

MICHIGAN BRIDGE INVENTORY: THE SURVEY SAMPLE

Submitted to

**Margaret Barondess, Staff Archaeologist
Project Planning Division
Michigan Department of Transportation
425 W. Ottawa
Lansing, Michigan 48909**

Submitted by

**Charlene K. Roise, Principal Investigator
Hess, Roise and Company
405 Cedar Avenue South, Suite 200
Minneapolis, Minnesota 55454**

**Clayton B. Fraser, Principal Investigator
Fraserdesign
1269 Cleveland Avenue
Loveland, Colorado 80537**

June 1995

MICHIGAN STRUCTURE INVENTORY CODING INSTRUCTIONS

Coded on
Card: 3

INVENTORY ITEM 43 - Main Structure Type

3 digits
Col. 49-51

The codes are for the main spans. The first digit of the three-digit code indicates type of design and kind of material of the main supporting members and the second and third digits indicate type of design and/or construction.

Special Michigan sub-types shown indented with "(" convert to Federal code immediately above it and are for optional use by local governments.

- | | | | |
|---|-------------------------------|----|--|
| 1 | Concrete | 00 | Other |
| 2 | Concrete continuous | 01 | Slab |
| 3 | Steel, simple or Cant. | | (71 Slab Timber - Composite |
| 4 | Steel continuous | 02 | Multi-Stringer, W or I-Beam, Non-composite |
| 5 | Prestress concrete | | (32 Multi-Stringer, W or I-Beam, Composite |
| 6 | Prestress concrete continuous | | (42 Multi-Stringer, W or I-Beam, Encased |
| 7 | Timber | | (52 Multi-Stringer, Plate Girder, Non-composite |
| 8 | Masonry | | (62 Multi-Stringer, I-Beam, Jack Arch Floor |
| 9 | Aluminum, W.I. or C.I. | | (72 Multi-Stringer, W or I-Beam, Timber Floor |
| 0 | Other | | (82 Multi-Stringer, Plate Girder, Composite |
| | | | (92 Multi-Stringer, Plate Girder, Encased |
| | | 03 | Girder & Floorbeam - Deck, Non-composite |
| | | | (33 Girder & Floorbeam - Composite Girder |
| | | | (21 Girder - Thru (Include conc. Camelbacks) |
| | | 04 | Tee Beam or inverted channel |
| | | 05 | Box Beam or Girders - Multiple |
| | | 06 | Box Beam or Girders - Single or spread (segmental) |
| | | 07 | Frame - Rigid or other (culvert) |
| | | 08 | Orthotopic |
| | | 09 | Truss - Deck |
| | | 10 | Truss - Thru & Pony (343-Thru; 344-Pony) |
| | | 11 | Arch - Deck, Filled Spandrel |
| | | | (22 Arch - Deck, Open Spandrel |
| | | 12 | Arch - Thru |
| | | 13 | Suspension |
| | | 14 | Stayed Girder |
| | | 15 | Movable - Lift |
| | | 16 | Movable - Bascule |
| | | 17 | Movable - Swing |
| | | 18 | Tunnel |
| | | 19 | Culvert (Box, Pipe or Pipe Arch) |
| | | 20 | Mixed types (Note: applicable only to approach span - Item 44) |
| | | 21 | Segmental Box Girder |

Example:

Timber Through Truss	Code
Masonry Culvert	710
Steel Suspension	819
Continuous Concrete Multiple	313
Box Girders	205
Simple Span Concrete Slab	101
Tunnel in rock	018

TABLE OF CONTENTS

MICHIGAN BRIDGE INVENTORY: THE SURVEY SAMPLE	1
CRITERION A EVALUATION	3
THE EVOLUTION OF MICHIGAN'S ROADS AND BRIDGES: AN INTRODUCTION	4
WAYNE COUNTY: AN EXEMPLARY ROAD COMMISSION	17
EARLY HIGHWAY DEPARTMENT BRIDGES	28
TOURISM'S INFLUENCE ON ROADS AND BRIDGES	29
BRIDGES OF THE DEPRESSION	34
BOMBERS AWAY: BRIDGE PROJECTS RELATED TO DEFENSE INDUSTRIES	38
MICHIGAN'S INNOVATIVE EXPRESSWAYS	43
CRITERION C EVALUATION	53
CONCRETE GIRDER (103, 203, 104, 204, 104, 205, 121, 221)	54
CONCRETE SLAB (101, 201)	61
CONCRETE RIGID FRAME (107, 207)	63
CONCRETE ARCH (111, 211)	65
CONCRETE BOX CULVERT (119, 219)	69
PRESTRESSED CONCRETE BEAM	70
STEEL STRINGER (302, 402, 332, 432, 342, 442, 363, 462, 372, 472)	71
STEEL GIRDER (303, 403, 321, 421, 333, 433, 352, 452, 382, 482, 392, 492)	79
STEEL PONY AND THROUGH TRUSS (310, 410, 343, 443, 344, 444)	84
STEEL DECK TRUSS AND DECK ARCH (309, 409, 322)	90
STEEL RIGID FRAME (307, 407)	92
STEEL MOVABLE SPAN (316, 417)	94
STEEL PIPE CULVERT (319)	96
TIMBER BRIDGES (702, 710, 771)	97
STONE MASONRY ARCH (811)	101
SOURCES CITED	104
APPENDIX A: THE SURVEY SAMPLE	
APPENDIX B: BRIDGES ELIMINATED FROM THE SURVEY SAMPLE	
APPENDIX C: MAIN STRUCTURE TYPE CODES	

MICHIGAN BRIDGE INVENTORY: THE SURVEY SAMPLE

Bridge inventory is, simply stated, a winnowing process in which the significant bridges are eventually identified and documented. For budgetary and logistical reasons, it is desirable to exclude the clearly nonsignificant bridges at the outset to reduce the inventory's scope to a more manageable and meaningful number. Given the sizable quantity of bridges in Michigan, this initial reduction of the number of inventoried structures allows the study to concentrate on the truly important structures without carrying all the baggage of the unimportant bridges. The first winnowing cut is thus intended to identify the field survey sample: those bridges which for historical or technological reasons merit further research and field documentation. The selection of the field survey sample is the most crucial phase of the inventory. As the first step in identifying those bridges that will eventually be determined eligible for the National Register, it points the direction for the entire project. From an administrative standpoint, the selection process is equally important for what it excludes, for this latter group of bridges is far larger than the included structures. It is also more vulnerable. Unlike the field survey sample, which will remain the center of attention throughout the inventory, the excluded bridges immediately pass from the study. To ensure that no significant bridges are overlooked at this important juncture, the selection criteria should be crafted so that they are generous to the resource, responsive to budgetary concerns and consistent with sound scholarship.

The following pages discuss survey sample selection based on National Register Criteria A and C. As engineering structures, bridges can most easily be evaluated under Criterion C. Establishing significance under Criterion A is a more difficult process which must often be pursued on a bridge-by-bridge basis. It is virtually impossible to anticipate which bridges will be important under Criterion B before local archival research is completed during field survey. Even then, a case can rarely be made for a bridge to merit National Register status under this criterion.

The contexts developed to delineate the survey sample will serve as the basis for subsequent National Register nominations. These contexts will be modified in light of findings from the survey. As a result, the contexts remain a work in progress.

Discussions of Criteria A and C contain lists of bridges to be included in the survey based on specific contexts. Appendix A consists of a composite list of bridges, arranged by county, which will be included in the survey sample. The criteria which qualify the bridge for inclusion in the survey are identified. Appendix B is a complementary list of bridges excluded from the survey. These structures were eliminated for one, or both, or the following reasons: (1) the bridge did not fall within the standards established for Criteria A or C, or (2) the bridge exhibited poor physical integrity. Assessment of the latter quality was determined by an examination of photographs of the state's pre-1956 bridges. During this assessment, some bridges were added because they possessed aesthetic merit, even if they were a common structural type of standard dimensions. In order to ensure that no bridge was arbitrarily

removed from the survey sample, bridges have been included in the survey if no photograph was available for analysis.

Since the numbering system for Michigan bridges is rather complex, each pre-1956 bridge has been assigned an alphanumeric identification (e.g. HOUG001) to facilitate field work and evaluation.

Research was completed at the Michigan Department of Transportation, Michigan Bureau of History, Michigan State Library, Michigan State Archives, Michigan State University libraries, and the city engineer's office in Lansing; the University of Michigan libraries (including the Bentley Historical Library) and city engineer's office in Ann Arbor; the Eastern Michigan University Library and city engineer's office in Ypsilanti; the Detroit Public Library (Burton Historical Collection), Wayne County Public Department of Public Services and Wayne State University Library in Detroit; the Bayliss Library in Sault Ste. Marie; Northern Michigan University, the Marquette County Historical Society, the Marquette Public Library, and the county courthouse in Marquette; Michigan Technological University in Houghton; Western Michigan University, Kalamazoo College and the city archives in Kalamazoo; the city engineer's office in Battle Creek; the city engineer's office and county courthouse in Grand Rapids; Central Michigan University Library (Clarke Historical Library) in Mount Pleasant; and the University of Minnesota libraries and the Minneapolis Public Library in Minneapolis.

Charlene Roise of Hess, Roise and Company was primarily responsible for developing the Criterion A contexts and sample selection. She received research and other assistance from Jeffrey A. Hess, Cynthia deMiranda, Ann Gaasch, Chad Perkins, and Shawn Rounds. Clay Fraser of Fraserdesign established Criterion C guidelines, with help from Karla Ogilvie.

MICHIGAN BRIDGE INVENTORY: CRITERION A EVALUATION

An extensive literature search revealed a number of themes which appear to be appropriate measures of significance under Criterion A. The overall context for these themes is discussed in the introductory section entitled "The Evolution of Michigan's Roads and Bridges." This is supplemented by more detailed "sub-contexts" which have been used to select bridges for the survey sample:

1. Wayne County: An Exemplary Road Commission
2. Early Highway Department Bridges
3. Tourism's Influence on Roads and Bridges
4. Bridges of the Depression
5. Bombers Away: Road and Bridge Projects related to Defense Industries
6. Michigan's Innovative Expressways

While there is inevitably some overlap between these themes, each subject appears to be of sufficient interest to merit separate discussion.

Since bridges of interest under Criterion A have been identified by archival research, copies of appropriate archival information have been sorted into county files that will be used during field work and National Register evaluation.

THE EVOLUTION OF MICHIGAN'S ROADS AND BRIDGES: AN INTRODUCTION

An excellent historical overview of the development of Michigan's roads and bridges is provided by Charles K. Hyde in *Historic Highway Bridges of Michigan*, published in 1993.¹ The following narrative provides some background information useful when considering Criteria A and C subcontexts.

The area that became the state of Michigan was criss-crossed by trails long before the nineteenth century. Some of these paths were adopted by the settlers who swarmed into the region after 1805, when Michigan Territory was established. By the 1820s, the federal government was surveying and improving military roads, designed for long-distance travel, while the territory's new inhabitants were establishing dozens of local roads to serve their nascent communities. A number of nineteenth-century routes are echoed in the alignment of today's highways, such as U.S. 12 (the "Detroit-Chicago Road"), Interstate 94 (the "Territorial Road"), and Interstate 96 (the "Grand River Road").²

While little is known of the bridges built during this era, they presumably were as primitive as the rutted trails that carried scores of pioneers to the area and points further west. Travellers were forced to ford small streams or trust simple timber spans. Ferries provided passage over broader waterways.

In the late 1830s, just as Michigan achieved statehood, railroads arrived on the scene. The Erie and Kalamazoo Railroad connected Adrian and Toledo in 1836; by 1849, tracks spanned the state from Detroit to Lake Michigan. The trains' speed and efficiency were far superior to other overland options. In response, ever short of funds to meet the growing demands of its population, the young state abdicated responsibility for its road system. Under Chapters 22 and 27 of the state code, bridges were put under the care of township road commissions. Townships were required to repair or replace a bridge when petitioned by twelve or more property owners. Road commissions could press local property owners into service to build and maintain structures, but were constrained by a mandate limiting their budget to \$250. Communities could seek assistance from the county board if "unreasonably burdened" by the construction. In 1867, townships were granted the authority to issue bonds to fund bridge construction and repair. The sum raised in a given year could not exceed one percent of the township's assessed property value for the proceeding year; total indebtedness could not be

¹ Charles K. Hyde, *Historic Highway Bridges of Michigan* (Detroit: Wayne State University Press, 1993).

² Frank F. Rogers, "Notes on Some Early Michigan Roads," *Michigan Roads and Pavements* 22 (December 1925): 7, 8; Roger L. Morrison, "The History and Development of Michigan Highways," *University of Michigan Official Publication* 39 (6 April 1938): 1-16.

greater than three percent of that amount.³

To stretch limited funds as far as possible, road commissioners turned to readily available materials. Stone was found in many areas in the state, but required skill and energy to utilize. Timber from Michigan's abundant forests produced simple stringer spans which served adequately, albeit temporarily, for many minor crossings. Timber was also used alone, or in combination with iron members, for truss bridges. These combination structures, as well as completely iron structures, were prefabricated by companies that specialized in designing and erecting bridges. The companies boomed in the late nineteenth century when innovative milling technology facilitated the economical production of steel on a large scale, and new ore mines in northern Michigan and Minnesota provided an abundance of raw materials. Steel proved extremely versatile and durable for structural use, and quickly supplanted wrought or cast iron for bridge construction. Many bridge companies also offered concrete designs when Portland cement became a common commodity in the early twentieth century.

The bridge companies filled an important need as America's frontier galloped westward. They did not, however, always do it in the most efficient or ethical manner. Problems were fostered by the process local governments typically used to procure bridges. Road commissions advertised the letting of a contract for one or more bridges, often providing only the bare minimum of specifications, such as span length and structural type. Since county commissioners were rarely competent to judge the structural merits of proposals, bridge companies sometimes supplied inappropriate or inadequate designs to win the contract as the cheapest bidder. Even when good plans were submitted, unscrupulous contractors insisted on provisions allowing substitution of "like-kind" structural members. According to a 1910 article by John J. Cox, an engineer from Sturgis who was soon to organize the University of Michigan's engineering department, "what is familiarly known as 'skinning the bridge' is the result. That is, the plans appear attractive to the board and may call for a strong, heavy structure; but the contractor, taking advantage of the substitution clause in the contract and the lack of training of the board, actually builds a much lighter, weaker and consequently cheaper bridge." Remarking on typical bridge-letting practices, Cox concluded that "this loose method of contracting for bridges makes it practically impossible for even honest officials to procure a satisfactory structure, and opens up a way for dishonest officials and contractors to arrange a deal whereby the public comes out second best." Bridge companies also formed pools to fix bids, splitting high profits by eliminating real competition.⁴

Frustration with corruption, and with the growing inadequacy of the state's roads, led to reform efforts by the turn of the century. The movement was spearheaded by Horatio Earle

³ Morrison, "The History and Development," 6-7; *Laws of the State of Michigan, relative to Highways and Bridges, and the Duties of Highway Commissioners and Overseers of Highways* (Lansing: Hosmer and Fitch, 1855), 3-4, 23-24; *Laws of the State of Michigan, relative to Highways and Bridges, and the Duties of Highway Commissioners and Overseers of Highways* (Lansing: W.S. George and Co., 1871), 48-49.

⁴ John J. Cox, "Highway Bridges and Culverts," *Michigan Roads and Forests* 5 (March 1910): 7-8.

who, like many other promoters of road improvements, was an ardent bicyclist. Seeking better routes for their sport, cyclists organized "Good Roads" groups that lobbied for the creation of a state agency to oversee Michigan's roads. In 1900, Earle was elected to represent Detroit in the state Senate on a good-roads platform. His reform efforts were slowed by opposition from farmers, who feared both higher taxes and the incipient invasion of the automobile into rural areas. It was not until 1903 that Michigan lawmakers established the State Highway Department and authorized incentives for road improvements. The attorney general almost immediately declared the legislation unconstitutional, however, because the state's charter prohibited the funding of internal improvements. In the brief time that the law was in force, Governor Bliss appointed Earle state highway commissioner, a position he maintained without pay even after the law was annulled. His tireless crusade to revise the state's constitution paid off in 1905, when a referendum allowed the state to fund road work. The law required the highway commissioner to "furnish outline plans and specifications for the improvement of public wagon roads, and, when requested . . . give expert advice of how to best build or improve public roads or bridges."⁵

The new department had an operating budget of \$10,000, plus \$20,000 for "reward" roads in the first year and \$50,000 in the second. "Rewards" were actually subsidies to counties and townships for road construction that met state specifications. The size of the reward ranged from \$250 per mile for a basic gravel road to \$1,000 for a mile of macadam. Frank Rogers, the first deputy highway commissioner and later the commissioner, noted that initially "it was impossible to induce the people to build enough roads to take the money available." Only a few progressive counties -- Bay, Kalkaska, Manistee and Mason -- created road commissions and adopted state construction standards early on. Also, Alpena and Chippewa counties each committed \$100,000 to improve roads.⁶

The department's inaugural biennial report, covering 1905 and 1906, discussed culverts and bridges in great detail. It included a chart outlining the minimum I-beam specifications to carry a ten-ton load for spans of 3.5 to 29.5 feet, and strongly encouraged the use of concrete floors and abutments. Concrete was also enthusiastically recommended by township road commissioners, whose comments were included in a "gabfest" at the end of the report. The commissioners' main complaints focused on property owners who paid road taxes with labor, a problem solved with passage of the Cash Road Tax Law in 1907.⁷

The 1907-1908 biennial report included basic plans for I-beam, riveted Warren pony truss,

⁵ The establishment and early years of the State Highway Department are discussed in detail in Frank F. Rogers, *History of the Michigan State Highway Department, 1905-1933* (Lansing: n.p., 1933). The "State Reward Road Law" is reprinted in the Michigan State Highway Department's *First Biennial Report, 1905-1906*, 13-19. Subsequent references to these biennial reports will be abbreviated SHDBR, with the appropriate number and years.

⁶ Frank F. Rogers, "Twenty Years Work by the State Highway Department," *Michigan Roads and Pavements* (January 1925): 5.

⁷ 1 SHDBR (1905-1906).

through plate-girder, and concrete slab spans. All featured concrete floors. The report also included general specifications. These restricted pin-connected trusses to spans 100 feet or more. Riveted Warren pony trusses were preferred for 60 to 100 foot spans; plate girders for 30 to 60 feet; and steel stringers for spans of less than 30 feet.⁸

While the department worked to improve bridge quality, quantity remained a pressing issue as well. In 1908, Deputy Highway Commissioner Frank Rogers reported: "A bridge company that claims to sell more than one-half of the bridges in Michigan sold only \$300,000 worth last season." Even if that sum represented only twenty to thirty percent of the bridges built in Michigan in 1907, bridge production clearly fell far short of demand. Faster and heavier loads made older bridges obsolete, while ever-increasing traffic levels required new routes to be opened. In an effort to ensure the longevity of the new bridges that were being built, a 1909 law required bridges to carry at least a ten-ton load and set minimum roadway width at sixteen feet.⁹

Improvement of the state's highway system took a major leap forward in 1913, when the legislature authorized designation of a trunk-line network totaling nearly 3,000 miles. Projects to upgrade these roads to state standards were eligible for twice the usual reward reimbursement. The legislation also required the state to design all trunk-line bridges, and to erect and maintain trunk-line bridges spanning 30 feet or more, if the county or local government improved three miles of adjacent road. The highway department let contracts and supervised construction for the trunk-line bridge projects. All were in rural areas, since the law prohibited the state from bridge work in towns with over 6,000 inhabitants. In the first year that the system was established, the department invested \$75,000 in eighteen bridges. Within four years, the state spent almost \$900,000 on trunk-line reward payments, and nearly \$400,000 on bridges. By 1918, the state could take credit for 113 new trunk-line bridges.¹⁰

Creation of the trunk-line system significantly enlarged the highway department's purview, requiring a substantial increase in staff. Within a few years, it became one of the largest state agencies. During the 1913 reorganization, a bridge department was established with Clement V. Dewart as its director. Dewart was trained as a civil engineer, and had earlier designed bridges for the Pere Marquette Railroad. Under his direction, copies of standard bridge and culvert plans were drafted and made available to township and county road commissions at no charge. Revisions were required after the 1915 legislature raised moving load requirements for new bridges from ten to fifteen tons, and increased minimum roadway width to sixteen feet. Within a few years, steel shortages precipitated by World War I increased the popularity

⁸ 2 SHDBR (1907-1908), 201-207.

⁹ Speech by Frank F. Rogers at State Round-Up Farmers' Institute, 25 February 1908, published as "Defects in Michigan Roads and How to Improve Them," *Michigan Roads and Forests* 5 (March 1908): 5.

¹⁰ Rogers, "Twenty Years Work," 5-6; 5 SHDBR (1913-1914), 8-9, 42-46, 113; 7 SHDBR (1917-1918), 1, 72; Frank F. Rogers, "Roads Built with the Fifty Million Dollar Bond Issue," *Michigan Roads and Pavements* 22 (19 February 1925): 3.

of concrete through-girder bridges for 30- to 50-foot spans. Also to conserve steel, older truss bridges on trunk-line routes were renovated with new stringers and floors when the structure maintained sufficient strength to justify the effort.¹¹

To lower construction costs and control quality, the state began to purchase standard materials in quantity. In 1914, for example, the department let a contract for all the plain rolled I-beams needed for state bridge construction in that season, saving an estimated 50 percent over the typical cost of buying on a bridge-by-bridge basis. The popularity of concrete construction led the department to purchase cement in volume and supply it to contractors for state road and bridge projects beginning in 1922. To further control prices, the state leased the Michigan Portland Cement Company in Chelsea late in 1923 and operated it with prison labor.¹²

Also during this period, the state began pushing to eliminate busy railroad-highway crossings, which had become a significant source of traffic accidents. Often, streets could be rerouted to avoid tracks. When it was necessary to erect a bridge to separate grades, the state could pay up to 25 percent of the cost. Typically, the department designed grade separations where the highway passed over the railroad tracks; when the roadway went below, the railroad produced the bridge plans. The first crossings to be considered under this law were in Washtenaw County, where the Michigan Central Railroad intersected the Ann Arbor-Whitmore Lake Road, and in Houghton County, where the Mineral Range Railroad traversed a county road. During the next eight years, 146 grade crossings were eliminated on trunk highways, nearly all by route realignment. Only five bridges over rail lines and four underpasses were built. The problem was particularly acute in densely populated areas, where heavy development made realignment impossible. In Wayne County, for example, the county road commission took on its first grade separation project in 1922, and had completed 49 by 1931.¹³

The Covert Act, passed by the 1915 legislature, required that the state, upon request of the appropriate locality, build all trunk-line roads as well as inter-county non-system roads. Adjacent land owners were assessed for half the cost; road commissions could issue bonds for the remainder. While this act ultimately played a significant part in improving road quality in the state, legalities tangled bond sales to fund the program until 1917. By that time, the federal government had enacted the Federal Aid Road Act of 1916 to subsidize state road construction on designated federal routes. Five years later, Congress began to shape federal-aid routes into a national highway system. Michigan Senator Charles E. Townsend was encouraged by Roy Chapin and other leaders of the state's burgeoning automobile industry to

¹¹ 5 SHDBR (1913-1914), 9; 6 SHDBR (1915-1916), 14, 126; 7 SHDBR (1917-1918), 32-33; 10 SHDBR (1923-1924), 31; "Michigan State Highway Department in New Quarters," *Good Roads* 13 (3 March 1917): 148; Rogers, "Roads Built," 3.

¹² 5 SHDBR (1913-1914), 9; 10 SHDBR (1923-1924), 31.

¹³ 6 SHDBR (1915-1916), 14, 17; 13 SHDBR (1929-1930), 55-56; "Many Dangerous R.R. Crossings Eliminated by Highway Dept.," *Michigan Roads and Pavements* 21 (10 April 1924): 3; H.A. Shuptrine, "Grade Separations," *The Michigan Engineer* 40 (March 1931): 16.

author the Federal Highway Act of 1921. He was also supported by State Highway Commissioner Rogers, Wayne County Road Commissioner Edward N. Hines, and other good roads activists from around the country.¹⁴

Soon after the initial federal-aid bill passed, Michigan authorized \$225,000 a year to match the federal contribution. The stakes increased significantly in 1919, when a public referendum approved a \$50 million bond issue for highway construction. About 4,000 miles of trunk-line roads were improved before the proceeds were depleted in 1924. This funding also helped the department meet its obligations under the Aldrich Bill, passed during the 1919 legislative session, which gave the state the responsibility of building and maintaining all trunk-line bridges. The state was also authorized to pay half the cost of bridges spanning 30 feet or more on state reward roads, if the cooperating county, good road district, or township built at least three miles of adjacent road. The department immediately began hiring workers to carry out this substantial mandate, more than doubling staff size within a year. Investment in bridges rose at an even faster rate, with expenditures in 1919 totalling over \$800,000 — almost as much as had been spent in the years from 1913 through 1918 combined. The work included erection of 49 trunk-line bridges, repair of 27 older bridges, and planning for 34 bridges for the following construction season.¹⁵

With an eye to its ever increasing workload, the department took steps to ensure that a steady supply of engineers would be available. In the mid-1910s, the University of Michigan had begun to develop an engineering curriculum, directed by John J. Cox. The university and the highway department hosted a "Short Course in Highway Engineering" in Ann Arbor in February 1915; this subsequently became an annual conference. Published proceedings from the first meeting included two papers on highway bridges, one by highway department bridge engineer C.V. Dewart and the other by O.L. Grover, chief bridge engineer of the U.S. Office of Public Roads. Most of the following conferences also included one or more speakers on bridge-related subjects. Professor Cox left for the private sector in 1919, and the university recruited Arthur H. Blanchard from Columbia University to create a graduate program. He was joined on the faculty by John Bateman, a University of Michigan graduate who had gained four years of engineering experience with the Michigan State Highway Department. Rather than setting up an independent facility, the highway department leased the university's testing laboratory, which was operated under Bateman's direction. The department also began using student interns for summer field work from both the University of Michigan and Michigan

¹⁴ "Mr. Rogers Suggests Changes in Townsend Bill," *Michigan Roads and Forests* 16 (December 1919): 8; Willis F. Dunbar and George S. May, *Michigan: A History of the Wolverine State* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 1965, rev. ed. 1980), 496, 572.

¹⁵ Frank F. Rogers, "Work of State Highway Department in 1919," *Michigan Roads and Forests* 16 (December 1919): 8; Rogers, "Twenty Years Work," 6; Willis F. Dunbar, *Michigan Through the Centuries*, vol. 2 (New York: Lewis Historical Publishing Company, 1955), 567-568.

State College, which also had an active engineering program.¹⁶

The highway department struggled to keep pace as the demand for new bridges mushroomed. In 1922, C.A. Melick, who had taken over as the department's chief bridge engineer, complained that "the arteries of design become clogged quite easily because of the fact that with a small working force of some eight or nine men, just one special structure such as a movable bridge or a particularly complicated grade separation will tie up about half of the force for a whole season."¹⁷

Oversight of bridge construction was also time-consuming. By 1924, in an effort to make the process more efficient, the department formed a special in-house construction group which built five or six bridges a year. The state was following the lead of a number of counties, such as Wayne, which had long maintained construction crews. To support this new venture, the department acquired an array of equipment, including mixers, concrete buggies, hoists, and a pile driver. In the winter, with a portable war-surplus sawmill, workers cut lumber for bridge floors and concrete forms.¹⁸

Legislation passed during the 1925 session required all new bridges in the state meet the highway department's specifications. Perhaps in response, the department updated its bridge specifications in 1926. By this time, the department acknowledged that traffic levels would continue to increase -- the state's registered motor vehicles doubled between 1922 and 1927 -- and engineers began to design bridges accordingly. The new standard roadway width for bridges on trunk-line and federal-aid routes was increased from twenty-four to thirty feet. To accommodate later expansion to forty feet, substructures were routinely built wider than initially required. The concrete through-girder bridge fell from favor, since this design became cumbersome in widths greater than 24 feet. In addition, it was almost impossible to widen existing structures. Steel trusses could be widened, but not easily, so the department adopted deck stringer and plate girder spans as standard, issuing plans for 30- to 75-foot spans with concrete floors and railings. Advances in manufacturing during this period also influenced the transition. Steel mills developed techniques to produce girders with deeper webs, which permitted rolled beams to span up to 60 feet. Previously, designers had to settle for built-up sections for spans greater than 45 feet. The highway department did not completely abandon concrete, however, as it began experimenting with cantilevered deck arch designs. The department's efforts earned it a favorable review in 1928 from the U.S. Bureau of Public Roads, which noted that Michigan's federal-aid bridges "are suitable for and properly

¹⁶ *Proceedings of the Short Course in Highway Engineering* (Ann Arbor, MI: University of Michigan, 1915); "Road Building Course at the University of Michigan," *Good Roads* 56/18 (3 September 1919): 125; "Graduate Courses in Highway Engineering at the University of Michigan," *Good Roads* 56/18 (8 October 1919): 176; 8 SHDBR (1919-1920), 12, 28.

¹⁷ Paper by C.A. Melick given at 1922 Highway Engineering Conference, published as "Standard Bridge Practice of the Michigan State Highway Department," *Michigan Roads and Pavements* 20 (29 March 1923): 9.

¹⁸ 10 SHDBR (1923-1924), 29.

fitted to their locations. The designs are adequate as to strength and liberal as to width of roadway. . . . Due attention has been paid to esthetic features."¹⁹

The seemingly limitless growth of the 1920s was brought to a halt by the economic downturn of the Depression. Faced with rapidly declining revenues, townships and counties defaulted on bonds issued for road improvements. The inefficiencies of road construction by 1,269 townships and the overlap of township and county road authorities could no longer be justified. Consolidation was forced by the McNitt Act of 1931, which merged all township roads into county systems over a five-year period. Counties received state funding from gasoline and vehicle weight tax revenue. Allocations were based on each county's existing mileage. In the same year, the Dykstra Act permitted the state to pay the full cost of urban trunk-line construction in cities under 20,000, and up to fifty percent for cities with over 50,000 inhabitants. The Horton Act, passed the next year, again modified the allocations, giving counties all income from the weight tax plus over \$6.5 million a year from gas taxes. With some modification, this law ruled the state's highway funding for about two decades.²⁰

Michigan became involved with road-related relief programs in the early 1930s. The state implemented a special program in the fall of 1931 that poured \$12 million into highway construction projects, including about \$2.25 million for bridges. Although scattered throughout the state, the largest projects and the greatest number of projects were in urban areas, where the concentration of unemployment was the highest. Up to 24,000 men were on the payroll at one time.²¹

In the following year, the federal government began providing direct grants for relief-related highway work. The Federal Emergency Relief and Construction Act gave the state \$3.8 million; another \$12.7 million came from the National Industrial Recovery Act in June 1933. The success of these programs paved the way for passage of the Hayden-Cartwright Act in June 1934, which Michigan's highway department heralded as "the most outstanding piece of highway legislation since the Federal Aid Act of 1916." The act allowed, for the first time, the use of federal dollars for highway improvements in municipalities, and also permitted funding of highway planning surveys. Federal funds provided \$26 million of the \$30 million expended on highway projects between 1934 and 1936. The Hayden-Cartwright Act of 1936 initiated federal funding for secondary roads. Michigan's first allocation was \$1.56 million for

¹⁹ Dunbar, *Michigan Through the Centuries*, vol. 2, 369; 13 SHDBR (1929-1930), 52-53; 15 SHDBR 1933-1934, 13; 16 SHDBR (1935-1936), 58; "Bridge Construction in Michigan during 1925," *Michigan Roads and Pavements* (December 1925): 22; "Bridge over Cheboyganing Creek on River Road," *Michigan Roads and Pavements* 24 (20 October 1927): 5; "Michigan Bridges Commended by U.S. Bureau of Public Roads," *Michigan Roads and Pavements* 25 (28 June 1928): 6.

²⁰ Dunbar, *Michigan Through the Centuries*, vol. 2, 569-570.

²¹ 14 SHDBR (1931-1932), 49-50.

1938-1939.²²

The highest priority of federal relief efforts was employment. As a result, most funding was dedicated to labor, rather than materials. Road work, which became particularly labor intensive when the use of heavy equipment was discouraged, claimed the highest number of projects during the eight-year existence of the W.P.A., a major federal work-relief program. Between 1935 and 1943, the W.P.A. built or maintained over 570,000 miles of rural roads, erected 78,000 new bridges and viaducts, and improved an additional 46,000 bridges throughout the United States. A contemporary report explained that "many of the bridges were small, replacing structures that were dilapidated or inadequate, or taking the place of fords; and many were two-lane bridges built to replace one-lane bridges."²³

While W.P.A. bridges were sometimes carefully crafted and picturesque, the economic constraints of the Depression often forced Michigan's highway department to adopt utilitarian designs with minimal ornamentation. Bridge construction was concentrated, as much as possible, in winter months, when other road work was curtailed. Bridge design, construction and maintenance responsibilities, which had been scattered among district offices, were centralized in Lansing in 1934. At the same time, the department adopted new bridge specifications, the first major modification since 1926. Revisions were issued in 1936, 1942, and 1950.²⁴

By the late 1930s, Michigan's economy was showing significant signs of recovery. Changes in federal relief program guidelines and, ironically, labor shortages, decreased the number of projects that were undertaken. Also, counties became disenchanted with the abilities of W.P.A. work crews. Concurrently, the amount of federal relief funding dropped dramatically: in 1938, emergency grants were reduced by 97 percent. The state was once again forced to bear more of the burden of highway maintenance and improvement.²⁵

One of Michigan's last efforts to secure W.P.A. funding occurred in 1941, when the department sought \$3 million to improve sections of the state's highway network "to minimum War Department standards." With war lurking on the horizon, attention quickly shifted from soup kitchens to armaments, ushering in a new era of highway construction in Michigan.²⁶

²² 15 SHDBR (1933-1934), 9-12; 16 SHDBR (1935-1936), 17; Dunbar, *Michigan Through the Centuries*, vol. 2, 570; 17 SHDBR (1937-38).

²³ U.S. Federal Works Agency, *Final Report on the W.P.A. Program, 1935-43* (Washington, D.C.: Government Printing Office, 1943), 53.

²⁴ 15 SHDBR (1933-1934), 13, 59-60; 16 SHDBR (1935-1936), 57-58; "New Standard Specifications for State Road Work Out April 15," *Michigan Roads and Construction* 47 (13 April 1950): 2.

²⁵ 17 SHDBR (1937-1938), 23, 27.

²⁶ "\$3,000,000 State Highway-WPA Program Sought," *Michigan Roads and Construction* 38 (17 April 1941): 3.

Speaking at a convention of the American Road Builders Association in New York City in January 1941, Michigan Governor Murray Van Wagoner remarked that "in an era of national defense, the country must be considered as a factory of which the streets and highways are the moving belts of the assembly lines." He observed, however, that "the roadways are both badly overcrowded and highly inefficient. . . . The channels over which defense dollars must flow must be dredged immediately by elevated structures, limited ways, and the blocking off of all important streets to speed production." As the department's 1941-1942 biennial report noted, "From Pearl Harbor on, the full energies of the Department were thrown into the war effort." This effort was challenged, however, by shortages of materials, decreases in gas tax and other revenues, and loss of personnel to military service.²⁷

As head of Michigan's highway department in 1940, Van Wagoner had overseen the designation of a 2,400-mile strategic road network, to which about 40 percent of the state's highway construction funds were immediately dedicated. Michigan's importance to the war effort was highlighted in September 1940, when the state was awarded the county's first military road project under the new national defense program. This project, which improved access to Fort Custer, was quickly dwarfed by other war-related road construction, particularly the Willow Run Expressway and the Detroit Industrial Expressway. The Wayne County Road Commission played an important role in developing these expressways, partly because the routes passed through Wayne and neighboring Washtenaw counties. More significant, however, was Wayne County's experience with this novel type of road. In 1941-1942, the county had built the state's first limited-access, high-speed freeway, the Davison Expressway in Highland Park.²⁸

Long before victory was in sight, planning began for post-World War II highway development. The need to employ decommissioned military personnel raised some of the same problems that the nation had faced during the Depression. At the annual Michigan Highway Conference in 1942, Charles Upham, head of the American Road Builders' Association, noted that "in the last depression the collapse occurred in the group of durable goods producers . . . which is in reality the construction industry. If this group can be kept in full production, unemployment would be held to a minimum and there will be an economic balance." Instead of looking to the "make work" emergency programs of the 1930s, planners sought to improve the country's infrastructure to catalyze the growth of private industry.²⁹

Since the mid-1930s, the highway department had been committed to developing routes by-

²⁷ "Michigan Represented in ARBA Convention Program," *Michigan Roads and Construction* 39 (30 January 1941): 2; 19 SHDBR (1941-1942), 3.

²⁸ "Progress in All Fields Reported by Highway Department," *Michigan Roads and Construction* 38 (2 January 1941): 2; "Fort Custer Highway to be First U.S. Military Road," *Michigan Roads and Construction* 37 (19 September 1940): 3; 19 SHDBR (1941-1942), 80.

²⁹ "Post-War Plans Discussed at Highway Conference," *Michigan Roads and Construction* 39 (19 February 1942): 2.

passing congested urban areas. Cities initially targeted for circumferential roadways included Battle Creek, Benton Harbor, Detroit, Flint, Grand Rapids, Monroe, Muskegon, Pontiac and Port Huron. At the same time, roads leading into these beltways were being upgraded. The purpose of these bypasses was undermined, however, by commercial and residential development attracted to the new corridors. Traffic jams quickly followed. The problem had grown so pervasive by 1941 that the state passed legislation allowing construction of controlled-access roads. Almost immediately thereafter, work began on the Davison Expressway in metropolitan Detroit.³⁰

Michigan's leadership in freeway development was acknowledged in April 1941, when President Roosevelt appointed G. Donald Kennedy, then a candidate for head of Michigan's highway department, to the seven-member federal Interregional Highway Committee. Over the next several years, the committee developed a plan for the nation's post-war road construction, focusing on creation of a 32,000-mile interstate highway system. In addition to improving transportation, the planners also sought to provide jobs for decommissioned servicemen, to revitalize deteriorating inner cities, and to control suburban growth.³¹

Highway planning proceeded concurrently in Michigan. In a paper presented to the annual meeting of the American Society of Civil Engineers in January 1942, Commissioner Kennedy outlined the twenty-year master plan for highway development in the state. This was complemented by a separate plan that addressed the unique issues presented by the Detroit metropolitan area. The state plan was based on information from a highway planning survey conducted as a 1930s relief project, which considered the social and economic implications of highway development in addition to standard statistics and technical analyses. The plan established three roadway designs for rural trunk highways, and designated which routes should be improved or maintained to meet these standards. Within two decades, according to projections, the state would have 2,624 miles of major multilane freeways, 3,764 miles of major two-lane roads, and 3,059 miles of minor two-lane highways. Work to upgrade the system was already pressing:

Of the mileage of existing trunk line listed for multilane construction, 32 per cent has pavement more than 15 years old with accompanying narrow width and faulty roadway alignment. It also includes 42 bridge structures which are too narrow, too low, or not strong enough for modern loads.³²

³⁰ Murray D. Van Wagoner, "The Michigan Highway Program and the Tourist Industry," *Michigan Roads and Construction* 32 (17 October 1935): 10; Michigan State Highway Department, *Highway Needs in Michigan: An Engineering Analysis*, a report prepared for the Michigan Good Roads Federation and the Highway Study Committee (N.p., 1948), 45.

³¹ Mark H. Rose, *Interstate: Express Highway Politics, 1939-1989* (Lawrence, KS: University Press of Kansas, 1979; revised edition, University of Tennessee Press, 1990; page numbers refer to revised edition), 19-21.

³² 19 SHDBR (1941-1942), 40-43.

The John C. Lodge and Edsel Ford expressways, both in Detroit, were the state's first post-war freeway projects. Again, the state and Wayne County teamed up to tackle the design and construction. In 1950, completion of the Michigan Avenue overpass at the Detroit-Dearborn border linked these roads with the Detroit Industrial Expressway, which had already attracted widespread attention. An article in *Motor News* in 1948 reported that "highway engineers from all over the country make pilgrimages to Detroit to inspect and admire this great improvement which is a demonstrated success and is building up a very impressive safety record. More and more motorists are learning its advantages from day to day and are acquiring the habit of using it whenever possible."³³

The department's ambitious plans to complete the expressways, as well as road and bridge projects throughout the state, were slowed by materials shortages well into the 1950s. All types of civilian construction projects clamored for raw materials, which became even scarcer when military production resumed for the Korean War. Steel deliveries took months, or were stopped altogether at whim of the National Production Authority. Cement supplies were low, particularly when a strike crippled one of the state's largest plants in 1948. Even aggregates were not always readily available. Limited supplies resulted in high prices: "The purchasing value of the Department's construction funds shrank about 40 per cent below prewar levels," according to the 1947-1948 biennial report. The department's initial response was to delay awarding contracts for less urgent projects. When this strategy appeared futile, in light of sustained higher prices, bridge engineers modified designs to reduce the use of more expensive materials, particularly steel.³⁴

Despite these roadblocks, however, the number of projects that had been initiated during World War II gave Michigan a running start. From mid-1942, when Charles Ziegler took over as commissioner, through the end of 1948, the department built 146 new bridges and grade separations. Over one-third were completed during the 1948 construction season. During the following biennium, contracts were awarded for 46 trunk-line highway bridges and 24 grade separations.³⁵

Try as they might, though, state, county and local efforts could not keep up with growing traffic demands. A 1948 study found that 471 rural trunk-line bridges were deficient, and estimated that repairing and replacing these structures would cost over \$46 million. Urban trunk-line bridges required an additional \$23.6 million, plus over \$35 million for primary and local county bridges. In an effort to address this pressing problem, the legislature made the first substantial changes in highway funding since the McNitt and Horton acts of the early 1930s. Gasoline and weight taxes were increased, raising revenues by one-third. Forty-four

³³ 23 SHDBR (1949-1950), 27; "Progress Report, Chicago-Detroit Expressway," *Motor News*, March 1948, 15.

³⁴ "Highway Steel Shortages Delay to Current Michigan Road Program," *Michigan Roads and Construction* 48 (23 August 1951): 2; 22 SHDBR (1947-1948), 14, 53-54.

³⁵ "State Near End of First Post-war Highway Program," *Michigan Roads and Construction* 45 (30 December 1948): 2; 23 SHDBR (1949-1950), 23.

percent of the net income was earmarked for the state highway department, while 37 percent was allocated to counties and the remaining 19 percent went to cities and incorporated villages.³⁶

An unfortunate set-back to highway planning occurred in 1951, when fire ravaged the drafting and file rooms of the highway department's offices in Lansing. Some plans in storage cabinets survived, but most survey notes and blueprints for projects under development were destroyed. The periodical *Michigan Roads and Construction* reported that "road plans are in somewhat better position than bridge plans, which suffered heavy damage as the fire slowly ate its way through the south wing of the building."³⁷

Michigan's Historic Bridge Inventory ends with the passage of the federal Interstate Highway Act of 1956. This legislation differed from previous highway acts by offering federal subsidies to cover 90 percent of interstate construction costs. Aided by this financial incentive, highway developers rushed to make decade-old plans a reality. Soon, a grid of high-speed, limited-access freeways connected the country. True to tradition, Michigan was once again a national leader. The Detroit Industrial and Ford expressways provided a head start for its interstate program. By the time the Interstate Highway Act passed, Michigan had made significant progress on I-94 and I-75. Interstate freeway development represents a watershed in the evolution of the transportation system in both Michigan and the United States.

³⁶ *Highway Needs in Michigan*, 124-126; Dunbar, *Michigan Through the Centuries*, vol. 2, 571.

³⁷ "Highway Department Plans Letting Despite Heavy Fire Losses," *Michigan Roads and Construction* 48 (15 February 1951): 2.

WAYNE COUNTY: AN EXEMPLARY ROAD COMMISSION

A study of bridge construction in Wayne County serves several purposes. The county's history reflects the evolution of laws, economics and technology related to road and bridge construction in the twentieth century, and offers a well-documented example of how these changes affected counties in Michigan. At the same time, the Wayne County Road Commission was internationally renowned for innovative ideas, sometimes breaking ground well in advance of the Michigan State Highway Department. The county's leadership is not surprising in light of its unique relationship to the automobile industry, and its status as by far the largest population center in the state and, historically, one of the largest metropolitan areas in the nation.

Wayne County encompasses approximately 623 square miles in southeastern Michigan. The city of Detroit claims the county seat. In the early twentieth century, the region became firmly established as the hub of the country's automobile manufacturing industry. Area residents were also significant consumers of this production: in 1935, 38 percent of the state's automobile registrations were concentrated in Wayne County. This totaled "more registrations than in the entire States of Delaware, Nevada, New Mexico, Utah, Vermont, and Wyoming, combined, and more than in any one of 26 additional states and the District of Columbia."³⁸

Early roads set the pattern for later development. The area's first long-distance road, which extended from Detroit to Fort Meigs (now Toledo), is still traced by West Jefferson Avenue. Michigan, Gratiot, Woodward and Grand River avenues, some of the major arteries radiating from downtown Detroit, were laid out as early nineteenth-century military roads.³⁹

Wayne County has a tradition of innovation. It claims credit for building the world's first mile of concrete pavement, the first divided highway, the first cloverleaf grade separation, and one of the first modern, limited-access freeways. The center line painted between lanes of opposing traffic was another Wayne County invention. The county's leadership role can be credited to the Wayne County Road Commission, which was created by a referendum in September 1906. When about 50,000 Wayne County voters cast their ballots, four-fifths favored adoption of a county road system. The first annual report of the Board of County Road Commissioners recalled that "every precinct in the City of Detroit gave the proposition a handsome majority, and every township, with the exception of four, did likewise." By the first of October, a three-man road commission had been appointed, consisting of Edward N. Hines, Cassius R. Benton, and world-famous automobile manufacturer, Henry Ford. The commissioners promptly proceeded with plans to survey and improve roads, and to levy a half-

³⁸ Michigan State Highway Department, *Street Traffic, City of Detroit, 1936-1937* (N.p.: Michigan State Highway Department, 1937), 251.

³⁹ Wayne County Board of Road Commissioners, *Forty-first Annual Report to the Board of Supervisors of Wayne County, 1946-1947*, 4. Annual reports of the Board of Road Commissioners will be referenced hereafter as WCAR.

mill tax to support this work. Opponents of the county road system, however, unwilling to rest even after passage of the referendum, waged a persistent and litigious war against the commission, particularly against its right to assess taxes. In the following April, Michigan's supreme court found the commission unconstitutional, and Benton and Ford retired from the battle. Hines persisted, and within a year the board was reorganized, reauthorized, and hard at work. Hines remained as a guiding light on the board for decades thereafter.⁴⁰

The commission quickly established priorities to direct its efforts, concentrating first on building or upgrading ten primary routes radiating from Detroit. Next, they improved roads extending from smaller communities. Finally, to link this network, the commission planned to ring Detroit with an inner, middle and outer beltway. This systematic approach became a model for other communities. As early as 1911, the commission felt confident in asserting that "Wayne County is coming to be known as a leader in the good roads movement, and the Mecca of those upon whose shoulders devolves the duty of solving traffic problems." Within a few years, the county hosted delegations of engineers from around the United States, as well as from a number of other countries, including Britain, Japan, Australia, and Borneo.⁴¹ The commission's international prominence was enhanced by its advocacy of concrete as a road material. It claimed credit for constructing the country's first mile of concrete-paved rural highway, a section of Woodward Avenue just beyond the Detroit city limits.⁴²

From the beginning, the commission took on bridge projects as well as road work. Bridges were required for new routes that the county developed. In addition, nearly every structure on the existing roads that the county adopted for its system was deficient. The road commission's third annual report, issued in 1909, included a photograph of "a flat-top I-beam, concrete floor bridge on Fort road" which it had built. The same report also described the improvement of River Road at Wyandotte, including construction of a 30-foot span for \$1,237.07.⁴³ In its first dozen years of existence, the commission averaged erection of one bridge a year. Then, the pace of construction significantly increased. Between 1918 and 1925, the county built 47 bridges at a cost of nearly \$5 million. Thirty-two of the bridges were of concrete; fifteen were

⁴⁰ 1 WCAR (1906-1907), 1; 34 WCAR (1939-1940), 6.

⁴¹ 5 WCAR (1910-1911), 10; 9 WCAR (1914-1915), 6; 16 WCAR (1921-1922), 23.

⁴² The concrete road was on Woodward Avenue immediately north of Highland Park, between Six Mile Road and Seven Mile Road, an area annexed by the city of Detroit after the pavement had been laid. The Wayne County Road Commissioners' 1921-1922 annual report notes "the passing of Woodward Avenue Road. . . . Barring the objection to its narrow width, this old concrete road has satisfactorily carried the heaviest traffic of any county road in America during its more than 13 years of existence and has justified in every particular what its developers and proponents . . . had hoped for it." The concrete was "broken up and torn out by the Department of Public Works to permit the extension of Detroit's standard city streets, the right of way being increased from 66 to 100 feet in width." (16 WCAR (1921-1922), 21; 50 WCAR (1955-1956), 5.)

⁴³ 3 WCAR (1908-1909), 18-19.

steel, including three bascules over the Rouge River.⁴⁴

The county quickly recognized the merits of standardization. In a 1910 article on "Michigan Bridges and Culverts," Commissioner Hines took the state's highway department to task for not producing adequate standard plans and specifications, and not overseeing local bridge construction. He noted, with some condescension, that the department "is small, and the force is pretty well overworked" and lacked an experienced bridge engineer.⁴⁵ The fourth annual report of the Wayne County Road Commission, in contrast, included plans and specifications for four- to sixteen-foot concrete culverts apparently prepared by staff bridge engineers George A. Dingman and George A. Burley. The county adopted 24 feet as the standard width for culverts and bridges, generously exceeding the state mandate of 18 feet. By the mid-1920s, they increased the minimum width for bridges on major roads to 40 feet.⁴⁶ Concrete slab construction was used for culverts spanning up to 18 feet. Concrete was also the preferred material for bridges. The specific design was determined by site considerations: "Where the banks to streams are low and maximum water way is desirable, we build the girder type of bridge with heavy steel reinforcement imbedded in concrete. Where the banks to a stream are high and the waterway will not be cut down by a reinforced arch type of concrete bridge, we believe it is the best."⁴⁷ When the county began to anticipate future roadway widening, however, through girders fell from favor. Deck girders became the design of choice by the early to mid-1920s, at a time when the state highway department still embraced arched through-girder spans. Steel stringer bridges became more common in Wayne County by the end of that decade.⁴⁸

Solid concrete railings modestly ornamented with recessed panels were typical in the 1910s. Concrete spindle rails were sometimes employed, becoming more popular in the 1920s. By 1922-1923, all new bridges included sidewalks. The county typically constructed simple concrete and steel structures in-house, using day labor crews.⁴⁹

In an urbanized region riddled by rivers, standard plans for simple concrete structures could not meet every need. For longer bridges, when site conditions precluded the use of multiple short spans, the commission hired outside contractors to erect steel pony trusses and, occasionally, deck plate girders. Bascule bridges sometimes served as a compromise between

⁴⁴ 19 WCAR (1924-1925), 39.

⁴⁵ 4 WCAR (1909-1910), 57-60.

⁴⁶ 4 WCAR (1909-1910), 20-24; 5 WCAR (1910-1911), 12; Edward N. Hines, *20 Years of Road Construction in Wayne County, Mich.* (Detroit: Detroit Automobile Club, [1926]), 10.

⁴⁷ 7 WCAR (1912-1913), 10; 12 WCAR (1917-1918), 13.

⁴⁸ 21 WCAR (1926-1927), 21.

⁴⁹ 14 WCAR (1919-1920), 69; 16 WCAR (1921-1922), 54; 25 WCAR (1930-1931) 50; 27WCAR (1932-1933), 39.

Wayne County's vehicular traffic and its manufacturing and shipping interests, which depended on unimpeded river transport. The commission's first bascule, initiated in 1912, was the Dix Road Bridge over the Rouge River. The need to deepen and widen the river in the late 1910s, however, required a reconstruction of the Dix Road Bridge and erection of two new bascules, including the Jefferson Avenue Bridge.⁵⁰

The Rouge improvement project accommodated factories upstream, particularly Ford's new Dearborn plant. The discussion of this project in the road commission's 1924-1925 annual report gives a picture of the rapid metamorphosis of the Detroit area during this era, largely stimulated by the automobile industry:

The inconspicuous Rouge River of the years prior to 1919, winding its way drowsily through useless, mosquito-infested marshes, has disappeared forever, and in its place . . . has appeared a straight, deep waterway, which during the past year has borne commerce to the extent of 1,400,000 tons. . . .

In these few short years, the clatter of a few hundreds of horse-drawn vehicles, the crash of street cars operating at regular and short intervals, and the buzz of a few hundred automobiles crossing the old drawbridges, have all been replaced by the steady hum of many thousands of automobiles with an undertone occasioned by hundreds of busses, quietly rolling over commodious bascule bridges. Quiet as is this new and dense traffic, the very volume and insistence of its hum completely engulfs any sound from the occasional street car and the handful of horse-drawn vehicles.⁵¹

Because of the constant pressure of growth, the county frequently faced problems and experimented with solutions well in advance of the rest of the state. Often, Michigan's highway department hired the road commission as a contractor for trunk-line projects in Wayne County, thereby tapping into the county's previous experience. Such was the case for a major highway project on the Wayne-Oakland county line initiated in 1930 which included a roadway grade separation, three river bridges, and reconstruction of the Rouge River channel. This was the state's first attempt at a highway grade separation; it was Wayne County's fourth. Two five-span, reinforced-concrete tee-beam bridges, each with a 40-foot-wide roadway and an eight-foot sidewalk, carried Base Line Superhighway (M-102) over Telegraph Superhighway (US-24). The bridges were separated by 84 feet "for future development."⁵²

The county's work with grade separations began in the 1910s with railroad-street intersections. Collisions between cars and trains multiplied as the county's cohort of automobiles rose from

⁵⁰ 6 WCAR (1911-1912), 15; 15 WCAR (1920-1921), 62-67.

⁵¹ 19 WCAR (1924-1925), 71.

⁵² 24 WCAR (1929-1930), 119-121.

under 12,000 in 1909 to 35,000 six years later. Of the grade crossings within the commission's jurisdiction, only one (Northville Road over the Pere Marquette Railway) had a bridge to separate traffic. At other busy intersections, the county posted flagman or installed warning bells. It was not until 1921, however, that the county began a concentrated effort to separate grades.⁵³ The additional work of negotiating with railroads and property owners, realigning streets, rerouting utilities, and moving rail tracks meant that a grade separation typically took longer to build and was more costly than a river bridge of comparable span. Soon, the commission reported that "we are continuously expending a large part of the energy of our organization and of the funds made available to us for this part of the work." Despite the high cost, the commission remained committed to this effort. In 1930, Commissioner Hines asserted that "hand in hand with the widening and building of new concrete roads and with the reconstruction of the entire bridge system of Wayne County goest the program of railroad grade separations."⁵⁴

The county's first railroad-street separation project was a subway for Telegraph Road under the Michigan Central tracks just south of Michigan Avenue. Bridges typically carried rail tracks, with the street passing below. Because rail overpasses are not highway structures, they are not included in the Michigan Historic Bridge Inventory. Occasionally the terrain, magnitude of traffic and other factors argued for a street overpass. Where the Fort Superhighway intersected with the Michigan Central, Pennsylvania and Wabash railroads, for example, it was found to be easier to elevate the street than to tunnel under the broad swath of railroad tracks.⁵⁵

The city of Detroit was also dedicated to separating railroad and street grades. In contrast to the county's approach, the city often employed viaducts to carry streets over rail tracks. A particularly large effort involved the Grand Trunk Line, which bisected the city just to the east of Woodward Avenue. In January 1923, the city and the railroad agreed to a grade separation involving 22 crossings. Later reconstruction of some of the early examples of this program (Jefferson, Lafayette and Larned Street) have destroyed the physical integrity of these structures; Chestnut, Adelaide and Antietam, which date from a particularly intensive period of construction for the Grand Trunk project (1929-1930), appear to be very well preserved.⁵⁶

In the meantime, the county's diligent efforts with the many railroads crossing its jurisdiction resulted in construction of 47 railroad-street grade separations by the mid-1930s. Then, however, the economic toll of the Depression curtailed the railroads' ability to initiate new projects. The companies were also less willing to commit their own funds once the federal

⁵³ 9 WCAR (1914-1915), 9-10, 70; 15 WCAR (1920-1921), 45; 22 WCAR (1927-1928), 121, 123.

⁵⁴ 22 WCAR (1927-1928), 117; "All Grade Crossings must Go," *Detroit Free Press*, 6 July 1930.

⁵⁵ 22 WCAR (1927-1928), 124-125.

⁵⁶ *Report of Engineers Committee on Grade Separations, Milwaukee Junction Manufactures Association; Presented to Cities of Detroit, Highland Park and Hamtramck* (Detroit: Rapid Transit Commission, 1930), 30.

government began subsidizing grade separations through state highway allocations and direct grants. After the federal program was established, Wayne County's grade separation initiative experienced a brief hiatus, since federal grants could not be used to acquire rights-of-way and the state and railroad companies could not, or would not, ante up the necessary dollars. The county soon took on responsibility for these costs to keep the program going.⁵⁷

While it concentrated on eliminating railroad-street grade crossings, the county also explored road grade separations. The commission's first example, built in 1926-1927, carried Outer Drive over Bonaparte Road. Outer Drive, one of the circumferential beltways around Detroit, featured ornamental light posts, attractive landscaping, and handsome reinforced concrete arch bridges. Eliminating an intersection with Bonaparte Road enhanced the experience of driving on this scenic parkway. The commission's next project, a major interchange between Michigan and Southfield superhighways, was far more ambitious and served a strictly pragmatic purpose. In addition to the two bridges for the Michigan overpass, new structures were required for the Michigan Central Railroad, which crossed over Southfield, and for the Southfield crossing of the Rouge River. Henry Ford donated all of the land needed for the primitive cloverleaf design of the Michigan-Southfield intersection. Despite its strictly functional role, the diamond-shaped interchange was landscaped like a park. Since all directional changes were accomplished by right-hand turns, dangerous cross traffic was eliminated. The commission proudly pronounced the project "one of the most complete grade separation projects, particularly between Superhighways, to be found anywhere in this Country."⁵⁸

The commission subsequently completed a number of road grade separations. Many of these were related to parkway construction following the precedent of the Outer Drive bridge. The commission's work on parkways complemented its dual role as Board of County Park Trustees, which it had taken on in the late 1910s.⁵⁹ It was a logical combination. The road commission planted trees along many of the streets it developed both for aesthetic purposes and to control erosion. Likewise, the commission was concerned about attractive landscaping around bridges. "A structure is not considered as complete," the 1923-1924 annual report noted, "until it is cleaned up and the banks sodded and all raw construction marks erased."⁶⁰ Also, by the 1920s, the county began completing the most urgently needed traffic arteries and could devote time to creating a master plan for park and parkway development.

The Wayne County Board of Supervisors appropriated funds for acquisition of additional park

⁵⁷ 28 WCAR (1933-1934), 39; 29 WCAR (1934-1935), 36-37.

⁵⁸ 22 WCAR (1927-1928), 59; schematic sketch of "traffic routing" on page 92; artist's conception 94; 23 WCAR (1928-1929), 129.

⁵⁹ The board gained control of airport operations in the late 1920s. A decade later, it took on responsibility for the county's water supply and sewage disposal. (43 WCAR (1948-1949), 67)

⁶⁰ 18 WCAR (1923-1924), 73.

land in 1929. Within four years, the road commission had purchased about 775 acres along eight miles of the Middle Rouge River between Newburgh and Northville roads. The county constructed a concrete-paved parkway, as well as tennis courts, bridle paths, foot bridges and baseball fields, with the assistance of federal work-relief labor.⁶¹

The onset of the Depression changed the dynamics of highway stewardship. Townships found it difficult, if not impossible, to maintain their roads, so in 1931, the Michigan legislature passed legislation requiring counties to take over all township roads within five years. This law, known as the McNitt-Smith-Holbeck Act, more than doubled the Wayne County Road Commission's purview from 479 to 1,143 square miles. In the sixth year, the county gained responsibility for subdivision streets beyond incorporated cities and villages, adding another 772 miles of streets and 372 miles of alleys to the system. Many of the bridges on these roads were substandard. As a result, a substantial part of the board's work in the 1930s involved upgrading these crossings. It was aided somewhat by another piece of legislation dating from 1931, the Dykstra Act, which authorized the state highway department to subsidize maintenance and construction of state trunk-line roads in urban areas.⁶²

The Horton Act of 1932 distributed a greater percentage of gas and weight tax proceeds to the counties, which were required, in turn, to allocate some of the funds to local governments. User taxes thus effectively replaced property taxes as the primary funding source of revenue for road work. The new paradigm was welcomed by the Wayne County Road Commissioners, who rarely authorized work which could not be funded out of annual tax proceeds. The considerable income from the county's sizable tax base allowed the board to accomplish a good deal even with this conservative fiscal policy. When the economy turned sour in the 1930s, Wayne County avoided the insolvency that plagued towns and counties which had leveraged bonds for capital improvements. As a result, during at least the first years of the Depression, the county found itself able "to carry on and to aid Cities and other communities of our County in these dark days." Detroit was the recipient of the most substantial assistance. In 1930, the city and state had agreed to split the cost of widening major streets in Detroit. When the city could not live up to its end of the deal, the county stepped in and took over the obligation, eventually contributing about \$11 million to the effort.⁶³

Federal Depression-era grants were primarily restricted to labor costs. Since communities were often unable to purchase construction materials, they assigned federally funded workers to the Wayne County Road Commission. The county, in return, provided materials and supervision. The county also received direct support from the early federal Civil Works Administration and subsequent relief programs. As a result, the road commission's labor force

⁶¹ 26 WCAR (1931-1932), 81; 27 WCAR (1932-1933), 64.

⁶² Michigan State Highway Department, "Preliminary Report on Michigan's Plan for Highways," typed report, 1934.

⁶³ 27 WCAR (1932-1933), 9; 38 WCAR (1943-1944), 7.

jumped from about 1,600 in the late 1920s to around 5,000 by 1933. The scope of federal assistance broadened during this period as well. The National Industrial Recovery Act of 1933 permitted, for the first time, the use of federal funds for road work within municipalities, a significant reversal of previous federal-aid policy. In the following year, the Hayden-Cartwright Act formally authorized the use of federal aid on designated urban roads.⁶⁴

In the following decade, with the onset of World War II, Detroit-area industries became crucial to the nation's defense, as did the roads that served these factories. "In the Wayne County region," the road commission observed, "highways and streets are actually part of the assembly lines." Improving access to the Willow Run bomber plant was a particularly critical project, and one in which the county played an important role, according to Harry Shuptrine, the road commission's chief bridge engineer:

The Wayne County Road Commission aided materially in expediting the early program by building some 7 miles of the Willow Run Expressway to the plant area. In addition its organization prepared the detail plans for several of the intricate grade separations of the Detroit Industrial Expressway.⁶⁵

To create the Willow Run Expressway, Wayne County transformed rural, gravel-covered Chase Road into a concrete-paved, multi-lane divided highway. Within two years, the commission had upgraded six miles of the route from the county line east to Hannan Road, and had supervised paving of the road in Washtenaw County. Southfield Superhighway, Eckles Road, Jefferson (near Grosse Ile), and Gallagher Avenue in Hamtramck were among the other roads improved to transport labor, materials and products for the war effort.⁶⁶

Although faced with a labor drain as engineers joined the military forces, the county looked ahead to the end of the war almost from the beginning of the hostilities. By 1942, the commission was surveying routes and planning right-of-way purchases to both improve the region's transportation network and put discharged soldiers to work. Work focused on the "Sixth-Hamilton" route (later christened the John C. Lodge Expressway) and on a riverfront drive. The state, in the meantime, pursued development of the Harper-McGraw cross-town route, soon renamed in honor of Edsel Ford.⁶⁷

By the time the war ended, the state, Wayne County and Detroit had reached an agreement authorizing the county to draft plans and specifications for the Lodge Expressway. Beginning

⁶⁴ 27 WCAR (1932-1933), 12; Bruce E. Seely, *Building the American Highway System: Engineers as Policy Makers* (Philadelphia: Temple University Press, 1987), 154-155.

⁶⁵ 35 WCAR (1940-1941), 5; Harry A. Shuptrine, "The Progress of Development of Limited Expressways in Detroit Metropolitan District," *The Foundation* 9 (January 1945): 3-4.

⁶⁶ 36 WCAR (1941-1942), 7-10.

⁶⁷ 36 WCAR (1941-1942), 6.

in 1946, the county supervised construction of the road as an agent for the state highway department, which was responsible for letting contracts on the new state routes. These roads would add to the 245 miles of trunk-line system that the state already maintained within Wayne County, 81 miles of which was in Detroit.⁶⁸

The board also continued to develop parkways, the non-commercial counterpart to the expressways. It initiated a major park expansion in 1945 with acquisition of 125 acres between Warren Avenue and the Outer Drive, thereby connecting the Middle Rouge Parkway with Detroit's Rouge Park. At the same time, Edward N. Hines Drive was extended east from Newburgh to Warren Avenue, and plans were advanced for the Lower Rouge Parkway. Since parkway grades were typically separated from other traffic, parkway development meant a good deal of work for the county bridge engineers. The E.N. Hines Drive extension alone called for construction of eleven structures.⁶⁹

Both the expressways and the parkways expanded the distance commuters could travel in a given time, opening up rural areas to suburban development. This coincided with a period of intense demand for new housing from the returning military forces. Housing construction had ground to a halt in the 1930s because of the Depression, and remained minimal in the early 1940s when materials were dedicated to the war effort. Personal automobile use had been restricted during the same period by lack of money and, later, by rationing of gas, rubber, and other materials. With the end of World War II, Americans demanded payback for their sacrifices. FHA and VA loans helped spur a construction boom of unprecedented dimension as both urban and rural families were drawn to the suburbs. During the 1940s, the population of Wayne County jumped from two million to over 2.4 million, while the greater metropolitan region including Wayne, Oakland and Macomb counties grew from 2.4 to over three million. The fastest rate of growth was outside the city limits of Detroit. Suburban sprawl transformed cars from a luxury into a necessity: the three metropolitan counties accounted for almost 50 percent of the state's automobile registrations.⁷⁰

Eventually, during the latter half of the twentieth century, the responsibilities of the Wayne County Road Commission were absorbed by the Wayne County Department of Public Services. As Wayne County evolved, a number of roads and bridges were widened. Aging structures have undergone renovation, often losing original railings and light standards. Such damage to historical integrity has caused a number of bridges to be excluded from the Michigan Historic Bridge Inventory. The following lists provide a representative sample of bridges in Wayne County. The majority of the structures were built by the county; some examples of local and state construction are included as well.

⁶⁸ 40 WCAR (1945-1946), 29-31.

⁶⁹ 39 WCAR (1944-1945), 33, 80.

⁷⁰ Oakland County Planning Commission, *Wagon Roads to Expressways* (N.p.: Oakland County Planning Commission, 1955), 13.

Representative Examples of Wayne County Bridges

East River Road	N. Hickory Canal	Grosse Ile S/Groh	1945	201
Gibraltar Road	Frank & Poet Drain	E/Jefferson	1933	104
Graham Road	Upper Rouge River	Redford W/Telegrph	1947	201
Haggerty Road	Middle Rouge River	Plymouth Township	1949	302
Harbin Drive	Silver Creek Canal	Brownstown W/Jeff	1930	111
Henry Ruff Road	Lower Rouge River	In Westland	1947	201
Horse Mill Road	Thorofare Canal	Grosse Ile E/Meridn	1937	402
Jefferson Avenue	Rouge River	Detroit/Rouge River	1922	316
Jefferson Avenue	Silver Creek	Brownstown S/Cam	1927	302
Jefferson Avenue	Monguagon Creek	Riverview N/Sibley	1927	104
Jefferson Avenue	Huron Creek	Brownstown Cty Ln	1930	302
Jefferson Avenue	Ecorse River	Ecorse/Wyandotte	1931	104
Korte Avenue	Fox Creek	Betw. Alter/Ashland	1922	111
Lilley Road	Lower Rouge River	Canton N/Michigan	1933	344
M-102 (Base Line)	Rouge River	0.1 m. W/US-24	1931	532
M-102 (Base Line)	Plum Creek	.5 m E/US-24	1931	111
Newburgh Road	Lower Rouge River	Wayne N/Michigan	1951	101
Northville Road	Middle Rouge River	Plymouth Twنش	1921/1953	201
US-24	Rouge River	In Dearborn	1937	302
Venoy Road	Lower Rouge River.	Wayne N/Michigan	1937	302
Waltz Road	Huron River	S/Hines(New Bost)	1924	344

Grade Separations

Adelaide	Grand Trunk RR	Orleans-St. Aubin	1929	342
Antietam	Grand Trunk RR	Orleans-St. Aubin	1929	342
Chestnut	Grand Trunk RR	Orleans-St. Aubin	1930	342
Division	Grand Trunk RR	Orleans-St. Aubin	1929	342
Fort Street	Pleasant and N&W	Conrail	1928	302
M-3 (Gratiot Ave.)	GTW Railroad	Detroit	1929	342
Industrial Road	Dix Road	Dearborn N/Miller	1930	342
US-24	Conrail	4.5 miles N/Flat Rk	1935	332
Ecorse Road	N & W RR	Taylor E/Telegraph	1936	302
Miller Road	M-153 (Ford Road)		1940	402

Parkways / Parks

Old M-14 (Plymouth)	Middle Rouge River	Livonia	1925	111
Wilcox & Hines	Middle Rouge River	Plymouth T N/Plym	1933	219
Six Mile Road	Middle Rouge River	Northville T W/Nort	1933	107
E.N. Hines Drive	Middle Rouge River	Westland W/Merrim	1948	201
E.N. Hines Drive	Middle Rouge River	Westland E/Merrim	1952	201

E.N. Hines Drive	Beech/Daly Road	Dearborn Heights	1953	332
Six Mile Road	E.N. Hines Drive	Northville T N/Nor	1933	107
Wayne Road	E.N. Hines Drive	Livonia N/Ann Arb	1947	207
Merriman Road	E.N. Hines Drive	Westland N/Warren	1951	107
Inkster Road	E.N. Hines Drive	Dearborn Ht/Westld	1953	107
Middle Belt Road	E.N. Hines/Middle Rouge	Westland S/Ann Arb	1953	207
Spinoza Drive	Rouge River	Rouge Park	1930	342
Tireman Avenue	Rouge River	Rouge Park	1930	342
John Daly Road	Rouge River	N/Michigan Ave.	1935	101
Outer Drive	Upper Rouge River	Detroit S/I-94	1927	104
Outer Drive	Lower Rouge River	Dearborn N/Mich	1930	111
Grosse Ile Parkway	West River Road	Grosse Ile E/Trent	1932	104
Parke Lane Road	Thorofare Channel	Grosse Ile	1930	104
West River Road	Thorofare Canal	Grosse Ile N/GIP	1935	352
S. Pointe Drive	Swan Island Canal	Grosse Ile	1939	104
Gibraltar Road	Waterway Canal	Gibraltar	1932	104
Casino Way	Canoe Stream	Belle Isle	1947	107
Central	Canoe Stream	Belle Isle	1947	302
Inselruhe	Canoe Stream	Belle Isle	1901	342
Oakway	Canoe Stream	Belle Isle	1913	107

EARLY HIGHWAY DEPARTMENT BRIDGES

A more detailed description of early Michigan State Highway Department history is contained in the preceding narrative overview on the evolution of Michigan's roads and bridges. Counties known to have an early commitment to good roads include Alpena, Bay, Chippewa, Kalkaska, Manistee, and Mason.⁷¹ These counties are the most likely to reveal early examples of standard state design, which is of interest from an historical, as well as an engineering, perspective. Bridges with the default date of 1900, and those dating from 1905 through 1913, will be included from these counties⁷²:

Kalkaska	Glade Valley Road	Rapid River	1 m. E/Rapid City	1910	372
Kalkaska	Kniss Road	NB Manistee	2 m. E/Sigma	1910	372
Kalkaska	Aarwood Road	Rapid River	1.5 m. NW/Rapid City	1913	505
Manistee	Psutka Road	Betsie River	5 m. NW/Copemish	1900	302
Manistee	Leffew Road	Big Bear Cr	5 m. SW/Copemish	1910	362
Mason	Stephens Road	S Br Lincoln	2.5 m. N, 1 m. E/Custer	1900	302
Mason	Reek Road	NB P.M. Riv	2 m. E, 1.5 m. S/Custer	1900	302
Mason	Cabana Road	NB Pentwatr	9 m. S, 1 m. W/Scottville	1900	372
Mason	Darr Road	Big Sable R	11 m. N, 1 m. E/Scottville	1900	303
Mason	Stephens Road	Big Sable R	1 m. E, 1 m. N/Freesoil	1900	302
Mason	LaSalle Road	Big Sable R	10.5 m N, 1 m W/Scottville	1900	310
Mason	Hawley Road	SB P.M. Riv	5 m. S, 2 m. W/Branch	1900	303
Mason	Hawley Road	Carr Creek	5 m. S, 2 m. W/Branch	1900	302
Mason	Tyndall Road	Little Sable	7 m. E/Fountain	1900	302
Mason	Decker Road	S Br Lincoln	2.5 m. N, 1 m. E/Custer	1900	302
Mason	Darr Road	S Br Lincoln	4 m. N, 1 m. E/Scottville	1900	310
Mason	Darr Road	N Br Lincoln	4 m. W/Fountain	1900	310
Mason	Tuttle Road	N Br Lincoln	3 m. W, .5 m. N/Fountain	1900	362
Mason	Fisher Road	Lincoln Riv	4 m. W, 4.5 m. N/Scottville	1900	303
Mason	Victory Corner Rd	N Br Lincoln	4 m. W, 4.5 m. N/Scottville	1900	302

⁷¹ Rogers, "Twenty Years Work," 5.

⁷² No bridges from this period survive in Alpena, Bay, or Chippewa counties.

TOURISM'S INFLUENCE ON ROADS AND BRIDGES

Michigan's varied and dramatic landscape has long attracted visitors. The economic impact of tourists was evident to the state's energetic entrepreneurs from the outset. In the nineteenth century, boats and trains gave relatively easy access to some remote areas. It was not until the advent of the automobile age, though, that the true scale of tourism began to be realized. J. Carl McMonagle, a planning and traffic engineer for Michigan's highway department, wrote in 1948 that "the motor car and the highway have transformed the character of recreation and have given a tremendous impetus to the tourist business. Reciprocally, the tourist business has had a strong influence in shaping important aspects of highway development in this state."⁷³

In the late 1910s and early 1920s, as car ownership burgeoned, organizations formed to promote the state's attractions. The Michigan Tourist and Resort Association, with headquarters in Grand Rapids, focused on western and northern Michigan. It was joined by the Flint-based East Michigan Travel and Resort Association, which promoted eastern and northeastern sites accessible from the Dixie Highway and the East Michigan Pike. Other good-roads groups, like the Detroit Automobile Club, also encouraged tourist travel. By 1925, a representative of the East Michigan group claimed that tourism was the third-largest industry in the state, surpassed only by manufacturing and agriculture. In the Upper Peninsula, tourism increased from a handful of visitors in the mid-1910s to nearly 150,000 in the summer of 1924. In that same year, the Michigan Tourist and Resort Association reported a 50-percent jump in activity, despite bad weather. In 1925, to further advance the area, the group dedicated \$100,000 to advertising. The industry's inherent boosterism must be viewed with some skepticism. A report on the annual meeting of the American Automobile Association in 1927, for example, asserted that "delegates brought news of the greatest flow and counter-flow of humanity the world has ever known." Regardless of the reliability of some of the industry's claims, however, tourism was clearly a significant factor in the state's economy, and had a major influence on highway department planning.⁷⁴

The West Michigan Pike (originally M-11, later US-21), which followed Lake Michigan north, enticed "the millions who swelter in Chicago's heat in the summer time and are [also] looking for winter sports." The East Michigan Pike, another scenic route leading to the Straits of Mackinaw, drew travellers from Detroit and points beyond. M-14 (US-27), on a north-south alignment through Lansing, traversed the middle of the state to reach Mackinaw City. By the

⁷³ J. Carl McMonagle, "Effects of the Tourist Business on the Michigan Highway System," *Michigan Roads and Construction* 45 (1 April 1948): 24.

⁷⁴ "Promoting Tourist Travel," *Michigan Roads and Forests* 16 (May 1920): 2-3; "No Mean Business' Flint Men Told of Tourist Trade," *Michigan Roads and Pavements* 22 (5 February 1925): 3; "Forty Million Tourists to Spend Three and One-third Billions [in] 1927," *Michigan Roads and Pavements* 24 (31 March 1927): 4; E.D. Tucker, "Good Roads have Opened the Way to Upper Peninsula's Splendid Attractions," *Michigan Roads and Pavements* 22 (January 1925): 70; "Sees Michigan on Verge of Boom because of its Roads," *Michigan Roads and Pavements* 21 (9 October 1924): 3.

mid-1930s, one of the highway department's highest priorities was improving these three routes to encourage greater tourism. For the shoreline roads, designers aimed to have the Great Lakes within view at least half of the time.⁷⁵

Intrastate routes developed, at least in part, with the tourist in mind, include the Cloverland Trail (now US-2 and US-41) across the Upper Peninsula, most of which had been at least somewhat improved by the late 1910s. The same was true for the "Wolverine Paved Way," which essentially followed the nineteenth-century Grand River Road from Detroit to Grand Rapids. Not wanting to be left out of the boom, commercial interests from Muskegon to Saginaw created the Rainbow Trail Association in the late 1920s to promote a direct east-west route between the two cities. While these and other routes played an important role for ordinary commercial traffic, one of their primary legacies was to stimulate tourism throughout the state.⁷⁶

Many of these roads connected with cross-country routes. One of the earliest was the Dixie Highway, which appropriated the East and West Michigan pikes as a scenic loop. The Theodore Roosevelt Highway linked St. Ignace to Duluth, Minnesota, and, ultimately, Portland, Oregon. The Taft Memorial Highway, created in the 1930s, stretched from Fort Meyers, Florida, to Sault Ste. Marie. Michigan's highway department continually upgraded the roads and bridges along these important visitor routes. It issued state maps annually, and sometimes even more often during the summer to provide up-to-date information on road conditions. One of the department's major innovations in the early 1930s was the accordion-fold map, which was easier to use in the confines of an automobile. In addition, the department opened the country's first tourist information station on US-12 near New Buffalo, the state's southwestern entry point, in the 1930s. The experiment proved so successful that plans were immediately drafted to open new stations at Menominee, Monroe, and Sault Ste. Marie by the following summer. The department also focused on roadside beautification, planting trees and creating picnic areas.⁷⁷

As the twentieth century progressed, intrusions from lumbering, mining, and other developments began to threaten the natural beauty that lured visitors to the state. Ironically, the increase in tourism significantly depleted fish and wildlife, and damaged sensitive natural

⁷⁵ Article from *Traverse City Record Eagle*, 15 December 1939, reprinted with the title "Asks Public Support for State Highways" in *Michigan Roads and Construction* 36 (21 December 1939): 2; Van Wagoner, "The Michigan Highway Program," 10; 16 SHDBR (1935-1936), 15.

⁷⁶ D.A. Thomas, "Michigan's Trunk Line System," *Good Roads* 51/13 (16 June 1917): 350-351; D.A. Thomas, "Large Mileage to be Added this Year to Michigan's Improved Roads," *Good Roads* 51/13 (31 March 1917): 199-200; "Wolverine Paved Way Across State," *Michigan Roads and Forests* 16 (July 1920): 9-10; "'Rainbow Trail Association' to Boost Muskegon-Saginaw Highway," *Michigan Roads and Pavements* 25 (28 June 1928).

⁷⁷ "Handicap to Touring in Upper Peninsula," *Michigan Roads and Forests* 17 (June 1921): 8; "Pave M-14 to the Straits," *Michigan Roads and Pavements* (January 1925): 11; "New Highway Booms Resort Area in Berrien County," *Michigan Roads and Pavements* 25 (26 April 1928): 10; Van Wagoner, "The Michigan Highway Program," 10; 16 SHDBR (1935-1936), 15.

areas. By the 1920s, conservation efforts were advancing. Governor Fred Green joined the cause in 1927 by declaring that "a live deer, as far as advertising is concerned, is worth a truck load of dead bucks."⁷⁸

State parks were established to protect attractive areas and make them accessible to state residents and tourists. By the early 1930s, the state system included 71 parks, of which 54 were improved for public use. Access became a priority with the aid of state legislation passed in 1929, which authorized the Highway Department to create trunk highways to and through state parks. Connections to Bay City, Hartwick Pines, Walter J. Hayes, Interlochen and Orchard Beach parks were among the first to be improved. In the Upper Peninsula, routes were upgraded from Silver City to the Porcupine Mountains and from Manistique to Big Spring. The parks proved extremely popular. In 1931, for example, the state system boasted ten million visitors, "a figure almost three times greater than the number that visited or utilized all the National Parks in the entire country during that period."⁷⁹

Prior to World War II, tourism was estimated to gross about \$400 million. That sum jumped to over \$500 million after the war, when the state's income from tourism was reportedly second only to the automotive industry. Tourists logged 1.5 billion miles in Michigan in 1946, accounting for one-tenth of the state's highway traffic in that year. Despite the highway department's industrious efforts to meet the demand, a survey of vacationers conducted by the Michigan Tourist Council found road deficiencies the third-highest source of complaints: "They even received more brickbats than the disappointing fishing conditions."⁸⁰

Documentary evidence ties each of the following bridges to growth of the tourism industry.

Dixie Highway

Monroe	M-125	Raisin River	In Monroe	1928	532
Saginaw	Dixie Highway	Cass River	1 m. N/Nott Road	1931	303

Huron Shore Road (US-23)

Alpena	US-23	Long Lake Cr	4.4 m. S/Presque Isl	1939	104
Cheboygan	US-23	Cheboygan R	Cheboygan (State S)	1940	316
Iosco	US-23	Private RR	2 m. N/Arneac Co	1931	302
Iosco	US-23	Private RR	2.2 m. N/Arneac C	1931	302
Monroe	US-23 SB	Saline River	Milan	1948	302

⁷⁸ "Governor says Tourist Industry is One of State's Greatest," *Michigan Roads and Pavements* 24 (24 November 1927): 10.

⁷⁹ 14 SHDBR (1931-1932); McMonagle, "Effects of the Tourist Business," 24.

⁸⁰ McMonagle, "Effects of the Tourist Business," 25; Walter O. Dow, "Effect of the Tourist Business on the County Road System," *Michigan Roads and Construction* 45 (1 April 1948): 28.

Presque Isle	US-23	Swan River	1.8 m. NW/M-65	1939	532
--------------	-------	------------	----------------	------	-----

M-14/US-27

Eaton	US-27 BR	Battle Creek	Charlotte	1921	111
Gratiot	US-27BR(Superior)	Pine River	Alma	1928	204
Roscommon	Old US-27	Muskegon R	S10/T23N/R4W	1947	332

Cloverland Trail (US-2/US-41)

Baraga	US-41	Sturgeon Riv	1.4 m. S/Alberta	1947	322
Gogibec	Old US-2	MB Ontonagon	Sec 21 Watersmeet	1919	121
Gogibec	Old US-2	Cisco B Ontonagon	Sec 15 Watersmeet	1927	352
Gogibec	Old US-2	Tenderfoot Creek	Sec 31 Marinesco	1927	302
Mackinac	US-2	Brevort River	SE/Brevort	1935	302
Mackinac	US-2	WCL Railroad	5 m. W/M-117	1938	302
Mackinac	US-2	Cut River	4.3 mi. NW/Brevort	1947	309
Keeweenaw	US-41	Fanny Hooe Cr	1 m. E/M-26	1928	111
Menominee	US-41	Menominee River	Menominee/WI line	1929	352
Menominee	US-41	C&NW/E&LS RR	Menominee/WI line	1929	104

Taft Memorial Highway

Lenawee	M-156	Silver Creek	Morenci	1935	302
---------	-------	--------------	---------	------	-----

Associated with Parks, Forests, or Recreational Areas

Allegan	M-40	Rabbit River	In Hamilton	1935	332
Antrim	M-88	Intermediate River	In Bellaire	1932	302
Bay	State Park Road	Kawkawlin River	2 m. N/Bay City	1929	352
Berrien	N. Watervliet Road	Paw Paw Lake Outlt	1 m. N/Watervliet	1916	111
Chippewa	M-123	Tahquamenon River	4.8 m. S/Paradise	1952	332
Chippewa	M-134	Albany Creek	.8 m. W/M-48	1947	302
Crawford	M-72	Manistee River	7.4 m. W/Grayling	1932	332
Crawford	I-75BL/M-72	Au Sable River	Grayling	1934	302
Gogebic	M-64	W Br Presque Isle R	S/Marenisco	1928	121
Gogebic	US-2	Little Black River	Wakefield	1947	302
Gogebic	US-2	Black River	2 m. E/Bessemer	1947	302
Gogebic	US-2	Sunday Lake Outlet	Wakefield	1947	302
Gogebic	US-2	Diversion Ditch	W/Wakefield	1946	104
Gogebic	US-45	Ontonagon River	N/Watersmeet	1953	104
Gogebic	US-45	Duck Creek	S/Watersmeet	1948	302
Gr.Traverse	US-31	Cedar Hedge Creek	1.6 m. E/Benzie Co	1927	505

Gr.Traverse	US-31	Tonawanda Creek	.9 m. E/M-137	1927	505
Gr.Traverse	US-31	Boardman River	Traverse City	1951	382
Gr.Traverse	Union Street South	Boardman River	Traverse City	1931	352
Huron	M-25	Rock Falls Creek	S/Harbor Beach	1935	302
Huron	M-25	Elm Creek	N/White Rock	1935	302
Huron	M-25	Ocha Creek	5.3 m. N/M-142	1953	104
Huron	M-25	Harbor Beach Creek	3.4 m. N/M-142	1953	104
Iosco	M-55	Br Au Gres River	4 m. E/M-65	1954	332
Iosco	M-65	Br Hale Creek	S/Hale	1952	302
Iosco	M-65	Johnson Creek	2.8 m. N/Arneac Co	1950	302
Iosco	M-65	Au Gres River	1 m. S/M-55	1951	402
Iosco	M-55	Au Gres River	.8 m. E/County line	1929	302
Iosco	M-55	Au Gres River	1 m. E/County line	1929	302
Iron	FR-157	Tamarack River	3.5m NW/Elmwood	1918	101
Iron	Old US-141	Hemlock River	.2 mi s Amasa	1924	121
Jackson	Denton Rd	Sparks Fdn Park Pd	Nr Cascades(Jacksn)	1931	302
Lake	US-10	Baldwin Creek	.9 m. E/Baldwin	1931	332
Leelanau	M-204	Lk Leelanau Narrows	Lake Leeaneau	1939	302
Macomb	Jefferson Avenue	Salt River	.3 m. N/SugarBush	1928	302
Manistee	M-55	Pine River	4.2m W/Wexford ln	1934	309
Mecosta	M-20	E Br Little Muskegn	Mecosta	1926	121
Misaukee	M-66	Clam River	3.6 m. N/McBain	1929	302
Misaukee	M-55	Muskegon River	1.8m W/Roscommn	1935	332
Monroe	US-24	Swan Creek	4 m. SW/Wayne Co	1922	303
Monroe	US-24	Little Swan Cr	4.2 m. SW/Wayne	1922	303
Monroe	US-24	Plum Creek	1 m. SW/M-50	1924	104
Monroe	US-24	Otter Creek	4.1 m. SW/M-50	1924	111
Oakland	I-96	Huron Riv	.5 m. E/Livingston	1948	332
Ottawa	Fruitport Rd	Petty's Bayou	.6 m. N/State	1948	302

BRIDGES OF THE DEPRESSION

Depression-era relief projects focused on employment. As a result, a large percentage of the funding for these programs was earmarked for labor, with little money provided for acquisition of materials. Project administrators were forced to use readily available raw materials, such as timber and stone, that could be obtained by work crews. About two-thirds of the 124,000 bridges throughout the country that were built or improved by W.P.A. forces between 1935 and 1943 were made of timber. Timber and masonry structures typically spanned about 30 feet; steel bridges averaged 50 feet in length.⁸¹

One characteristic of the relief programs was their geographical focus. A government strategy concentrated projects where unemployment was highest, namely near intensely industrial areas such as Detroit and Grand Rapids, and the mining region in the Upper Peninsula. Another tactic was to disperse the unemployed to rural areas. Here, they could enjoy healthier surroundings than the congested inner city. They would, at the same time, be less likely to disrupt the uneasy social balance of the era. In Michigan, shoreline roads were one of the larger beneficiaries of relief funding, receiving \$6 million of the \$20.6 million dedicated to highway improvements in 1935. About \$3.58 million of this sum went to projects in the Lower Peninsula and \$2.76 million to the Upper Peninsula. Most of the money financed trunk-line realignments, paving, and grading.⁸²

Houghton County offers an example of the tremendous impact of federal relief programs on road improvements. In the fiscal year ending in August 1936, the W.P.A. produced nine bridges, in addition to a substantial amount of road construction and repair. The county's annual report claimed "that there is hardly a section in all of Houghton County's one thousand square miles of area that has not appreciably and permanently benefited[sic] from these improved highways." In the same year, St. Clair County received support from the P.W.A. for three bridges, one over Mill Creek in Clyde Township and two over Belle River in Chica Township. In addition, with assistance from the W.P.A., the county installed "448 culverts, built four new bridges and extended two bridges."⁸³

Iosco County provides another illustration of the scope of work completed during this period. Between 1933 and 1935, the county "had a bridge crew rebuilding all bridges that were unsafe as rapidly as funds would permit," according to J.N. Sloan, the county engineer. Thanks to this highly focused effort, "about 80 per cent of all of our structures have been rebuilt of

⁸¹ U.S. Federal Works Agency, *Report on the Progress of the W.P.A. Program* (Washington, D.C.: Government Printing Office, 1941), 67; U.S. Federal Works Agency, *Final Report*, 53.

⁸² "Six Million Being Spent on Shoreline Roads," *Michigan Roads Construction* 32 (17 October 1935): 44.

⁸³ "Houghton Co. Benefits from WPA Road Program," *Michigan Roads and Construction* 33 (12 November 1936): 46; "St. Clair County to Build Three PWA Bridges," *Michigan Roads and Construction* 33 (12 November 1936): 42.

concrete and steel." While it is unclear if this work was funded by a relief program, the rapid progress was undoubtedly catalyzed by the abundance of cheap labor.⁸⁴

The Baldwin Street Bridge in Big Rapids, while apparently no longer extant, reflects the type of renovation project undertaken by the W.P.A. Consisting of a 76-foot pony truss and two through trusses, one 108 feet long and the other 96 feet, this 1888 bridge was "reconditioned, strengthened, and painted" as a W.P.A. project in 1938.⁸⁵

The period of significance for bridges evaluated under this context begins in 1931, since Michigan initiated a relief program in that year, prior to federal action. The period continues through 1942. By this time, the economy was improving, fueled by preparations for war, and most federal relief efforts were winding down.

Several approaches are used to evaluate bridges of this era. The first examines possible surviving examples of timber construction. Secondly, representative shoreline road bridges from the period will be examined. Individual bridges identified by archival research will also be included. Finally, bridges will be reviewed in selected counties where federal-relief programs are well documented.

Timber Bridges

Berrien	Private	Unknown	Unknown	1932	710 ?
Gogebic	Kusisto Road	Black River	Sec 34 Bessemer Twp	1940	702
Iosco	Curtis Road	Smith Creek	.1 m. W of Allen Road	1931	771
Montcalm	Vickeryville	S Br Pine Riv	Co. Rd. 575(.02 m S Edga)	1934	700
Presque Isle	Old State Rd	Thompson Creek	24 m. E of Millersburg	1940	702
Sanilac	Hoadley Rd	N Br Cass R Dm	Sec 16-17 Greenleaf Twp	1940	771
St. Clair	Long Island	unnamed canal	Sec 22 Ira Twp	1938	771
Tuscola	Ringle Road	Wiscoggin Drain	Sec 15-16 N Akron Twp	1942	702

Shoreline Bridges

Bay	M-13/M-38	E Channel Saginaw	Bay City (Lafayette Ave.)	1938	316
Bay	M-13/M-38	W Channel Saginaw	Bay City (Lafayette Ave.)	1938	482
Cheboygan	US-23	Cheboygan River	Cheboygan(State St.)	1940	316
Huron	M-25	Rock Falls Cr	S of Harbor Beach	1935	302
Huron	M-25	Elm Creek	N of White Rock	1935	302

⁸⁴ "WPA Surfacing Program is sought by Iosco County," *Michigan Roads and Construction* 32 (17 October 1935): 44.

⁸⁵ Advertisement for F. Yeager Bridge and Culvert Works in *Michigan Roads and Construction* (29 February 1940): 8.

Iosco	US-23	Private RR	2 m. N Arneac Co line	1931	302
Iosco	US-23	Private RR	2.2 m. N Arneac Co line	1931	302
Mackinac	US-2	Brevort Riv	SE of Brevort	1935	302
Mackinac	US-2	WCL RR	5 m. W of M-117	1938	302

WPA and Other Relief Program Bridges

Chippewa	Easterday Ave.	Ashmun Cr	Sault Ste. Marie	1935	342
Chippewa	Riverside Dr	Mission Cr	Sault Ste. Marie	1935	332
Crawford	M-72	Manistee Rv	7.4 m. W of Grayling	1932	332
Gratiot	N State St	Pine Riv	Alma	1938	402*
Isabella	Millbrook Rd	Pony Cr	.4 m. W SE cor S35 T14	1939	302*
Isabella	Shepherd Rd	Potter Cr	.02 m. S NE cor S32 T14	1939	302*
Isabella	Shepherd Rd	Onion CrDm	.1 m. S NE cor S20 T14	1939	362*
Isabella	Vendecar Rd	Thatcher Cr	S26-27 Freemont Twp	1939	362*
Ionia	Cleveland St	Grand R	South limit Ionia	1931	104
Kalkaska	US-131	Boardman R	S limits Kalkaska	1940	104
Manistee	M-55	Pine River	4.2 m. W of Wexford line	1934	309*

* Indicates possible WPA involvement.

Selected Counties

Houghton	M-38	Sturgeon WB	2.7 m. W/Baraga Col.	1934	302
Houghton	M-38	Silver River	.7 m. W/Baraga Col.	1934	402
Houghton	US-41	Snake R Bur	3.7 m. SE/ Chassel	1934	104
Houghton	Township Park Rd	Traprock Riv	2 m. S/1 m. E Copper City	1938	302
Iosco	US-23	Private RR	2 m. N/Arenac Co. Line	1931	302
Iosco	US-23	Private RR	2.2 m. N/Arenac Co. Line	1931	302
Iosco	Swan Rd (Davison)	Silver Creek	1625 ft. E/Brooks Road	1935	302
Iosco	Brooks Road	Silver Creek	600 ft. S/Curtis Road	1935	342

Note: In 1939, the St. Clair County highway engineer observed that "experience over the past few years indicate[s] that we should confine [federal relief] projects to fence moving, brushing, grubbing, ditching, some types of culvert work, and trimming grades."⁶⁶ As a result, the appropriate period of significance for analysis of this context in St. Clair County ends in 1939.

St. Clair	M-19	Belle River	.3 m. N/Macomb Co. Line	1932	352
St. Clair	M-19	Cowhey Cr	1.8 m. S/M-21	1936	104
St. Clair	M-25	Black R Spl	In Port Huron	1932	302

⁶⁶ "St. Clair County Road and Bridge Program Summarized," *Michigan Roads and Construction* (28 December 1939): 22.

St. Clair	Gratiot Road	Richmd-Col	Sec 32, Columbus Twnship	1931	104
St. Clair	Gratiot Road	Belle River	Sec 32, Columbus Twnship	1932	302
St. Clair	Gratiot Road	Unnamed Cr	Sec 24, Columbus Twnship	1931	104
St. Clair	Gratiot Road	Unnamed Cr	Sec 18, St. Clair Township	1931	104
St. Clair	Gratiot Road	Rattle Run C	Sec 18, St. Clair Township	1931	104
St. Clair	Gratiot Road	Pine River	Sec 9, St. Clair Township	1932	302
St. Clair	Rattle Run Road	Pine River	Pvt Clm #307, St. Clair T	1931	302
St. Clair	Masters Road	Belle River	Sec 17/20, Riley Township	1935	302
St. Clair	Keewahdin Road	Howe Drain	Sec 17/20, Ft. Gratiot Twn	1935	105
St. Clair	Norman Road	Black River	Sec 29/32, Grant Township	1935	302
St. Clair	Capac Road	S Br Mill C	Sec 33/34, Lynn Township	1938	303
St. Clair	Capac Road	N Br Mill C	Sec 15/16, Lynn Township	1938	101
St. Clair	Riley Center Road	Belle River	Sec 17/18, Riley Township	1935	302
St. Clair	Palms Road	Casco Drain	Sec 23/24, Casco Township	1937	302
St. Clair	Cribbins Road	Pine River	Sec 30, Clyde Township	1935	302
St. Clair	Lakeshore Dr	Carrigan Dm	Sec 15, Ft. Gratiot Townsh	1936	104
St. Clair	Jeddo Road	S Br Mill Cr	Sec 4/9, Brockway Townsh	1939	302
St. Clair	Fisher Road	Burtch Creek	Sec 6, Burtchville Townsh	1931	302
St. Clair	Hessen Road	Jerome Cr	Sec 2/3, Casco Township	1937	372
St. Clair	Phelps Road	Swartout Dr	PC 198-309, Clay Townsh	1935	302
St. Clair	Genaw Road	Beaverdam D	Sec 21, Cottrellville Twn	1935	362
St. Clair	Pointe Dr	Unnamed Cn	Sec 24, East China Twn	1938	101
St. Clair	Krafft Road	Howe Drain	Sec 22/27, Ft. Gratiot Twn	1935	362
St. Clair	Comstock Road	Eves Drain	Sec 12, Greenwood Twn	1939	302
St. Clair	Vernier Street	Swan Creek	Sec 15, Ira Township	1938	103
St. Clair	Long Island Ct	Unnamed Cn	Sec 22, Ira Township	1938	771
St. Clair	Palms Road	Smiths Creek	Sec 25/26, Wales Township	1932	302
St. Clair	7th Street	Black River	In Port Huron	1933	316

BOMBERS AWAY: BRIDGE PROJECTS RELATED TO DEFENSE INDUSTRIES

The First World War prompted improvements to roads, rivers, and the concomitant bridges. The state dedicated \$5 million to fund war-related projects. One of the major benefactors was Monroe County, where the state spent \$80,000 to upgrade ten miles of a road "which many of the motor vehicles manufactured for the Government will have to use when they are taken to the seaboard under their own power." The Rouge River was straightened, widened, and deepened to permit large supply ships to reach Ford's new industrial complex in Dearborn, which produced Eagle boats for the war effort.⁸⁷

This was relatively insignificant, however, when compared to the activity generated by the onset of World War II. The country's first military road project under the new national defense program was at Fort Custer, a military training center, where a 2.6-mile, four-lane concrete highway replaced a World War I-vintage access road. New paving and grading, and construction of a railroad grade separation, improved the fort's link to Kellogg Airport and Battle Creek. The first phase of the project, which totalled \$200,000, gave only a slight indication of things to come. By 1942, defense-related road work proposed for Michigan totalled over \$36 million, of which the federal government had authorized \$12.7 million, funded in large part by the Defense Highway Act of 1941.⁸⁸

Strategic highway projects served industrial plants as well as military bases. Michigan's heavy industries made the state vital to the war effort. The most prominent industrial development was the Willow Run bomber plant near Ypsilanti. Designed to produce the massive B-24 bombers, the \$47 million complex included "its own airport, hangars, assembly building nearly a mile long, machine shop, power plant and offices." When the Ford Motor Company unveiled plans for the facility in February 1941, Michigan's highway department was confronted with a significant problem: "Here was the world's largest plant under one roof located more than 20 miles from its main source of labor." The Willow Run work force was projected to reach 100,000, mostly to be drawn from Detroit. Employee transportation was not the only logistical quandary confronting planners. A highway department survey in 1941 found that thirteen percent of Michigan's factories received all production materials by truck; over half relied on trucks to ship their finished product.⁸⁹

Almost three-quarters of the highway department's engineering staff focused on the problems of circulation around the plant and associated access roads, a road system christened the

⁸⁷ "The Construction of 10 mi. of Improved Roadway in Monroe County, Michigan," *Good Roads* 53/15 (13 April 1918): 205; Charles K. Hyde, *Detroit: An Industrial History Guide* (Detroit: Detroit Historical Society, 1980), 21.

⁸⁸ "Progress in All Fields," 2; "Fort Custer Highway," 3; 19 SHDBR (1941-1942), 80.

⁸⁹ George A. Harding, "World's Largest Bomber Plant under Construction by Ford Motor Company," *Michigan Engineer* 60 (Summer 1941): 8; 19 SHDBR (1941-1942), 59, 82.

Willow Run Expressway. As many staff left for military service, the department increasingly relied upon consulting engineers and the Wayne County Road Commission. In addition, the railroads assisted with developing track-highway grade separations. Together, these engineers responded quickly and creatively, designing a highway that reflected the unusual needs of the factory, such as the massive traffic movement at shift changes. Among the most innovative features of the expressway were two three-level, steel-girder grade separations. The only other structure of this type in the country was under construction at the same time on a highway serving the Pentagon in Washington, D.C.⁹⁰

In addition, the highway included seven three-span, continuous-concrete T-beam structures, and an underpass for the Michigan Central Railroad consisting of two timber stringer and two steel girder spans. The bridges were designed with an eye to both speed of construction and economy of critical materials. Engineers were also concerned about the appearance of the bridges and especially the railings, the feature most visible to the motoring public. Concrete was used whenever possible to conserve precious steel. Lester Millard, Michigan highway department bridge engineer, observed that "this group of bridges represents one of the most complex problems in design and detailing ever completed by the Bridge Division."⁹¹

Working closely with the road commissions in Wayne and Washtenaw counties, and with the federal Public Roads Administration, the highway department began awarding contracts for the roadway improvements in October 1941. Construction started immediately, even though the regular season for concrete work had ended two weeks earlier. Contractors improvised and innovated to keep the ground and materials from freezing. Later that winter, contracts were awarded for the remainder of the project, including construction of the final six grade separations. The speed with which one of the Willow Run tri-level grade separations was erected illustrates the urgency of the defense build-up: construction began the day after the contract was let on 11 February 1942, and the structure was completed by 1 August of that year.⁹²

The Detroit Industrial Expressway linked the urban labor market with the bomber plant. The unique traffic problems of the Detroit metropolitan area had long challenged transportation planners. By the late 1930s, it was clear that increasing traffic levels could not be adequately handled by widening surface streets, so Michigan's highway department began planning the Detroit Industrial Expressway. Construction was accelerated by the war. By mid-1942, most of the route had been surveyed, and contracts for 5.7 miles of road work and four grade

⁹⁰ 19 SHDBR (1941-1942), 52, 82; Lester W. Millard, "Design Features of Willow Run Structures," *Michigan Roads and Construction* 39 (15 October 1942): 8, 10.

⁹¹ 19 SHDBR (1941-1942), 52, 82; Millard, "Design Features," 8, 10.

⁹² 19 SHDBR (1941-1942), 82; G. Donald Kennedy, "The Access Highway System at Willow Run," *Michigan Roads and Construction* 39 (15 October 1942): 3-4; Speech by G. Donald Kennedy at dedication Willow Run access roads, 12 September 1942, carbon of typed copy in Box 1, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.

separations had been awarded. Ultimately, this section required twelve highway grade separations, six highway-railroad separations, and two river crossings. Together, the Willow Run and Detroit Industrial expressways included two river crossings, 43 road grade separations, and eleven highway-railroad grade separations.⁹³

Although construction was rushed, the designers had long-term plans for the expressway, which was to connect with the proposed cross-town expressway in Detroit and, ultimately, with the Detroit to Chicago expressway. The highway was also tied to a beltway that provided a bypass south of Ypsilanti for travellers to Ann Arbor on US-112. In 1942, even as the fast-track design and construction for the Willow Run route was underway, State Highway Commissioner G. Donald Kennedy sought advice regarding the design from New York planner Robert Moses, who was particularly famous for work on parkways and other limited-access highways. Moses suggested that bridges be built four feet wider than specified in existing plans to accommodate future development of a third traffic lane. Although the Detroit Industrial Expressway was primarily on grade level, Moses recommended that the road be depressed when it was extended east through Detroit. He argued that this design would have a less detrimental effect on surrounding properties. The commission had considered single- and two-tier roadways, but ultimately elected a depressed design.⁹⁴

The road was opened from Hannan to Southfield roads in July 1943, and to Greenfield Road in November 1944. Ribbon-cutting ceremonies for the completed expressway, which stretched about 21 miles from the Willow Run Expressway to the intersection of Michigan and Wyoming avenues at the boundary between Dearborn and Detroit, were held 9 March 1945. Charles Ziegler, who had become head of the Highway Department in 1943, pronounced it "one of the finest highways in the nation – certainly Michigan's greatest contribution to highway construction." G. Donald Kennedy, who had become vice president of the Automotive Safety Foundation, observed that "today . . . Detroit's highway past meets Detroit's highway future." He accurately predicted that "once the people of Detroit drive over this new expressway, and industrial freight rolls over it on trucks, the demand for more of these roads will be irresistible."⁹⁵

While not on as large a scale, highways were also improved around a number of other important industrial facilities, including Eaton Manufacturing Company in Battle Creek; the Dassel Carter Factory in Benton Harbor; the Hudson Naval Arsenal and Chrysler Tank Plant

⁹³ 19 SHDBR (1941-1942), 84; 21 SHDBR (1945-1946), 57.

⁹⁴ Robert Moses to G. Donald Kennedy, typed report, 4 April 1942, Box 3, Sidney D. Waldon Papers, Burton Historical Collection, Detroit Public Library; Leroy C. Smith, "Wayne County Road Commission Activities, Plans," *Michigan Roads and Construction* (15 March 1945): 8.

⁹⁵ "Highways to War Plants Feature 1942 Program," *Michigan Roads and Construction* 39 (31 December 1942): 6; "Colorful Ceremonies Mark Expressway Opening," *Michigan Roads and Construction* 42 (15 March 1945): 3; "Michigan's Greatest Road System Cost \$26,000,000," *Michigan Roads and Construction* (15 March 1945): 4; Kennedy speech at opening of Detroit Industrial Expressway, 9 March 1945.

in Macomb County, immediately north of Detroit; the Dodge truck factory in Detroit; the Grand Blanc Tank factory and the Palace Coach Company near Flint; the Extruded Metals Corporation in Grand Rapids; Continental Motors in Muskegon; the Yellow Truck and Coach Company in Pontiac; and, in Saginaw, the General Motors plant.⁹⁶

Shortages of materials challenged the design skills of bridge engineers. Steel was particularly scarce, a problem that affected not only beam and girder bridges but reinforced concrete as well. Continuous concrete T-beam superstructures substituted for the more standard steel on larger bridges. H-piles used in semi-rigid frame structures were replaced by concrete-filled tubes in the M-29 bridge in Algonac. Timber, usually reserved for small-span bridges on lightly travelled routes, was called into service for more substantial structures. These included a bridge in Allegan carrying M-89 over the Kalamazoo River, and others south of Milan on US-23, near Negaunee on US-2/US-41, and at West Branch over the Rifle River. On the Allegan bridge, the 45-foot steel beam spans called for in the pre-war design were replaced by 15-foot timber stringer spans, supported by additional wood-pile bents.⁹⁷

Fort Custer

Calhoun	M-66	Wanondager Creek	3.2 m. SW/Barry C	1940	302
Calhoun	Col Avenue	Kalamazoo River	Emmett Twn, Sec 18	1940	302
Calhoun	Col Avenue	Raymond Road	Emmett Twn, Sec 8	1940	302
Calhoun	29-1/2 Mile	Kalamazoo River	Albion Twn, Sec 1	1940	319
Kalamazoo	S Avenue	Portage River	.8 m. N/Findian Lk	1940	302
Kalamazoo	E Michigan	Comstock Creek	In Comstock	1940	302

Willow Run Expressway / Detroit Industrial Expressway

Washtenaw	US-12 EB	Conrail	.9 m. W/Wayne Co	1944	204
Washtenaw	US-12 WB	Conrail	.9 m. W/Wayne Co	1944	204
Washtenaw	Wiard NB (UP)	US-12	1.4 m. W/Wayne C	1942	382
Washtenaw	US-12	Wiard Road SB	1.4 m. W/Co. line	1942	332
Washtenaw	Ford Ext D NB(UP)	US-12	.5 m. W/Wayne Co	1942	382
Washtenaw	US-12 (MID)	Ford Exit Dr SB	.5 m. W/Co. line	1942	332
Washtenaw	Tyler Road	Willow Run	Ypsilanti T, Sec 12	1942	201
Washtenaw	Lima Center	Mill Creek	Lima T, Sec 27/34	1941	302

⁹⁶ "Highways to War Plants," 6; Michigan State Highway Department, "Military Access Roads in Michigan: Notes and Data Concerning Immediate and Tentative Future Needs," June 1941, in Box 3, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor; G. Donald Kennedy, "Military Highways of Michigan," *Proceedings of the 27th Annual Highway Conference, February 19 - 21, 1941* (Ann Arbor: University of Michigan, [1941]): 49.

⁹⁷ 19 SHDBR (1941-1942), 53-54; "Highways to War Plants," 6.

Washtenaw	Guenther Rd	Mill Creek	Lima T, Sec 34	1944	302
Wayne	I-94 EB	Ecorse Creek	In Allen Park	1943	219
Wayne	I-94 WB	Ecorse Creek	In Allen Park	1943	219
Wayne	I-94 EB	Rouge River	S Lts/Dearborn	1943	332
Wayne	I-94 WB	Rouge River	S Lts/Dearborn	1943	332
Wayne	I-94 EB	Outer Dr	In Allen Park	1943	332
Wayne	I-94 WB	Outer Dr	In Allen Park	1943	332
Wayne	I-94 EB	Oakwood Blvd	In Allen Park	1943	204
Wayne	I-94 WB	Oakwood Blvd	In Allen Park	1943	332
Wayne	US-12(Michigan)	I-94 Ramp	In Dearborn	1944	332
Wayne	Ramp from US12EB	I-94	In Dearborn	1948	302
Wayne	US-12(Michigan)	I-94	In Dearborn	1948	352
Wayne	Ramp to US-12	I-94	In Dearborn	1948	302
Wayne	Ann Arbor Tr	N Branch Rouge R	In Dearborn Heigts	1943	402

Modified Materials

Allegan	M-89	Kalamazoo River	In Allegan	1943	302
St. Clair	M-29	Marine City Drain	In Algonac	1942	302

Other Bridges Potentially Related to the World War II Defense Industry

Since road and bridge construction virtually stopped during World War II, except for projects related to defense industry transportation, bridges built between 1942 and 1945 have the potential for Criterion A significance under this context. Few from this era, however, could be linked by archival research to the defense built-up.

Muskegon	US-31 BR EB	Muskegon River	In Muskegon	1944	201
St. Joseph	M-60/US-131	Rock River Race	In Three Rivers	1942	104
Van Buren	I-196BL	Black River	.2 m. S/Allegan Co	1941	302

MICHIGAN'S INNOVATIVE EXPRESSWAYS

One of the precursors of the modern freeway was the "superhighway," a term apparently coined in the 1920s. The concept was popularized in Detroit in 1923-1924 when the Rapid Transit Commission distributed a master plan for the metropolitan area's road system. Rights-of-way for superhighway routes were set at 204 feet; 120 feet was considered adequate for other section line roads, and 86 feet for quarter-section roads. The Wayne County Road Commission adopted the plan in 1925, and began developing the road network of superhighways in conjunction with Detroit and other local communities, as well as neighboring Oakland and Macomb counties. The 165-mile system adopted the existing diagonal roads radiating from Detroit, as well as circumferential routes which Wayne County had started to establish. Originally, superhighway improvements stopped about six miles from the center of downtown Detroit. By 1930, planners recognized the wisdom of continuing into the city, and the county board had given the road commission authorization to proceed. Detroit, however, was unable to fund its share of planned state road improvements within the city, and the county was forced to take on that responsibility. As a result, the logical extension of the superhighway system in Detroit was delayed.⁹⁸

Soon the inadequacy of even the superhighways became evident. As early as 1934, the U.S. Congress passed legislation to initiate state highway surveys to aid long-term planning. By the late 1930s, the Wayne County Road Commissioners were voicing alarm about the repercussions of traffic congestion: "A city which pioneered motor transportation and which depends upon the automobile industry for its existence, is lagging behind other metropolitan centers, and the lack of highway facilities is rapidly becoming an economic barrier to Detroit's progress."⁹⁹ A more poetic -- and even more dire -- warning was sounded in a study issued by Michigan's highway department:

Detroit has a definite rhythmic movement, like the beating of a giant heart. Its streets are arteries, and its traffic is its life blood. In the morning the blood rushes into the heart, in the evening it is pumped out again into the body and limbs of the city. When the arteries harden the heartbeat weakens. Without its strong, replenishing pulse, Detroit will die.¹⁰⁰

The Wayne County Road Commission called for a network of limited-access "express" superhighways to accommodate the ever-increasing commercial and passenger traffic. Better roads could help revive Detroit's Depression-plagued economy by convincing companies to expand existing manufacturing facilities rather than move to other locations, and by attracting

⁹⁸ Shuptrine, "The Progress": 3; 34 WCAR (1939-1940), 10-11.

⁹⁹ 33 WCAR (1938-1939), 5-6; Michigan State Highway Department, *Highway Needs in Michigan*, 45.

¹⁰⁰ Michigan State Highway Department, *A Comprehensive Plan of Motorways for Detroit* (N.p., 1941).

new industry. Furthermore, in considering route layout, "there are numerous slum areas which could be cleared, thereby right-of-way costs would be reduced to a fraction of what they would ordinarily be."¹⁰¹

Michigan engineers received ideas regarding the new generation of highways from a number of sources. Murray Van Wagoner, Michigan's highway commissioner from 1933 to 1940 and governor from 1941 to 1942, toured the German Autobahn while attending the International Road Congress in The Hague in 1938. Upon his return, Van Wagoner observed that "Germany has the roads while we have the traffic. It seems to me that if Germany can build roads of this type, the United States, home of the world's automobile industry, can do the same." In the same year, he led a delegation from the state to New York City "to study the metropolitan method of grade separation to speed through traffic across congested areas." Michigan engineers were undoubtedly familiar with Long Island's Meadowbrook Causeway, the world's first limited-access, high-speed parkway, which had opened just a few months ahead of the Autobahn in 1934.¹⁰² Meadowbrook was among the many innovative developments undertaken during the reign of Robert Moses, an influential planner who transformed the face of New York in the first half of the twentieth century. In addition to New York, Van Wagoner visited the construction underway on the Pennsylvania Turnpike, the nation's first long distance, limited-access highway which opened in 1940.¹⁰³

In Detroit, three routes were under study. The state highway department was most interested in a route near Harper and McGraw avenues, since this alignment provided a logical link to the statewide highway system. Improvements to this route, in fact, had been advocated by the 1925 master plan. The Wayne County Road Commission preferred the "Mack-Myrtle Route," which was closer to downtown. Midway between these alternatives, another option appropriated the path of Warren Avenue. A pair of north-south routes would be intersected by another east-west highway near the river, thus completely encircling the city's center. The Detroit Common Council organized a committee with representatives from the city, county and state to recommend a plan of action.¹⁰⁴

Ironically, none of these alternatives were the first to come to fruition. Instead, by 1941, plans were laid to make a 1.3-mile stretch of Davison Avenue the state's first modern freeway. The route traversed Highland Park, a city completely surrounded by Detroit. It was probably

¹⁰¹ 32 WCAR (1937-1938), 7.

¹⁰² Parkways, unlike other limited-access roads, do not allow commercial traffic.

¹⁰³ "State Officials Eye N.Y. Road System," *Detroit Free Press*, 23 August 1938; J.D. Cruise to J. Carl McMonagle, Michigan State Highway Department, memo, 21 July 1942, in Record Group 58-5-A, Box 4, Michigan DOT Collection, Michigan State Archives, Lansing; photographs, Box 2, Murray Delos Van Wagoner Papers, Bentley Historical Library, University of Michigan, Ann Arbor; Seely, *Building the American Highway System*, 148, 152.

¹⁰⁴ 33 WCAR (1938-1939), 7-8; "Carrying Out the Master Plan," report by Advisory Committee to Detroit Common Council, submitted 2 October 1925.

no coincidence that the Ford Motor Company, long a promoter of road improvement, had significant property holdings in Highland Park. Upgrading Davison promised significant relief of the congestion around Ford's massive plant on Woodward Avenue. Heavily travelled Davison Avenue, the only east-west artery across Highland Park, also caused a bottleneck for a number of important north-south roads leading into downtown Detroit. By separating the grades of crossing traffic, planners hoped to eliminate daily traffic snarls.¹⁰⁵

The city and county signed a development agreement for the expressway in April 1941. The construction schedule was accelerated following the nation's entry into World War II, and the road was opened to traffic in November of the following year. The Davison Expressway consisted of six eleven-foot lanes, three for each direction, divided in the center by a six-foot median strip. Seven rigid-frame concrete bridges, erected at a total cost of \$607,000, carried local streets over the below-grade highway. The rigid-frame style was chosen, in part, because it used a relatively small amount of steel, a critical war material. Four of the bridges featured single spans of up to 77 feet in length. Two-span bridges, with spans of up to 42.5 feet, were used for the three roads with street-car lines. Single lanes between the sidewalk and the railing permitted U-turns for traffic on the grade-level surface roads that flanked the expressway. The \$3.6 million project was financed entirely with funds generated by county gas and other taxes. The *Detroit News* heralded the Davison as the "first depressed highway in the United States outside the New York area." In addition to ranking as one of the first modern freeways in the nation, the Davison was noteworthy for its development in a densely developed urban neighborhood.¹⁰⁶

At the same time, the Ford Motor Company caused a stir in rural western Wayne County by announcing plans to develop the Willow Run bomber plant. The massive facility, which straddled the border of Wayne and Washtenaw counties, was estimated to require 50,000 to 100,000 workers. Most would have to come from central Detroit, some 25 miles to the east. The round-the-clock construction of the bomber factory was matched by a similar effort for access roads. By late August 1941, the U.S. Public Roads Administration had approved the state highway department's design plans for access roads to the Willow Run plant. The first contract for construction was awarded in October. Federal aid funded three-quarters of the cost of the two road projects that connected Detroit to Willow Run. A seventeen-mile section, known as the Detroit Industrial Expressway, extended west and south from the Detroit city limits across a mostly rural landscape. Another sixteen miles of highway, the Willow Run Expressway, linked the Detroit Industrial Expressway to the factory. Part of the western end of the road near the bomber plant was opened to traffic in September 1942; by July 1943, a

¹⁰⁵ 34 WCAR (1939-1940), 6-7; 35 WCAR (1940-1941), 25-28; 36 WCAR (1941-1942), 4, 11-14; 38 WCAR (1943-1944), 7; Hyde, *Detroit*.

¹⁰⁶ The single-span bridges were erected at Third, Second, John R and Brush; two-span structures are at Hamilton, Woodward and Oakland. Good overviews of the expressway are provided by Shuptrine, "The Progress": 3-4; Board of Wayne County Road Commissioners, *Davison Limited Highway* (N.p., 1951 reprint); other details are in 34 WCAR (1939-1940), 6-7; 35 WCAR (1940-1941), 25-28; 36 WCAR (1941-1942), 4, 11-14; 38 WCAR (1943-1944), 7; *Detroit News*, 25 November 1942.

critical section extended east to Southfield Road, near the Ford plant in Dearborn. Development of these roads is described in more detail in the "World War II" contextual narrative.¹⁰⁷

While serving an immediate military need, the Willow Run and Detroit Industrial expressways were envisioned as part of a larger transportation system connecting Chicago and Toledo. The link to Detroit was the previously identified Harper-McGraw cross-town route. Later named in honor of Edsel B. Ford, this freeway was to stretch fourteen miles across Detroit from Dearborn northeast to the Macomb County line at Harper Woods. In combination with the Detroit Industrial Expressway and the Willow Run Expressway, this route ultimately became part of Interstate 94, connecting Chicago with the Canadian border at Port Huron, Michigan.

One of the proposed north-south expressways edging downtown Detroit also became a priority during this period. Initially known as the Sixth-Hamilton route after the roads it followed, it was subsequently named in honor of former Detroit mayor John C. Lodge. In January 1944, the Wayne County Road Commission, led by engineer Leroy C. Smith, made public a \$50 million plan for this route. With interchanges tying this route to the Ford and Davison expressways, and with the route flowing into the existing James Couzens superhighway, the beginnings of a modern freeway system emerged.¹⁰⁸

This activity was paralleled by national trends. The 1944 Federal Aid Highway Act called for creation of a National System of Interstate Highways connecting principal metropolitan areas. The law also included provisions for funding highway development and, for the first time, dedicated federal funds for urban highway construction. To match the federal allocation, the state agreed to pay 50 percent of the \$6 million annual budget, with Wayne County and the city of Detroit each shouldering 25 percent. When construction costs came in at about \$8 million a mile, much higher than anticipated, the inadequacy of the original funding level was soon recognized. By 1951, with the promise of more federal aid and pledges of revenue from gasoline and vehicle taxes, the state, county and city backed a bond sale grossing \$80 million to accelerate construction.¹⁰⁹

The state designed and supervised construction of the Ford Expressway, hiring the Wayne County Road Commission to oversee development of the Lodge Expressway. Both used the design of the Davison as a prototype, although some dimensions were slightly more generous. Like the Davison, the later roads consisted of a depressed roadway with three traffic lanes in each direction. The Davison's six lanes were eleven feet wide, with a central median of six feet. The Lodge and the Ford featured three twelve-foot lanes in each direction separated by

¹⁰⁷ Shuptrine, "The Progress": 4; report on "Detroit-Willow Expressway," n.a., n.d., Box 3, Record Group 58-5-A, MDOT Collection, Michigan State Archives, Lansing; Kennedy, speech, 9 March 1945.

¹⁰⁸ Shuptrine, "The Progress": 4; 38 WCAR (1943-1944), 9, 18-19.

¹⁰⁹ 46 WCAR (1951-1952), 37; 47 WCAR (1952-1953), 37; Michigan State Highway Department, *Detroit Expressways* (N.p., 1953); Michigan State Highway Department, *Detroit Expressways* (N.p., 1954).

a central median of twelve to fourteen feet, plus eight- to ten-foot "refuge" shoulders along the outer edges of the pavement. Grade-level planning again following the Davison's pattern: one-way service streets paralleled the expressways, and bridges traversed the eighteen-foot-deep depression at regular intervals for crossing traffic. These continuous steel-beam bridges accommodated two sidewalks and roadways as wide as the approaching streets and many, in addition, carried U-turn lanes. The Lodge ultimately required 36 structures and the Ford 70 structures, plus a total of 45 pedestrian overpasses. The Ford-Lodge interchange alone called for fourteen structures.¹¹⁰

The state began acquiring rights-of-way for the Ford Expressway after receiving the first federal allocation for the project in October 1945. Actual construction began in January 1947. Work on the first phase of the Ford Expressway extended about 5.3 miles east from its juncture with the Detroit Industrial Expressway at Wyoming Avenue, on the Dearborn-Detroit border, to John R, one block beyond Woodward. The section from Wyoming to Livernois avenues, which included bridges carrying those roads as well as Saxon Avenue and Lonyo Road, was the initial priority. It reached John R by 1955. Within a year, the average daily traffic count on this expressway had grown to 90,000 vehicles.¹¹¹

The first phase of the nine-mile-long Lodge Expressway extended north from First Street, near the Detroit River, to Pallister Avenue, just north of the Grand Boulevard beltline, a distance of about 3.4 miles. A bridge carrying Milwaukee Avenue, apparently the earliest highway structure surviving from the Lodge Expressway, opened to traffic in November 1948. Each of the two spans of this steel-beam structure measure approximately 55 feet. The concrete deck provides a 44-foot-wide roadway for Milwaukee Avenue flanked by 10-foot sidewalks. The construction contract, which was let in February 1948, included about a block of excavation for the nascent expressway. In the following September, a contract was awarded for building a similar two-span structure for Forest Avenue. The roadway was wider, however, to include a 15-foot lane beyond each sidewalk to permit U-turns from the grade-level service roads paralleling the expressway. The West Grand Boulevard Bridge and a pedestrian overpass near Holden Avenue were also completed by 1950 for the first phase of the expressway. Only after work was well advanced on these structures, as well as on necessary utility and railroad relocations, were contracts awarded for grading and paving the expressway itself. The first section completed, running from Holden to Pallister and passing beneath the Grand Boulevard Boulevard and Milwaukee bridges, opened in 1950. Immediately to the south, work on bridges required at the interchange with the Ford Expressway was stopped for eight months by delays in obtaining structural steel. Traffic began passing on the Lodge axis of the interchange in January 1953. Some of the ramps connecting the Lodge and Ford expressways opened in

¹¹⁰ Shuptrine, "The Progress," 4; 40 WCAR (1945-1946), 31; Michigan State Highway Department, *Detroit Expressways* (1954).

¹¹¹ 42 WCAR (1947-1948), 34-35; 49 WCAR (1954-1955), 48; Michigan State Highway Department, *Detroit Expressways* (1953) and *Detroit Expressways* (1954).

January 1955; the entire interchange officially opened in October of that year.¹¹²

While the Detroit area's freeways attracted the most attention, congestion problems also appeared in other communities. They developed by-pass routes to keep through-traffic from blocking downtown streets. Soon, however, the by-passes spawned adjacent development, generating traffic that clogged the by-passes. A crucial state law adopted in 1941 permitted government agencies to restrict roadside development, since uncontrolled growth reduced the public's investment in road improvements.¹¹³

These local by-passes and existing intercity routes were often adopted by interstate planners, who laid out a network consisting of 978 miles in Michigan in 1947. In August of that year, the U.S. Public Works Administration announced a 37,681-mile interstate system, including the following routes in Michigan (current interstate routes are given in parenthesis):

1. Detroit-Lansing-Grand Rapids-Benton Harbor (I-96/I-196)
2. Grand Rapids-Muskegon (I-96)
3. Detroit-Dearborn-Kalamazoo-Benton Harbor (I-94)
4. Kalamazoo-South Bend
5. Detroit-Toledo (I-75)
6. Detroit-Port Huron (I-94)
7. Detroit-Highland Park-Pontiac-Flint-Saginaw-Mackinaw City-Sault Ste. Marie (I-75)

For the most part, these routes followed the general course of trails first developed by Native Americans and subsequently appropriated by explorers, the military, pioneers, and government highway departments. The initial interstate proposal was essentially carried out in the following decades, with only two significant changes. The Kalamazoo-South Bend route was abandoned, and was apparently replaced by I-69 connecting Port Huron, Flint, and Lansing with a major east-west artery, I-80/I-90, in Indiana.¹¹⁴

The following bridges will be surveyed for an overview of expressway development in Michigan.

The Davison Expressway

This includes all of the bridges originally constructed for the Davison with the exception of Oakland Avenue, which has apparently been replaced.

¹¹² 42 WCAR (1947-1948), 30-31, 33-34; 44 WCAR (1949-1950), 42-44; 45 WCAR (1950-1951), 43-44; 47 WCAR (1952-1953), 38-44; 48 WCAR (1953-1954), 35-39; 49 WCAR (1954-1955), 41.

¹¹³ Michigan State Highway Department, *Highway Needs in Michigan*, 44.

¹¹⁴ "Federal Highway Plans are Drawn," *Battle Creek Enquirer News*, 3 August 1947; Michigan State Highway Department, "Preliminary Reports," 1934.

M-1 (Woodward Ave.)	Davison Expressway	Highland Park	1943	207
Brush Street	Davison Expressway	Highland Park	1942	107
Hamilton Avenue	Davison Expressway	Highland Park	1942	207
John R Street	Davison Expressway	Highland Park	1942	107
Second Avenue	Davison Expressway	Highland Park	1942	107
Third Avenue	Davison Expressway	Highland Park	1942	107

The John C. Lodge Expressway (M-10)

Road and pedestrian bridges will be examined from the first phase of the expressway's development, which originally extended about 3.4 miles from First Street to Pallister Avenue. Development of the Detroit Civic Center and adjacent property delayed construction of the southernmost end of the Lodge Expressway, so the survey area runs north from Lafayette Boulevard. The section, which is entirely within Wayne County, includes the intersection of the Lodge and Ford expressways.

Porter Street Walkover	M-10	In Detroit	1954	303
Elizabeth Street Walkover	M-10	In Detroit	1954	382
Spruce Street Walkover	M-10	In Detroit	1953	303
Selden Avenue Walkover	M-10	In Detroit	1953	303
Canfield Avenue Walkover	M-10	In Detroit	1953	303
Merrick Avenue Walkover	M-10	In Detroit	1953	303
Lafayette Boulevard	M-10	In Detroit	1952	432
Howard Street	M-10	In Detroit	1953	432
US-12	M-10 NB	In Detroit	1954	332
US-12	M-10 SB	In Detroit	1954	332
Bagley Avenue Ramps	M-10	In Detroit	1954	332
Grand River Avenue	M-10	In Detroit	1953	432
M.L. King (Stimson)	M-10	In Detroit	1952	432
Forest Avenue	M-10	In Detroit	1950	432
Warren Avenue	M-10	In Detroit	1950	432
Holden Avenue Walkover	M-10	In Detroit	1950	303
Milwaukee Avenue	M-10	In Detroit	1949	432
West Grand Boulevard	M-10	In Detroit	1950	432
Pallister Avenue	M-10	In Detroit	1954	432
M-10 SB	I-94 Ramp	In Detroit	1953	352
M-10 SB	I-94	In Detroit	1953	332
M-10 NB	I-94	In Detroit	1953	332
M-10 NB	I-94 Ramp from M-10	In Det over Rp HE	1953	352

The Edsel Ford Expressway (I-94)

The survey will evaluate the road and pedestrian bridges built as part of the expressway's first section. This consists of a 5.3-mile section between Wyoming Avenue and John R, including

the route's intersection with the Lodge Expressway. The entire route is within Wayne County.

M-153, Wyoming Ave.	I-94	W. limits of Detroit	1949	302
Trenton Ave. Walkover	I-94	In Detroit	1951	303
Lumley Ave. Walkover	I-94	In Detroit	1952	303
Tarnow Ave. Walkover	I-94	In Detroit	1952	303
Roosevelt Ave. Walkover	I-94	In Detroit	1952	303
Brooklyn Ave. Walkover	I-94	In Detroit	1955	332
Weir Road	I-94	In Detroit	1950	302
Addison Road	I-94	In Detroit	1949	302
Lonyo Avenue	I-94	In Detroit	1949	332
Central Avenue	I-94	In Detroit	1950	302
Cecil Avenue	I-94	In Detroit	1950	332
Martin Avenue	I-94	In Detroit	1949	302
Livernois Avenue	I-94	In Detroit	1950	332
Wesson Street	I-94	In Detroit	1951	302
Junction Street	I-94	In Detroit	1950	332
30th Street	I-94	In Detroit	1951	302
Warren Avenue	I-94	In Detroit	1953	332
Scotten Avenue	I-94	In Detroit	1953	332
SB West Grand Boulevard	I-94	In Detroit	1953	352
I-94 to W. Grand Blvd.	Open Area	In Detroit	1953	332
NB West Grand Boulevard	I-94	In Detroit	1953	352
Grand River Avenue	I-94	In Detroit	1954	302
Linwood Avenue	I-94	In Detroit	1953	332
14th Street	I-94	In Detroit	1953	332
12th Street	I-94	In Detroit	1953	432
Trumbull Avenue	I-94	In Detroit	1954	332
I-94 EB	I-94 Ramp to M-10	In Det ovr Rp D-A	1955	352
I-94 EB Ramp to M-10	M-10 SB and I-94 WB	In Detrt Ramp B-G	1953	352
I-94 WB Ramp to M-10	M-10 NB and I-94 EB	In Detrt Ramp F-C	1953	352
I-94 WB	I-94 Ramp from M-10	In Det ovr Rp HE,S	1955	352
Third Street	I-94	In Detroit	1955	352
Second Boulevard	I-94	In Detroit	1954	332
Cass Avenue	I-94	In Detroit	1955	332
M-1 (Woodward Avenue)	I-94	In Detroit	1955	332
John R Street	I-94	In Detroit	1955	332

Other Early Interstate Freeway Routes

By the mid-twentieth century, standard plan bridges were typical for highway bridge construction. This was presumably true for early interstate construction in Michigan. By the end of 1955, three major interstate routes were under development: I-75, connecting Toledo, Detroit and, ultimately, Sault Ste. Marie; I-94, extending across the state from Port Huron in

the east to Berrien County in the west; and I-96, between Detroit and Muskegon. Of these, I-75 in Monroe County and I-94 in Kalamazoo and Jackson counties were the most advanced by the mid-1950s. The following structures have been selected to provide a representative sample.

Interstate 75

A good example of intensive interstate development is provided by I-75 in Monroe County, between Toledo and Detroit. A significant portion of this route was completed by the end of 1955. The MDOT database lists 27 pre-1956 bridges related to this route. Five are overpasses for crossing roads; the remainder carry I-75 traffic. All of the structures were built between 1953 and 1955. In terms of design, the database classifies ten of the bridges as steel multi-stringer, W or I-Beam, composite (332); six as steel continuous multi-stringer, W or I-Beam, non-composite (402); five as concrete tee beam or inverted channel (104); and five as continuous concrete tee beam or inverted channel (204). There is a single example of a steel deck girder (303). Representative examples were selected based on the following criteria:

104: these 35- to 40-foot structures each contain a single span. A pair of the 40' spans is included in the survey.

204: all carry roads over I-75; all consist of four spans, with the maximum span ranging from 56 to 81 feet. The structures with the shortest and longest maximum span have been selected for the survey.

303: the only example is included.

332: this group includes of structures ranging from one to four spans, with maximum span length between 43 and 77 feet. The sample contains two bridges of this design: (1) the bridge with both the greatest number of spans and the shortest maximum span; and (2) the bridge with the longest span.

402: the maximum span of these three-span structure ranges from 40 to 45 feet. A pair of the 45-foot bridges has been added to the survey.

Monroe	I-75	Conrail, Raisin River	Monroe (over Front)	1955	303
Monroe	I-75 NB	Bay Creek	4.2 m. NE Ohio	1955	104
Monroe	I-75 SB	Bay Creek	4.2 m. NE Ohio	1955	104
Monroe	I-75	Industrial Tracks	Monroe	1954	332
Monroe	I-75	Conrail	.9 m. N of M-50	1955	332
Monroe	S Huron R D	I-75	In S Rockwood	1954	204
Monroe	Newport Rd.	I-75	6.2 m. NE of M-50	1955	204

Interstate 94

The earliest sections of I-94 have been discussed above as part of the Willow Run, Detroit Industrial, and Edsel Ford expressways. The remaining 27 bridges built prior to 1956 are located in Berrien, Kalamazoo, Jackson, Washtenaw, Wayne, Macomb and St. Clair counties. The largest concentration of these structures is in Kalamazoo and Jackson counties, each of which have seven. These fourteen bridges offer a range of vintages (1947 to 1955) and bridge types, and their construction is well documented. As a result, they are included in the survey sample as representative examples of post-war bridges outside of Wayne County.

Jackson	M-106	I-94	@ M-106 (Cooper)	1948	332
Jackson	Lansing Rd	I-94	.6 m. E of M-50	1951	332
Jackson	Elm Rd	I-94	1 m. E of M-106	1949	402
Jackson	I-94	I-94 BL SB	@ I-94 BL WB	1949	302
Jackson	I-94	Sandstone River	3 m. W of M-60	1953	402
Jackson	I-94	Conrail & Grand River	.4 m. W of M-106	1949	452
Jackson	I-94	Parma Road	6.3 m. W of M-60	1954	204
Jackson	I-94	US-127 & M-50	@ US-127 & M-50	1953	332
Kalamazoo	I-94	Conrail	Kalamazoo	1954	332
Kalamazoo	Miller Rd	I-94	.6 m. W I-94BL	1955	332
Kalamazoo	I-94 BL EB	I-94	@ I-94	1955	332
Kalamazoo	I-94	E Michigan Avenue	6.6 m. E I-94 BL	1952	402
Kalamazoo	I-94 BL	Portage Creek	Kalamazoo	1947	302
Kalamazoo	Scott (38th)	I-94	5.7 m. E I-94 BL	1951	302
Kalamazoo	Shafter(35th)	I-94	4.2 m. E I-94 BL	1951	302

SOURCES CITED

Books and Published Reports

- Dunbar, Willis F., and George S. May. *Michigan: A History of the Wolverine State*. Grand Rapids, MI: William B. Eerdmans Publishing Company, 1965, rev. ed. 1980.
- Dunbar, Willis F. *Michigan Through the Centuries*. New York: Lewis Historical Publishing Company, 1955.
- Hines, Edward N. *20 Years of Road Construction in Wayne County, Mich.* Detroit: Detroit Automobile Club, [1926].
- Hyde, Charles K. *Detroit: An Industrial History Guide*. Detroit: Detroit Historical Society, 1980.
- _____. *Historic Highway Bridges of Michigan*. Detroit: Wayne State University Press, 1993.
- Proceedings of the Short Course in Highway Engineering*. Ann Arbor, MI: University of Michigan, 1915.
- Report of Engineers Committee on Grade Separations, Milwaukee Junction Manufactures Association; Presented to Cities of Detroit, Highland Park and Hamtramck*. Detroit: Rapid Transit Commission, 1930.
- Rogers, Frank F. *History of the Michigan State Highway Department, 1905-1933*. Lansing: n.p., 1933.
- Rose, Mark H. *Interstate: Express Highway Politics, 1939-1989*. Lawrence, KS: University Press of Kansas, 1979; revised edition, University of Tennessee Press, 1990.
- Seely, Bruce E. *Building the American Highway System: Engineers as Policy Makers*. Philadelphia: Temple University Press, 1987.

Articles

- "All Grade Crossings must Go." *Detroit Free Press*, 6 July 1930.
- "Asks Public Support for State Highways." *Michigan Roads and Construction* 36 (21 December 1939): 2.
- "Bridge Construction in Michigan during 1925." *Michigan Roads and Pavements* (December 1925): 22.

- "Bridge over Cheboyganing Creek on River Road." *Michigan Roads and Pavements* 24 (20 October 1927): 5.
- "Colorful Ceremonies Mark Expressway Opening." *Michigan Roads and Construction* 42 (15 March 1945): 3.
- "The Construction of 10 mi. of Improved Roadway in Monroe County, Michigan." *Good Roads* 53/15 (13 April 1918): 205.
- Cox, John J. "Highway Bridges and Culverts." *Michigan Roads and Forests* 5 (March 1910): 7-8.
- Dow, Walter O. "Effect of the Tourist Business on the County Road System." *Michigan Roads and Construction* 45 (1 April 1948): 28.
- "Federal Highway Plans are Drawn." *Battle Creek Enquirer News*, 3 August 1947.
- "Fort Custer Highway to be First U.S. Military Road." *Michigan Roads and Construction* 37 (19 September 1940): 3.
- "Forty Million Tourists to Spend Three and One-third Billions [in] 1927." *Michigan Roads and Pavements* 24 (31 March 1927): 4.
- "Governor says Tourist Industry is One of State's Greatest." *Michigan Roads and Pavements* 24 (24 November 1927): 10.
- "Graduate Courses in Highway Engineering at the University of Michigan." *Good Roads* 56/18 . 8 October 1919): 176.
- "Handicap to Touring in Upper Peninsula." *Michigan Roads and Forests* 17 (June 1921): 8.
- Harding, George A. "World's Largest Bomber Plant under Construction by Ford Motor Company." *Michigan Engineer* 60 (Summer 1941): 8.
- "Highway Department Plans Letting Despite Heavy Fire Losses." *Michigan Roads and Construction* 48 (15 February 1951): 2.
- "Highway Steel Shortages Delay to Current Michigan Road Program." *Michigan Roads and Construction* 48 (23 August 1951): 2.
- "Highways to War Plants Feature 1942 Program." *Michigan Roads and Construction* 39 (31 December 1942): 6.
- "Houghton Co. Benefits from WPA Road Program." *Michigan Roads and Construction* 33 (12 November 1936): 46.

- Kennedy, G. Donald. "The Access Highway System at Willow Run." *Michigan Roads and Construction* 39 (15 October 1942): 3-4.
- _____. "Military Highways of Michigan." *Proceedings of the 27th Annual Highway Conference, February 19 - 21, 1941* (Ann Arbor: University of Michigan, [1941]).
- "Many Dangerous R.R. Crossings Eliminated by Highway Dept." *Michigan Roads and Pavements* 21 (10 April 1924): 3.
- McMonagle, J. Carl. "Effects of the Tourist Business on the Michigan Highway System." *Michigan Roads and Construction* 45 (1 April 1948): 24.
- Melick, C.A. "Standard Bridge Practice of the Michigan State Highway Department." *Michigan Roads and Pavements* 20 (29 March 1923): 9.
- "Michigan Bridges Commended by U.S. Bureau of Public Roads." *Michigan Roads and Pavements* 25 (28 June 1928): 6.
- "Michigan's Greatest Road System Cost \$26,000,000." *Michigan Roads and Construction* (15 March 1945): 4.
- "Michigan Represented in ARBA Convention Program." *Michigan Roads and Construction* 39 (30 January 1941): 2.
- "Michigan State Highway Department in New Quarters." *Good Roads* 13 (3 March 1917): 148.
- Millard, Lester W. "Design Features of Willow Run Structures." *Michigan Roads and Construction* 39 (15 October 1942): 8, 10.
- Morrison, Roger L. "The History and Development of Michigan Highways." *University of Michigan Official Publication* 39 (6 April 1938): 1-16.
- "Mr. Rogers suggests Changes in Townsend Bill." *Michigan Roads and Forests* 16 (December 1919): 8.
- "New Highway Booms Resort Area in Berrien County." *Michigan Roads and Pavements* 25 (26 April 1928): 10.
- "New Standard Specifications for State Road Work Out April 15." *Michigan Roads and Construction* 47 (13 April 1950): 2.
- "'No Mean Business' Flint Men Told of Tourist Trade." *Michigan Roads and Pavements* 22 (5 February 1925): 3.

- "Pave M-14 to the Straits." *Michigan Roads and Pavements* (January 1925): 11.
- "Post-War Plans Discussed at Highway Conference." *Michigan Roads and Construction* 39 (19 February 1942): 2.
- "Progress in All Fields Reported by Highway Department." *Michigan Roads and Construction* 38 (2 January 1941): 2.
- "Progress Report, Chicago-Detroit Expressway." *Motor News*, March 1948, 15.
- "Promoting Tourist Travel." *Michigan Roads and Forests* 16 (May 1920): 2-3.
- "'Rainbow Trail Association' to Boost Muskegon-Saginaw Highway." *Michigan Roads and Pavements* 25 (28 June 1928).
- "Road Building Course at the University of Michigan." *Good Roads* 56/18 (3 September 1919): 125.
- Rogers, Frank F. "Defects in Michigan Roads and How to Improve Them." *Michigan Roads and Forests* 5 (March 1908): 5.
- _____. "Notes on Some Early Michigan Roads." *Michigan Roads and Pavements* 22 (December 1925): 7-8.
- _____. "Roads Built with the Fifty Million Dollar Bond Issue." *Michigan Roads and Pavements* 22 (19 February 1925): 3.
- _____. "Twenty Years Work by the State Highway Department." *Michigan Roads and Pavements* (January 1925): 5.
- _____. "Work of State Highway Department in 1919." *Michigan Roads and Forests* 16 (December 1919): 8.
- "St. Clair County Road and Bridge Program Summarized." *Michigan Roads and Construction* (28 December 1939): 22.
- "St. Clair County to Build Three PWA Bridges." *Michigan Roads and Construction* 33 (12 November 1936): 42.
- "Sees Michigan on Verge of Boom because of its Roads." *Michigan Roads and Pavements* 21 (9 October 1924): 3.
- Shuptrine, H.A. "Grade Separations." *The Michigan Engineer* 40 (March 1931): 16.
- "Six Million Being Spent on Shoreline Roads." *Michigan Roads Construction* 32 (17 October

- _____. "The Progress of Development of Limited Expressways in Detroit Metropolitan District. *The Foundation* 9 (January 1945): 3-5.
- "Six Million Being Spent on Shoreline Roads." *Michigan Roads Construction* 32 (17 October 1935): 44.
- Smith, Leroy C. "Wayne County Road Commsision Activities, Plans." *Michigan Roads and Construction* (15 March 1945): 8.
- "State Near End of First Post-war Highway Program." *Michigan Roads and Construction* 45 (30 December 1948): 2.
- "State Officials Eye N.Y. Road System." *Detroit Free Press*, 23 August 1938.
- "\$3,000,000 State Highway-WPA Program Sought." *Michigan Roads and Construction* 38 (17 April 1941): 3.
- Thomas, D.A. "Large Mileage to be Added this Year to Michigan's Improved Roads." *Good Roads* 51/13 (31 March 1917): 199-200.
- _____. "Michigan's Trunk Line System." *Good Roads* 51/13 (16 June 1917): 350-351.
- Tucker, E.D. "Good Roads have Opened the Way to Upper Peninsula's Splendid Attractions." *Michigan Roads and Pavemens* 22 (January 1925): 70.
- Van Wagoner, Murray D. "The Michigan Highway Program and the Tourist Industry." *Michigan Roads and Construction* 32 (17 October 1935): 10.
- "WPA Surfacing Program is sought by Iosco County." *Michigan Roads and Construction* 32 (17 October 1935): 44.
- "Wolverine Paved Way Across State." *Michigan Roads and Forests* 16 (July 1920): 9-10.
- Unpublished Sources**
- Cruise, J.D. to J. Carl McMonagle, Michigan State Highway Department, memo, 21 July 1942, in Record Group 58-5-A, Box 4, Michigan DOT Collection, Michigan State Archives, Lansing.
- Kennedy, G. Donald. Speech at dedication Willow Run access roads, 12 September 1942, carbon of typed copy in Box 1, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.
- Moses, Robert, to G. Donald Kennedy. Typed report, 4 April 1942, Box 3, Sidney D. Waldon Papers, Burton Historical Collection, Detroit Public Library.

Van Wagoner, Murray D. Papers. Bentley Historical Library, University of Michigan, Ann Arbor.

Government Documents

"Carrying Out the Master Plan." Report by Advisory Committee to Detroit Common Council, submitted 2 October 1925.

Michigan State Highway Department. *Biennial Reports*. 1(1905-1906); 2(1907-1908); 3(1909-1910); 4(1911-1912); 5(1913-1914); 6(1915-1916); 7(1917-1918); 8(1919-1920); 9(1921-1922); 10(1923-1924); 11(1925-1926); 12(1927-1928); 13(1929-1930); 14(1931-1932); 15(1933-1934); 16(1935-1936); 17(1937-1938); 18(1939-1940); 19(1941-1942); 20(1943-1944); 21(1945-1946); 22(1947-1948); 23(1949-1950); 24(1951-1952); 25(1953-1954).

_____. *A Comprehensive Plan of Motorways for Detroit*. N.p., 1941.

_____. *Detroit Expressways*. N.p., 1953.

_____. *Detroit Expressways*. N.p., 1954.

_____. *Highway Needs in Michigan: An Engineering Analysis*. A report prepared for the Michigan Good Roads Federation and the Highway Study Committee. N.p., 1948.

_____. "Military Access Roads in Michigan: Notes and Data Concerning Immediate and Tentative Future Needs." Report, June 1941. Box 3, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.

_____. "Preliminary Report on Michigan's Plan for Highways." Typed report, 1934.

_____. *Street Traffic, City of Detroit, 1936-1937*. N.p.: Michigan State Highway Department, 1937.

_____. "Detroit-Willow Expressway." N.p., [ca. 1943]. Box 3, Record Group 58-5-A, MDOT Collection, Michigan State Archives, Lansing.

Oakland County, Michigan. Planning Commission. *Wagon Roads to Expressways*. N.p.: Oakland County Planning Commission, 1955.

U.S. Federal Works Agency. *Final Report on the W.P.A. Program, 1935-43*. Washington, D.C.: Government Printing Office, 1943.

_____. *Report on the Progress of the WPA Program*. Washington, D.C.: Government Printing Office, 1941.

Wayne County, Michigan. Board of Wayne County Commissioners. *Annual Reports to the Board of Supervisors of Wayne County.* 1(1906-1907); 3(1908-1909); 4(1909-1910); 5(1910-1911); 6(1911-1912); 7(1912-1913); 9(1914-1915); 10(1915-1916); 11(1916-1917); 12(1917-1918); 14(1919-1920); 15(1920-1921); 16(1921-1922); 17(1922-1923); 18(1923-1924); 19(1924-1925); 20(1925-1926); 21(1926-1927); 22(1927-1928); 23(1928-1929); 24(1929-1930); 25(1930-1931); 26(1931-1932); 27(1932-1933); 28(1933-1934); 29(1934-1935); 30(1935-1936); 31(1936-1937); 32(1937-1938); 33(1938-1939); 34(1939-1940); 35(1940-1941); 36(1941-1942); 37(1942-1943); 38(1943-1944); 39(1944-1945); 40(1945-1946); 41(1946-1947); 42(1947-1948); 43(1948-1949); 44(1949-1950); 45(1950-1951); 46(1951-1952); 47(1952-1953); 48(1953-1954); 49(1954-1955); 50(1955-1956).

 . *Davison Limited Highway.* N.p., 1951 reprint.