Director DDA of Okemos

Public Input / Education Efforts

Before the project was implemented the Village Council and DDA held public hearings to inform the residents about the project. There was a test LED streetlight installed in the downtown area so the public could evaluate the new lights and the project as a whole. Attached to the test light post was information about LED technology and a phone number for residents to call to voice their opinion. However the village didn't receive a lot of feedback. Bob Peterson (Elk Rapids Village Manager) suspects the reason for the lack of public comment was due to the time of implementation. The test light was installed during the summer and therefore doesn't get dark

[45] Photos taken by Paul Brake Executive Director DDA of Okemos, Michigan

until 10:00pm. In May of 2009, Elk Rapids also held an event called "Green-ER Day" to inform residents of current programs to go "Greener" and also to bring up other environmental issues.

Conclusion

The addition of the lights hasn't brought about any local business improvements or the creation of extra jobs to date. However the estimated savings is over $4,000 per year for the new LED lights and have brought Elk Rapids closer to their goal of being a "Greener" community.[46]

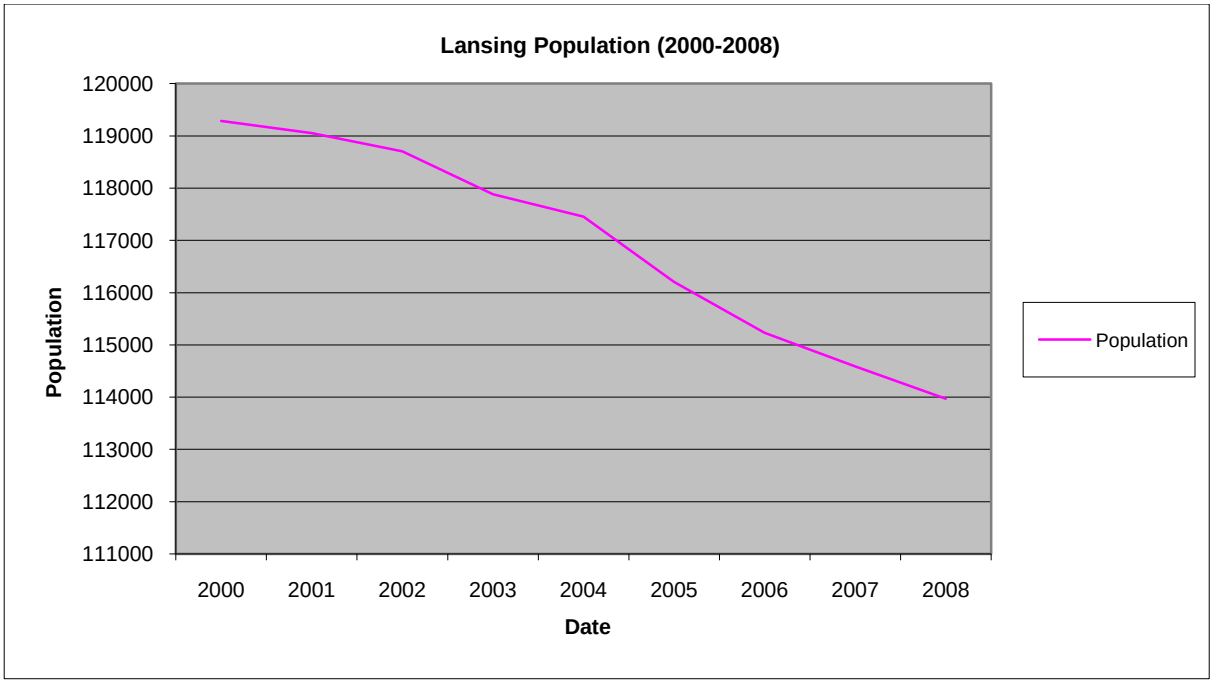
[46] Interview with Bob Peterson – Elk Rapids Village Manager

3.4 CASE STUDY: LANSING, MICHIGAN

Site Background

Lansing Michigan is home to a diverse population of over 110,000 people. Located in the heart of the Lower Peninsula, the state's capital offers diverse opportunities for housing, education, and employment. In recent years, the area has experienced a decline in total population, as seen below in **FIGURE 3.11**, and **TABLE3.4.**[47]

FIGURE 3.11: Lansing Population (2000-2008)



Source: U.S. Census Bureau

TABLE 3.4: Lansing Population (2000-2008)

Date	Population	Change
2000	119288	0
2001	119050	-238
2002	118705	-345
2003	117881	-824
2004	117453	-428
2005	116208	-1245
2006	115234	-974
2007	114590	-644
2008	113968	-622

Source: U.S. Census Bureau

[47] United States Census Bureau www.census.gov

Light Emitting Diode (LED) streetlight initiatives began in 2007 when the locally owned municipal utility company, the Lansing Board of Water and Light (LBWL), sought out funding for this new technology. The Lansing Board of Water and Light provides power to the greater Lansing area.[48]

Reason for Implementation

The Lansing Board of Water and Light chose to work with the new LED technology for street lighting for several reasons. The previous lighting used, mercury vapor lamps, have a very short lifetime (of two to four years) compared to the lifetime of LED lighting which averages around 14 years. Additionally, the previous lighting brought about concerns of hazardous waste due to the disposal of mercury, and consumed a greater amount of energy than LED lighting does. Finally, the LBWL wanted to install a brighter, whiter, cleaner light for the citizens of Lansing.[49]

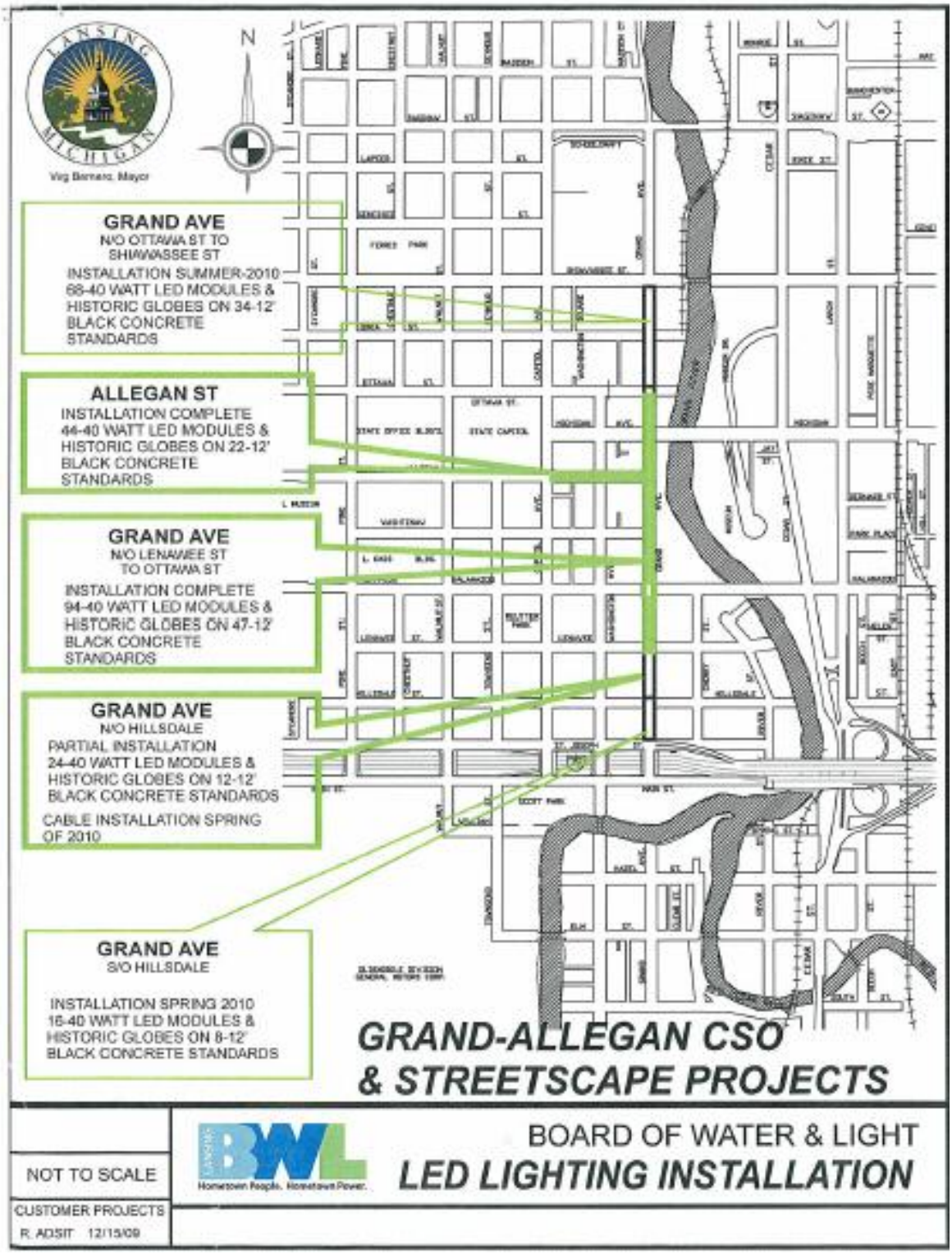
A Lansing ordinance mandates street lighting within the City. With nearly 35,000 streetlights, the LBWL was looking for ways to reduce energy consumption and costs stemming from street lighting.[50]

Scope of Implementation

The Lansing Board of Water and Light began implementing new LED streetlights in 2007, with the installation of 17 streetlights as a test group, utilizing funding from the APPA DEED grant. To begin the process, the LBWL made a request for different manufacturers and companies to design LED fixtures to retrofit to the existing lighting infrastructure. Different types of LED fixtures were used in the test group to identify the best lighting pattern, and color. As a result of the success in this trial based upon positive local reaction, 13 additional LED street lights were installed, totaling 30 new streetlights.[51] These streetlights were installed on Grand Avenue between Ottawa Street and Lenawee Street, and on Allegan Street between Capital Avenue and Grand Avenue (see **FIGURE 3.12**).

[48] Lansing Board of Water and Light website www.lbwl.com
[49] PHILLIPS Case Study http://www.philipslumileds.com/pdfs/CS11.pdf
[50] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light
[51] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

FIGURE 3.12: LED Streetlight Installation Locations



Source: Lansing Board of Water and Light

Project Funding

In 2007, the Lansing Board of Water and Light received a grant totaling $13,500 from the American Public Power Association (APPA) Demonstration of Energy-Efficient Development (DEED) grant to install the first 17 test lights. This grant was matched by the LBWL through engineering services and labor, to complete the installation of the first round of lights. The additional 13 lights that were installed thereafter were funded completely by the LBWL. [52]

Duration of Implementation

From the very start of the LED streetlight project, including the time spent in choosing designs and testing fixtures and the actual installation of the new infrastructure, the Lansing Board of Water and Light has spent a total of three-and-a-half years on this project. This test group of 30 lights required a great deal of time in determining the best design including color, appearance, and affordability.[53] Future efforts of the LBWL to install additional LED streetlights will likely go quicker, once a final design has been agreed upon.

Project Evaluation

Conversations with Ms. Kellee Christensen, the project manager at the LBWL indicated the general sense of success with the implementation of this new technology. Because of this, the LBWL has begun to install additional LED lights, as part of a project, which will result in a total of 246 new LED streetlights installed, and 127 previous lights removed when completed. Estimates for replacing the previous lighting with new LED fixtures, energy savings, and cost savings associated with this project has been generated by the LBWL and can be found in **TABLE 3.5**.

According to **TABLE 3.5** the energy per year in kilowatt-hours is 311,360, compared to the energy consumption of the new LED lights, which totals only 41,328 kilowatt-hours per year. As a result of the reduced energy consumption, the annual energy cost will be reduced from $12,267.60 with the previous lighting, to an estimated $1,628.32. The City of Lansing should save over $10,000 a year in energy costs alone, once the project has been completed and all 246 lights are installed.

[52] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

[53] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

TABLE 3.5

Energy Cost Savings Installation of LED Street Lights-Total Project								
	Wattage (bulb and ballast)	Hours per year	Energy per Year / fixture KWH	Energy Cost / KWH*	Energy Cost Per Fixture / Year	Number of Fixtures for Project	Energy per Year KWH	Energy Cost Per year
Removal of Mast Arm Lights	469	4200	1970	$ 0.0394	$ 77.61	61	120,158	$ 4,734.22
Removal of HPS Tunnel Lights	469	8760	4108	$ 0.0394	$ 161.87	42	172,554	$ 6,798.65
Removal of HPS Lights	185	4200	777	$ 0.0394	$ 30.61	24	18,648	$ 734.73
Removal Total						*127*	*311,360*	*$ 12,267.60*
Light Emitting Diode	40	4200	168	$ 0.0394	$ 6.62	246	41,328	$ 1,628.32
	LED energy reduction over 400 Watt+ballast		-91%			Saving Per Year	(270,032)	$ (10,639.27)
	LED energy Reduction over 150 + Ballast		-78%				-87%	

* based on current cost of service study for Street Lighting.

Source: Lansing Board of Water and Light

In addition to cost savings, the LED fixtures have additional benefits including reduced pollution concerns, compared to that of the previous lighting types regarding mercury disposal. Maintenance and replacement of LED lights are considerably less as well. The average life span of an LED fixture is more than three times that of the mercury vapor lamps or high-pressure sodium lights (14 years and 2-4 years respectively). This results in reduced re-lamping efforts, both scheduled, and spot-re-lamping, ultimately lowering overall maintenance cost.[54]

LED fixtures produce a lower amount of radiant heat than that of other types of lighting, therefore, concerns regarding the possible icing and covering of the lights in adverse weather conditions of Michigan winters were taken into account. However with the historical design of the streetlight (a single globe, as seen below in **FIGURE 3.13)** the ice and snow appears to slide right off of the globe.[55]

FIGURE 3.13: LED Streetlight Design

Traditional LED

Source: PHILLIPS Case Study

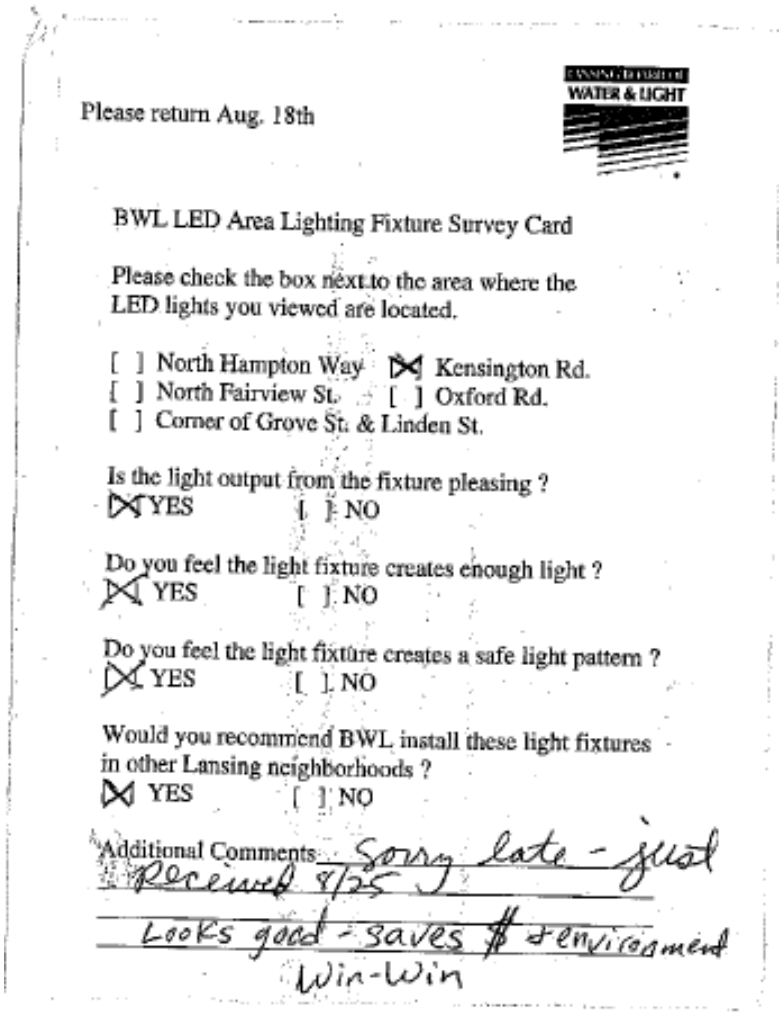
[54] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

[55] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

Public Input / Education Efforts

At the beginning of the project, employees of the LBWL met with local neighborhood groups and other governmental agencies to discuss the LED streetlighting project, and gain public input. Since the implementation of the new infrastructure, community responses have been overwhelmingly positive. The LBWL conducted a survey in the neighborhood (approximately 650 survey cards were sent out) where the new lighting was installed, and 85% of responses were positive (approximately 400 were returned). [56]. Survey respondents mentioned they liked the cleaner, brighter light, and that they felt it was safer than the old HID lights.[57] A sample of the survey cards distributed can be found below in **FIGURE 3.14**.

FIGURE 3.14: Sample Survey Card from the LBWL



Please return Aug. 18th

WATER & LIGHT

BWL LED Area Lighting Fixture Survey Card

Please check the box next to the area where the LED lights you viewed are located.

[ ] North Hampton Way [X] Kensington Rd.
[ ] North Fairview St. [ ] Oxford Rd.
[ ] Corner of Grove St. & Linden St.

Is the light output from the fixture pleasing ?
[X] YES [ ] NO

Do you feel the light fixture creates enough light ?
[X] YES [ ] NO

Do you feel the light fixture creates a safe light pattern ?
[X] YES [ ] NO

Would you recommend BWL install these light fixtures in other Lansing neighborhoods ?
[X] YES [ ] NO

Additional Comments Sorry late - just Received 8/25
Looks good - saves $ + environment
Win-Win

Source: Lansing Board of Water and Light

[56] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light
[57] PHILLIPS Case Study http://www.philipslumileds.com/pdfs/CS11.pdf

Suggestions from the respondents on the coloring and intensity of the light were taken into consideration, and the LED designs are now constructed with a softer light (around 5000K) instead of the original cool white light (6500K). Furthermore, a Type 3 lighting pattern is being used to focus the light onto the street, and shield it from front yards, and private property.[58] **FIGURE 3.15** shows a new LED street light in a neighborhood setting.

FIGURE 3.15: Difference Between Traditional and LED Streetlights

LED Traditional

Source: PHILLIPS Case Study

Conclusion

The LED streetlighting project has proven to be beneficial for the Lansing community. Stemming from the original 30 LED streetlights installed, the Lansing Board of Water and Light has begun the process of installing an additional 246 LED lights, designed by Sylvania. These lights cost an approximate $250.00 per light, and will be funded by the LBWL. The cost of installation will be recovered through the state mandated surcharges for renewable energy and energy efficiency, which are part of the LBWL energy rates.

Currently, there are a total of 162 LED streetlights in Lansing. The LBWL is installing them in areas where existing lights need replacing first, and then will continue to replace any additional lights left throughout the City according to the map below in **FIGURE 3.16**. The remaining 84 lights will be installed in the spring and summer of 2010, based upon construction schedules for

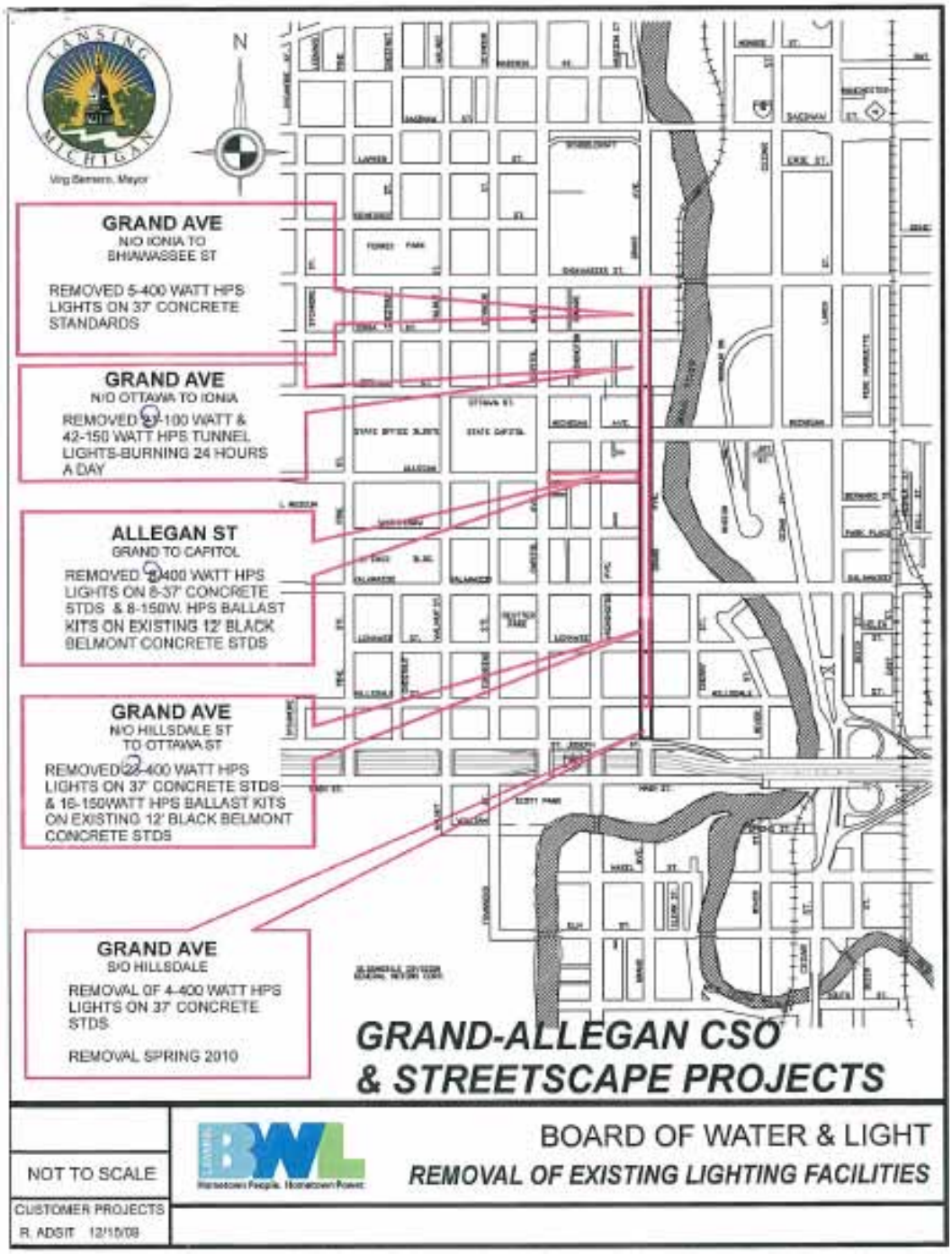
[58] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

projects in the study area. **FIGURE 3.16** below identifies locations where old streetlight fixtures will be replaced with LED streetlight fixtures.

A study will be conducted eventually to better determine the exact costs and benefits of LED streetlights. This study will not be conducted until the remaining lights have been installed and it is estimated to take approximately four years for study completion. It is the eventual goal of the LBWL to replace all 35,000 streetlights in the city. The LBWL is working this year to determine a rate for LED usage.[59]

[59] Interview with Kellee Christensen – Project Manager and Roger Adsit – Streetlight Designer from the Lansing Board of Water and Light

FIGURE 3.16: Locations of Streetlight Removal



Source: Lansing Board of Water and Light

CHAPTER 4: CONCLUSIONS

CONCLUSION

LED lighting presents benefits over other streetlights, making it a good alternative for downtown Okemos. With lower energy consumption and reduced operating costs, the LED streetlight project provides an opportunity to improve the public safety, traffic safety, and walkability within the downtown Okemos area which currently has minimal street lighting.

The case studies conducted as a part of this project highlight and exemplify the benefits of LED technology use in street lighting. Overall, each case study has revealed positive results from LED streetlight installation and implementation. As identified in the Oakland, CA and Elk Rapids, MI and Lansing, MI case studies and **TABLE 4.1** each instance has resulted in lower operating costs, reduced maintenance time and costs, and lower energy consumption. These advantages have been realized in both large (Oakland, CA) medium (Lansing, MI) and small (Elk Rapids, MI) scopes of implementation. While the initial cost of implementing the new LED technology is high with the installation of alternate fixtures, the long-term benefits of the technology justify the initial cost when considering all of the potential benefits of LED lighting.

TABLE 4.1: Advantages and Disadvantages of Case Studies

Case	Advantages	Disadvantages
Oakland, California	• Annual electrical savings are estimated to be 36%(Phase II) and 52% (Phase III) • Reduce the over-lighting areas compares with HPS • Reduce the maintenance costs	Long payback period
ELK Rapids, Michigan	• Create more than 60% reduction in electricity use • Reduce the glare to the night sky	New metal cages that house the light create dark spots on the streets and sidewalks.
Lansing, Michigan	• Annual energy cost reduced from $12,267.60 with the previous lighting, to an estimated $1,628.32 • Reduced pollution concerns regarding the mercury disposal • Reduce the maintenance costs • Average life span of an LED fixture is more than three times that of the mercury vapor lamps or high-pressure sodium lights	LED fixtures produce a lower amount of radiant heat than that of other types of lighting, therefore, concerns regarding the possible icing and covering of the lights in adverse weather conditions of Michigan winters were taken into account.

After the LED streetlights are installed, downtown Okemos will likely experience the benefits of LED technology similar to those evidenced in the case studies. Adequate lighting helps people feel safe and comfortable while walking in neighborhoods and commercial areas at night. It allows passengers to easily observe other people and signs of businesses in the evening and night hours. Traffic accidents could be reduced in the area with better illumination. Additionally, artistic symbols which can enrich the neighborhood's aesthetics will be more visible at night for pedestrians and vehicles passing through the region.

Increase in safety levels can enhance pedestrian movement in the area; therefore, economic activity for the commercial units in downtown Okemos may be positively affected. LED streetlights can further assist in the creation of a more desirable business climate for

downtown Okemos. Respectively, the level of business attraction can be affected in future developments in the region.

Recommendations for Lighting Placement

The following list includes recommendations for the placement of the LED streetlights in downtown Okemos. The list was formulated after careful review of the current conditions of the site, the possible effects lighting has on commercial districts, and analysis of the presented case studies. They are proposed as elements to be considered in the implementation and installation of the LED fixtures.

1. Commercial signage should be taken into consideration when deciding the location of the LED streetlights. The fixtures should be located in close proximities to the signs in order to assist and facilitate the advertisement of these businesses during dark hours.

2. Emphasis should be placed on Okemos Road in relationship to the number of LED streetlights. This vehicular route has a greater width and carries a larger number of vehicles compared to Hamilton Road. More LED streetlights might be needed along this road in order to have efficient lighting across downtown Okemos.

3. An LED streetlight should be placed in the North-East corner of Douglas J. Salon & Spa. Currently, the proposed plan does not include any fixtures in this area. The scale and importance this commercial unit has toward downtown Okemos, makes it an important element that requires better illumination during dark hours.

Helpful Hints for Future Communities on Successful LED Implementation

As LED technology continues to gain popularity as an energy efficient source of lighting, and new and improved fixtures are developed, it is likely that additional communities will explore options to update their existing lighting fixtures to support LED technology. As a result, communities must take steps to prepare for implementation, educate members of the community on the benefits of LED lighting, and secure funds for installation.

Chapter 2 provides a succinct summary of the advantages and disadvantages of LED streetlight implementation. While the initial costs of implementation are high, the long-term benefits of LED lighting outweigh the initial cost. As mentioned previously, communities of all sizes and

various scopes of implementation have experienced positive results. The following discussion identifies what should be completed prior to LED implementation.

One of the most important aspects of planning for LED streetlight implementation is to secure the necessary funding to support the project. The grant included in this study (Appendix D) which was submitted by Meridian Township, provides an excellent example of what individual communities can look to submit on their behalf to supplement the initial cost of implementation. Grants that are provided for energy-efficiency or new technologies provide a great opportunity for communities to gain necessary funds to complete LED projects. Different funding opportunities may be available to communities based upon the type of municipality they are located in, including local, state, and federal funding sources.

Once grant applications have been submitted, and funding secured for the project, the next step is to educate the public on the advantages and disadvantages of LED technology and gain support for the project. This can be done through various survey efforts, the development of informational brochures, public presentations, and many other ways. It is important to notify the public of the safety benefits associated with LED lighting, along with a potential increase in walkability within the community.

The last step is the actual installation of the new streetlights. During the design and layout of the lights, careful attention must be paid to the placement of the lights in order to avoid dark spots, and provide the greatest possible illumination. It is important to place the lights in a manner that illuminates sidewalks or paths along roadways, intersections, and streets themselves; this increases the safety for drivers along with pedestrians in the implementation area. Discussions with professional LED installers and engineers are necessary to ensure a successful installation process.

APPENDIX A: PRE SURVEY

Pre Survey Questions

1- Do you have any previous knowledge about Light Emitting Diode (LED) technology?

-Yes
-No

2- What kind of advantages do you think LED streetlights might have?
(Check all that apply)

Advantages
-Reduce light pollution
-Reduce energy consumption
-Provide safety for drivers and pedestrians
-Reduce maintenance costs
-Others (Please be specific)

3- What kind of disadvantages do you think LED streetlights might have?
(Check all that apply)

-Higher initial price for LED lights
-Others (Please be specific)

4- Have you ever seen LED streetlights within Okemos?

-Yes
-No
-I don't know

5- Do you think streetlights (such as LED lights) will improve nighttime safety in your neighborhood?

-Yes

-No
-I don't know

6- Do you think brighter streetlights (such as LED) will improve visibility for you as a pedestrian?

-Yes
-No
-I don't know

7- Do you think brighter streetlights (such as LED) will attract additional foot traffic in your community?

-Yes
-No
-I don't know

8- Do you think streetlights (such as LED) can result in increased economic activity in your community?

-Yes
-No
-I don't know

9- Do you agree that using LED lights instead of using traditional lights, such as High Pressure Sodium (HPS) lights, will create a strong neighborhood identity?

-Yes
-No
-I don't know

Reminder: If you wish to be informed on the LED Streetlight Educational Program airing on the HOM-TV channel this summer, or if you would like to know more on this project or on LED streetlight technology advantages, please provide your email in the space below.

[Insert email address]

Note: Please look for the Post-Survey to be distributed after the LED streetlight project has been completed.

Thank you for taking the time to complete this survey!

APPENDIX B: POST SURVEY

Post Survey

1- Did you watch the LED Streetlight Education Program on HOM-TV?

-Yes
-No
-I don't know

2- Did you take the survey distributed before the installation of the LED streetlights?

-Yes
-No
-I don't know

3- Since the installation of the LED streetlights along Okemos Road and Hamilton Road in downtown Okemos, have you noticed a difference in brightness compared to that before their installation?

-Yes
-No
-I don't know

4- Do you feel the new LED streetlights installed in downtown Okemos have improved visibility for pedestrians and drivers in the area? (select only one)

-Strongly improved visibility
-Somewhat improved visibility
-Not improved visibility
-Unsure

5- Do you feel the new LED streetlights installed in downtown Okemos create less glare in the area compared to the previous existing street lighting? (select only one)

-Much less glare
-Somewhat less glare
-More glare
-Unsure

6- Do you feel the new LED streetlights improve the neighborhood nighttime safety?

-Yes
-No
-I don't know

7- Do you feel the new LED streetlights installed in downtown Okemos promote and/or create walkability within the community?

-Yes
-No
-I don't know

8- Are you shopping more after the installation of the LED streetlights?

-Yes
-No
-I don't know

Reminder: If you are interested in this project, and would like to receive additional information on the advantages of LED technology, please provide your email address in the space below.

[Insert email address]

Thank you for your time in completing this survey!

APPENDIX C: HOM-TV CONTENT

Special Feature: LED Lights

Show Treatment:

The LED Lights Special Feature is a 30-minute program that will be dedicated to inform and educate Meridian Township residents about the LED street lights and how they fit into the Meridian Township Master Plan. This Special Feature will give details about the general benefits of LED technology, case studies of other community projects, and the uniqueness of the grant Meridian Township received for this project to help promote economic development. This program will also give visual examples and resident opinions before and after the street lights are installed.

Purpose:

Engage viewers by increasing awareness and stimulating interest of what is happening in Meridian Township.

Flow of the show:

Documentary Style (dispersed interviews and video footage)

APPENDIX D: LED DEMONSTRATION GRANT APPLICATION

Meridian Township
Downtown Development Authority

LED Demonstration Grant Application

Paul J. Brake - ICMA-CM
Assistant Township Manager/
DDA Executive Director

David E.S. Bowman
Management Intern

5151 Marsh Rd
Okemos MI 48864-1198
T: (517) 853-4208
F: (517) 853-4096
www.twp.meridian.mi.us

Meridian Township Downtown Development Authority
LED Demonstration Grant Application
November 5, 2009

V-A **Identification of Organization**

Meridian Charter Township
5151 Marsh Road
Okemos, MI 48864-1198
(517) 853-4206
Federal Tax ID Number 38-6007712

Subordinate/Contracting Firm

Lansing Board of Water and Light
730 E. Hazel Street
P.O. Box 13007
Lansing, MI 48901
(517) 702-6831

V-B **Authorized Negotiators**

Gerald J. Richards
Township Manager
Meridian Charter Township
5151 Marsh Road
Okemos, MI 48864
(517) 853-4254

V-C **Management Summary**

Meridian Township has the leadership staff and community capacity to carry out this important project.

The proposed project manager for the LED Demonstration Grant is Paul Brake. Mr. Brake serves in the dual role as the Downtown Development Authority's (DDA) Executive Director and Assistant Township Manager.

Diana Hasse, CPA, will be the financial manager of the grant project. Ms. Hasse is employed as the Finance Director of Meridian Township and she is responsible for planning, directing and overseeing the financial functions of the Township.

To assure quality financial control measures, Meridian Township maintains a system of internal accounting controls to assure that transactions are properly authorized and recorded. This system includes: the preparation and approval of a budget which appropriates funding; a purchasing policy that requires competitive bids, management approval, and proper documentation; separation of duties in recording and reconciling financial transactions; and financial statement review by management and the Township Board. In addition, the system of internal controls is audited annually in conjunction with

the financial audit performed by an independent accounting firm whose contract is also bid an on regular basis. The project will be evaluated according to the following criteria:

- Energy performance – Measurement of energy reduction
- Lighting performance – Direct lighting performance comparison between High Pressure Sodium (HPS) and Light Emitted Diodes (LED) luminaries.
- Economic performance – Cost reduction and performance improvements.
- Customer satisfaction and technology awareness – Customer opinions' will be gathered from direct mail survey to all property owners in the Downtown Development Authority. Further, the demonstration video posted on the Internet will ask citizens to complete an on-line survey to gauge the public education program.

V-D **Statement of the Problem**

Meridian Charter Township desires to replace existing HPS and cobra head luminaries, in the downtown area, with 20 historic LED lighting fixtures and poles. The Meridian Township Board is committed to saving energy and reducing carbon emissions to help protect the environment.

The community supports the introduction of improved lighting in Meridian Township and is evidenced through responses in the most recent National Citizen Survey; (NCS) completed May 2009. The NCS was developed by the National Research Center, Inc. (NRC) to provide statistically valid surveys of resident opinions about government provided community services. The findings of the survey support providing more adequate street lighting in the community.

In June 2008, a community vision forum was held to discuss future ideas for the Downtown Okemos area. This was part of a study, sponsored by Meridian Township and the DDA, to improve the Downtown area and surrounding neighborhoods. Participants specifically mentioned a desire for energy efficient amenities, including street lights. Those who attended the community vision forum expressed an interest in aesthetically pleasing streetscapes that encouraged a more walkable community.

Meridian Township residents value good community design, public safety and environmental stability as top priorities in their community. Installation of LED products will help the Township meet the above citizen focused goals in addition to civic goals of implementing long-term energy efficient projects. The Township hopes to reach its goals of sustainability through a reduction of greenhouse gas emissions and cost savings realized through reduced fuel consumption and extended LED life spans. According to the Lansing Board of Water and Light, the realized energy savings of conversion from HPS cobra-head luminaries to LED's is estimated to be a 53% savings in life cycle maintenance, approximately $9,000 over the life of the fixture (14 years).

Energy and Energy Cost Savings
Installation of LED Street Lights versus HPS Street Lights - Meridian Township

Light Source in Single Historic Lansing Globe	Output (Lums)	Wattage	Hours per year	Energy per Year / fixture KWH	Energy Cost / KWH[1]	Energy Cost Per Fixture / Year	Number of Fixtures for Project	Energy per Year KWH	Energy Cost Per year
Incandescent	5800	85	4200	357	$ 0.0084	$ 14.67	20	7,140	$ 281
Light Emitting Diode	4800	40	4200	168		$ 6.82		3,360	$ 133
			Energy Differential per fixture	(189)	Cost Savings per Fixture	$ (7.45)	Saving Per Year	(3,780)	$ (148)

[1] Energy cost are extracted into fully developed LBWL SL Rate

Estimated Maintenance Savings
Installation of LED Street Lights versus HPS Street Lights - Meridian Township

Light Source in Single Historic Lansing Globe	Relamp Schedule	Fixture Replacement	Failure of lamp replacements	Replacement of Fixture due to damage	14 year cost of relamping maintenance for 20 fixtures
HPS	4 years	12 - 14 years	10 % to 15% per year	1 to 2 % per year	$ 35,672
Light Emitting Diode[1]	12 years+	12-14 years	1 % or less per year	1 to 2 % per year	$ 26,400
				Estimate Maintenance Savings over 14 year	$ (9,272)

Note: Saving for reductions in fuel emissions for relamping and maintenance as well as manufacturing and disposal of fixtures and lamps/drivers.

[1] Lamp maintenance and relamping figures are estimates based on use of replacement costs and three years of field testing.

REF: 10/28/2009 LBWL

Downtown Okemos or the Meridian Township Downtown Development Authority (DDA) is inclusive of a small downtown area that has remained dormant for a long period of time. The DDA is a relatively new organization; formed less than four years. The purpose of the DDA is to halt property value deterioration and increase property tax valuation where possible in its business district and eliminate deterioration causes. Within walking distance of downtown, there are areas of poverty. One apartment complex in particular (within the same 2000 census tract as the DDA) identified 19% of its residents (699 of 3,631 of all persons) with incomes below the poverty line. Additionally, one of Okemos' public schools, Central Elementary School (within the same census tract), reported 37% of its 223 students as eligible for Free or Reduced Lunch Programs as of the 2009 - 2010 academic year.

Economic Impact

Despite the economic challenges of the Michigan economy, Meridian Township and other surrounding communities continue to proactively attract and retain business growth. The design and construction of the new LED street light system would further provide jobs to a struggling labor market. LED street lights will improve tourism, retention and attraction of new businesses to Downtown Okemos as well as the Greater Lansing Region. Businesses, in the LED Demonstration Grants Area of Potential Effect (APE)

have pledged to create fifteen (15) new full-time jobs directly related to investments made in the DDA's infrastructure.

Below is a calculation of jobs retained and created as a result of this proposed investment:

Survey of Downtown Businesses in Area of Potential Effect			
Number of Businesses	Current Number of Full-Time Equivalent (FTE) Employees	Projected Number of Job Retained – FTE	Projected Number of Jobs Created – FTE
25	130	130	15

Quality public services such as community lighting are essential for companies to attract a quality workforce. Improved community lighting promotes regional economic opportunity.

Community Engagement

Citizens and stakeholders of Meridian Township support and provide input through a variety of forums. Meridian Township proposes informing and demonstrating the benefits of LED products through a unique forum. The Township will use its government access channel, HOM-TV (an award winning organization that broadcasts to 11,000 households through Comcast Channel 21 on the East Lansing/Meridian channel lineup) to produce and broadcast a program describing the project. The television program will be a twenty minute feature about the new technology, energy efficiency and commitment to "green" technology. Aside from the cable television broadcast, HOM-TV programs are available through video archives on the Internet.

Additionally, HOM-TV will produce a shorter segment video (3 minutes in length) to be featured as a computer based video. This short video will be made available through the Township's Web site and referenced through social media, such as Facebook, Linked-In, and Twitter.

In 2003, HOM-TV produced a special feature titled "Keeping Meridian Green", which fully demonstrates the professional, studio quality, public affairs television that Meridian Township's Government Access cable television station is capable of generating.

The program highlighted accessibility to recycling efforts in the community including implementation of curbside recycling through Granger and use of recycled items for craft projects through the Creation Station in Lansing. The intention of "Keeping Meridian Green" was to educate and increase resident awareness of various recycling opportunities in their community. (*see attachment H-DVD*)

The introduction of LED's to Meridian Township will allow the Department of Energy Labor and Economic Growth (DELEG) and the Township an opportunity to demonstrate the usefulness, ease of implementation and public/private advantages of supporting innovative environmentally beneficial technology. The Meridian Township DDA has the special capability to isolate and highlight the advantages of LED's through HOM-TV. HOM-TV presents pertinent issues in the community and region.

The DDA believes that by better informing other communities of new technologies, such as LED's, serve as an excellent example. By utilizing the government access television in providing informational programming, this will encourage others to consider and utilize the cost effective, environmentally friendly lighting options presented by LED's.

The Meridian Township DDA is eager to add LED lighting to its current community-supported environmental conservation efforts. The DDA is poised to build upon its' Reduce, Reuse, Recycle policy while stabilizing and enhancing its local economy and community pride.

Leveraging Regional Partners

Meridian Township is working with the Lansing Board of Water and Light (LBWL) on a distinctive regional project. The Township's DDA is working with the LBWL to install the streetlights for this project. The DDA will benefit from a proposed volume purchase through the LBWL for a similar project to be conducted in Downtown Lansing (Lansing Principal Shopping District) scheduled to begin in the same timeframe as this project. A letter of support is included to demonstrate the project cost and management commitment to the project (*see attachment I – Letter Dated October 19, 2009 from Kellee Christensen*)

The project is also supported through a partnership with the Ingham County Economic Development Corporation. Upon the formation of the DDA, Meridian Township entered into a tax sharing agreement with Ingham County to further the downtown revitalization goals of the DDA. A letter of support is also included to show the support of the regional economic development partner (*see attachment J – letter dated November 3, 2009 from Susan Pigg*). Meridian Township Economic Development Corporation has also extended its support of this project (*see attachment K – letter dated November 3, 2009 from Marsha Madle*). Meridian Township also has two collaborative committees who are committed to resource efficiency and emerging technologies (*see attachment L – letter dated November 3, 2009 from LeRoy Harvey and attachment M – letter dated November 4, 2009 from Dennis Louney*).

Meridian Township will be working with Michigan State University's James Madison College and the Urban Planning Department in conducting the program evaluation. Professors Louise Jezierski and Rex LaMore will lead a group of qualified students to perform quantitative and qualitative analysis of the LED technology. Students will assist with developing the survey and questionnaire documents, produce equations to measure economic development, analyze data and report these findings, as part of the Township's

final report. A letter of support is included to demonstrate this collaborative partnership *(see attachment N – letter from Louise Jezierski, PhD.)*

V-E **Work Plan**

Explanation of how the proposal will be implemented—
An abbreviated action plan outline

Action #1
Design Plan Review Cost Estimate
Lansing Board of Water and Light (60 hours)
January 2010 (Completion Date: March 2010)

Develops street light layout project plans, reviews electrical design drawings plans and evaluates standards specifications.

Action #2
Financing in Place
Meridian Township (20 hours)
February 2010 (Completion Date: April 2010)

Project Manager will seek financing for project costs. The construction match will be paid from loan proceeds pledged from future tax increment financing revenues from the DDA budget.

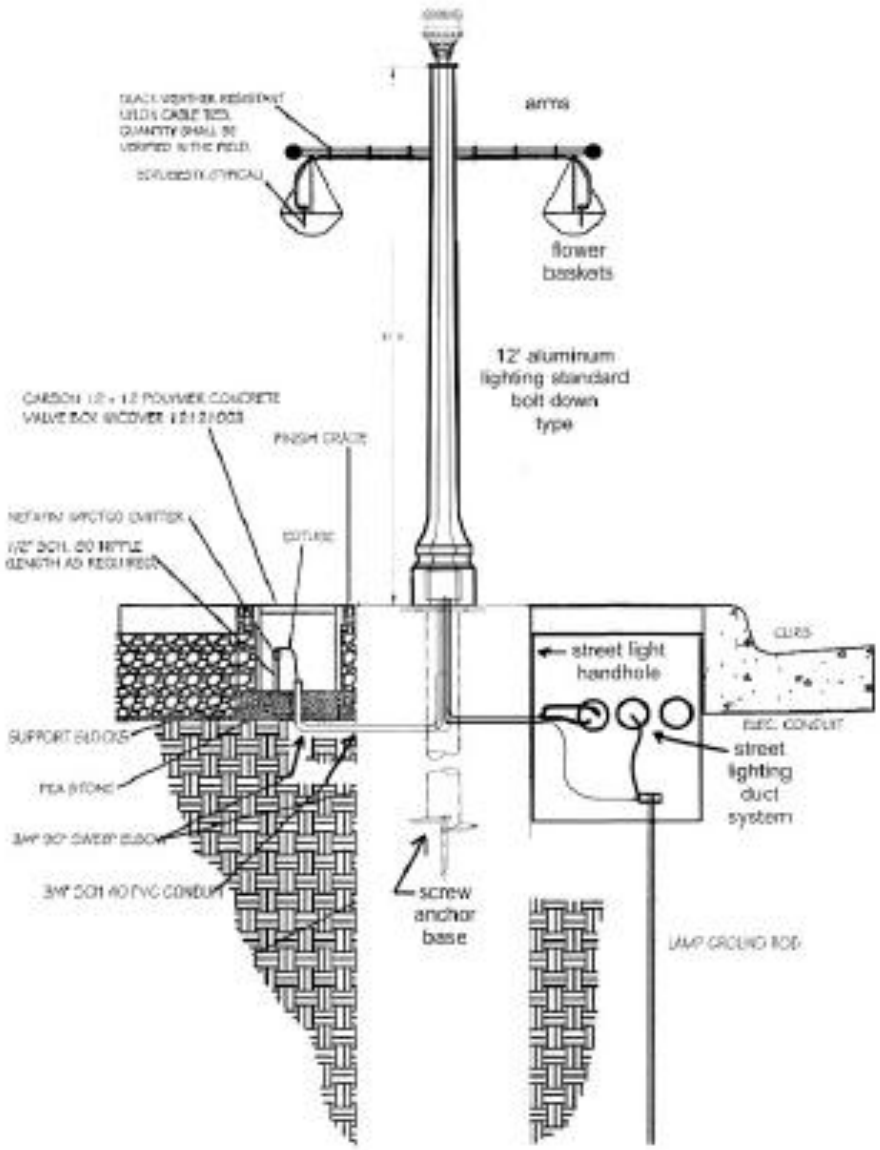
Action # 3
Construction/Project Implementation
Lansing Board of Water and Light (50 hours)
April 2010 (Completion Date: June 2010)

This entails the installation of the street lighting systems: installing conduit, wiring for grounded 120 volt system, trenching, boring, poles, LED fixtures, and restoration.

Historic streetlights with banner

Street lights with irrigated flower basket

Proposed Streetlight Construction



Meridian Township Downtown Development Authority
LED Demonstration Grant Application
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Action #4
Develop and Implement Public Education Program
Meridian Township (60 hours)
July 2010 (Completion Date: September 2010)

Produce, edit and film public affairs/education television demonstration video. The education element will include background information about the benefits of LED technology.

Action #5
Program Evaluation
Meridian Township/Michigan State University (20 hours)
August 2010 (Completion Date: September 2010)

Program evaluation will be jointly performed by Meridian Township and Michigan State University. Students from the Social Studies and Urban Planning programs will be performing quantitative and qualitative analysis of the LED technology. Students will assist with developing the survey and questionnaire documents, produce equations to measure economic development, analyze data and report these findings, as part of the Township final report.

V-F **National Environmental Policy Act Questionnaire**
Attachment D

V-H **Historical Preservation Office (SHPO) Review**
Attachment E

V-I **Prior Experience**

Meridian Township has demonstrated successful prior grant management experience through the following programs:

Michigan Department of Natural Resources $1,482,616

This includes funding for 17 separate grants from 1972 to 2001 for park land acquisition, development and capital improvements of various parks in Meridian Township.

Michigan Department of Natural Resources $1,137

This consists of funding from the Forest Stewardship Program Outreach and Education Project Grants. It paid for interpretative signage at Van Atta Woods Park installed in 2006.

Office of the Governor – Centers for Regional Excellence $25,000

This is funding for a multi-jurisdictional project to create and implement a community media center. Meridian Township was the lead applicant for this 2008 awarded project.

Michigan Office of Highway Safety Planning $104,000

This is a multi-jurisdictional program aimed at reducing alcohol related traffic fatalities, increasing seat belt use, and decreasing compliance violations for businesses selling to minors. Meridian Township managed this 2009 project on behalf of the Police Departments of Lansing, Lansing Township, East Lansing, Michigan State University and the Ingham County Sheriff's Department.

V-J **Personnel**

The proposed project manager for the LED Demonstration Grant is Paul Brake. Mr. Brake is the DDA's Executive Director and also doubles as the Assistant Township Manager. He is also an ICMA-Credentialed Manager and has over 21 years of local government management experience.

Mr. Brake has a Bachelor of Arts Degree from Grand Valley State University and a Masters of Arts Degree in Public Administration from Western Michigan University and has managed the DDA since its inception in 2005. He will guide the DDA Board and volunteers through the planning and implementation of the street light enhancement project in its entirety.

Ms. Kellee E. Christensen, P.E. Manager of Customer Projects and Development will act as the LED Demonstration Grant project consultant on behalf of the Meridian Township DDA. Kellee is an experienced project and development manager for the Lansing Board of Water & Light (LBWL). Kellee has worked for the LBWL for 19 years.

Ms. Christensen has an extensive professional background in distribution, design, planning and maintenance of enhancement projects in the areas of electricity and water. She specializes in LED street lighting, rate application, rules and regulations, and utility marketing and branding services.

Ms. Christensen's prior experience with LED street lighting projects and project development will assist the Meridian Township DDA in assuring proper adherence to guidelines and timetables related to the LED Demonstration Grant project.

Mr. Chad Taylor is the supervisor of Electric Design and will guide and lead the design staff. Reporting to Chad Taylor is Street Lighting Designer, Roger L. Adsit. Mr. Adsit has been employed by LBWL for 43 years.

Ms. Deborah Guthrie is the Station Manager at the cable government access channel, HOM-TV. She has served as executive editor of the television production for over two

years and has been employed with the station for over 11 years. She will oversee the twenty minute television program feature about the new technology, energy efficiency and commitment to "green" technology.

Mr. Brian Dumont is Senior Production Manager at HOM-TV and has been employed with the station for over 8 years. Prior to HOM-TV, Mr. Dumont worked for various commercial television stations as a photojournalist. He will be assisting Ms. Guthrie with the television program.

Project Staffing Hours	
Paul J. Brake	40
Kellee E. Christensen, P.E.	20
Chad Taylor	10
Roger L. Adsit	80
Deborah Guthrie	20
Brian Dumont	20

V-K **Time Frame**

	January 2010	February 2010	March 2010	April 2010	May 2010	June 2010	July 2010	August 2010	September 2010
Action #1 Design Plan Review Cost Estimate									
Action #2 Financing in Place									
Action #3 Construction/Project Implementation									
Action #4 Develop and Implement Public Education Program									
Action #5 Program Evaluation									

V-L **Budget Considerations**

The proposed budget for the removal of existing overhead lights and installation of 20 historic LED lighting fixtures and poles will be as follows:

Line Item	State	Applicant	Total
Personnel/Fringes			
Contractual Services		92,000	92,000
Equipment		12,000	12,000
Supplies/Materials	$50,000	50,000	100,000
Total	$50,000	$154,000	$204,000

V-M **Additional Information and Comments**

Meridian Charter Township, population 41,170 (2007 Estimated Census), is located in Ingham County, in Michigan's south central lower peninsula. Its close proximity to economic hubs and major highways place Meridian Township in a perfect position to drive economic development in Ingham County.

Meridian Township is located to the east of two major cities, Lansing (Michigan's state capital) and East Lansing, home of Michigan State University (MSU). Meridian Township abuts the western border of MSU, one of the largest universities in Michigan.

Okemos is an unincorporated community within Meridian Charter Township with a large residential base. The impacted area within Downtown Okemos is bound by Methodist, Moore, and Clinton Streets and Ardmore Avenue.

In 2005, the Meridian Township Board adopted Ordinance 2005-12 creating the Okemos Downtown Development Authority (DDA) which covered an area known as Okemos Village. The Meridian Township DDA's mission is to end property devaluation and encourage economic development within its boundaries. The Okemos DDA receives its funding through Tax Increment Financing and is steadily in search of initiatives to improve its tax capture.

While the DDA is a relatively new organization, the authority's Board of Directors have spearheaded a number of projects to improve the downtown area. Streetscape and street light enhancements are the most immediate and ambitious projects to date.

Current agreements amongst Mid-Michigan municipalities show a history of successful, positive, beneficial, and cost-effective collaborative efforts. Those agreements include sharing of water services between East Lansing and Meridian Township through the East Lansing – Meridian Water and Sewer Authority. Lansing Township, City of East Lansing, City of Lansing, Meridian Township, and other governments also share fire and EMT services when the need arises through Mutual Aid Agreements. Lastly, Meridian Township is currently collaborated with Lansing and East Lansing towards establishing a community media center.

The Meridian Township DDA recommends the installation of street lights in conjunction with the Ingham County Road Commission and the Lansing Board of Water and Light. The Township currently has an agreement with Consumers Energy to provide electrical and maintenance service for street lighting within the Township. The Township accepts the responsibility of continued support of utility and lighting maintenance expenses with Consumers Energy along with the addition of metered electricity for all newly installed street lights.

V-N **Authorization to Submit Proposal**

I certify that all information contained in the proposal is true to the best of my knowledge and belief, and that the organization is in compliance and agreement with all sections of the request for proposal.

_____

Paul J. Brake, Meridian Township Downtown Development Authority
517-853-4206 and brake@meridian.mi.us
Charter Township of Meridian
5151 Marsh Rd
Okemos MI 48864-1198

APPENDIX E: DELEG NEWS RELEASE

News Release

Jennifer M. Granholm, Governor
Stanley "Skip" Pruss, Director

Contact: Jan Patrick
517.241.6153
www.michigan.gov/deleg
Email: mediainfo@michigan.gov
patrickj@michigan.gov

Granholm Announces $17.4 Million in Energy Efficiency Grants to 125 Michigan Communities

JANUARY 25, 2010 - Governor Jennifer M. Granholm today announced that the Michigan Department of Energy, Labor, and Economic Growth (DELEG) has awarded $17.4 million in grants to 125 cities, villages, townships, and counties throughout Michigan to support local energy efficiency projects. The state Energy Efficiency and Conservation Block Grants (EECBG) are funded through the American Recovery and Reinvestment Act of 2009 (Recovery Act).

DELEG's Bureau of Energy Systems (BES) awarded the EECBG grants to projects that will create and retain jobs, save energy, and reduce greenhouse gas emissions. A list of the recipients and project descriptions is attached.

"These Recovery Act funds will assist our ongoing efforts in moving to a clean energy economy," said Governor Granholm. "Investing in energy-saving projects throughout Michigan will boost the state's energy efficiency and renewable energy industries, reduce energy costs for communities, and create jobs."

BES is administering these grants through two separate programs:

- **Multi-purpose competitive grants for smaller communities** will support energy efficiency measures such as replacing high-energy systems in municipal buildings and street lighting, creating or expanding community recycling programs, and installing small-scale renewable energy generating systems. DELEG encouraged communities to decide how best to address energy efficiency and conservation opportunities, and awarded projects that will help achieve the Recovery Act's objectives to create and retain jobs, save energy, and reduce greenhouse gas emissions.

- **Light Emitting Diode/Solid State Lighting (LED/SSL) competitive grants** will fund demonstrations of LED/SSL technology in various high-demand applications such as exterior parking, street and traffic lighting. The awards are designed to demonstrate market demand and attract LED/SSL manufacturing to the state. Grants will fund 90 percent of the costs for equipment. Recipients have committed to cover 10 percent of the equipment costs, 100 percent of the labor and installation costs, and to help educate the public on the technology through signage, media or a community event after the LED project has been installed.

Michigan Department of Energy, Labor & Economic Growth, P.O. Box 30004, Ottawa Bldg 4th Floor., Lansing, MI 48909

State EECBG grant awards generally range from $50,000 to $140,000 for single cities, townships, or villages and up to $650,000 for single counties and multi-jurisdictional recipients. BES requires award winners to collect, track, and report data on energy savings, costs savings, job creation and/or retention, and emissions reductions.

"At a time when municipalities are hard pressed to fund capital improvements, these grants will jump start their efforts and allow them to realize operational savings that can be used to fund other energy efficiency and conservation projects," said DELEG Director Stanley "Skip" Pruss. "This funding will support a pipeline of projects, offer the option of bulk purchasing, and encourage increased manufacturing, including diversified suppliers, as well as new manufacturers."

Find the full list of selected projects and funding amounts at the BES website: www.michigan.gov/energyoffice.

For more information about DELEG, please visit www.michigan.gov/deleg.
Follow DELEG at http://twitter.com/MIDELEG or visit the "DELEG" page on Facebook and Become a Fan.

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APPENDIX F: OAKLAND CONSUMER SURVEY

PACIFIC NORTHWEST NATIONAL LABORATORY LED STREETLIGHT QUESTIONNAIRE
JOB # 320-341
FINAL
UFT N=60

Hello, I'm _____ from FMMA, a public opinion research company. We're conducting a short public opinion survey about the new streetlights the City of Oakland installed in your neighborhood this past October. I am not trying to sell you anything and I will not ask you for a donation or contribution of any kind. May I please briefly speak about these streetlights with the adult in the household who is 18 years of age or older and that most recent celebrated a birthday? **(IF NOT AVAILABLE, ASK:)** "May I speak to another adult in the household about these streetlights?" **(VERIFY THAT THE PERSON LIVES AT THE ADDRESS LISTED; OTHERWISE, ASK TO SPEAK TO SOMEONE THAT LIVES AT THE ADDRESS LISTED AND RESTATE THE INTRODUCTION.)**

1. Have you noticed that new streetlights were installed in your neighborhood this past October?

Yes	33%
No **(SKIP TO Q11)**	67%
(DON'T KNOW/NA) (SKIP TO Q11)	0%

(ASK Q2-Q10 ONLY IF YES IN Q1)

2. Do you feel that the new streetlights installed this past October have improved or not improved visibility for you as a driver? **(IF IMPROVED/NOT IMPROVED, ASK:)** "Is that strongly or just somewhat?"

Strongly improved	70%
Somewhat improved	10%
Somewhat not improved	5%
Strongly not improved	0%
(DON'T READ) No change/about the same	5%
(DON'T READ) DK/NA	10%

3. Do you feel that the new streetlights installed this past October have improved or not improved visibility for you as a pedestrian? **(IF IMPROVED/NOT IMPROVED, ASK:)** "Is that strongly or just somewhat?"

Strongly improved	65%
Somewhat improved	10%
Somewhat not improved	10%
Strongly not improved	0%
(DON'T READ) No change/about the same	10%
(DON'T READ) DK/NA	5%

4. Do you feel that the new streetlights installed this past October have made it easier or more difficult to recognize people at night under the streetlights? **(IF EASIER/MORE DIFFICULT, ASK:)** "Is that much easier/more difficult or just somewhat easier/more difficult?"

Much easier	50%
Somewhat easier	15%
Somewhat more difficult	5%
Much more difficult	0%
(DON'T READ) No change/about the same	20%
(DON'T READ) DK/NA	10%

5. Do you feel that the new streetlights installed this past October create less glare or more glare? **(IF MORE/LESS, ASK:)** "Is that much or just somewhat less/more glare?"

Much less glare	25%
Somewhat less glare	25%
Somewhat more glare	5%
Much more glare	10%
(DON'T READ) About the same as old lights	25%
(DON'T READ) DK/NA	10%

6. Do you feel that the new streetlights installed this past October give off the right amount of light or are they too bright or too dim? **(IF TOO BRIGHT/DIM, ASK:)** "Is that much or just somewhat too bright/dim?"

Right amount of light	80%
Much too bright	0%
Somewhat too bright	0%
Somewhat too dim	5%
Much too dim	10%
(DON'T READ) DK/NA	5%

7. Do you feel that the new streetlights installed this past October create fewer or more shadows? **(IF FEWER/MORE, ASK:)** "Is that many or just somewhat fewer/more?"

Many fewer	0%
Somewhat fewer	30%
Somewhat more	5%
Many more	5%
(DON'T READ) No change/about the same	25%
(DON'T READ) DK/NA	35%

8. Next, I want to read you some specific ways that the new streetlights installed this past October may have affected different aspects of your neighborhood. In each case, please tell me whether you think the new streetlights have improved or not improved each aspect. **(IF IMPROVED/NOT IMPROVED, ASK:)** "Is that strongly or just somewhat?"

(ROTATE)	STR. IMP.	S.W. IMP.	S.W. NOT IMP.	STR. NOT IMP.	(DON'T READ) NO CHANG	(DON'T READ) DK/NA
[ ]a. Your neighborhood's overall appearance	55%	20%	0%	0%	20%	5%
[ ]b. Your neighborhood's nighttime safety	65%	5%	0%	0%	20%	10%
[ ]c. Your neighborhood's nighttime visibility	55%	25%	0%	0%	10%	10%

9. When all things are considered, do you prefer the new streetlights that were installed this past October or do you prefer the old streetlights they replaced? **(IF PREFER THE OLD/NEW TYPE OF STREETLIGHT, ASK:)** "Do you strongly or just somewhat prefer that type of streetlight?"

Strongly prefer new streetlights	60%
Somewhat prefer new streetlights	10%
Somewhat prefer old streetlights	15%
Strongly prefer old streetlights	0%
(DON'T READ) DK/NA	15%

(ASK Q10 ONLY IF NEW/OLD PREFERRED IN Q9)

10. In a few words of your own, why do you prefer the **(NEW/OLD)** streetlights? **(OPEN-END; RECORD VERBATIM RESPONSE BELOW)**

a. New streetlights

- Improves visibility ---- 50%
- Like the color/more natural ---- 14%
- Better vision at night ---- 7%
- Brighter ---- 29%
- Less glare/softer light/does not flicker ---- 21%
- Less energy/servicing ---- 7%
- **Improved appearance of neighborhood ---- 7%**

b. Old streetlights

- Old visibility was better ---- 33%
- Old was brighter ---- 33%
- New ones not changed/costing more money ---- 33%

THESE QUESTIONS ARE FOR CLASSIFICATION PURPOSES ONLY.

11. Do you have any children under the age of 18 living at home?

- Yes ---- 23%
- No ---- 68%
- **(DON'T READ)** DK/NA ---- 8%

12. In what year were you born?

- 1989-1983 (18-24) ---- 7%
- 1982-1978 (25-29) ---- 2%
- 1977-1973 (30-34) ---- 2%
- 1972-1968 (35-39) ---- 5%
- 1967-1963 (40-44) ---- 2%
- 1962-1958 (45-49) ---- 7%
- 1957-1953 (50-54) ---- 8%
- 1952-1948 (55-59) ---- 5%
- 1947-1943 (60-64) ---- 3%
- 1942-1933 (65-74) ---- 10%
- 1932 or earlier (75 & over) ---- 22%
- **(DON'T READ)** Refused ---- 26%

13. Do you have a driver's license and currently drive?

Yes	60%
No	23%
(DON'T READ) DK/NA	17%

THANK AND TERMINATE

GENDER (BY OBSERVATION):	Male	40%
	Female	60%
LIST (BY PHONE LIST):	List 1 (Light group)	27%
	List 2 (Non-light group)	73%

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