

HAZARDOUS MATERIALS ROUTING SYNOPSIS REPORT

Wayne County: Proposed Recommendations



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TABLE OF CONTENTS

1. Summary	1
2. Introduction	3
3. Hazardous Materials	4
4. Existing Restrictions	5
5. Reasons for Review	5
6. Authority	6
7. Roles in Determining Restrictions or Specific Requirements for Transport of Hazardous Materials in Michigan	7
7.1 MDOT's Role	7
7.2 The Role of the Public	7
8. Analysis	7
8.1 Truck Crash Rate Estimates on Selected Route Segments	8
8.2 Hazardous Materials Commodity Flow Analysis	10
8.3 Assessment of Potential Consequences on Selected Routes	12
8.4 Routing Methodology for Selected Routes	13
9. Routes and Proposed Recommendations	14
9.1 Ambassador Bridge [Detroit] from Porter Street to Canada [Windsor]	14
9.2 Windsor Tunnel [Detroit] from Jefferson Avenue to Canada [Windsor]	15
9.3 State Road M-10 [Detroit] from Howard Street to Woodward Avenue [Under Cobo Hall (approximately 1 mile)]	15
9.4 State Route M-10 [Detroit] from 8 Mile Road [South] to Wyoming Road	15
10. Conclusion	17
11. References	18
12. Acronyms	18

LIST OF FIGURES

Figure 1: Examples of Hazardous Materials Placards	6
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LIST OF TABLES

Table 1: Classes and Divisions of Hazardous Materials	4
Table 2: Estimated Annual Truck Crash Rates for Major Roads in Wayne County	8
Table 3: Number of Hazardous Materials Releases Due to Truck Crashes in Wayne County over a Seven-Year Period	9
Table 4: Survey Results: Hazardous Materials Shipments at Eight Michigan Checkpoints	10
Table 5: Total Hazardous Materials Shipments to or from Detroit	11
Table 6: Risk Analysis Based on Accident Scenarios	13
Table 7: Proposed Recommendations for Hazardous Materials Restrictions on Selected Hazardous Materials Routes	16

1. SUMMARY

This synopsis report focuses on specific Michigan roads or highways with respect to the transport of hazardous materials. Hazardous material (hazmat) is defined as a substance or material capable of posing an unreasonable risk to health, safety, or property when transported in commerce.¹ This definition underscores the importance of minimizing risk to the public, to the environment, to public and private property (including animals and the built environment), and to hazmat shippers or carriers. Moreover, the definition explains the need for regulatory requirements and strict management of the transport of hazardous materials.

Hazardous materials include elements of everyday life – ranging from petroleum-related substances (such as fuel) and explosives (such as fireworks) to a broad range of materials used in the manufacture of ordinary products, such as fertilizers, detergents, bleaching agents and myriad other goods used or dispensed in households, hospitals, water purification plants, industrial facilities, laboratories, dry cleaners, gas stations, farms and other endeavors or establishments on a daily basis. Hazardous materials are transported by a broad spectrum of transportation modes, including highways, rail, waterways and air, as well as by pipelines.

The Michigan Department of Transportation (MDOT) is the authorized agency responsible for all Non-Radioactive Hazardous Materials (NRHM) routing designations and restrictions or requirements in the state of Michigan. In addition, MDOT works collaboratively with other state agencies, including the Department of Environmental Quality and the Michigan State Police, to administer routing of radioactive materials. Michigan's roads and highways fall into one of two categories – **designated routes** (highways or roads on which hazardous materials may be transported)² and **restricted routes** (highways or roads on which hazardous materials may not be transported) or routes that have specific restrictions, such as requirements for escorts, time-of-day restrictions, limitations about specific hazardous materials that may be prohibited and/or other requirements or restrictions. Michigan's hazmat routes and respective restrictions are included in the U.S. Department of Transportation Federal Motor Carrier Safety Administration's National Hazardous Materials Route Registry (NHMRR). The registry is the national repository for NRHM as well as radioactive materials routes.

In November 2008, MDOT received a formal request to change restrictions relative to the designated routes in Wayne County. Subsequent to this request, MDOT has taken the following steps:

- ✓ Commissioned a study focused on the four Wayne County hazardous materials routes
- ✓ Reviewed the findings highlighted in the study
- ✓ Conferred with industry experts and other stakeholders regarding the findings
- ✓ Developed this synopsis report

¹U.S. Department of Transportation, Pipeline & Hazardous Materials Safety Administration, "Glossary," <http://phmsa.dot.gov/hazmat/glossary>. [Accessed Feb. 12, 2012].

²Texas Department of Transportation, Texas Transportation Institute. *Public Guidance for Managing Hazardous Materials Transportation in Texas*, 2009.

As part of its review process in considering a change that would impact specific, restricted hazardous materials routes, a study was conducted which focused specifically on the four restricted hazardous materials routes in Wayne County. These four routes existed at the time of federal regulatory changes enacted by the Hazardous Materials Transportation Act of 1994, as amended in 2002. The current restrictions apply to all hazardous materials truck shipments traversing these routes.

As Michigan's designated routing authority, MDOT is required to follow all applicable federal and state laws, regulations, and guidelines, including those specified in Federal Motor Carrier Safety Regulation 49 CFR 397, with respect to possible changes in designated hazardous materials routes. In carrying out hazmat routing responsibilities, MDOT works collaboratively with federal partners, including the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the Pipeline and Hazardous Materials Safety Administration (PHMSA) and others. Moreover, MDOT maintains close contact with other state departments of transportation, as well as Canadian partners, to ensure a flow of information and to employ best practices and lessons learned – with respect to safety and other issues, including hazardous materials transport.

This synopsis report is intended to provide information as part of MDOT's efforts to reach out to the public and to inform stakeholders about the following:

- Current hazardous materials routing, including restrictions and requirements,
- The process involved when considering changes to restricted routes and/or related restrictions/requirements,
- The studies and analyses reviewed and utilized in developing this report, and
- MDOT's proposed recommendations for modifications to current restrictions that would impact existing routes in Wayne County (as outlined in the Conclusion of this report).

2. INTRODUCTION

Close to a million shipments of hazardous materials traverse the United States daily.³ Hazmat shipments vary widely in terms of content, size and weight. The transportation modes of shipping hazardous materials also vary. Hazardous materials are transported via highway, rail, air, and waterways, as well as by pipelines. According to the FMCSA, roughly 95 percent of U.S. hazmat shipments are transported by trucks on highways and roads.⁴ Also, slightly more than half the hazmat tonnage shipped in the United States is moved by motor carriers (trucks) on highways.⁵ Because such significant amounts of hazardous materials are transported on highway routes shared by the public, these shipments must be regulated in a manner that provides utmost safety for human life, the environment, and property.

While ease of travel and the efficient, economic passage of goods and commerce are high priorities, MDOT and its federal partners – the FMCSA and the PHMSA – consider safety to be a paramount consideration when it comes to transportation of hazardous materials. Thus, like all states in the nation, the State of Michigan mandates specific restrictions and imposes certain requirements related to the transportation of hazardous materials on public routes.

Existing hazardous materials routes were established in Michigan on Nov. 14, 1994, and were subsequently reported to the FHWA on March 8, 1995. All ensuing routing designations and restrictions/requirements for transportation of NRHM in Michigan have been established in accordance with regulations.

The key objective of this synopsis report is to provide public information about the required process for hazardous materials routing that includes conducting and evaluating studies and analyses relative to any possible changes, as well as providing recommendations relating to the NHMRR and Wayne County routes. Specific considerations include whether:

- Current restrictions for specific hazardous material classes should remain on each of the four studied routes,
- Current restrictions for certain hazardous material classes should be removed on all, or part of, each of the four routes, and
- New restrictions/requirements concerning specific hazardous materials classes should be added on each, or any, of the four routes.

In summary, this synopsis report:

- Presents an overview of some of the existing hazardous materials routing restrictions currently in place in the state of Michigan, with specificity regarding four restricted hazmat routes in Wayne County,
- Sets forth possible modifications that might impact hazardous materials transport on the four existing routes studied,
- Cites the regulatory authority for hazardous materials routing and MDOT's responsibilities in the process,
- Addresses the roles of MDOT and the public in determining changes to existing restrictions or requirements,
- Describes the technical analyses used in evaluating the subject hazardous materials routes, along with related restrictions, and
- Includes proposed recommendations for changes to existing restrictions or requirements impacting hazardous materials routes in Wayne County.

³National Research Council, Transportation Research Board. *Special Report 283, Cooperative Research for hazardous Materials Transportation: Defining the Need, Converging on Solutions*, Washington, D.C. 2005.

⁴*Federal Register* (Vol. 67, No. 193) – FR DOC 02-25226, Dept. of Transportation, Federal Motor Carrier Safety Administration "Supplemental Information," Oct. 4, 2002.

⁵U.S. Department of Transportation, Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics, *Hazardous Materials Highlights – 2007 Commodity Flow Survey*, Washington, D.C. January 2011.

3. HAZARDOUS MATERIALS

Similar to the definition provided in PHMSA's online glossary, the U.S. Code of Federal Regulations at 49 CFR 397.65 defines "hazardous material" as:

A substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, or property when transported in commerce, and which has been so designated.

3.1 CLASSES OF HAZARDOUS MATERIALS

Hazardous materials are categorized in nine specific classes. Each class is based on various characteristics of the substance or material, such as physical state and risk potential. Classes are further delineated into divisions, allowing for more detailed specification of the materials or substances. The table that follows highlights key classes and divisions:

Table 1. Classes and Divisions of Hazardous Materials

CLASS OR DIVISION	HAZMAT TYPE/CHARACTERISTIC
1	EXPLOSIVES
1.1	Explosives with mass explosion hazard
1.2	Explosives with projection hazard
1.3	Explosive with mass fire hazard
1.4	Explosives with minor hazard, such as ammunition or consumer fireworks
1.5	Very insensitive (chemically stable) explosives, such as blasting agents
1.6	Extremely insensitive detonating substances
2	GASES
2.1	Flammable Gases
2.2	Non-flammable, nonpoisonous, non-toxic compressed gas
2.3	Poisonous Gases (Toxic - by inhalation)
3	FLAMMABLE LIQUIDS (includes COMBUSTIBLE LIQUIDS)
4	FLAMMABLE SOLIDS AND REACTIVE SOLIDS/LIQUIDS
4.1	Flammable Solids
4.2	Spontaneously combustible materials
4.3	Dangerous-when-wet materials
5	OXIDIZERS AND ORGANIC PEROXIDES
5.1	Oxidizers
5.2	Organic Peroxide
6	POISONOUS (TOXIC) MATERIALS AND INFECTIOUS SUBSTANCES
6.1	Poisonous (Toxic) Materials
6.2	Infectious Substances
7	RADIOACTIVE MATERIALS
8	CORROSIVE MATERIALS
9	MISCELLANEOUS MATERIALS/DANGEROUS GOODS

4. EXISTING RESTRICTIONS

The State of Michigan currently has nine thoroughfares designated as restricted hazardous materials routes. Four of these routes are located in Wayne County and include:

NAME OF EXISTING HAZARDOUS MATERIALS ROUTE	CURRENT RESTRICTIONS
Ambassador Bridge [Detroit] from Porter Street to Canada [Windsor]	Classes 1, 3, 7 and 8
Windsor Tunnel [Detroit] from Jefferson Avenue to Canada [Windsor]	Classes 1, 3, 7 and 8
State Route M-10 [Detroit] from 8 Mile Road [South] to Wyoming Road	Classes 1 and 3
State Route M-10 [Detroit] from Howard Street to Woodward Avenue [Under Cobo Hall (approx. 1 mile)]	Classes 1 and 3

The aforementioned routes in Wayne County and the pertinent restrictions are included in the NHMRR, the national repository for both NRHM and Radioactive Materials (RAM) routes.

5. REASONS FOR REVIEW

On Nov. 20, 2008, MDOT received an official request from the Detroit International Bridge Co. (DIBC) to change the NHMRR and initiate the process to modify current restrictions regarding the transportation of certain hazardous materials across the Ambassador Bridge in Wayne County. Subsequently, MDOT elected to review all existing hazardous materials routes in Wayne County.

On July 13, 2010, MDOT received an additional request from the DIBC (while the review was pending) proposing the restrictions be modified to allow the transport of specific hazardous materials to include escort vehicles accompanying the primary carrier to enhance safety.

6. AUTHORITY

The statutory authority over highway routing of hazardous material, which has been delegated to the FMCSA, may be found at 49 USC § 5112. Section 5112(a) provides in part:

- (1) This section applies to a motor vehicle only if the vehicle is transporting hazardous material in commerce for which placarding of the vehicle is required under regulations prescribed under this chapter . . .
- (2) . . . each State and Indian tribe may establish, maintain, and enforce—
 - (A) designations of specific highway routes over which hazardous material may and may not be transported by motor vehicle; and
 - (B) limitations and requirements related to highway routing.

49 CFR 397 provides:

- Routing requirements and procedures that States and Indian tribes are required to follow if they establish, maintain, or enforce routing designations for non-radioactive hazardous material (NRHM),
- Regulations for motor carriers transporting placarded or marked NRHM and procedures for dispute resolutions regarding NRHM routing designations,
- Motor carriers transporting NRHM shall comply with NRHM routing designations of a State or Indian tribe.

MDOT is the designated routing agency responsible for all NRHM routing designations and restrictions in Michigan, MCL 480.11a. These routing designations and restrictions apply to all motor carriers transporting hazardous materials commercially for which the use of placards is required under the Federal Hazardous Materials Regulations.

Examples of hazardous materials placards for Class 3 (Flammable Materials) and Class 8 (Corrosive Materials), two of the nine classifications of hazardous materials (presented in Table 1, page 4), are depicted in the figure that follows:

Figure 1. Examples of Hazardous Materials Placards



Trucks carrying most types of hazardous materials are required to display placards identifying the classification of hazmat being transported. This requirement underscores the importance of visually communicating that hazardous material is being transported by the motor carrier and serves as a reminder to other motorists to exercise caution around vehicles displaying hazmat placards.

Responsibility for **enforcement** of designated hazardous materials routes rests with the Commercial Vehicle Enforcement Division (formerly Motor Carrier Division) of the Michigan State Police.

7. ROLES IN DETERMINING RESTRICTIONS OR SPECIFIC REQUIREMENTS FOR TRANSPORT OF HAZARDOUS MATERIALS IN MICHIGAN

As explained earlier, MDOT is the authorized state agency responsible for routing the transport of hazardous materials on Michigan’s roads and highways. The public and other stakeholders also have a voice in MDOT’s determinations relative to routing restrictions and requirements. An overview of the roles of MDOT and the public concerning routing restrictions/requirements associated with transport of hazardous materials in Michigan follows:

7.1 MDOT’S ROLE

MDOT has executed a key role in the routing of hazardous materials in Michigan for many years. As early as 1929, routing restrictions were being developed. In 1994, as a result of federal law, MDOT was recognized as the state’s designated routing agency. Thus, the agency is responsible officially for all NRHM routing designations and restrictions/requirements in Michigan. In 1995, routes with specific hazmat restrictions or requirements were “grandfathered in” as existing hazmat routes. Requests by infrastructure owners to change any existing routes or to modify current restrictions or requirements on these routes must be written and presented in hard copy to MDOT. Upon receipt of a request to modify existing hazmat routing requirements or restrictions, MDOT must initiate the process by which to consider a change. MDOT has 18 months after public notification of the proposed recommendations to issue a final decision on the request to modify the existing hazmat routes or restrictions applicable to the respective routes.

In the course of carrying out its various responsibilities, MDOT regularly engages in a broad range of outreach activities to ensure that the public is informed and involved. With respect to this synopsis report and the proposed recommendations and/or changes of restrictions on hazmat routes in Wayne County, MDOT also will allow for public involvement.

7.2 THE ROLE OF THE PUBLIC

The requirements for public participation in the hazmat routing process is set forth in 49 CFR 397.71. This federal requirement ensures public participation in the routing process. It requires that the public be given notice of any proposed NRHM routing designation (or change) and a 30-day period in which to comment. Public input will help MDOT recognize and address any concerns about possible impacts of the proposed recommendations. Comments submitted by the public within the designated 30-day period will be considered by MDOT in its final determination.

8. ANALYSIS

The analysis for this synopsis report focused on the following major factors:

- 8.1 Truck Crash Rate Estimates on Selected Route Segments
- 8.2 Hazardous Materials Commodity Flow Analysis
- 8.3 Assessment of Potential Consequences on the Selected Routes
- 8.4 Routing Methodology for Selected Routes

8.1 TRUCK CRASH RATE ESTIMATES ON SELECTED ROUTE SEGMENTS

This section provides an overview of truck crashes that occurred during a seven-year period (2000-2006) in Wayne County and reviews the number of related hazmat materials releases/spills. It is important to note here that the analysis and related chart provides data about all truck crashes in Wayne County during the seven-year period – not just trucks transporting hazardous materials.

Table 2. Estimated Annual Truck Crash Rates for Major Roads in Wayne County

ROUTE	TOTAL MILES	TRUCK CRASHES	ANNUAL TRUCK MILES TRAVELED	CRASH RATE/ 10 ⁶ MILES
I-275 from Grand River Road to US-24	33	348	102,913,513	1.13
I-96 from I-275 to I-75	21	353	72,265,328	1.63
I-94 from Wayne-Washtenaw Co. Line to S-102	39	1076	201,987,542	1.78
I-75 from Wayne-Monroe Co. Line to I-96	20	827	84,615,258	3.26
M-10 from Wayne-Oakland Co. Line to M-8 (Davidson)	7.5	30	15,156,996	1.05
M-10 from M-8 (Davidson) to M-85 (West Fort Street)	5.6	44	9,508,590	2.60
M-39 from M-10 to Wayne-Monroe Co. Line	18	250	29,010,545	2.87
M-5 (Grand River Avenue) from I-96 to US-24	18	14	7,697,111	0.61
US-12 from Wayne-Washtenaw Co. Line to Jefferson (Detroit River)	25	278	10,130,848	9.15
M-85 from I-75 to (River Rouge) Junction of M-3	16	109	9,601,774	3.78
M-153 from Wayne-Washtenaw to Wyoming Road (I-94)	20	117	10,693,774	3.65
US-24 from Wayne-Oakland to Wayne-Monroe Co. Line	26	337	12,437,261	4.66
Detroit Windsor Tunnel	1	3	203,337	4.92
Ambassador Bridge, including approaches	2	15	3,577,934	1.40

Table 2 demonstrates that expressways – such as I-275, I-94, I-96, M-39, and the northwestern portion of M-10 (highlighted in light gray) – tend to have lower crash rates compared to primary highways, such as US-12, US-24, and M-85. Exceptions include the southeastern portion of M-10 in the metropolitan area of Detroit, I-96 and M-5 (Grand River Avenue). Overall, crash rates for the subject area of I-75, the lower part of M-10 and I-96, are similar to the crash rates for non-divided highways. M-5 (Grand River Avenue) had the lowest overall crash rates of all the routes evaluated. The truck crash rates depicted in Table 2 were applied to the route risk assessment.

8.1.1 FREQUENCY OF HAZARDOUS MATERIALS SPILLS ON WAYNE COUNTY ROADS

Hazmat motor carriers involved in accidents that result in spills or releases of hazardous materials are required to file a report with the PHMSA. This information is compiled in the Hazardous Materials Incident Reporting System (HMIRS) database. (For reference, a Hazardous Materials Class and Division list is outlined in Table 1 in Section 3 of this synopsis report.) A review of hazmat motor carrier accidents in Wayne County between 2000 and 2006 revealed 67 reported crashes that resulted in hazardous materials releases or spills. A breakdown of those releases documented in the study period is displayed by hazmat class or division in Table 3 that follows:

Table 3. Number of Hazardous Materials Releases Due to Truck Crashes in Wayne County over a Seven-Year Period

CLASS/DIVISION	NUMBER OF HAZMAT RELEASES	PERCENTAGE
2.1	3	4.5%
2.2	6	9.0%
2.3	1	1.5%
3	34	50.7%
5.1	1	1.5%
5.2	1	1.5%
6.1	1	1.5%
8	16	23.9%
9	4	6.0%
TOTAL	67	100%*

*Rounded

Slightly more than half of the truck crashes that resulted in hazmat releases during the seven-year period involved Class 3 (Flammable Liquids) while the next highest release category was Class 8 (Corrosive Materials). Class 2 (Gases) materials, flammable, non-flammable and toxic gases, were the third-most commonly released substances, representing 15 percent of the total hazardous material releases identified in the study.

In addition to hazmat releases or spills that occur during transportation accidents, the HMIRS database also includes releases or spills that occur while the hazardous materials are being loaded and unloaded, or are in temporary storage. Releases that occurred during loading and unloading and/or related to temporary storage are not included in Table 3. Among the cited data, the HMIRS database lists the location and type of road on which the hazmat incidents occurred, making it possible to determine which crashes occurred on highways built to interstate specifications. Of the 67 accidents in Wayne County involving hazardous materials releases during the seven-year period, 18 incidents (or just over 25 percent) occurred on divided and limited access highways – thoroughfares that meet interstate specifications.

8.2 HAZARDOUS MATERIALS COMMODITY FLOW ANALYSIS

This section provides an overview of hazardous materials shipments at designated Michigan checkpoints. Data was obtained by surveying hazardous materials carriers at seven (Michigan) state-operated weigh stations and at the Blue Water Bridge during the fall 2009 (a total of eight Michigan checkpoints). Hazmat motor carrier monitoring was conducted during two eight-hour workdays at each of the following weigh stations, including the Blue Water Bridge:

WEIGH STATION	HIGHWAY
Monroe	I-75 NB
Monroe	I-75 SB
Fowlerville	I-96 WB
Fowlerville	I-96 EB
Grass Lake	I-94 WB
Grass Lake	I-94 EB
Pontiac	I-75
Blue Water Bridge (Customs)	I-69

During the monitoring period, more than 1,200 hazardous materials shipments were tabulated. No estimates were made about the ratio of hazardous materials to total truck shipments. The number of shipments distributed among the various classifications of hazardous materials is presented in Table 4. Class 3 (Flammable Liquids) materials dominated, accounting for about 39 percent of all hazardous materials shipments. Class 8 (Corrosive Materials) shipments accounted for roughly 20 percent of all the hazmat shipments in the study, with Class 9 (Miscellaneous Materials/Dangerous Goods) accounting for about 18 percent.

Table 4. Survey Results: Hazardous Materials Shipments at Eight Michigan Checkpoints

HAZARDOUS MATERIALS CLASS CODE	NUMBER OF SHIPMENTS	PERCENTAGE OF HAZMAT SHIPMENTS SURVEYED
1.1	1	0.1%
1.2	1	0.1%
1.3	1	0.1%
1.5	1	0.1%
2.1	102	8.3%
2.2	111	9.0%
2.3	17	1.4%
3	477	38.6%
4.1	12	1.0%
4.3	8	0.6%
5.1	10	0.8%
6.1	17	1.4%
6.2	2	0.2%
7	2	0.2%
8	247	20.0%
9	227	18.4%
TOTAL	1,236	100% *

*Rounded

As part of the survey, the origin and destinations were tabulated for as many of the hazardous materials shipments as possible. Using this data, the distribution of origins and destinations were applied to the entire hazardous materials truck population tabulated. Consequently, it was possible to estimate the number of hazardous materials shipments that were transported to or through Detroit. These shipments represented about 26 percent of the total. The percentages of the hazmat substances being shipped were similar to the breakdown for all of the hazardous materials shipments surveyed - about 41 percent were Class 3 (Flammable Liquids) materials, 27 percent Class 8 (Corrosive Materials) and 22 percent Class 9 (Miscellaneous Materials/Dangerous Goods). The distributions, by hazardous materials classification, of all the inspection results and for those shipments that presumably went to or came from Detroit, are provided in Tables 4 and Table 5, respectively.

Table 5. Hazardous Materials Shipments to or from Detroit

HAZARDOUS MATERIALS CLASS CODE	NUMBER OF SHIPMENTS	PERCENTAGE OF HAZMAT SHIPMENTS SURVEYED
1.1	0	0.0%
1.2	0	0.0%
1.3	0	0.0%
1.5	0	0.0%
2.1	6	1.9%
2.2	9	2.8%
2.3	0	0.0%
3	133	41.3%
4.1	6	1.9%
4.3	0	0.0%
5.1	4	1.2%
6.1	4	1.2%
6.2	1	0.3%
7	1	0.3%
8	88	27.3%
9	70	21.7%
TOTAL	322	100% *

*Rounded

8.3 ASSESSMENT OF POTENTIAL CONSEQUENCES ON THE SELECTED ROUTES

This section evaluates the potential consequences of hazardous materials carrier accidents on the four selected hazmat route segments in Wayne County, including the Detroit Windsor Tunnel, the Ambassador Bridge, the segment of M-10 under Cobo Hall, and the lowered section of M-10 between the junction of the interchange with Wyoming Road and the interchange with 8 Mile Road.

The consequences of hazmat releases or spills were analyzed without addressing the likelihood of occurrence. Some assumptions were made regarding the consequences of the releases. The first assumption related to the toxic end point used to estimate consequences. Additional assumptions concerned first responder (emergency personnel) response time, the response behavior of people in vehicles who would be at risk of exposure to the potential hazmat plume, and the response behavior of people residing (or present) near the route that would be in the release plume.

The probability of fatal exposure given the concentration and duration of exposure was applied in conducting the consequence assessment. The number of individuals in vehicles, in residences, or other nearby facilities in the affected area was assumed with a 50 percent potential fatality exposure rate and was used to estimate the consequences of a release. Regarding residents and others in the vicinity of the highway, it was assumed that emergency responders would be able to notify them to shelter in place or to evacuate before the hazmat plume could reach the affected residences and/or other facilities.

Some uncertainties were inherent in the evaluation, and these uncertainties could have impacted the risk assessment results. One of the major uncertainties was associated with the accident rate for each of the route segments. The route segment evaluated was less than a mile. Traffic data averaged over a much longer route segment may not be representative of the traffic density in the short route segment that was evaluated. Varying traffic density also posed a significant unknown.

The analysis applied Wayne County accident data focused on a three-year period. It is possible that accident data for a longer period of time, perhaps during five or more years, might increase the accuracy of the estimate. However, collecting historical data for the past five years or longer may pose other challenges because accident rates have been declining. Traffic counts for each of the evaluated segments might increase the accuracy of the accident rate estimate.

Another uncertainty was associated with the quantity and distribution among the classes/divisions of hazardous materials being transported through Wayne County. While some information was collected on the volume and the classes/divisions of hazardous materials traveling into and out of Wayne County, the available collection points often were distant from Wayne County, making an exact count of hazardous materials shipments in Wayne County difficult to determine. The uncertainty in the distribution of shipments among the various hazardous materials classes and divisions presents an uncertainty that might be mitigated by collecting more data. In spite of the stated uncertainties, a serious attempt was made to perform an objective analysis. While the exact shipment risk data might be uncertain, the relative risk numbers should provide a valid understanding of the classes and divisions of hazardous material shipments that travel through Wayne County.

8.3.1 IDENTIFICATION OF POTENTIAL CONSEQUENCES BASED ON HAZARDS

Based on 10 accident scenarios, a risk analysis was performed. The scenarios, which are presented in Table 6, are predicated on specific characteristics of certain hazardous materials that could serve as “triggers” for these hypothetical incidents. These scenarios have been categorized in three outcomes or consequences: fire, chemical release, and explosion. Using these accident scenarios, each of the four routes in Wayne County were analyzed. The results of these analyses were compared with a base risk assessment of the same 10 scenarios on a standard highway. The results of the risk analysis, augmented by other aspects of the research and a thorough review, indicate which classes of hazardous materials should be restricted for each of the four routes, based on each respective route’s characteristics and the potential for risk to human life, the environment, property and infrastructure.

Table 6. Risk Analysis Based on Accident Scenarios

ACCIDENT SCENARIO CONSEQUENCE	ACCIDENT SCENARIOS – HAZMAT “TRIGGERS”
Fire	Gasoline Fire
	Propane Fire
Chemical Release	Small Acrolein Release
	Ammonia Release
	Chlorine Release
	Acrolein Release
Explosion	Cold BLEVE
	Hot BLEVE
	Propane VCE
	Gasoline VCE

BLEVE: Boiling LiquidExpanding Vapor Explosion

VCE: Vapor Cloud Explosion

8.4 ROUTING METHODOLOGY FOR SELECTED ROUTES

The routing methodology combined the hazmat carrier crash rate data, the commodity flow data, and the consequence analysis; subsequently, this data was applied to the current restrictions on the four Wayne County routes. The next step was to estimate the number of hazardous materials accidents that might occur on the route segments being evaluated. The two discriminating factors were route length and hazmat carrier accident rate differences.

For all the route segments analyzed, restricting (prohibiting) Class 3 (Flammable Liquids) hazardous materials shipments would result in the biggest risk reduction. This is because Class 3 materials represent more than half of the hazmat shipments documented in this study. Although higher fatality rates are projected for other classes of hazardous materials, the higher frequency of accidents involving Class 3 hazmat carriers outweighs the higher consequences of the other classes and divisions of hazardous materials. If transportation of previously restricted hazardous materials was allowed on Wayne County routes, a safeguard could be added by requiring that the hazmat shipment motor carriers travel with an escort vehicle or vehicles. In addition to escorting, another precaution could be added to close the particular route segment being used for a short, controlled distance and/or for a specified period of time.

9. ROUTES AND PROPOSED RECOMMENDATIONS

This section contains proposed recommendations for retaining, removing and/or adding hazardous materials class restrictions or requirements on the four restricted routes in Wayne County. The proposed recommendations include suggestions for increasing restrictions or requirements for special measures on some routes, while suggesting limitations or reductions of the shipments of certain classes/divisions of hazardous materials on other routes. As indicated in Section 7.2 of this report, the role of the public is important and will be considered in making a final determination.

There are no recommendations with respect to transportation of Class 6.2 (Infectious Substances) or Class 7 (Radioactive Materials) as they have other regulations that apply. Generally, the transportation of Class 6.2 and Class 7 material is rigorously controlled and subject to strict restrictions.

Table 7 on page 16 summarizes MDOT's proposed recommendations for hazardous materials restrictions and/or changes to the selected hazardous material routes, showing current restrictions and proposed recommended restrictions.

9.1 AMBASSADOR BRIDGE [DETROIT] FROM PORTER STREET TO CANADA [WINDSOR]:

The bridge is inherently most vulnerable to explosive materials. As a result of limited escape paths, in the event of a hazmat incident resulting in an explosive-caused fire or a toxic release triggered by an explosion, many vehicle occupants might be trapped and possibly not survive. Toxic releases pose a less significant concern because these releases would be elevated and, thus, are less likely to harm people below the bridge, although there is still obvious risk. Corrosives, while not specifically evaluated, would have smaller hazmat release plumes compared to explosive materials. However, many corrosive materials are recognized water contaminants. Lastly, the recommendation to permit motor carriers with placards to transport Class 3 (Flammable Liquids) would allow the movement of gasoline and other fuels needed to supply fuel stations and other facilities in areas of Michigan with changing demographics that require readily available fuel supplies.

A request for escorts (accompanying vehicles) for shipments on NRHM routes has been analyzed. Based on the research, it has been determined that vehicular escorts provide an acceptable alternative to restricting certain hazardous materials through the use of protective measures. The requirement for escorts – as an additional means to reduce risk – was recommended as a viable approach based on key variables, including the length of the route, speed of traffic, and control of the traffic.

PROPOSED RECOMMENDATION:

- Restrict Class 1
- Require the use of escort vehicles for all allowable hazardous materials (Class 2, 3, 4, 5, 6, 6.1, 8, and 9).
- Escort vehicles may be subject to additional federal, state, or local permit requirements with regard to the type of escort vehicles, special markings, time of day, and/or day of the week.

NOTE: See Table 7 for information regarding Class 6.2 and Class 7.

9.2 WINDSOR TUNNEL [DETROIT] FROM JEFFERSON AVENUE TO CANADA [WINDSOR]:

The tunnel is inherently most vulnerable to hazardous materials due to the limited ability of vehicle occupants to avoid toxic fumes in the tunnel. The ventilation system inside the tunnel might contribute to (exacerbate) or impede escape with respect to hazmat incidents. If the ventilation system were kept on, the air supply could fan any fires and make the conditions in the impacted section of the tunnel worse. In the case of toxic gas and liquid spills, if the ventilation system were kept on, one has to consider the possibility (and resultant consequences) of toxic gases being discharged from, or distributed through, the ventilation system. The dilution of the hazardous materials would be a function of the number of ventilation zones in the tunnel affected by the release. For spills of toxic liquids, the impact could be significant because gravity would allow the spill to travel toward the lowest point in the tunnel, consequently causing more of the toxic gases to flow into the ventilation system. While the video surveillance system would allow tunnel managers to identify dangerous situations quickly, the number of individuals that might be trapped in the tunnel and the lack of any safe escape portals from the tunnel decrease the likelihood of escape. Escape portals are present in most modern tunnels longer than 500 meters, but presently not installed in the Windsor Tunnel.

PROPOSED RECOMMENDATION:

- Restrict all placarded vehicles.

NOTE: See Table 7 for information regarding Class 6.2 and Class 7.

9.3 STATE ROAD M-10 [DETROIT] FROM HOWARD STREET TO WOODWARD AVENUE [UNDER COBO HALL (APPROXIMATELY 1 MILE)]:

The route under Cobo Hall is a function of the configuration of the route that creates a “de facto” tunnel, and, as such, there is a need to protect the adjacent downtown area of Detroit, as well as the highway infrastructure. An explosion under the building would pose an obvious risk to the building structure and to people inside and immediately outside of the building, as well as to those on the affected highway. Many of the types of plumes from a hazmat release resulting from a crash near, or under, Cobo Hall have the potential to impact Detroit’s highly populated downtown business district.

PROPOSED RECOMMENDATION:

- Restrict all placarded vehicles.

NOTE: See Table 7 for information regarding Class 6.2 and Class 7.

9.4 STATE ROUTE M-10 [DETROIT] FROM 8 MILE ROAD [SOUTH] TO WYOMING ROAD:

For the lowered section of the M-10 (John C. Lodge Freeway) from 8 Mile Road to Wyoming Road, restricting the transport of gases and liquids is recommended. These restrictions would be in addition to the current restrictions on Class 1 (Explosives) and Class 3 (Flammable Liquids) materials. In the event of a hazmat release, the vertical walls surrounding the lowered highway could confine spills of gas, extend the hazardous concentration farther down the roadway and delay the dissipation of potentially hazardous plumes. Safe escape routes would be limited to existing ladders along M-10’s vertical walls, thus limiting safe escape routes for vehicle occupants. The risk would be reduced on road sections that are lowered but with sloped, rather than vertical, walls. Based on analysis of the data, which examined the potential for a hazardous gas (Class 2 material) involved in an accident to combust or vaporize rapidly – presenting the potential for high risk – Class 2 (Gases) hazardous materials also should be restricted.

PROPOSED RECOMMENDATION:

- Restrict Classes 1, 2, 3, 5, 6 and 8.

NOTE: See Table 7 for information regarding Class 6.2 and Class 7.

Table 7 summarizes the proposed recommendations for hazardous material restrictions and/or changes on the selected hazardous materials routes.

Table 7. Proposed Recommendations for Hazardous Materials Restrictions on Selected Hazardous Materials Routes*

MDOT PROPOSED RECOMMENDED HAZARDOUS MATERIALS CLASS RESTRICTIONS FOR HAZARDOUS MATERIALS ROUTES																			
NAME OF EXISTING ROUTE	CURRENT RESTRICTIONS									PROPOSED RECOMMENDED RESTRICTIONS									ADDITIONAL RESTRICTIONS OR COMMENTS
	CLASS NUMBERS									CLASS NUMBERS									
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
Ambassador Bridge [Detroit] from Porter Street to Canada [Windsor]	Full Class	No Restrictions	Full Class	No Restrictions	No Restrictions	Full Class	Full Class	No Restrictions	No Restrictions	Full Class	No Restrictions	No Restrictions	No Restrictions	No Restrictions	Other Regulations Apply	Other Regulations Apply	No Restrictions	No Restrictions	Require escort(s) for Classes 2-6.1 and 8-9; subject to further restrictions
Windsor Tunnel [Detroit] from Jefferson Avenue to Canada [Windsor]	Full Class	No Restrictions	Full Class	No Restrictions	No Restrictions	Full Class	Full Class	No Restrictions	No Restrictions	Full Class	Full Class	Full Class	Full Class	Full Class	Full Class	Other Regulations Apply	Full Class	Full Class	Prohibit all placarded vehicles
State Route M-10 [Detroit] from Howard Street to Woodward Avenue [under Cobo Hall (approximately 1 mile)]	Full Class	No Restrictions	Full Class	No Restrictions	Full Class	Full Class	Full Class	Full Class	Full Class	Full Class	Other Regulations Apply	Full Class	Full Class	Prohibit all placarded vehicles					
State Route M-10 [Detroit] from 8 Mile Road (South) to Wyoming Road	Full Class	No Restrictions	Full Class	No Restrictions	Full Class	Full Class	Full Class	No Restrictions	Full Class	Full Class	Other Regulations Apply	Full Class	No Restrictions	None					

No Restrictions
 Full Class
 Partial Class (see note below)
 Other Regulations Apply (see note below)

*NOTE: For **Partial Class** and **Other Regulations Apply**, there are no recommendations with respect to transportation of Class 6.2 (Infectious Substances) or Class 7 (Radioactive Materials) as they have other regulations that apply. Generally, the transportation of Class 6.2 and Class 7 material is rigorously controlled and subject to strict restrictions.

10. CONCLUSION

The information presented in this synopsis report is based on a review of the comprehensive study, other research and discussion with experts. It highlights hazardous materials transportation issues affecting four restricted hazardous materials route segments in Wayne County, ranging from the types (classes and divisions) of hazardous materials to the levels of risk and relative numbers of hazmat shipments. This synopsis acknowledges the risks of hazardous materials transport to the motoring public, property owners, the environment, critical infrastructure, local communities, and the citizens of Michigan and Canada. The transportation of these materials, however, is essential to daily life and the economic vitality of Wayne County and the state of Michigan. Therefore, reasonable restrictions and added safeguards that address potential risks are essential. Safety continues to be a primary concern.

MDOT proposes that the existing routes be modified to reflect the proposed recommendations presented in Section 9 of this synopsis report. In some cases, the use of effective protective measures, including escort vehicles on limited routes and possible time-of-day restrictions, would be acceptable as reasonable approaches to reduce risks. By reviewing various studies and analyses, MDOT evaluated existing hazardous materials routes with respect to suitability for the transportation of specific hazardous materials/substances and the potential impact on each of four routes in the event of a crash and potential release or spill of these materials. Based on the research and the review of many factors for safe routing of hazardous materials, MDOT developed proposed recommendations for the selected routes. These proposed recommendations are highlighted in the chart that follows:

NAME OF EXISTING ROUTE	CURRENT RESTRICTIONS	PROPOSED RECOMMENDED RESTRICTIONS*
Ambassador Bridge [Detroit] from Porter Street to Canada [Windsor]	Classes 1, 3, 7 and 8	Restrict Class 1 Require the use of escort vehicles for all allowable hazardous materials (Classes 2, 3, 4, 5, 6, 6.1, 8, and 9) Escort vehicles may be subject to additional state or local permitting requirements specifying type of escort vehicles, special markings, time of day, and/or day of the week
Windsor Tunnel [Detroit] from Jefferson Avenue to Canada [Windsor]	Classes 1, 3, 7 and 8	Restrict all classes
State Route M-10 [Detroit] from Howard Street to Woodward Avenue [Under Cobo Hall (approximately 1 mile)]	Classes 1 and 3	Restrict all classes
State Route M-10 [Detroit] from 8 Mile Road [South] to Wyoming Road	Classes 1 and 3	Restrict Classes 1, 2, 3, 5, 6 and 8

*Note: See Table 7 for information regarding Class 6.2 and Class 7.

11. REFERENCES

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12. ACRONYMS

BLEVE – Boiling Liquid Expanding Vapor Explosion

CFR – Code of Federal Regulations

FHWA – Federal Highway Administration

FMCSA – Federal Motor Carrier Safety Administration

HMIRS – Hazardous Materials Incident Reporting System (a transportation regulation)

MCL – Michigan Compiled Laws

MDOT – Michigan Department of Transportation

NHMRR – National Hazardous Materials Route Registry

NRHM – Non-Radioactive Hazardous Materials

PHMSA – Pipeline and Hazardous Materials Safety Administration

RAM – Radioactive Materials

U.S. – United States

USC – United States Code

USDOT – United States Department of Transportation

VCE – Vapor Cloud Explosion



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