

# 2009 Michigan Infrastructure Report Card

## Not Making The Grade.

Michigan's  
Infrastructure  
GPA

➔ **D**

*The ASCEMI Report Card is an assessment by professional engineers of the state's status in nine categories of infrastructure.*

*Michigan's infrastructure is in dire condition. Reversing the decay of our most valuable assets is essential to reviving Michigan's fortunes.*

For More Information

 [MichiganReportCard.com](http://MichiganReportCard.com)

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# Introduction



We take so many things for granted. The clean water from our kitchen faucet, convenient disposal of our waste products, power to light and heat our homes, a system of roads and bridges for traveling and for delivering our food and medicine and other necessities of life. Where would we be if even one of these systems stopped working?

Society's infrastructure is the foundational support of our daily existence. Often unseen and usually well-functioning, it is often and easily ignored. But it becomes an overriding issue when it stops working.

To help remind us all of the importance of Michigan's infrastructure, and to alert us to the poor condition of much of it, the Michigan Section of the American Society of Civil Engineers (ASCE) has prepared this Report Card on Michigan's Infrastructure. Modeled after the Report Card on America's Infrastructure by the national headquarters of ASCE (updated in early 2009), this document evaluates nine areas of our state's infrastructure. A simple letter grade is assigned to each. These grades and brief overviews are given on the Report Card. Background information, discussions of current conditions and funding options, and recommendations are given in separate reports on nine areas. All of this is available online at [www.MichiganReportCard.com](http://www.MichiganReportCard.com).

Areas of Michigan's infrastructure that are not evaluated in this first edition of the Report Card (due to limitations inherent in an all-volunteer

project) but are no less important include schools, solid and hazardous wastes, public parks and recreation, and security. It is hoped that future editions of the Report Card will include these areas.

The primary purpose of this state-level Report Card is to raise awareness of the current conditions of our aging and neglected infrastructure, the problems its shortcomings present, and the urgent issues we as concerned citizens, who are critically dependent on that infrastructure, must face. We hope that the Report card will serve to facilitate dialogue among local and state officials, policy makers, and the general public and will contribute to the eventual resolutions we must together make.

The Report Card was prepared by an adhoc committee of the Michigan Section of ASCE. Members of this all-volunteer committee, primarily professional engineers well-versed in the infrastructure on which they chose to report, formed subcommittees who researched existing data, surveyed and interviewed experts from all over the state, and devised systems for assigning letter grades to the current conditions. The actual grades were assigned by these subcommittees. Subcommittee chairpersons summarized their findings in reports on the nine areas. A review committee composed of senior engineers, public officials, and other experts in one or more areas of infrastructure reviewed the authors' reports and the suitability of the final grades.



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# AVIATION



## OVERVIEW

Michigan's 200+ airports bring \$4.3 billion into the economy each year. The state's Tier 1 and Tier 2 airports were evaluated based on six key infrastructure components. Each component was given a statewide grade, ranging from an "A" to a "C," based on the percentage of airports meeting State guidelines for that component. Michigan's aviation infrastructure is generally in good shape, but funding issues are beginning to cause problems. Resources are being diverted to fund security and airspace safety easements, thereby reducing funds available for infrastructure maintenance, repair and expansion. Terminal facilities are reaching the end of their useful life system. Dedicated funding for airport infrastructure must be established.

## BACKGROUND

The Federal Aviation Administration requires that each state publish an Aviation System Plan describing its current aviation system plans and forecasts. In Michigan's Aviation System Plan (MASP), published by the Michigan Department of Transportation (MDOT), airports are classified as belonging to one of three tiers.

Tier 1 airports, or Air Carrier airports, are used by scheduled airlines or charter companies. Eighty-eight (88) airports in Michigan meet the Tier 1 definition. These airports respond to essential or critical state airport system goals and objectives. The MASP's goal is that these core airports be developed to their full and appropriate level. Typical Tier 1 airports include Houghton County, Gerald R. Ford International Airport, Muskegon County, Beaver Island, Mackinac Island, or Sparta Airports.

Tier 2 airports, or General Aviation airports, complement the critical state airport system and/or respond to local community needs.

The goal of these facilities is to maintain infrastructure with a lesser emphasis on facility expansion. Typical Tier 2 airports include Hastings, Cheboygan, or South Haven Airports.

Tier 1 and Tier 2 airports share purposes but Tier 1 airports have higher priority for state funding to meet MASP goals. Michigan airports across all three tiers pump \$4.3 billion into the state economy annually. To increase that annual revenue, MASP outlines seven goals for the state's airports:

- Serve significant population centers
- Serve isolated areas
- Serve significant business centers
- Serve significant tourism centers
- Allow general population access to aviation system
- Serve land areas
- Preserve regional capacity

In order to develop an airport to the fullest extent to serve the public effectively, the authors of this report believe that there are 6 important components necessary to effective Tier 1 and Tier 2 airports. Those components are:

- 1) Complete and Adequate Runway System
- 2) Runway Pavement Conditions
- 3) Terminal Buildings (Air Carrier and General Aviation)
- 4) All Weather Access (Navigation Aids and Airport Weather Service)
- 5) Security (Air Carrier and General Aviation)
- 6) Basic Pilot and Aircraft Services

## CURRENT CONDITIONS

Runway Pavement Conditions

Using an FAA-developed procedure to track pavement history and to predict pavement performance, MDOT-Bureau of Aeronautics evaluated two-thirds of the Tier 1 airports in



Michigan in 2006 and 2007. This evaluation procedure uses the Pavement Condition Index (PCI) to quantify pavement conditions. Following is a typical PCI grade scale for airport pavements. (Note that this scale differs from the scale used to evaluate the overall condition of Michigan’s airports.)

- PCI – 87 to 100 = **A**
- PCI – 74 to 85 = **B**
- PCI – 60 to 73 = **C**
- PCI – 41 to 59 = **D**
- PCI – 40 or less = **F**

MDOT evaluated 35,000,000 square feet of airfield pavements. The average PCI rating was 84, a grade of B. Although a PCI rating of 84 indicates the pavements are currently in good condition, it is important to note that Michigan airports have received significantly more state funding through a special State of Michigan aviation bond program for airport improvements in the last six years (2001-2007) than it has at any time in the history of state aviation funding. This special bond program expired in 2007. As a result, funding for airport improvements at the state level has been significantly reduced for upcoming years.

**Terminal Buildings (Air Carrier and General Aviation)**

Whether vacation or business traveler, passenger on commercial airlines or on corporate aircraft, the terminal building creates a visitor’s first impression of the state. Upgrading terminal buildings are important steps in creating a positive impact.

According to MDOT, the terminal buildings in airports servicing Air Carriers rate B grades. However, for General Aviation airports, the grade is closer to a C. In order to improve the conditions of General Aviation terminal buildings, state officials and community aviation leaders should review their respective terminal buildings to determine whether the facility meets the current Americans with Disabilities Act (ADA) code, energy code and building

code requirements. Facilities that do not meet current standards should be upgraded to meet codes. Most of the funding programs available for General Aviation airports are designated for runway improvements, expansions or airfield safety projects. Projects to improve or replace terminal buildings are given low priority for funding.

**All Weather Access**

Navigational aids, Federal Aeronautics Administration (FAA) instrument approach procedures, and airport weather reporting systems assist pilots when landing or taking off in a wide range of weather conditions. These systems ensure safer flying operations and allow more people access to more Michigan communities at all times of the year. MDOT has reported in MASP 2008 that 62 of 88 Tier 1 airports (70%) meet this standard completely.

**Complete and Adequate Runway System**

Many of the corporate aircraft in use today require a runway with a minimum length of 4,300 feet. Some of the aircraft owned by the larger corporations require a mile or more of pavement to operate safely. Longer runways and parallel taxiways where warranted through operations allow the airport and the communities it serves to be accessed by more aircraft. The MASP outlines the level of service that an airport should provide to the communities it serves. MDOT has determined that approximately 76% of the Tier 1 airports currently meet the MASP goal.

**Security (Air Carrier and General Aviation)**

Since 9/11/2001 the Federal Government has offered significant funding to help Air Carrier airports develop, maintain, and improve security measures. The consequence is that this emphasis on funding for security has diverted money from other infrastructure projects. While funding these necessary security projects are important to the airline industry, the focus



on security creates a significant shortfall in funding for the other five components of airport infrastructure. Due to limited funding and no scheduled passenger service, general aviation airports have less stringent security requirements.

**Basic Pilot and Aircraft Services**

Ground service for pilots, aircraft, and passengers are important at Tier 1 and Tier 2 airports. Basic services include 24 hour access to shelter, telephone, restrooms, gas pumps, aircraft parking, aircraft maintenance, and at least one available airport staff member during business hours. 67 of 88 Tier 1 airports (76%) meet this standard.

**FUNDING**

“The Michigan Department of Transportation and the Michigan Aeronautics Commission have a long history of partnering with airports, consultants and other aviation stakeholders resulting in an adequate aviation basic infrastructure. Primary pavements and navigation aids are in good repair.”

“However, mandated Federal Aviation Administration changes are putting demands on existing resources to fund security and airspace safety easements, thereby reducing funds available for infrastructure maintenance, repair and expansion. Terminal facilities are reaching the end of their useful life system wide, at both air carrier and general aviation airports. Retrofits to address handicap accessibility and security have provided short term relief, but new facilities will be necessary to address energy efficiency, security, and other needs.”

“Current requests for infrastructure repair, maintenance and expansion exceed \$1.3 billion over the next five years. In order to keep pace with these aviation needs, expansion of existing revenues or creation of new revenue sources will be necessary.”

- Joyce Woods, Chair, Michigan Aeronautics Commission

According to the Chair of the Michigan

Aeronautics Commission, the amount required to keep pace with state airport aviation needs over the next five years exceed \$1.3 billion. The program that funded the recent improvements in Michigan airports expired in 2007. If Michigan is to meet the goals established in its MASP to preserve, improve, or expand the aviation infrastructure, then it must increase current funding to meet or exceed the levels of the now-expired program.

The state tax on aviation fuel sold in Michigan has not changed since 1929, when it was established at \$.03/gallon.

**DISCUSSION AND GRADES**

The state’s Tier 1 and Tier 2 airports were evaluated based on six key infrastructure components:

- Complete and Adequate Runway System
- Runway Pavement Conditions
- All Weather Access
- Security
- Basic Pilot and Aircraft Services
- Terminal Buildings

Tier 3 airports, which are privately held and often with short grass runways, are not included in this evaluation.

Grading rules for the report card are as follows:

- Excellent (90 to 100):** **A**
- Good (80 to 89):** **B**
- Average (70-79):** **C**
- Below Average (60-69):** **D**
- Fail (59 and below):** **E**

## REPORT CARD ON MICHIGAN AVIATION INFRASTRUCTURE

### Airport Infrastructure Component



#### Runway Pavement **B**

Condition Two-thirds of the Tier 1 airport pavements (58) have been evaluated and found to be in good condition, with overall average PCI score of 84. The Pavement Condition Index (PCI), coupled with a pavement maintenance program will help preserve pavement conditions for the future. (Tier 2 and 3 airports would score lower because of funding limitations.)

#### All Weather Access **C**

Navigation aids, airport weather reporting services to pilots coupled with FAA Instrument Approach Procedures (IAP) are very important for safe flying operations. MDOT has reported in MASP that 62 of 88 Tier 1 airports (70%) meet the state standard completely.

#### Security **A1**

(Air Carrier and General Aviation)

Perimeter airport fencing, terrorist counter-measures, baggage screening, and air traveler checkpoints, are all necessary security items that help keep air travelers safe. Air carriers airports rate an A. Due to limited funding and no scheduled passenger service, general aviation airports have less stringent security requirements. (Note 1: The grade at right relates only to airports that service Air Carriers and is shown for informational purposes only. This grade is not factored into the overall score.)

#### Terminal Buildings **B**

(Air Carrier)

Family travelers, corporate travelers, and professional pilots expect to have comfortable and accessible facilities at Tier 1 and 2 airports. Terminal buildings that service Air Carriers rate a B for traveler amenities.

#### Terminal Buildings **C**

(General Aviation)

General Aviation airport terminal buildings are less than adequate due to poor energy efficiency, handicap inaccessibility, or low security. Some General Aviation terminal buildings have reached the end of their useful life.

#### Complete and

#### Adequate Runway Systems **C**

Complete and adequate runway systems are important considerations for many corporations and airlines, when evaluating business location or expansion sites. Length and width of runway, parallel taxiway (if warranted through operations) and instrument approaches are important for safe operations. 76% of Tier 1 airports have complete and adequate runway systems.

#### Basic Pilot and Aircraft Services **C**

It's important for airports to have phones, restrooms, aircraft maintenance, aircraft parking, fuel, shelter for patrons and one airport staff member available during business hours. 67 out of 88 Tier 1 airports (76%) meet these state facility goal guidelines completely.

#### Overall Score **C**

The overall score of the six key airport infrastructure components averages to a grade of C.

## RECOMMENDATIONS

Adding \$.03 tax per gallon of aviation fuel sold to the current \$0.03 per gallon would help to mitigate the state funding shortfall. Increasing the sales tax on aviation parts and supplies by \$.01 would also help to boost the aeronautic state fund. These funding proposals would significantly increase the amount of funding available for the state's vital aviation needs.



## SOURCES

1. Michigan Airport System Plan – 2000: Volume 1 Report
2. Michigan Airport System Plan – 2000: Volume 2 Technical Supplement
3. Quote from Joyce Woods – Chair, Michigan Aeronautics Commission (E-mail)
4. Michigan Airport System Plan – 2008 in Final Draft
5. John P. Kozal, PE – American Society of Civil Engineers/Michigan Section/Aviation Committee
6. Ron Engel, PE – American Society of Civil Engineers/Michigan Section/Aviation Committee
7. Mark Noel, PE – Manager Project Development – MDOT Airports Division



# DAMS



## OVERVIEW

Over 90% of Michigan's 2,581 dams will reach or exceed their design life by 2020. Many dams are abandoned, no longer serve any useful purpose, and pose safety hazards to downstream residents. No funding is currently available in Michigan to help dam owners repair, rehabilitate or remove aging dams.

## BACKGROUND

Michigan has supported the intensive use of rivers for economic development throughout its history. Dams provide tremendous benefits but also pose great risks to public safety, local and regional economies and the environment. Historically, some of the largest disasters in the United States have resulted from dam failures. The 2003 Silver Lake Dam failure in Michigan resulted in \$100 million in damages and economic losses of \$1 million per day. Over the last decade, as more aging dams require repairs, growing concern about dam safety and environmental quality has become more prevalent. Many dam owners -including public agencies - do not have the financial capability to repair and maintain their dams or remove them.

## CURRENT CONDITIONS

The Michigan Department of Environmental Quality's (MDEQ) Dam Safety Unit maintains records showing that 93% of Michigan's dams will have reached their design life of 50 years by 2020 and that 166 of them built before 1900 have already passed this design life by a factor of two. With the exception of 110 hydropower dams only a few dams (mostly lake level control structures) produce any income or have a mechanism for funding needed maintenance or repairs. MDEQ's Dam Safety Unit requires that all dams over 6-ft-high and impounding over 5

acres at flood stage are to be inspected every 3 to 5 years, depending on its hazard potential rating. While this ensures that any dam at serious risk of failure will be identified as such, it still takes money to repair, rehabilitate or remove them. Often, many deficiencies identified during dam inspections are left uncorrected due to funding shortfalls.

## FUNDING NEEDS AND OPTIONS

Funding for Michigan's aging dams is reaching crisis proportions. One study estimates that 120 Michigan dams need at least \$50 million for repairs or rehabilitation<sup>2</sup>. Many municipalities and other owners of dams can not afford to repair and replace or remove their dams on their own. As Michigan's dams continue to age the need for state or federal funding or funding from some other source will become more acute.

## GRADE

Owners of Dams that do not generate revenue generally do not set aside funds for their eventual repair, rehabilitation or removal. The lack of State or other public-funding mechanisms to assist dam owners with these tasks causes inadequate or crumbling dams to go unattended, posing significant safety hazards to downstream residents and local and regional economies. While the actual condition of our dams is generally better than a "D", the fact that many dams in need of repair, replacement or removal go without warrants the grade of "D."

## CONCLUSIONS

The lack of a source of stable, reliable rehabilitation funding for the owners of Michigan's aging dams is a critical infrastructure safety issue, given the condition and age of our dams.

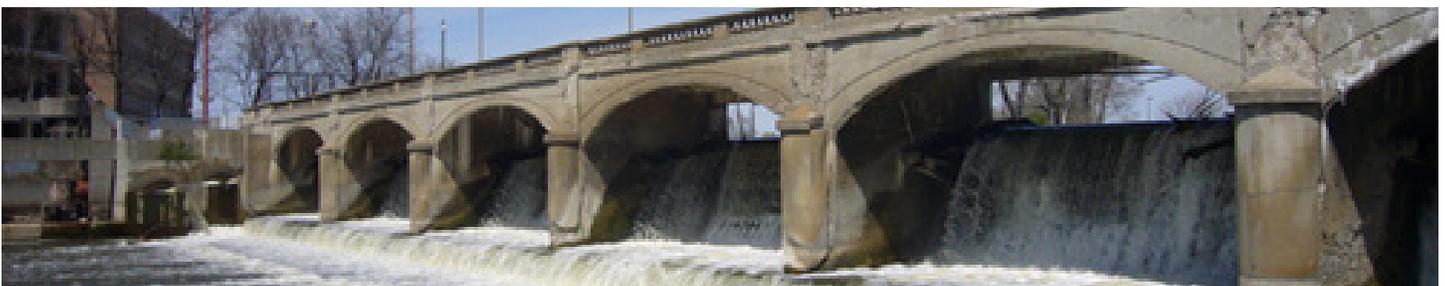
## RECOMMENDATIONS

- Fully fund and staff Michigan's dam-safety program.
- Educate the public on the need for proper maintenance and repair of dams.
- Establish a dedicated State fund of at least \$50,000,000 for the repair, replacement, or removal of unsafe dams.
- Seek a federal funding program to assist with loans and matching grants for repair, replacement or removal of unsafe dams.



## SOURCES

1. MDEQ Dam Safety Unit Dams Data Base.
2. Coscarelli, M. and Hegarty, J. The Growing Crisis of Aging Dams: Policy Considerations and Recommendations for Michigan Policy Makers; Michigan River Partnership, 2007.



# DRINKING WATER SYSTEMS

# DRINKING WATER SYSTEMS

## OVERVIEW

The State of Michigan is in a unique position of being surrounded by the Great Lakes, an abundant supply of fresh water. Yet the State faces crucial funding challenges both in treating and distributing clean drinking water to continue to meet the level of service demands of its residents.

## BACKGROUND

Some 75% of the population of the State of Michigan, approximately 7.5 million people, gets its drinking water from the State's 1,420 community water systems (CWS). Both ground water and surface water provide the raw water for these CWS. The surface water systems are generally larger and supply more residents with drinking water.

Approximately 20% of the State's CWS (292 of 1,420) use surface water from the Great Lakes and a few inland rivers to provide drinking water to nearly 80% of the CWS-served population. The rest of the CWS (1,128 of 1,420) supply the remaining 20% of the CWS-served population using ground water.

The centralized nature of the State's water supply network is heightened by the fact that less than a quarter of the surface-water CWS (63 of 292) operate their own water-treatment plants. The remaining surface-water CWS purchase their water from these water-treatment facilities. The large systems in Detroit, Grand Rapids, and Saginaw supply the majority of them.

About half of the State's CWS (730 of 1,420) are owned and operated by municipalities (cities, townships and villages). The remaining half are either privately-owned systems that serve manufactured housing

communities, apartment complexes, nursing homes and condominium associations, or State-owned systems that serve prisons, universities, and the like.

The following categories were assessed and assigned grades for the circumstances found:

## CURRENT CONDITIONS

### Water Source and Treatment Systems

Nearly 40% of CWS have some degree of water treatment. Some of these are vast and complex treatment systems, with complete water filtration processes which use coagulation, sedimentation, filtration and chlorination. Many also consist of membrane filtration systems for treating lake water, lime systems for softening groundwater, and iron-removal plants with oxidation and filtration to remove color, odor and arsenic. However, the majority of the treatment systems use methods as simple as deploying one or more positive displacement pumps to feed liquid sodium hypochlorite or a polyphosphate into the discharge pipe of a well. The majority of the complex water treatment facilities require significant financial investment on a periodic basis to rehabilitate, replace or upgrade the equipment needed to maintain water quality.

All but six of the 63 CWS with treatment plants get their water from the Great Lakes or connecting channels. These systems have access to abundant supply and can easily meet the needs of the residents they serve so long as they keep ahead of the demand by constructing and maintaining the required facilities.

The remaining six CWS with treatment plants get their water from inland rivers and are more likely to face capacity limits. With increasingly stringent treatment regulations and limited capacity, these inland-river systems have begun to develop groundwater systems to supplement or even replace their surface water systems.

Only a few areas of Michigan have groundwater resources that are limited in capacity, availability or by poor quality. The vast majority of the CWS in the state that rely upon groundwater are able to locate and install new wells as needed. Like surface-water treatment facilities, the source-related infrastructure for ground water wells, well houses, intake cribs, intake lines, shore wells, pumps and motors, etc. require significant financial investment to periodically rehabilitate or replace this equipment to maintain adequate source capacity.

Michigan has more public water systems than most states that were impacted by the revised arsenic standard of 0.010 micrograms per liter. This revised standard became effective in 2006. Because impacted systems are all small ground water systems serving fewer than 3,300, the statewide costs may not seem significant, but the need compared to other states is high, as is the cost borne by the limited number of customers in each system.

While most CWS have operation and maintenance budgets, the challenge they face is ensuring revenues generate adequate funds to cover the cost of maintaining and eventually replacing the equipment necessary to provide finished tap water at a consistent high quality. Too often, the equipment must reach a critical stage of deterioration, even approaching outright failure, before the infrastructure need is addressed. Fortunately, given the immediate impact of dissatisfied customers or potential public health jeopardy created by poor quality or inadequate capacity, CWS are more often likely to assign the resources necessary to address problems and restore their source and treatment facilities.

## **DISTRIBUTION SYSTEMS**

Transmission and distribution mains account for most of the state drinking water infrastructure. A significant portion of the states primary distribution system is nearing 100 years old. CWS are facing a significant challenge to maintain the vast network of aging, underground infrastructure. Within the city of Detroit alone,



approximately 80% of its distribution piping was installed prior to 1940, which is not unusual for CWS in Michigan. Booster pumping stations and storage tanks that are part of the distribution delivery system are more likely to be maintained and eventually replaced when necessary because like treatment systems, their deterioration is apparent and their failure results in more dramatic impacts on customers.

While water treatment systems are more stable because they are difficult to ignore, much of the delivery system including piping, valves and hydrants are reaching the end of their anticipated design life and routine replacement has been postponed for too long. Out of site and out of mind...until the road is closed and flooded out, toilets cannot be flushed, food cannot be cooked, dishes cannot be washed, or a shower cannot be taken. Water main breaks, low pressures and isolation failure commonly drive distribution system rehabilitation priorities. System disruptions continue to become more frequent as the distribution system ages. The workforce has adapted to effectively implement new technologies and materials for water distribution system repair. Tooling and emerging market forces continue to drive the distribution system rehabilitation by means of low impact trenchless construction technologies to minimize open cut excavation and social disruption.

The age of the majority of the state's distribution system is the primary contributor to normal decay and failure. In many cases, pipe life has far exceeded useful service life. Much of the older water systems consist of undersized mains constructed of materials such as unlined cast iron pipe. Minor fluctuations in system flows or pressure may cause red water complaints and even result in pipe failure. All CWS should have routine flushing and valve maintenance programs; however many are hesitant due to the time and cost. However, other factors are present within the distribution

system. Chemical additives and natural minerals in distribution systems are in a steady flux to minimize adverse delivery affects such as lead and copper leaching and taste and odor complaints. While this practice is the generally accepted cost effective and quality conscious distribution system management, signs of build up in the mains as solids particulate are suspended to the interior of the pipe is becoming increasingly more prevalent.

Under the Stage 2 Disinfection Byproducts Rule, all CWS that disinfect are required to provide increased trihalomethane (THM) and haloacetic acid (HAA5) monitoring due to the potential byproducts of chlorine reactions within the pipe system. Corrosion, scale, solid suspension on the interior sidewall of pipe, in addition to the age and condition of the system will require diligent rehabilitation investment to maintain system integrity.

The majority of distribution system piping installed today is lined ductile iron, often with a polyethylene wrap which has proven to be effective in corrosive soils, and is expected to exceed the life of the existing sand cast system. Also, the use of plastics in distribution systems including high density polyethylene (HDPE) and poly vinyl chloride (PVC) have been gaining momentum due to their widely accepted use for potable water transmission, suitability for trenchless construction installations, and the non metal/ferrous components. The life of these plastic systems is also expected to exceed the life of the existing sand cast materials in the original system.

While better materials and advanced technology is available to replace the aging distribution system, resources remain scarce when compared with the magnitude of the rehabilitation task at hand. Too often, distribution system replacement costs are underfunded and the first item to be slashed when budget problems arise.

Overall, distribution system maintenance is reactionary in much of the older systems. Since the majority of the antiquated system

will require removal and replacement beyond the CWS funding resources for systematic upgrade, a reactionary rehabilitation program is inevitable and must be funded accordingly.

## **FUNDING NEEDS/OPTIONS**

CWS face a significant shortfall in capital funds to maintain the aging infrastructure. Along with the cost to maintain treatment operations, the need to replace antiquated infrastructure including pumps, piping, hydrants, valves and storage reservoirs looms. All of these components of the majority of the CWS are reaching the end of their design life. A significant portion of the state's primary distribution system is nearing 100 years old. CWS have recognized this daunting task and the major systems have invested resources in master planning, needs assessments, and project plan development. The continued implementation of GIS mapping has allowed the larger CWS to quantify and prioritize the preservation of a vast network of underground infrastructure. Furthermore state regulatory required reliability assessments and sanitary surveys serve as a tool for regular system oversight and checkup.

The most comprehensive analysis performed on the state of Michigan's drinking water systems is the EPA Drinking Water Needs Survey. The Safe Drinking Water Act requires that the EPA conduct an assessment of the national public water system capital improvement needs every four years. The purpose of the survey is to document the 20-year capital investment needs of public water systems eligible to receive Drinking Water State Revolving Fund (DWSRF) monies. The needs survey is designed to compile the 20-year drinking water system needs that meet EPA criteria for project funding. These surveys were performed in 1995, 1999, 2003, and most recently in 2007. In every survey so far, the transmission and distribution system needs were found to be largely underfunded. The results from the 2007

survey are scheduled to be completed by the EPA and MDEQ in February 2009, and were not available at the time of this research. It can be reported however that the 1999 study estimated \$6 billion in fiscal needs in Michigan and the 2003 study showed a remarkable increase to \$11 Billion Dollars in needs. The 2007 survey is anticipated to post an even larger total, climbing at a rate beyond the monies available to meet the needs.

It must be emphasized that the EPA needs survey funding represent only the projects which fit the EPA established criteria of need. One major deficiency in this process is the limitation on identifying funding for distribution system rehabilitation in excess of 0.05% of the total system. This number is based on matching the state's largest City's planned 20-year CIP expenditure apportioned against its true critical system needs. Therefore, a significant shortfall exists in this process to meet the true needs of the distribution systems statewide, by backing into only what it can afford to levy.

## CONCLUSIONS

The State of Michigan's larger water systems have improved or updated their raw water and treatment systems to an adequate level to keep the systems operating. There are instances when the rehabilitation of critical unit processes such as filters are delayed for cost reasons. Other items that have delayed maintenance and/or rehabilitation are the plant piping and pumping systems maintenance demands. Some raw water source systems have recently been shown to be inadequate either to handle adverse environmental conditions (i.e. freezing of intake lines) or regulations (i.e. inadequate back-up source). Generally, source and treatment system components have been better maintained because they are more visible assets whose operation is often critical to providing satisfactory customer service, both from a quality and quantity standpoint. In addition, DEQ oversight often focuses on inspection and evaluation of wells, pumps and treatment facilities, and the majority of MDEQ regulations require that treatment facilities be



properly operated and maintained in order to stay in compliance, which has not been the case with distribution system components, particularly piping.

Deficiencies with the source and treatment systems are addressed due to immediate impact of dissatisfied customers or potential public health jeopardy created by poor quality or inadequate capacity. However, CWS are more often likely to assign the resources necessary to address problems and restore their source and treatment facilities rather than invest in the rehabilitation of aging infrastructure and distribution systems. Planning and Capital investment for rehabilitation of aging infrastructure must be secured and is critical to ensure sustainable drinking water distribution systems.

Much of the State's underground infrastructure has been ignored in an effort to delay system capital expenses. If water mains are depreciated over 100 years (longer than usual) a water system should be replacing at least 1% of its system every year. This is rarely if ever done. In reality, large portions of systems were constructed during growth eras and therefore the system replacement is not spread out equally. This will result in large portions of distribution systems failing at or near the same time. The problem seems to be underfunding. The use of asset management systems can help, and we recommend they aggressively pursued. There has been a history of delaying capital investment in an effort to artificially keep rates low. This is critical to the rehabilitation and replacement of distribution system components.

## RECOMMENDATIONS

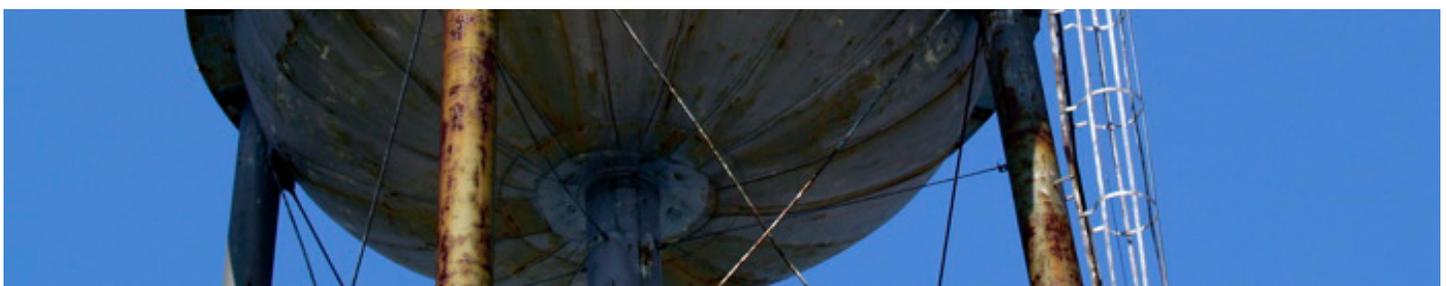
Many but not all water utilities have done some level of Master Planning. However, the ability of the utility to follow through on the resulting recommendations appears to be the more critical and missed step. It appears essential that CWS, especially the large systems with

multiple consecutive customer communities, have to be prepared to implement the critical utility rehabilitation planning initiative and make those processes as transparent as possible, and be able to reasonably and equitably justify to each of those communities all of the improvements and how they should be funded. Integrating a true asset management program into the annual budgeting process may ensure adequate planning.

CWSS must prepare to finance rehabilitation of their respective distribution systems with user based fees and legal utility management controls to properly plan for inevitable continued system deterioration. This will require local and regional efforts to establish the funds and resources. The overall state and federal sources available will not suffice for anticipated system maintenance. Only a relatively small number of WSS are applying for the DWRP Funds available, purportedly due to the cost match requirement. WSS leaders must be educated to bring the fiscal needs of the drinking water production, treatment and distribution systems to the forefront of the local politicians, leaders, law makers, financial analysts, and budget committees.

### SOURCES

1. The Safe Drinking Water Act
2. EPA Drinking Water Needs Survey
3. Drinking Water State Revolving Fund (DWSRF)
4. MDEQ Water Quality Bureau



# ENERGY



# ENERGY

## OVERVIEW

The overall health of Michigan's energy generation and transmission system generally meets the State's current needs, but reliability and security concerns are posed by the State's dependence on coal and natural gas fueled generation with fuel supplied by external sources, as well as congestion and interface limitations existing between the State's transmission system and neighboring grids in Wisconsin, Indiana, Ohio, and Ontario, Canada. Diversification of energy supply and investments in renewable energy and transmission system upgrades are needed to address these and other concerns such as fossil energy's contributions to global warming.

## BACKGROUND

Michigan, like many other states, developed its electric energy system over a long time period as technology improved and demand increased with virtually all primary generation provided by coal-fired boilers and steam turbine/generators. Originally, electricity was generated locally by central, or "base load", plants with high capacity factors to meet specific demands such as from steel mill, automobile manufacturing complex, and other industry operations or to power community street and home lighting. As demands grew, distribution circuits were developed to transport energy from base load generators to remote points of demand. These early electrical systems were focused in southeast Michigan where demand and population growth were greatest and radiated outward as population growth required an efficient means for transmitting energy via overhead lines. Remote base load and other duty-based generating facilities were also constructed in both the Upper and Lower Peninsulas. Similar development of natural gas, oil and other energy pipelines also evolved on a demand-based profile via independent pipeline corporations, primarily in southeast Michigan where population growth and industry demanded such.

Evolution of the electrical generation, transmission, and distribution systems in the State has produced a combination of generation and distribution-owning investor-owned utilities, cooperatives, municipalities and independent power producers and a private industry-owning transmission system serving the residents. As illustrated in the attached service territory map, two investor-owned utilities (Detroit Edison and Consumers Energy) own over 85 percent of the existing generation and local distribution in the state, with other utilities, municipalities, and independent power producers owning and operating the balance. The MPSC regulates electric and steam utilities including nine investor owned utilities and nine rural electric cooperatives, but does not regulate smaller municipality-owned electric utilities and generators which are self-regulated by its residents. A large percentage of the State's transmission grid is owned and operated by ITC Holdings, LLC.

The Midwest Independent Transmission System Operator (MISO) is an independent, fully integrated regional transmission organization that operates the bulk transmission system within both peninsulas of Michigan, and coordinates the operations of generators sustaining grid stability. MISO is also responsible for improving system efficiency and transmission access, minimizing delivered electricity costs, and coordination of electric reliability in the Lower Peninsula. American Transmission Company provides similar services and has responsibility for Upper Peninsula grid reliability. MISO also manages a majority of the Midwest's wholesale markets. Three geographic regions within Michigan correspond to electric transmission owners and operating areas (physical transmission assets). Southeast

Michigan comprises the area served by the International Transmission Company (ITC). The balance of the Lower Peninsula is primarily served by the “Michigan Joint Zone”, including the ITC-owned Michigan Electric Transmission Company (METC), Wolverine Power Supply Cooperative, Inc., and certain municipal entities in the Michigan Public Power Agency and the Michigan South Central Power Agency. The Upper Peninsula is served by the American Transmission Company (ATC). MISO also operates the bulk transmission systems of member companies in 15 other states and the province of Manitoba.



lower than that of other forms of generation on a life cycle basis. However, it is well-recognized that fossil fuel-based generation produces harmful airborne emissions. Given that Michigan’s fossil fuel-based generating fleet is the second oldest in the country (average age of 49 years), investment in new base load power generation and improved transmission system to distribute such power are needed in the near future.

## GENERATING CAPACITY

In terms of electrical generation, Michigan currently is served by a combination of coal- and natural gas-fired power generation, nuclear power generation, and to a smaller extent, hydroelectric, internal combustion engine and turbine, wood-fired, and other alternative power generation. Table 1 summarizes this generation capabilities of existing facilities. Given its northern climate, Michigan has both peak instantaneous demand for electricity in hot (summer peak) and cold weather (winter peak) conditions.

The State of Michigan also relies on four nuclear reactors for base load power production. However, these reactors are also aging and these reactors will likely cease to operate under permitted output on the following dates: Fermi-II (1,110 MW, year 2025); Palisades (800 MW, year 2031), DC Cook Unit 1 (1,030 MW, year 2034) and DC Cook Unit 2 (1,070 MW, year 2037). These expiration dates are far enough into the future that plans for replacement of said generating capacity need not initiate immediately. However, the lead time for nuclear power

<b>TABLE 1 – TOTAL GENERATING CAPABILITY – MICHIGAN (MEGAWATTS, MW)<sup>1</sup></b>				
<b>Facility Type</b>	<b>Lower Peninsula (412 Generators, largest at 1,110 MW)</b>		<b>Upper Peninsula (174 Generators, largest at 90 MW)</b>	
	Summer Peak	Winter Peak	Summer Peak	Winter Peak
Steam Generator	14,171	14,256	841	850
Combined Cycle	8,178	8,539	47	52
Internal Combustion	679	681	22	22
Nuclear	3,930	4,023	0	0
Hydro/Pumped Storage	2,002	2,022	171	174
Wind/Other	53	53	0	0
<b>TOTALS</b>	<b>29,014</b>	<b>29,577</b>	<b>1,081</b>	<b>1,097</b>

<sup>1</sup>Statistics approximate as of December 1, 2008 (Source: References 1 and 4) and include peaking units.

The “steam generator” category (coal, gas, and oil-fired generation in conventional boiler-based cycles, dominated by coal firing) is relied upon for providing nearly half of the nameplate generation, and are counted on for base load electricity because the cost of fuel and cost of generation are significantly

project initiation in advance of commercial need is at least ten years.

Actual power generation statistics for Michigan and the Midwest are contained in Table 2 (total generation for the East North

**TABLE 2 – NET MICHIGAN ELECTRICAL GENERATION BY SECTOR, SEPT. 2007 AND 2008  
(thousands of MWh)**

Census Division  and State	Electric Power Sector Generation										
	Total (All Sectors) Generation			Electric Utilities		Independent Power Producers		Commercial Sector Generation		Industrial Sector Generation	
	Sep- 08	Sep- 07	Percent Change	Sep- 08	Sep- 07	Sep- 08	Sep- 07	Sep- 08	Sep- 07	Sep- 08	Sep- 07
East North Central	52,885	55,964	-5.5	28,507	31,898	23,396	23,012	123	123	859	931
Illinois	16,242	16,922	-4	352	824	15,635	15,823	40	44	215	231
Indiana	10,316	10,861	-5	9,258	9,781	767	789	20	15	NM	277
<b>Michigan</b>	<b>9,074</b>	<b>9,458</b>	<b>-4.1</b>	<b>7,540</b>	<b>7,975</b>	<b>1,378</b>	<b>1,283</b>	<b>54</b>	<b>55</b>	<b>103</b>	<b>146</b>
Ohio	12,100	13,561	-10.8	7,713	8,580	4,302	4,905	NM	--	85	76
Wisconsin	5,153	5,161	-0.2	3,645	4,738	1,313	212	NM	9	NM	201

Source: Table 1.6.A published by U.S. Department of Energy, EIA, Report Number DOE/EIA-0226 (December 11, 2008); NM = Not Measured

Central region, or “Midwest” is roughly 105 million megawatt-hours (MWh) per year):

Of this Midwest generation, approximately 54 percent is coal-fired, 10 percent is natural gas-fired, 4 percent is oil-fired and 25 percent is nuclear. Total fossil generation is 68%. The balance is comprised of primarily hydroelectric and wood-fired capacity. In the Upper Peninsula, a much larger percentage of generation is coal or gas-fired. Over 88 percent is fossil-fuel based generation.

Being comprised of two uniquely shaped peninsulas, Michigan depends on sound power import/export capabilities via transmission lines crossing borders into Ontario, Canada and neighboring states of Wisconsin, Indiana and Ohio, as well as its internal transmission grid. A recent report from ITC cited many challenges with the existing integrated Michigan transmission system including capacity limits on Ontario grid interfaces and presence of many points of congestion. In addition, it is recognized that the ability to transmit and distribute renewable power from region having the greatest potential are also limited by the presence of limited capacity transmission in Michigan.

Approximately 75 percent of the natural gas supply to the state is from external sources, and this percentage will continue to increase as Michigan’s gas reserves are depleted. A large percentage of gasoline is also derived from suppliers outside of Michigan.

### DEMAND AND NEED

State residents and businesses demand a reliable supply of electricity. The most recent predictions in terms of electrical generation needs in the State of Michigan are given in the Michigan Public Service Commission (MPSC) “21st Century Energy Plan” issued on January 31, 2007 (Reference 1), as updated in MPSC’s “Semi-Annual Appraisal of Energy Markets” issued September 29, 2008 (Reference 2). According to Reference 1 as supported by Reference 4, Michigan’s peak electric demand will grow at approximately 1.2 percent per year for the next 20 years. This growth equated to the need for at least one new base load power generating plant to be operating by 2015, and at least three more plants built in a similar timeline if renewable energy mandates and energy conservation measures were not employed. In late 2008, the State of Michigan legislature did enact

regulations associated with a renewable portfolio standard (RPS) and other energy policy (Reference 3), and subsequent actions taken since then point toward measures wherein renewable energy sources will be used in the near-term.

It is important to note that since References 1 and 2 were written, the federal and state economies have entered a recession and actual demand for electricity has significantly decreased. Specific factors include declines in residential demand, milder weather patterns, and reduction in automotive and other heavy industries requiring large power supply. The Table 2 data also reflects a significant downturn in energy demand in the State, associated with the recession.

According to the latest statistics, the combined generation reported in Table 1 represents a reserve operating margin of about 13.7 percent over recent year peak demand, which is close to U.S. industry standards. However, such margin is threatened by an aging infrastructure and constraints limiting effective power flow from certain generators to the load. Reliability of power supply is highly influenced by the condition, load flow capability, and performance of the transmission grid, so MISO as operator and ITC (Lower Peninsula) and ATC (Upper Peninsula) play vital roles in maintaining such reliability.

The Upper Peninsula has chronic constraints caused by the lack of robust transmission interconnections with the Lower Peninsula and Wisconsin, its low concentration of demand and load, and its reliance on one large indigenous power plant Presque Isle. As recently as 2003, significant power outages caused by flooding produced a near blackout of the Upper Peninsula because of significant transmission constraints. In Reference 4, the MPSC identified expansion of the transmission system as a key part of the solution to satisfy Michigan's capacity needs, particularly in the UP. Michigan heavily relies on the integrated transmission system to meet the state's current demand and the transmission system must be expanded to enhance capacity, long-term reliability and economic benefits for customers. The main transmission lines serving the UP consist of a 345 kV line that "dead ends" into the heavily congested

138 kV Green Bay system to the south, and a more than 80-year-old double circuit 138 kV line. However, the ongoing Northern Umbrella Project (a multi-year project being implemented by ATC to connect the Upper Peninsula grid to the Wisconsin 345 kV grid, to serve the Upper Peninsula's growing demand without new base load generation) will increase transfer capacity from the current 215 MW to 500 MW.

As the demand for electricity has diminished with the 2008 recession and manufacturing production downturns, the current reserve margin of electric supply over demand exceeds desired minimums. However, the primary electric generating stations in Michigan are older, with many fossil-based generating plants operating beyond their original design lives. The electric service territory areas in Michigan are depicted in the following map, issued by the Michigan Public Service Commission (MPSC, 2008). The MPSC regulates electric (and steam) utilities, including nine investor-owned utilities and ten rural electric distribution cooperatives, but does not regulate the smaller municipally-owned electric utilities interspersed, which tend to be self-regulated.

No supply shortages or transmission constraints are expected to impact the ability of Upper or Lower Peninsula utilities to meet winter peak electric demand, which is normally at least 25 percent lower than the summer peak demand. However, chronic problems still remain in the Upper Peninsula, particularly during periods of high demand due to transmission constraints between it and the Lower Peninsula (120 MW maximum transfer) and Wisconsin (220 MW maximum import, 475 MW maximum export).

In addition to demand, it is critical that energy supply within the State of Michigan continue to improve in reliability and security against

external threats. Reliability is measured by overall availability of electricity supply on a continuous basis. Issues such as aging equipment, vegetation and other impacts, harmful weather patterns, cyber security, and protection against harmful human intervention are all threats against reliability of supply. The regional transmission organization, generator and transmission owners, and state regulators are all aware of reliability threats and are following the lead of both the Federal Energy Regulatory Commission (FERC) and North American Electric Reliability Corporation (NERC) to make systematic improvements.

Gasoline and distillate oil use in both state peninsulas are expected to continue to drop between 3 to 5 percent per year for the next several years. Sufficient natural gas storage is projected to exist in the State to handle winter time heating needs. Michigan is rife with underground caverns, salt domes, and tapped oil/gas reefs for natural gas storage. In summary, both natural gas and gasoline supply systems in Michigan appear adequate for the diminishing demands in coming years.

## **CURRENT AND FUTURE PRIORITIES**

Current generation capacity statistics were reported in Table 1. While current capacity exceeds demand, the existing base load generation in Michigan is aging, and numerous plans for new, more efficient and lower-polluting coal-fired base load generating plants have been recently announced by Consumers Energy, Wolverine Power, City of Holland, LS Power. Detroit Edison also filed an application with the U.S. Nuclear Regulatory Commission for possible future construction of a second nuclear power generator. The need for new generation must be weighed against decreasing demand and increasing age of the current generating fleet, and desired increased in state-based renewable energy utilization.

Consumption: total electricity demand and consumption in Michigan during 2008 was slightly lower than 2007 levels, as slight growth in the commercial and industrial sectors was overcome by decline in the residential sector, primarily as a result of milder summer temperatures and industrial

production declines in the automobile and other heavy industries in the state. Total electricity demand/consumption is expected to decline in 2009 due to the slow growth in new housing construction and reduced demand in the industrial sector (Reference 2). However, there is anticipation of future load growth associated with industrial resurgence in the state as well as from future demand due to increased electric vehicle use.

According to Reference 1, Michigan's peak electric demand is forecast to grow at approximately 1.2 percent per year over the next 20 years. At this rate, and given the long lead-time necessary for major plant additions, additional base load generation is projected to be necessary as soon as practicable but no later than 2015, as no new base load units have been built or even started in recent years. This need must carefully balance generation, transmission, and distribution improvements and RPS goals.

The State of Michigan presently has few proactive programs aimed at further improving energy efficiency and maximizing energy conservation. Individual utility actions coupled with targeted actions led by the Michigan Department of Energy, Labor, and Economic Growth (DELEG) have been observed, and the recently enacted RPS included provisions for demonstrated actions on behalf of generation owners beginning in 2009.

Price: spot prices for power generation fuels continue to decline from their peak summer 2008 levels. But electricity prices for 2009 are likely to increase several percent as a result of settled rate cases with the major utilities and likely will increase by several percent more in the future particularly as the State's new renewable portfolio standard takes form. With current electricity rates amongst the lowest in the Midwest, it is anticipated that

rate increases will not jeopardize future business growth. The same holds true for other energy (natural gas, gasoline) costs. However, other economic pressures exist and it is critical for the State to maintain power costs at affordable levels.

**Renewable Energy Options:** the State of Michigan possesses promising opportunities for growth in use of renewable energy, particularly with respect to biomass-fired generation and wind energy. Other technologies, such as solar, water-current capture, and fuel cells, offer the potential for local deployment to help reduce the state's dependence on grid-based generation. The State legislature passed renewable portfolio standard (RPS) laws in late 2008, which should stimulate use of renewables (e.g., 10 percent of generation by 2015). Other than biomass-based generation, such renewables will unfortunately not provide base load capacity unless coupled with other forms of generation (e.g., natural gas-based generation or compressed air storage).

**Regulatory Status:** the State of Michigan has a proactive Public Service Commission, which is attempting to improve energy policy and communications amongst its residents, industries, public utilities, generators, and transmission owners, MISO, and other interested parties. Recent passage of RPS rules has led to the conversion of said rules into systematic changes to power generation and transmission planning under MPSC direction.

Any new construction or improvements to electric generation or transmission, including that to support the new RPS, will ultimately be paid for by the state ratepayers (residents and businesses). Impending regulatory changes are expected to ease the speculative nature of current project financing to encourage construction. It is anticipated that a needs based program will be adopted. The MPSC is very active in future planning and both the generator owners and transmission owners are keen on improvements needed. One significant remaining issue that could hamper project implementation is lack of clear project selection criteria supported by financing and rate recovery rules.



**Alternative Transmission Options:** as an alternative to new generation, American Electric Power (AEP) and ITC Holdings Corp. (ITC) are supporting a program to extend AEP's existing 765-kilovolt (kV) transmission infrastructure from the southwest corner of the State (DC Cook Nuclear Plant substation), east through Michigan's Lower Peninsula to a new transmission substation west of Detroit for interconnection to AEP's 765 kV system in Ohio. This project would reduce the need for new generation, enhance reliability and support a more efficient generation marketplace. It is anticipated that this extension would allow as much as 5,000 megawatts of additional power to be transported to and through Michigan, expanding access to additional competitive generation options and reducing the amount of generation necessary for reserve needs. This transmission network would increase efficiency by reducing current transmission line losses by approximately 250 megawatts. Extra-high voltage transmission also would provide a reliable, stable electricity delivery system in the region to enhance economic development and support increased development of renewable generation. The estimated cost for this system is \$2.6 billion (in 2007 dollars) and would take approximately eight years to complete, assuming three years to site and five years to construct. This option is still being examined by the MPSC and its task force for viability.

**Reliability:** since the 2003 regional blackout, significant improvements in the reliability of electricity supply have been witnessed in the Midwest region and Michigan in particular. It is anticipated that cooperative actions by involved organizations will continue, such that associated constraints and other issues (congestion, import/export limits, restrictions on renewable energy interconnection) are resolved and cyber security is preserved.

## CONCLUSIONS AND RECOMMENDATIONS

Michigan, like many other states, developed its electric energy system over a long period, as technology and supply chains for fuels such as coal and natural gas developed and demand increased. The State's significant manufacturing base requires that a reliable supply of low-cost electricity be available and sustainable in the future. This requirement, coupled with the desire to minimize the importation of fuels and production of greenhouse gas emissions all point towards increased utilization of renewable resources and improvements in energy efficiency/conservation practices and transmission grid. Given that current electrical rates are low and that current generation and transmission/distribution needs are generally met, ASCE's Michigan Section gives Energy in Michigan a grade of C-.

The Michigan Section of ASCE makes the following recommendations related to the energy infrastructure:

1. The State needs to adopt and implement programs which reduce overall energy consumption and maintain electric rates as low as reasonably achievable so as to sustain current industry and to attract new businesses. Examples include adopting of a more current energy code for new construction and pursuing anticipated federal block grants to fund efficiency/conservation programs.
2. New base load generation or removal of significant transmission congestion will be needed in the next five to ten years, regardless of economic conditions. The State and its stakeholders need to carefully weigh available alternatives with the public utilities, other generators, and transmission system operators on the basis of need. Prudent electricity regulations including investment financing and environmental policy need to be adopted to allow for generation/transmission project implementation.
3. The MPSC should ensure that its initiatives (e.g., Michigan Planning Consortium, Wind Working Group, others) are properly implemented and that prudent decisions



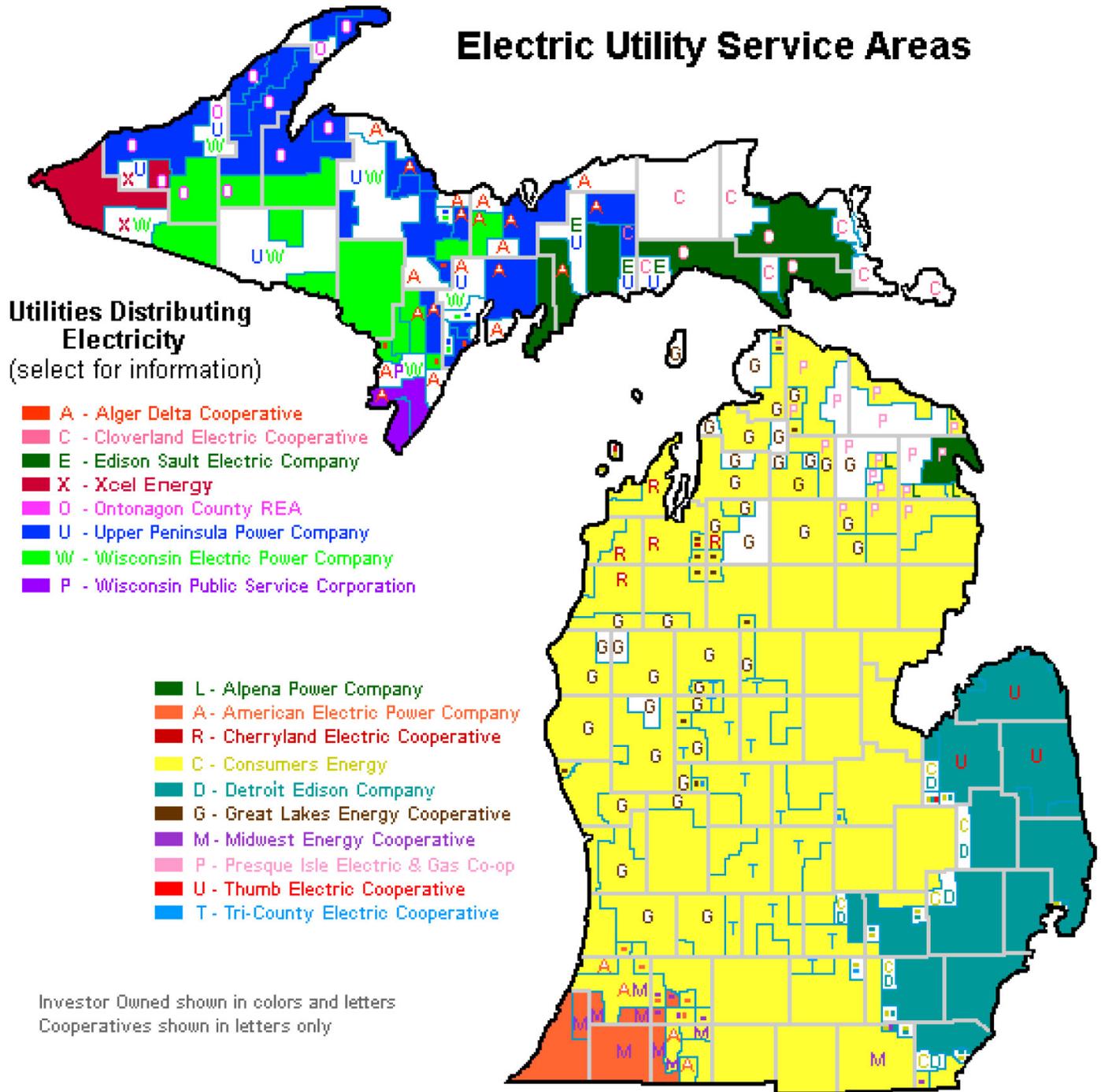
are made and supporting regulations passed for increased renewable energy use and improved reliability, as well as reduced congestion on the existing peninsula-based transmission and distribution networks.

4. Transmission constraints into and out of the Upper Peninsula need to be reduced by completing the ongoing Northern Umbrella project and other initiatives. Further transmission system improvements are needed to allow use of renewable energy systems where such systems are found fiscally prudent.
5. No significant improvements are needed to the non-electric energy infrastructure (e.g., oil and gas pipelines) aside from continual updating that regularly takes place.

## SOURCES

1. Michigan Public Service Commission (MPSC), "21st Century Energy Plan", January 31, 2007 (<http://www.dleg.state.mi.us/mpsc/electric/capacity/energyplan/index.htm>).
2. MPSC, "Semi-Annual Appraisal of Energy Markets", Report PSC-PUB 0017, issued September 29, 2008. <http://www.dleg.state.mi.us/mpsc/reports/energy/08winter/ea-winter08.pdf>
3. State of Michigan, 94th Legislature, Regular Session of 2008, "Enrolled House Bill No. 5524 and Enrolled Senate Bill No. 213", effective dates of October 6, 2008.
4. MPSC Operations & Wholesale Markets Division, "Michigan Capacity Need Forum: Staff Report to the Michigan Public Service Commission", Volumes 1 and 2, January, 2006.

## Electric Utility Service Areas



### State of Michigan – Electric Power Distribution

This map depicts the responsibilities for electricity distribution within the State of Michigan. From a geographic and load perspective, both Consumers Energy and Detroit Edison Company dominate this responsibility. Following Public Act 141, high voltage transmission lines forming the “grid” were acquired by International Transmission Company in the Lower Peninsula and American Transmission Company in the Upper Peninsula. These entities have the responsibility of distributing electricity from generators to distributors under the direction and rules of the Midwest Independent Transmission System Operator (MISO).

# NAVIGATION



## OVERVIEW

Michigan's navigation system includes coastal infrastructure, navigation harbors, channels, locks, and dams. The system contains approximately 90 harbors, 14 waterways or rivers, the significant Soo Lock system, and numerous disposal facilities for depositing dredged material. Approximately 40 of these harbors and waterways are commercial harbors, the remainder are recreational. The Army Corps of Engineers is provided a limited amount of money each year from the federal government. That amount does not meet the annual system needs, therefore the total system needs continue to grow each year. Because commercial harbors are prioritized and exceed the available funding, recreational harbors are rarely maintained or improved.

## BACKGROUND

### Coastal Infrastructure

The 3,200 miles of Great Lakes shoreline within Michigan includes some of the most beautiful, valuable, and vulnerable property in the Midwest. Cities and towns have flourished along the shores of the Great Lakes because of their natural beauty and the value they bring to commerce, navigation, and recreation. Most of these coastal cities were established as ports, taking advantage of the Great Lakes as their primary mode of transporting goods, material, and people.

Over 65 coastal cities and towns around the Great Lakes Michigan shoreline have federal navigation projects that include channels into harbors or rivers for navigation structures like breakwaters and piers. These facilities are authorized to safeguard navigation activities in the federal harbors from waves and ice. However, they also provide critical flood and storm protection for buildings, roads, and facilities that developed in their shadow along

the urban waterfront. In some cases, urban waterfront includes critical infrastructure for power generation, water supply, and wastewater treatment.

### Great Lakes Navigation System

The Great Lakes navigation system is a network of harbors, channels, locks, and dams that provides for interstate and international transportation of goods and materials.

The US Great Lakes navigation system includes over 130 federal navigation projects with 610 miles of channels, 117 harbors, 140 miles of breakwaters, 20 dredged material disposal facilities, and the locks at Sault Ste Marie, Chicago, and Buffalo. More than 50 of these harbors, 14 of the channels, and a significant portion of the breakwaters and dredged material disposal facilities lie within the State of Michigan.

## CURRENT CONDITIONS

### Coastal Infrastructure

The coastlines are subjected to harsh, rapid changes in weather and wave conditions. Waves exceeding 10 feet, created by strong winds blowing across the lake surface, can deliver a powerful force capable of moving multi-ton stones. Often, large waves combine with up to 8 feet of storm surge, creating a substantial rise in water level. The combination of storm surge and large waves, especially when accompanied by ice, generates powerful forces on harbor structures and breakwaters. These elements can be exposed to these forces many times each year, which weaken structures with each succeeding event. Many breakwater structures are built with timber, where deterioration is most acute, since wood decays rapidly when exposed to the air during low lake levels. Lake levels have been low over the last several years, speeding the deterioration.



## Great Lakes Navigation System

Most of the federal harbors in the Great Lakes were constructed between 1860 and 1940. At some of these harbors, commercial navigation has declined or ceased completely during the past 50 years. Recreation has become the major industry at many of the harbors, in some cases completely replacing commercial shipping. Currently only approximately 30 federal navigation projects in Michigan support commercial navigation. Approximately 80% of Great Lakes harbor structures are older than the typical 50 year design life expected at the time of construction. Many others are more than 100 years old.

### FUNDING SITUATION

Federal funding for the maintenance and upkeep of federal harbors, breakwaters, piers, and channels is prioritized based on the national economic benefits of the facility related to commercial navigation. The Harbor Maintenance Trust Fund, which is funded by user fees on commercial cargoes, is used to maintain the commercial ports. Recreational harbors are funded by the General Fund. Navigation facilities that lack significant commercial navigation are not currently a high funding priority. Consequently, maintenance of recreational harbors and those with limited commercial traffic has been deferred and will continue to be deferred if funding levels do not significantly increase.

With current funding levels, the majority of harbor structures are not likely to be repaired in the foreseeable future. Over half of federal harbors are no longer considered a budget priority because they are not used commercially. With the lack of adequate maintenance, harbor structures will continue to deteriorate. Reduced maintenance could increase commercial shipping costs, reduce recreational usage opportunities, reduce protection of natural coastal assets, and reduce protection of infrastructure currently sheltered by harbor and breakwater structures. Replacement costs of harbor infrastructure, if

not maintained, will be much more expensive than a maintenance investment today.

The funding levels for Michigan paint a much better picture than the funding levels for the Great Lakes Navigation System as a whole, including all of the lakes and surrounding navigation channels and rivers in the states of Minnesota, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, and New York. The total of all appropriations for the system in 2006 was \$73 million. The Army Corps projects an average annual need over the next six years of approximately \$210 million per year. This is over 2 ½ times the current funding level.

### GRADES

The grades given to the Michigan navigation system are based on discussions with the Army Corps of Engineers and the American Great Lakes Ports Association, and from the five year development plan prepared by the Army Corps of Engineers. The grades reflect a composite of the information collected.

<b>Category</b>	<b>Grade</b>
<b>Commercial Harbors</b>	<b>C-</b>
<b>Recreational Harbors</b>	<b>D</b>
<b>Channels/Rivers</b>	<b>C-</b>
<b>Locks</b>	<b>C-</b>

### CONCLUSIONS / RECOMMENDATIONS Harbors

Examples of Michigan harbors with significant commercial use include those at Detroit, Saginaw River, Grand Haven, Muskegon, Ludington, Monroe, Ontonagon, and St. Joseph. The Army Corps of Engineers spent approximately \$8 million in 2006 on harbors in

Michigan. The harbors are mostly commercial because priorities require spending only on commercial harbors unless work on recreational harbors is specifically authorized by Congress or is imperative for safety. The Army Corps projects a need of more than \$16 million in 2008 (and beyond, annually). Commercial harbors receive most of the currently allocated funding. Recreational harbors have very little money allocated to them. Harbor funding includes coastal infrastructure such as breakwaters and piers.

### Channels/Rivers

Examples of Michigan navigable channels or rivers include the Keewanaw Waterway, St. Mary's River, Saginaw River, Detroit River, Rouge River, and the Inland Route. If any of the rivers or channels are navigable but do not support commercial use, very little to no federal money is spent on them. The Inland Route in the northern lower peninsula has no money allocated to it, whereas the St. Mary's River has over \$16 million allocated. The Army Corps spent approximately \$25 million total in 2006 for navigable channels and rivers in Michigan. The Army Corps projects a need of over \$35 million annually for channel and river maintenance.

### Locks

There is one major lock system in Michigan, the Sault Ste Marie or Soo Locks. The Army Corps spent approximately \$1.5 million on these locks in 2006. They project an ongoing annual need of almost \$2.5 million for upkeep.



Over the past several years the Corps has spent an average \$2 to \$2.5 million on the lock maintenance/upgrade. The Soo Locks require a partial replacement, including a second large lock, and significant upgrade in order to prepare them for use over the next 30 to 50 years. This is a significant capital investment already in the Army Corps plan. This investment need increases the near-future budget needs for the Locks to \$25 million per year over the next few years.

### SOURCES

This report and grades given to the Michigan navigation system are based on discussions with the Army Corps of Engineers and the American Great Lakes Ports Association, and from the five year development plan prepared by the Army Corps of Engineers. The title of this document is "The Great Lakes Navigation System Five Year Development Plan Fact Sheets" and the document is dated November 27, 2007.



# ROADS AND BRIDGES



# ROADS AND BRIDGES

## OVERVIEW

There was a time when Michigan's extensive network of roads and bridges enabled its millions of residents to travel safely and freely and its tens of thousands of businesses to serve their customers efficiently. But now 38% of Michigan's roads are in poor or mediocre condition and 25% of its bridges are structurally deficient or functionally obsolete. US truckers rate Michigan roads as third worst in the country. Congestion of urban-area roads ranks eighth worst among the fifty states. Along with these problems, road and bridge funding is declining. Without increased funding, Michigan's transportation network will continue to deteriorate and fail to meet demand. Continuing to shortchange the transportation system will lead to declining quality of life for its residents, and reduced economic competitiveness in the global economy. Bold action beyond the federal stimulus package is required now to address long-term funding.

## BACKGROUND

Michigan residents enjoy modern lifestyles that rely on a high level of personal and commercial mobility. Annual vehicle travel in Michigan has increased between 1990 and 2005 by 28%, from 81 billion vehicle miles of travel (VMT) in 1990 to 104 billion VMT. Traffic volumes and congestion have decreased since then, due to the price of gas and the current economic recession, but congestion still exists and continues to impede motorist's travel and economic development. The Road Information Program (TRIP) estimates that travel on Michigan's roads and highways will increase by 25% by 2020, to 130 billion VMT per year. Increased VMT will worsen the condition of an already deteriorated road and bridge network. In addition, traffic congestion will continue as a growing burden in Michigan's major urban areas, impeding the state's economic development. In 2005, 39%

of Michigan's urban highways (interstates and other freeways) were congested compared to 23% in 2000.

The efficiency of Michigan's transportation system, particularly its highways and border crossings, is critical to the health of the state's economy. The advent of modern national and global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement. The quality of the transportation system is key to a business' ability to compete locally, nationally and internationally.

An efficient transportation system is vital to successful commerce. Businesses choose to locate and expand in regions with a well-designed and highly accessible network of roads and bridges. Numerous firms cite reliable access to the Interstate highway system and other major routes as a major factor in their choice. A 2002 comprehensive report by the Transportation Research Board, a division of the National Research Council, on the movement of freight in the US found that a region's ability or failure to minimize traffic congestion and provide reliable freight movement has a significant impact on job creation or relocation. The report states that "workplaces and residences will move away from congestion within metropolitan areas and from more congested to less congested regions within the United States."

The Federal Highway Administration estimates that commercial trucking will increase by 50% in Michigan by the year 2020. Currently on an annual basis, \$389 billion in goods are shipped out of Michigan and another \$407 billion in goods are shipped into the state.

## CURRENT CONDITIONS

Michigan's road system is deteriorating. According to the Michigan Asset Management Council, the condition of 10,000 lane-miles of Michigan's federal-aid-eligible roads (i.e., state and primary local roads) went from either "good" or "fair" to "poor" between 2004 and 2007. The Highway, Bridge, and Roads Subcommittee of the Citizens Advisory Committee to the State Transportation Funding Task Force, in a July 2008 report, identified six primary causes for this. They are:

- A history of under-funding: According to US Census Bureau data, Michigan has ranked among the bottom ten states in per-capita state and local road funding for more than 40 years.
- Declining revenues: Michigan's road funding has been declining, in real dollars, for the last 18 months, following nearly a decade of stagnant revenues. That decade of stagnation alone resulted in a significant decline in purchasing power due to inflation. The current five-year plan of the Michigan Department of Transportation (MDOT) shows an additional 15% decline in funding between 2008 and 2011.
- Rising costs: The costs associated with constructing and maintaining roads are increasing dramatically (most are increasing far more than the rate of consumer inflation) at the same time that road funding is declining.
- Aging infrastructure: Current maintenance efforts of Michigan's road agencies cannot keep pace with the deterioration of its rapidly aging road infrastructure.
- Rising demand: Despite Michigan's slow population growth in recent years and a temporary decline in VMT due to the state's current economic struggles, demand for its roads is expected to continue to rise in the long term. The fact that vehicles continue to become more fuel efficient means these increased miles of travel will generate less and less revenue per mile of travel under the current funding methodology.



- Diversion of available funds: The state is skimming millions of dollars from its transportation fund and transferring those dollars to other state departments, in the form of interdepartmental grants (IDGs).

Another issue for Michigan's roads and bridges, which many states do not face, is the numerous freeze/thaw cycles and associated road-clearing operations they undergo. The freeze/thaw cycles cause continual breakdown of road and bridge surfaces, which escalate quickly once initial deterioration occurs. The road clearing operations often include high salt applications (even compared to other northern states) and are especially tough on bridges, causing corrosion and concrete deterioration from chloride intrusion.

All of this has resulted in a road system that is recognized as one of the worst in the United States. Groups ranging from the nation's truckers to one of the most respected academic institutions dedicated to studying the nation's transportation system (The Texas Transportation Institute at Texas A&M University) have come to the same conclusion: Michigan's roads are worse than those in most other states, in terms of both the condition of road surfaces and the congestion levels in the large urban areas. This situation is not unique to any one of the three levels of road jurisdiction in the state (MDOT, county and city/village). In fact, numerous sources reveal that roads at all levels are either already in dire condition (county and city/village roads) or will reach that point in the coming years (MDOT roads) if funding is not increased.

Consider these national rankings from the 2007 Annual Report on the Performance of State Highway Systems, published by the Reason Foundation:

- Michigan has the 8th worst road system based on overall performance.

- Michigan has the 4th worst rural interstate conditions.
- Michigan has the 8th worst urban interstate conditions.
- Michigan is 8th in the nation in congested roads in urbanized areas.
- Michigan is 6th in the nation in the total cost of road miles needed.

Consider this ranking from Overdrive Magazine's 2007 survey of the nation's truckers, published in the Highway Report Card Survey 2007: Michigan has the 3rd worst road conditions in the nation.

Consider this data published by The Road Information Program (TRIP):

- 38% of Michigan's major roads are rated in poor or mediocre condition, including interstates, state highways, and key local roads and urban streets. Half of these roads are in poor condition.
- 25% (over 2,700), of the state's bridges are either structurally deficient or functionally obsolete, directly impacting safety and mobility due to weight restrictions, narrow lanes and other correctable factors.
- The average one-way commute time in Michigan increased 15% between 1990 and 2000. That works out to an additional three working days over the course of a year.
- By 2030, unless additional roadway capacity is added, rush hour travel in the Detroit, Lansing, and Grand Rapids areas will take significantly longer to complete than during non-rush hour, up to 50% longer.
- Driving on crumbling roads costs each Michigan motorist approximately \$400 to \$500 annually, depending on location, for a statewide total of \$2.6 billion per year.
- Driving on congested roads costs the average urban Michigan motorists an annual amount varying from \$300 in Grand Rapids to nearly \$1,000 in Detroit, for a total of \$2.3 billion per year.
- Roads that lack sufficient lanes, have



sharp curves, have inadequately designed intersections or interchanges, or lack updated safety features (i.e. guardrail, clear distances, barriers, updated breakaway lights and other appurtenances) put motorists, pedestrians and bicyclists at risk and contribute to approximately one-third of all traffic accidents in Michigan.

- Traffic crashes and fatalities in which roadway design is an important factor cost Michigan motorists \$2.1 billion annually, approximately \$250 per motorist.

Michigan's bridges fare better than its roads. In 2004, 29% of the state's bridges were structurally deficient or functionally obsolete. In 2008 that figure had decreased to 25%, according to the Better Roads 2008 Bridge Inventory. This improvement in bridge condition was better than that of any state in the country. The condition of Michigan's bridges now ranks 21st worst in the nation.

## FUNDING SITUATION

Current funding of Michigan's transportation network is insufficient. More money must be made available to make necessary repairs to roads and bridges, to relieve current and future traffic congestion, and to improve the movement of freight. Inadequate investment in the road system today will mean not only accelerated deterioration but increased maintenance costs in the future.

According to the July 2008 report by Citizens Advisory Committee on Transportation Funding, Michigan's roads and bridges will require an estimated annual investment of \$6.1 billion – nearly two times the current funding level – for basic improvements of its road and bridge system.

The report states that under Michigan's current funding mechanisms:

- Between 2010 and 2015, the Michigan Department of Transportation will lose an average of \$750 million per year and local transportation agencies will lose an average of \$204 million per year due to the State's inability to match available federal road funds.
- A total of 23,000 road lane miles will need to be repaired or replaced by 2015, while expected funding will pay for only 876 lane miles, just 4% of what's needed.
- An additional 30% of Michigan roads will decline to fair or poor condition over the next decade.

The February 2009 American Recovery and Reinvestment Act will help the funding situation in the short term. But long-term funding depends largely on reauthorization of the current federal legislation for transportation funding, SAFETEA-LU (Safe, Accountable, Flexible, Efficient, Transportation Equity Act – A Legacy for Users), which expires in 2009, and on Michigan's ability to match the funds made available. Under the state's current funding mechanisms, Michigan stands to lose nearly \$1 billion in federal funds each year, because its transportation agencies will not have enough revenue to provide the required matching funds.

Current mechanisms for state funding utilize vehicle-registration fees and motor-fuel taxes for the bulk of the state's transportation revenue. However, revenue from motor-fuel taxes has declined as travel on Michigan roads decreases and fuel efficiency of motor vehicles, especially with the advent of electric-powered cars, increases. Other mechanisms for generating funds must be considered.

## GRADES

### Category Grade

**Roads**

**D**

**Bridges**

**C**



## CONCLUSIONS

A deteriorating and inadequate highway transportation system costs Michigan motorists billions of dollars every year in wasted time and fuel, injuries and fatalities caused by traffic crashes, and wear and tear on their vehicles. Making needed improvements to Michigan's roads and bridges is key to providing a safer, more efficient transportation system that will save lives, decrease the amount of time wasted and money spent by motorists, and improve the state's economic livelihood.

Allowing the crisis of insufficient funding to go unchecked will put the state in a position from which it may never recover, forever relegating it to inferior status among its fellow states. State leaders must acknowledge the gravity of the road and bridge crisis and provide creative, substantial and sustainable funding to put Michigan back on the road to prosperity.

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# STORM WATER MANAGEMENT SYSTEMS

# STORM WATER MANAGEMENT SYSTEMS

## OVERVIEW

Michigan's storm water management system provides flood protection, makes development possible, improves agricultural production, and extends the service life of roads, streets and highways. Storm water management affects the water quality of streams, rivers and the Great Lakes, bearing directly on the quality of the State's recreational experience. No inventory of the State's storm water management system exists. Although federally mandated storm water permits are helping to overcome the problem, there is no consistency in operation or maintenance. Funding for continued maintenance, repair and water quality improvement is inadequate or nonexistent.

## BACKGROUND

Michigan has the distinction of being the only state in the nation virtually surrounded by fresh water. Parts of lakes Superior, Michigan, Huron and Erie make up forty percent of the State's almost 96,000 square mile surface area.

Clean water is one of our greatest natural resources. Rainwater that falls within our state will eventually make its way into our streams, rivers and lakes. As storm water passes over impervious surfaces, it collects pollutants that are deposited on those surfaces. From the land, storm water collects fertilizers and pesticides that degrade water quality.

The first state legislature enacted Chapter 80 of the Regular Session Acts of 1839 entitled "An Act to Provide for the Draining of Swamps, Marshes, and Low Lands." Although this was the first public works law in Michigan, the legislature probably never anticipated having to deal with the breadth of storm water management issues we face today.

The State's drainage system is vast. The Michigan Department of Agriculture and County Drain Commissioners oversee approximately 18,000 established county drains comprising about 40,000 miles of drainage system. Other systems are owned and maintained by cities, towns and villages and by other agencies such as Michigan Department of Transportation and county road commissions.

There are approximately 122,000 miles of roads, streets and highways in the State, most of which have roadside ditches or enclosed storm drainage systems of one form or another. Roadbed drainage is a key component in the service life of our roadways. Without proper drainage, potholes appear and vehicle repair costs increase.

The Michigan Department of Natural Resources estimates that there are about 54,000 miles of streams in Michigan, some of which are also established county or intercounty drains. Most are receiving waters from smaller storm drainage systems and/or outfalls from combined sanitary and storm sewers.

The USDA estimates that Michigan has ten million acres in agricultural production. Drain tiles have been installed in much of that land to enhance drainage and production. Although these tiles are private, most discharge into public drainage systems. The maintenance and upkeep of the public system directly impacts the function of the private system.

Countless private drainage systems underlie residential, commercial and industrial developments. In many cases local regulations require that these include detention, retention and pretreatment as a means of better managing storm water quantity and quality.

## CURRENT CONDITIONS

### Operation

No statewide system exists for managing Michigan's storm water. Nor is there a consolidated inventory of Michigan's many independent systems. At best there are only estimates of the overall size and extent of the combined systems. As a result, the entire drainage network is a hodge podge of interlaced jurisdictions, standards and responsibilities, with little coordination of the separate parts.

Because most drainage systems are gravity systems, active "operation" of these has not been a consideration except where pump stations, dams or other mechanical devices require operative effort. Detention and retention basins that are intended to help manage the quantity and quality of storm water also tend to be ignored. Consequently, in an operational sense, much of the storm drainage system is ignored until it fails.

Failure takes many forms: clogging by tree roots or debris, slow deterioration of the materials or collapse of the system. Collapse of a system is usually evident by structural failure or flooding and generally requires immediate repair. Immediate repairs with no opportunity for planning can lead to inefficient use of the already scarce funds dedicated to maintenance. Slow deterioration of storm water systems is not readily apparent unless regular inspections and maintenance are performed. If slow deterioration is not identified, it can eventually lead to failure.

### Maintenance

Without proper control, design and maintenance, storm water runoff can damage roads, flood valuable property, and destroy crops. Maintenance occurs at many different levels and intensities. These range from no maintenance (somewhat attributable to the fact that some jurisdictions are unaware of the existence of their systems) to a regular and high degree of maintenance. Maintenance has improved in jurisdictions which fall under the NPDES Phase II requirements. Regular street and catch basin cleaning, pre-treatment



basins, CSO separation projects and improved outfalls have the potential to improve storm water quality.

Preventative maintenance of the conveyance system is not consistent across the State. Some jurisdictions have very proactive maintenance programs. Genesee County, which has about 1750 drainage districts and nearly as many miles of system, has an average maintenance interval of 10 to 15 years. Lenawee County, which has about 700 drainage districts and 1500 miles of system with an average age of 80 years, inspects and/or performs some maintenance on all drains on a 5 year cycle. Newago County's average maintenance interval is 3 years. But, there exist many established county and intercounty drains, both open and enclosed, that have not been maintained in more than 100 years.

As in county jurisdictions, maintenance in municipal jurisdictions varies from one to the next. Many jurisdictions do not pay much attention to their drainage systems until a failure occurs. Little or no maintenance occurs in most private systems.

### Water Quality

Before 1987, the quality of Michigan's storm water was deemed a low priority. With increased environmental awareness and the passage of the Clean Water Act, the paradigm has begun to change. The EPA NPDES Phase II requirements, which include development of storm water regulations, have heightened interest in water quality. This interest has prompted growing numbers of local strategies to improve storm water quality and reduce the threat of pollution. Communities like Grand Rapids, in conjunction with community action groups like the West Michigan Environmental Action Council, are developing proactive storm water management plans and promoting alternative storm water management strategies to reduce runoff and improve water quality. As



communities become more aware, the interest in “Green Roofs”, LEED certified buildings and low impact development (LID) is increasing. The recent increase in water quality projects in Kalamazoo, Lansing and Traverse City is evidence of this trend.

Still, there is no coherent state plan or funding method in Michigan for managing storm water runoff. The Michigan Department of Environmental Quality estimates that less than 40% of the State’s storm water infrastructure has ever been reviewed for its potential impact on water quality. Rehabilitation of the statewide infrastructure for water quality purposes is not in the foreseeable future.

**FUNDING NEEDS AND OPTIONS**

There are over 250 Michigan communities that need to implement mechanisms to pay for storm water management programs mandated by the Clean Water Act. Neither the State nor the Federal government will pay for pollution control or maintenance.

Mechanisms do exist at the local level. Adrian, Ann Arbor, Berkley, Chelsea, Harper Woods, Marquette, New Baltimore and Saint Clair Shores have enacted storm water fees to provide dedicated funding for storm water systems. Others have attempted to generate funding by setting user fees, but in the lawsuit, Bolt v. City of Lansing, the Michigan Supreme Court held that revenue collected by a local government for a storm water utility was a tax and not a fee. Legislation is needed that addresses concerns raised by the Court, thus enabling communities to fund operation.

Established county and intercounty drainage districts can maintain their systems by special assessment. However, maintenance assessments are limited by statute to \$5000 per mile of drain. In many cases proper maintenance requires greater funding.

Although funding by other jurisdictions may be done by special assessment, it is usually through general fund or operating budgets. General

funds are easily affected by the economy and can be cut during economic slowdowns. Restoration of funding is slow and rare.

For the most part, maintenance of private systems is unfunded and virtually non-existent. Mechanisms exist to convert private systems to public systems; however, private owners do not typically wish to incur assessments by converting systems.

**GRADES**

The storm water grades are based on information collected from personal interviews with representatives of a cross section of jurisdictions that own and operate storm water facilities or otherwise handle storm water. Each interviewee was asked to respond to the four category questions with an Excellent (A), Good (B), Fair (C), Mediocre (D) or Poor (F). The grades reflect a composite of the responses given.

**CATEGORY & GRADE**

**Open Channel systems:** **C**  
**Drains, Creeks, Streams, Rivers**

**Enclosed systems:** **C**  
**Tiles, Storm Drains**

**Water Quality of Discharge:** **D**

**Availability of future funding for maintenance and repair** **D**

**CONCLUSIONS**

Storm water issues are of immense importance to the State of Michigan. Until this is understood by citizens across the State, there is little hope for change. Due to the NPDES Phase II requirements, some jurisdictions have begun taking action and community action groups are also slowly raising awareness. The

Michigan Department of Environmental Quality hopes to change the paradigm for handling storm water runoff through the use of permits, economic pressures, and environmental understanding. MDEQ is promoting a model that uses on-site controls to keep and use the storm water at or near the point where it fell. However, no statewide standard exists. There is little consistency in operation or maintenance from one jurisdiction to the next. Funding for continued maintenance, repair and water quality improvement is inadequate or nonexistent.

## RECOMMENDATIONS

As a state, Michigan needs to do a better job of managing storm water runoff to protect our greatest asset. The Michigan Chapter of the American Society of Civil Engineers makes the following recommendations concerning the management of storm water in Michigan.

1. Increase education about storm water management and its critical role in Michigan. Education is a key component in improving the storm water outlook. Town hall meetings, in-school presentations and community action groups have been successful in increasing awareness, but further work is needed.
2. Increase funding at the state level. Funding for education is possible through various grants and environmental funds but funding for asset management, maintenance, repair and water quality is sparse and may require statutory revision.
3. Establish statewide standards and practices for storm water management. The Southeast Michigan Council of Governments (SEMCOG) has developed a manual for low impact development (LID). The Michigan Department of Environmental Quality (MDEQ) has published its Storm Water Management Guidebook. Further efforts are needed, including asset management guidelines to help identify the extent of the statewide system.



## SOURCES

Information was collected from personal interviews with representatives from many jurisdictions. Because of the large number of agencies that own and handle storm water and storm drainage facilities, only a cross section of jurisdictions were contacted. These included

- Michigan Department of Agriculture
- Michigan Department of Environmental Quality
- Michigan Department of Transportation
- County Drain Commissioners
- County Road Commissions
- Cities, Towns and Villages representing Rural and Urban Communities.

The interviews sought to collect similar information for each jurisdiction. This information included the following:

- Total length of drainage system
- Percentage of enclosed (tiled) system
- Average age of the system
- Maintenance interval in years
- Ideal maintenance dollars spent per year
- Actual maintenance dollar spent per year
- Estimated conveyance capacity of the system (storm return interval).

The grades were based specifically on answers to the following four questions.

1. Estimated condition of open channel storm drainage system.
2. Estimated condition of enclosed storm drainage system.
3. Estimate of water quality discharged from the system.
4. Estimate of future funding for maintenance and repair.

# PUBLIC TRANSPORTATION



# PUBLIC TRANSPORTATION

## OVERVIEW

Following a national trend, transit use in Michigan has grown faster over the last two decades than any other mode of transportation. The rise in demand is outstripping capacity. Services are expanding in an attempt to keep pace, but often the money used for the expansion is siphoned from funds allocated to maintenance. As a result, the physical condition of the infrastructure is declining.

Some form of public transportation is available throughout the state, particularly in rural areas, but the capacities of most urban systems fail to meet demand. The presence of efficient public transportation increases property use and value. Improving public transportation services within the state is a key component in reviving Michigan's economy.

## BACKGROUND

Public transportation, or transit, is an integral component of the entire transportation network. It includes bus-route services, light-rail services (of which Michigan currently has none), ferry services, ride-share programs, and government-sponsored car-pooling. It provides an essential level of mobility and transportation options for those unable to otherwise commute. It helps commuters make better use of their commuting time by freeing them of the responsibility of driving. It enables commuters to save money. And, it provides a convenience for those commuters who prefer not to drive.

Public transportation also benefits the environment. By reducing the number of vehicles on the road, public transportation reduces air pollution and the production of green-house gases.

Public Transportation can be divided into five classifications, based on funding sources:

[MichiganReportCard.com](http://MichiganReportCard.com)

urban transit (Michigan has 19 urban transit agencies), non-urban transit (58 non-urban transit agencies in Michigan currently report statistics to the state government), local government-funded transit, semi-private transit, and private transit. This report focuses on urban and non-urban public transit and transit run by local governments. Private transit service - typically associated with senior communities or worship communities, and semi-private transit service, typically school-district systems - are not included in this report.

Urban and non-urban transit agencies receive operating and capital funding from federal, state and local sources. The federal program provides funding primarily for capital investments. While state and local funding supports maintenance and operations, non-profit organizations provide limited services to seniors or other under served populations.

Land use and density influence transportation options. Urban areas that are well-served by transit are more appealing places to live to many people than those not well-served. However, in most metropolitan areas, less than 10% of the housing is located in "walkable" urban places where transit is accessible. Recent studies suggest that roughly one in three homeowners would prefer to live in "walkable" urban places. Transit can provide the link between "walkable" urban places and the remaining 90% of the housing. A recent trend is that decline in property values is occurring faster in areas further from transit than in areas with transit access. Therefore, connecting more areas with transit makes economic sense.

## CURRENT CONDITIONS

The grade for Michigan is based on system efficiency, performance and functionality, upkeep, and area of operation.

Following a national trend, transit use in Michigan has grown faster over the last two decades than any other mode of transportation. Although funding has increased, particularly at the federal level, the demand for services is outstripping funding and current capacity of the transit systems. As services are expanded to meet the increasing demand, funds intended for general upkeep of the infrastructure are diverted to support the expanded services, resulting in maintenance being deferred or canceled. This has led to an overall decline of the existing infrastructure. How long this trend can continue before components begin to fail has yet to be determined.

Each of Michigan's 83 counties has some level of public transportation. In urban areas, this is typically through intracity fixed-route bus systems. In more rural areas, it is often a county-operated door-to-door system, such as a ride-share program. Five intercity bus routes carried over 85,000 passengers in 2005 between Michigan cities and out of the state. Intercity rail service covers most urban areas within the lower part of the state, with service provided by Amtrak serving three routes: Pere Marquette (Grand Rapids/Holland/Chicago), Blue Water (Port Huron/Lansing/Chicago), and Wolverine (Pontiac/Detroit/Jackson/Kalamazoo/Chicago). Michigan's Rideshare Program covers the entire state and consists of eleven local Rideshare offices that organize and promote ride-sharing programs. The MichiVan program, a separate ride-sharing program, provides fleet management to 146 commuter vanpool groups.

Michigan, being surrounded by the Great Lakes, also has a significant ferry system. Of particular note are the ferries on St. Mary's River, servicing Sugar, Neebish and Drummond Islands. In 2005, over 537,000 vehicles and 852,000 passengers were served. Lake Michigan also has a few ferries. This includes Charlevoix to Beaver Island (carries about 6,400 vehicles and 42,000 passengers annually), Muskegon to Milwaukee, WI (over 100,000 passengers annually), and Ludington to Manitowoc, WI (about 100,000 passengers annually).

## FUNDING

In 2005, the State of Michigan supported transit with about \$195 million in funding, which translates to \$19.30 per-capita. This is an extremely significant amount, as it covers 20% of the capital funds and 30% to 45% of the operating funds of a typical urban transit agency. Federal funding typically covers the remaining 80% of the capital funds and 15% to 20% of the operating funds of urban transit agencies. Capital funding is generally significantly less than operating funds, on average 15% of the overall costs associated with an agency. Rider-generated revenues (fares) typically account for 10% or less of operational funding and make no contribution to capital funding. Funding gaps are typically made up by local governments.

While transit ridership is increasing, funding to increase service is decreasing and many transit operators have actually had to cut service at a time when it should be expanded. Why is this? Because more people using public transit means fewer gallons of gasoline purchased, reducing receipts to the Michigan Trust Fund, which results in fewer dollars going to support transit in general. Funding actually decreases as ridership increases. Public policy must change.

## GRADE

Many of Michigan's citizens have access to some form of public transportation, however the access and availability of that public transportation to many of the living areas, especially in the metro Detroit area, is inadequate. In addition, many of the urban systems are unable to adequately service transit demands and maintain their deteriorating infrastructure. This is primarily due to a lack of capital and operational funding. The grade for Michigan's transit system is a D.

## CONCLUSIONS

Overall, Michigan's transit is in a declining condition as services are being expanded (where funding is available) due to demand. These expansions divert funds allocated to maintenance of existing systems. Not only this, revenues for transit in general are in decline. Communities have a desire to improve transit service because this service does contribute to stabilizing and increasing property use and values. Improving public transportation services within the state can be a key component in helping to revive the Michigan economy.



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# WASTEWATER AND COLLECTION SYSTEMS

# WASTEWATER AND COLLECTION SYSTEMS

## OVERVIEW

Michigan is faced with aging infrastructure and limited funding. It is essential for the health of our future generation that we maintain and invest in our wastewater infrastructure. As of 2004, our state's wastewater infrastructure needs to protect our quality of life were approximately \$6 billion dollars.

## BACKGROUND

Michigan is a water wonderland. It is surrounded by four of the five Great Lakes which are fed by some 35,000 inland lakes and ponds. These inland bodies of water cover approximately 889,600 acres of the State, per USGS and NHD data. In addition, Michigan has approximately 54,300 miles of river systems and approximately 5,500,000 acres of various wetland types. Great care must be taken to protect these valuable state assets that make up our environment, support our economy (a \$15 billion dollar industry) and quality of life.

To protect its waterways, Michigan has created an infrastructure system of sewers, pumping stations and wastewater treatment facilities. These systems are taxed everyday by the materials they transport and treat. These materials, which consist of chemicals, human waste, plastic, brick, gravel, wood, etc., create a harsh demanding environment. As a result of these demands, the life expectancy of the sewers and structures is 50 years. The life expectancy of the mechanical/electrical systems is 20 years.

## CURRENT CONDITIONS

Michigan's wastewater treatment plants (WWTP) attained secondary treatment standards required by the Clean Water Act (CWA) in the 1970s. As a result, our WWTPs

are 30 to 40 years old and sewage collection systems (sewers/pump stations) are typically 50 to 100 years old and greater, pending development and age of the community. For example, over half of the approximately 25,000 miles of sanitary sewers in the state were built before 1970.

## FUNDING NEEDS AND OPTIONS

The State of Michigan has funding requirements of approximately \$6 billion dollars according to the EPA Clean Watershed Needs Survey. This report addresses the needs for replacement, rehabilitation, expansion or process improvements for our State's wastewater treatment and collection systems. The correction of combined sewer overflows alone accounts for approximately a third of these capital improvement needs.

Options available for funding these improvement projects are limited. A community can fund a project by selling bonds at current market rates, typically an interest rate of 4.5% to 5.5%. Another funding source created by the Federal Government in 1988 is the State Revolving Fund (SRF) Program. The State supplements the fund and the Michigan Department of Environmental Quality (MDEQ) administers the program on behalf of the State. The SRF loan is a low interest loan, currently at 2.5%. However, Federal support of this program has been cut over the last several years and it is not anticipated to meet our state's demand for the next several years.

## GRADE: C

The stewards of our State's environment, the Michigan Department of Environmental Quality (MDEQ), have given Michigan an overall good grade regarding the existing health of our waterways. However, the aging collection and

treatment systems protecting these waterways are coming to the end or exceeding their planned/expected life cycles. It is clear that significant investment is necessary to sustain meeting our environmental and health requirements mandated by the State's regulatory agencies and protecting our future generation's Quality of Life.



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<b>GRADE</b>	
Funding	<b>D</b>
Condition	<b>C</b>
Level of Service	<b>B</b>
Asset Management	<b>B</b>
Security and Safety	<b>C</b>





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