Level 1 Traffic Analysis of the Illustrative Alternatives Technical Report

The Detroit River International Crossing Study

MDOT
Michigan Department of Transportation

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1. Introduction

1.1 Background

This Traffic Analysis Report (TAR) is one of three TARs that will be developed during the course of the Detroit River International Crossing Study (DRIC). This TAR describes the traffic forecasts that were made to support the evaluation of Illustrative Alternatives. The two additional TARs to be developed will support the evaluation of Practical Alternatives: 1) for the Travel Demand Analysis; and, 2) for the Highway Capacity Analysis.

Illustrative Alternatives were developed for a wide range of new plazas, crossings and alignments. This report will explain the model used to estimate traffic measures of effectiveness, describe the alternatives, and summarize the results. Under separate cover, model runs, summarized here, have been provided to the Michigan Department of Transportation.

1.2 Evaluation Process

Travel demand is one of the inputs to the DRIC evaluation process. For Illustrative Alternatives, a wide range of alternatives was tested. Each alternative is a combination of:

- Canadian connecting route to plaza (six-lane freeway)
- Canadian plaza location
- Crossing location
- U.S. plaza location
- U.S. connecting route (six-lane freeway)

Four primary measures of effectiveness (MOEs) were calculated for each alternative. They are:

- Vehicle miles of travel (VMT) for international trips.
- Vehicle hours of travel (VHT) for international trips.
- Crossing volumes for each crossing by direction.
- Volume/Capacity ratios for key freeway links for all traffic.

For all Illustrative Alternatives, the MOEs were calculated for the 2035 PM peak hour conditions which represent the most travel in one hour.

Alternatives of new crossing systems were also tested with and without the Ambassador Bridge to allow the assessment of potential impacts of the disruption of traffic at the Ambassador Bridge. This is a test of redundancy. In addition, model runs with the Detroit-Windsor Tunnel closed for a sample of proposed alternatives were conducted to determine if a new crossing system could also maintain traffic in the event of a disruption at the Tunnel.

2. Summary of the Model

2.1 Approach to Travel Demand Model

The travel demand model used for the analysis of DRIC Illustrative Alternatives is an update of the model used for the Planning/Needs & Feasibility (P/N & F) Study conducted between 2001 and 2004. The model operates with TransCAD software and uses updated estimates of international traffic along with networks and background trip tables from the most recent local (U.S. and Canadian) models. It was validated to available, existing traffic data. Details of the model's development are available on the project's Web site www.partnershipborderstudy.com. A discussion of the link level validation conducted for the U.S. is presented in Section 2.2 below.

The model provides traffic data for three peak hours: AM, PM and midday. A multi-class traffic assignment routine is used to load vehicles onto the network of roads. There are nine classes of vehicles: U.S. passenger cars, U.S. light trucks, U.S. medium trucks, U.S. heavy trucks, Canadian domestic cars, Canadian domestic trucks, international cars using the Blue Water Bridge, international trucks using the Blue Water Bridge, international cars crossing the Detroit River (currently either the Ambassador Bridge or Detroit-Windsor Tunnel), and international trucks crossing the Detroit River. Nine classes are required because of the different vehicle classes used by the source models, as well as to display the number of trips by class on each link in the network. The travel demand process uses a single-logit route choice model to allocate cars and trucks to either the Blue Water Bridge or Detroit River crossings on the basis of competing times and costs. New crossings compete for Detroit River trips on the basis of the minimum time path, as is common in advanced urban travel demand models.

The model is set up to provide forecasts for three years: 2004 (the year of validation), 2015 (following the expected opening of the crossing in 2014) and 2035 (the required 30-year planning horizon). Appendix A provides base forecast traffic volumes for the 2035 PM Peak Hour within the U.S. for total traffic, international trucks, and international cars.

2.2 Link Level Validation

Introduction

A link-level validation compared the 2004 model results to three sets of traffic counts provided by MDOT:

- The Michigan Intelligent Transportation Systems Center (MITSC) freeway counts.
- MDOT's 2004 ADT traffic count map as posted on MDOT's website: http://www.michigan.gov/documents/detmetro_19640_7.pdf.
- MDOT's "Sufficiency File," which has MDOT's best estimate of existing annual average daily traffic for all trunkline roads.

The validation effort was essentially a review of the SEMCOG model because, except for international travel, trip tables provided by SEMCOG are the basis of the model on the U.S. side of the border.

All comparisons between traffic assignments produced by the model and traffic counts were made on a daily basis because the source counts were for 24 hours. Because the DRIC model is set up to produce volumes for AM, PM and midday peak hours, factors were developed from SEMCOG's model documentation to factor model values to a 24-hour period.

Link volumes were compared to counts to produce percent root-mean-square error (RMSE) summaries and cutline summaries. First, counts from two MDOT sources were compared to each other to assess the reliability and range of expected error in the traffic counts.

Comparison of MITSC and MDOT ADT Map Volumes

Comparisons of MITSC counts and MDOT's Average Daily Traffic were made for 34 locations where both sources provided data. The percent RMSE for these 34 links is 39.63%. This comparison does not suggest which source is the most reliable, but it does suggest that the two data sources are different, and that getting closer than an RMSE of about 40% should be the target for model assignments when compared to counted traffic.

Comparison of DRIC Model Results and MDOT ADT Map Volumes

The consultant compared the DRIC model results to the MDOT ADT map volumes for the same 34 locations. The percent RMSE for this comparison is 39.04%, or slightly better than the comparison of MITSC and MDOT ADT map volumes.

Comparison of DRIC Model Results and MITSC Volumes

The consultant compared the DRIC model results to the MITSC volumes for the same 34 locations. The percent RMSE for this comparison is 28.41%, which is a much closer and more acceptable match. The RMSE in terms of vehicles per day (VPD) is 16,885, which is less than the daily capacity of a freeway lane. The idea behind the calculation of RMSE is to ensure that the model is estimating travel demand within the capacity of a lane. Under this definition, comparing model volumes to MITSC volumes, the model meets this goal.

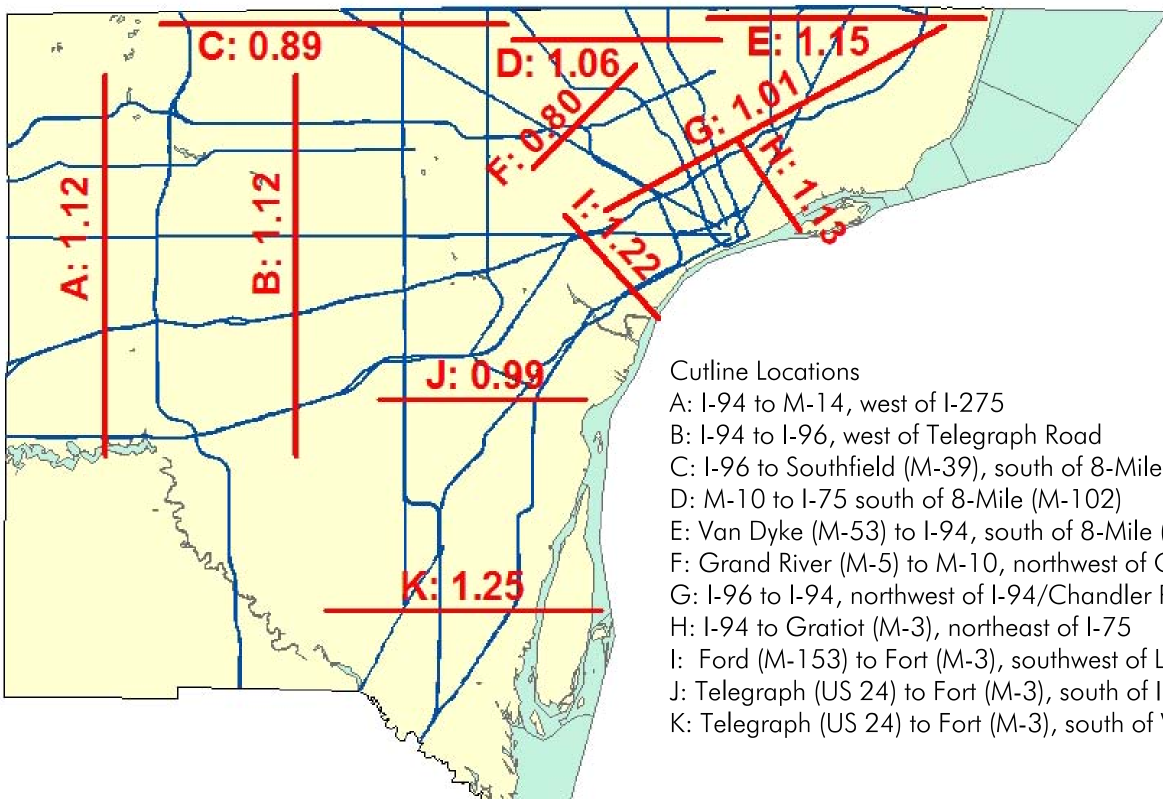
Comparison of DRIC Model Results to Sufficiency File Volumes

To provide a broader geographical test, the consultant compared model results to MDOT's Sufficiency file, which contains MDOT's best estimate of annual average daily traffic for all trunkline roads. The overall percent RMSE for the 591 links used in this analysis is 30.5%. For freeways only, the percent RMSE is 25.7%. This converts to 15,200 VPD, which is less than the daily capacity of a freeway lane. For trunkline arterials, the percent RMSE is 38.58% or 8,600 VPD, which is near the capacity of a lane of interrupted flow on an arterial roadway.

Cutlines

To display the ability of the model to estimate traffic flow in major corridors, "cutline" comparisons were prepared for 11 locations that include significant intra-regional traffic corridor within Wayne County (Figure 1). Similar to a regional "screenline," which aggregates all traffic crossing a designated regional axis, a cutline aggregates traffic on all alternative roadways within a particular travel corridor, typically consisting of three to seven facilities. A general rule is that cutlines should have an error of 15% or less (i.e., the ratio of model predicted volumes to actual count volumes should be between 0.85 and 1.15). Figure 1 shows that all but three of the cutlines meet this standard.

Figure 1
2004 DRIC Model
Daily Cutline Comparison
Model vs Sufficiency Volumes



Note: The values labeled in each cutline are the ratio of MDOT 2004 Sufficiency File AADT to model traffic volume.

Summary

The DRIC model satisfactorily replicates available trunkline, ADT map, and MITSC traffic counts and estimates. The model agrees with the trunkline volumes, the ADT map volumes, and the MITSC volumes with variation smaller than there is between daily counts and calculated annual average daily traffic.

2.3 Definition of Networks

Networks were developed from files provided by MDOT and SEMCOG for the U.S. portion of the model. Within the SEMCOG region, the networks were prepared with SEMCOG's 2005 base network and SEMCOG's 2030 Regional Transportation Plan network. SEMCOG's 2030 Regional Transportation Plan contains a relatively small number of major capacity-increasing projects. Thus, the use of the SEMCOG 2030 network for the 2035 DRIC model applications is acceptable, as it represents the roadways that are most likely to be in place between 2030 and 2035.

For the Canadian part of the model, networks were developed by the IBI Group from files provided by Windsor/Essex County and the Ontario Ministry of Transport.

The traffic analysis zone (TAZ) system was constructed to fit the networks. In Canada, the TAZs were developed from the Ontario Ministry of Transport and Windsor/Essex County models. In the U.S., TAZs were assembled from the SEMCOG and MDOT statewide models. Statewide model TAZs were used outside the SEMCOG region. Within the SEMCOG region, SEMCOG TAZs were used directly within Wayne County. Outside Wayne County, some TAZs were combined to reduce the number of TAZs to improve the processing time of the model.

2.4 Definition of Trip Tables

Base year international trip tables were updated from the data used in the P/N & F Study. The development of the tables is described in detail in "*Detroit River International Crossing Study Travel Model Update*," prepared by the IBI Group with input from The Corradino Group. That document is available at www.partnershipborderstudy.com. The estimation of future international trip tables is described in "*Detroit River International Crossing Study Travel Demand Forecasts*," prepared by the IBI Group. Subsequent sections of this report contain summaries and excerpts from these two reports.

International Passenger Cars

The international passenger car trip tables include cars that use the Ambassador Bridge, the Detroit-Windsor Tunnel, and the Blue Water Bridge. Origins and destinations extend throughout North America. As noted earlier, trip tables were developed for the AM peak hour, PM peak hour, and a midday hour.

The *Ontario-Michigan Border Crossing Traffic Study* of August 2000 was the source of cross-border passenger car origin-destination data and travel characteristics. It provided the basis for establishing the 2000 base year travel demand in the P/N&F Study. The dataset consists of trip characteristics obtained from 22,310 roadside surveys of passenger-vehicles crossing the Ambassador, Blue Water and International (Sault Ste. Marie) Bridges, as well as the Detroit-Windsor Tunnel, coded and expanded to represent the total auto volumes at each crossing. This passenger-car travel database, cleaned and re-geocoded as described in the P/N&F report, formed the basis of passenger-car travel matrices for the 2004 update. As described in the Model Update Report, growth and adjustment factors by trip purpose were applied to update the passenger-car travel matrices by purpose for a 2004 fall average weekday period, the season and period representing the highest average travel demand.

Projections for three passenger car trip purposes (work/business, other same-day trips, and overnight trips) for 2015 and 2035 were based on forecasts of the key causal factors affecting the behavior of travel by trip purpose. Growth rates were determined from official projections of each factor. The growth rates for each of the 2015 and 2035 horizon years were applied directly to the number of passenger cars in 2004 estimated for each trip purpose. Growth by category is as follows:

<u>Work/business trips</u> – Growth in cross-border commuting is expected to continue as the regional economies of SEMCOG and Windsor/Essex County continue to integrate as a primary effect of NAFTA and other influences. However, such growth could be dampened by shifts in exchange rates and potential border processing delays and inconveniences due to increased security measures. However, for forecasting purposes, the Essex-Windsor labor force remains a reasonable indicator of future growth in cross-border commuting, with future commuting growth increasing at the same rate as the general Essex-Windsor labor force. This assumes that the proportion of the Essex-Windsor labor force

working in the US will remain constant in the future at its 2001 level of 4.7%, compared to the pre-2001 historic range of 2.2% to 3.1%.

The 2035 forecast calls for a 36 percent increase in cross-border work/business trips, which is an annual growth of 1.0 percent. While this growth rate is larger than the originally projected SEMCOG area employment growth rate of 0.4 percent per year, it is a reasonable assumption that the additional Canadian workers could be absorbed into the SEMCOG regional economy given the very small proportion that Canadian workers represent and their specialized areas of employment. Conversely, American residents working in the Greater Windsor Area are assumed to increase at the similar rate as Canadians working in the U.S., given that both groups of commuters work in the same regionally integrated industries and represent a very small proportion of the combined regional workforce.

<u>Other same-day trips</u> – The outlook for same-day discretionary travel is highly uncertain because the long-term effects of 9/11, and other influences are difficult to anticipate. Historically, there have been no other extreme events of such magnitude from which to gauge the timing and extent of a potential recovery of discretionary travel at a border crossing. While discretionary trips have declined by about 50 percent since 2000, a reasonable estimate is that one-half of these trips will resume over the next ten years. However, it is unclear when in this period such a recovery might begin. Between 2015 and 2035, growth in discretionary traffic is assumed to increase in relation to population. Canadian same-day discretionary travel is forecast to increase in relation to Essex-Windsor population, and U.S. traffic is forecast to increase in relation to the SEMCOG area population. Therefore, between 2004 and 2035 same-day discretionary travel is projected to increase by 84 percent, or an annual growth of 2.0 percent. This growth assumes that the economies of both countries, the exchange rate, entertainment and recreation venues, and other factors will continue to provide an incentive for same-day discretionary travel by both Americans and Canadians. Marketing to promote Windsor-Detroit as a destination is expected to help in the recovery. However, the rate of growth is forecast to be lower than experienced over the past 30 years, which was affected by the cross-border shopping and the Windsor Casino phenomena, which have since run their course.

<u>Overnight trips</u> - Overnight/vacation travel has been much less affected by 9/11, SARS, the Iraq War and overall heightened security levels at the border than same-day discretionary trips, as the border delay represents a much smaller proportion of the travel time for longer-distance overnight travel. It is estimated that overnight/vacation trips have decreased by less than 10 percent between 2002 and 2004. This decline is attributable to Toronto's SARS crisis in 2003, which had a devastating effect on Toronto tourism with significant impacts throughout Southern Ontario. The events of 9/11 do not appear to have significantly affected tourism in Ontario, with 2002 visitation higher than 2001 for trips using the Detroit River crossings. For forecasting purposes, it is assumed that the approximate 10 percent decrease in overnight/vacation travel will be fully recovered by 2008. Beyond 2008, it is assumed that the growth will be in proportion to Ontario population growth for trips by Canadian residents to the U.S., with Michigan/Ohio population growth used to forecast the growth in trips by American residents to Canada. To the study horizon of 2035, overnight/vacation trips at the Detroit River crossings are projected to increase by 30 percent, or 0.8 percent per year.

<u>Total Passenger-car Forecast</u> - Between 2004 and 2035 horizon, total annual passenger-car trips are expected to increase from 12.0 million to 18.7 million, representing an absolute growth of 57 percent and an annual growth of 1.5 percent. Overall, the projected total passenger car traffic represents modest growth at a significantly lower rate than the 30-year trends for the Detroit River crossings. Even with the assumed levels of recovery from 9/11 and SARS, the projected 2035 traffic level will be only somewhat higher than the 1999 level.

International Commercial Vehicles

The international commercial vehicle trip tables include all commercial vehicle trips that use the Ambassador Bridge, the Detroit-Windsor Tunnel, and the Blue Water Bridge. Origins and destinations extend throughout North America. Trip tables were developed for the AM peak hour, PM peak hour and a midday hour.

The *Commercial Vehicle Survey* (CVS) database provided by the Ontario Ministry of Transportation (MTO) was the primary source of information for developing cross-border commercial vehicle trip tables for the P/N&F study. The CVS is based on the 1999 *National Roadside Survey* (NRS) and combines results from MTO's 2000 survey. The CVS provides a sample of more than 13,500 records of truck trips crossing between Ontario and Michigan. This is the most comprehensive and recent data set of commercial vehicle travel characteristics for crossings between Michigan and Ontario. It was used as the basis for the 2004 model update. Adjustments were made to reflect changes in overall truck freight flows, trends for different commodity types, and interactions with other modes, as described in the *Model Update Report*. The U.S. Bureau of Transportation *Statistics Transborder Freight Database* and other sources were used to update the trip tables from 2000 to 2004.

Estimates of future commercial vehicle traffic are based on forecasts of Canadian trade by commodity type. Growth rates were determined from national projections of trade expressed in dollar value, by commodity group, as prepared by Informetrica Limited in November 2004. The commodity trade growth rates for each of the 2015 and 2035 horizon years were applied directly to the number of commercial vehicles estimated to be carrying each commodity and to the weight of goods transported by truck and rail. The assumptions that are made, or that are implicit to this method, include:

- A constant 2004 rail mode share by commodity type and direction is maintained over the study horizon;
- The value-to-weight per truck relationships by commodity type remain constant over the study horizon; and,
- The proportion of trucks with no load (empties) will remain the same. Empty trucks are a measure of the "efficiency" of the goods movement industry which is dependant on such factors as logistics, trade imbalances, commodity truck-type requirements, etc. and is assumed to be currently maximized.

The same growth rates were used to develop the peak-hour truck trip matrices for the travel demand model. The rates were applied to each commodity- and direction-specific trip matrix, which were then summed to create a single international truck trip table. The trip table is assigned to the network, with the proportion using each port (the Detroit River or Blue Water crossing) determined with a discrete-choice, logit model based on travel time and cost.

<u>Automotive & Metal</u> - The automotive sector is the dominant industry in Southeast Michigan and Southwestern Ontario, currently representing approximately 35 percent of commercial vehicle traffic at the Detroit River and St. Clair River crossings. "Metal" is combined with automotive for analysis purposes because a high proportion of the metal crossing the border within the study area is related to the auto industry. Automotive/metal, as a combined category, currently represents approximately 43 percent of the total commercial vehicle traffic. The government of Canada merchandise trade projections indicate that all aspects of the automotive and metal commodity groups will grow steadily throughout the horizon period, with growth in total Canadian exports slightly outpacing total imports.

The combined automotive/metal sector is projected to increase at 3.5 percent, 2.5 percent and 2.0 percent annually for Canadian exports and 3.3 percent, 2.7 percent and 2.1 percent annually for Canadian imports in the first three decades of the 21st Century, respectively.

Machinery and Equipment - At present, this commodity group is responsible for approximately 5 percent of commercial vehicle traffic at Detroit River crossings, although its share in terms of value is much higher given the high value of the goods being transported. This group consists of such items as office machinery, aircraft and locomotive engines, electronics and other household and industrial equipment. After a steep climb in trade during the 1990s, recent trade has been depressed following the collapse of the high-tech sector in the early years of that decade, particularly for Canadian exports to the U.S. Total trade growth was 9.5 percent annually during the 1992 to 1999 period, but declined almost as dramatically by 5.1 percent annually between 1999 and 2004. Looking ahead, machinery and equipment is projected to be the fastest growing sector, with the dominant direction of trade continuing to be from the U.S. to Canada. This growth is expected to be spurred by: low interest rates, aging capital equipment, and strong demand for information-technology products. The trade gap is projected to widen further given large growth in Canadian imports that are forecast, which the government of Canada projects at 6.2 percent, 4.7 percent and 3.1 percent annually in each of the first three decades of the 21st Century, respectively. Canadian exports are expected to be almost as strong, growing at 4.6 percent, 3.3 percent and 2.4 percent annually in each decade. This growth is consistent with strong global demand for manufacturing equipment and robust commodity prices.

Forest - At present, forestry represents approximately 9 percent of truck volumes at Detroit River crossings. This sector consists of raw and semi-processed wood material including: pulp, scrap paper and paperboard, wood charcoal and both hardwood and softwood lumber. This sector has also experienced a recent downturn since 2000 following strong growth in the 1990s, with an annual growth of 8.1 percent between 1992 and 2000 before declining by 3.0 percent through 2003. The dominant direction of flow of forest products is from Canada to the U.S., although the relative proportions of directional traffic are more balanced within the study area than at the national level. Pulp and paper is dominated by the newspaper industry, and it tends to move in cycles annually with consumer spending, driven by advertising, changing prices, and volume. Demand for pulp and paper has continued despite increases in electronic communications, particularly over the Internet. The other large component of forest products is lumber and related products. In the late 1990s, this component experienced considerable growth, although the growth was curtailed and resulted in declines in trade with the imposition of duties that increased the price of Canadian softwood lumber by approximately 30 percent. Softwood lumber disputes between Canada and the U.S. continue to curtail trade in this sector and have resulted in low/negative growth in recent years. In addition to trade disputes and electronic media competition, a further cause for uncertainty in this sector are potential changes in Canadian environmental legislation that could have an impact on the costs of production for pulp and paper as well as lumber products. In recent years, the industry has had to adopt new technology to keep abreast of policies regarding sustainability of the environment. Rising electricity prices, the value of the Canadian dollar and high wood fiber costs introduce additional challenges. Nonetheless, the prospects for growth appear good in the near term due to rising prices and continued demand. The government of Canada projects low-to-moderate growth and a narrowing of the trade gap, with Canadian exports growing at 1.3 percent, 1.0 percent and 0.9 percent annually and Canadian imports growing at 2.9 percent, 2.2 percent and 1.8 percent in each of the first three decades of the 21st Century, respectively. This growth represents the lowest among the sectors discussed in this report.

Agriculture - At present, approximately 9 percent of commercial vehicles at Detroit River crossings are carrying agricultural products. This sector has shown moderate-to-strong annual growth of 5.9 percent over the past 13 years. The agricultural sector has been affected by ongoing trade disputes in beef, pork and chicken, among other areas. However, strong economic activity and employment in the U.S. has increased demand for prepared food and beverages. The direction of trade has been, and is projected to continue to be, fairly even throughout the study horizon. The government of Canada projections of growth of Canadian imports are at rates of 3.8 percent, 3.9 percent and 2.8 percent annually relative to U.S. import growth rates of 2.3 percent, 3.0 percent and 2.3 percent in each of the first three decades of the 21st Century, respectively.

Other Commodities - This sector consists of items such as chemicals and plastics, energy, minerals, textiles and other consumer products not included in the previous sectors. While this sector has also undergone a decline since 2000, overall it has grown by 6.4 percent annually since 1992. At present, "other" commodities represent approximately 22 percent of the commercial vehicle flows at Detroit River crossings. U.S.-to-Canada is the dominant direction of trade. The government of Canada projections show strong growth of Canadian imports at 3.7 percent annually relative to 3.3 percent for exports. In the next two decades of the planning period, however, the trade gap is expected to widen further due to annual growth of imports of 2.9 percent and 2.3 percent relative to 2.6 percent and 2.0 percent for exports in each of the first three decades of the 21st Century, respectively.

Total Commercial Vehicle Demand Forecast - Based on the above forecasts by commodity applied to the values of each commodity at the Detroit River and St. Clair River crossings, exports from the U.S. to Canada are expected to grow at a faster rate than exports from Canada to the U.S. So, the trade value gap between the U.S. and Canada is expected to narrow over the study horizon, with much of this occurring between 2010 and 2030. Over the long term, Canada is expected to narrowly remain a net exporter of goods in terms of value within the study area with increases in the value of the Canadian dollar and increasing integration of the U.S. and Canadian economies. In total, annual two-way commercial vehicle demand is projected to increase from 5.3 million in 2004 to 12.3 million in 2035, representing a 2.8 percent annual increase. The narrowing of the trade gap will result in a lower proportion of empty trucks for U.S.-to-Canada flows. Total commercial vehicle trips, including empty vehicles from Canada-to-the-U.S., are now and forecast to remain greater than U.S.-to-Canada given "triangulation" in commercial vehicle routing with many vehicles entering the U.S. via the Ambassador Bridge but returning to Canada via other crossings (e.g. Peace Bridge, International Bridge at Sault Ste. Marie).

Of the total Detroit River and St. Clair River crossing demand, 66 percent of commercial vehicles presently use Detroit River crossings. This proportion is projected to remain stable in the future, given the anticipated travel demand growth and assumed infrastructure improvements. In the near-term, a diversion toward the Detroit River crossings is expected with the easing of border delay following the opening of new customs booths at the Ambassador Bridge. But, this benefit will erode in time as congestion builds on the access roads.

The choice of using the Detroit River or St. Clair River crossings is determined by the logit model within the travel demand model. The results show a 128 percent increase in truck traffic at Windsor-Detroit over the study period from 3.5 million trips in 2004 to 8.1 million by 2035, equivalent to an annual growth of 2.7 percent. The effect of the narrowing trade gap is apparent, as the 55 percent-to-45 percent directional split in 2004 is reduced to a 52 percent-to-48 percent split by 2035, with the balance still in the Canada-to-U.S. direction.

U.S. Domestic Trips

As noted earlier, U.S. domestic trip tables were developed from SEMCOG's 2005 base year and 2030 Regional Transportation Plan trip tables. Linear interpolation and extrapolation were used to estimate tables for 2004, 2015 and 2035. SEMCOG provided separate vehicle trip tables for AM, midday, PM and off-peak (night) time periods, which when added together represent travel for a 24-hour day. Each matrix file contained four tables: passenger cars, light trucks, medium trucks, and heavy trucks.[1]

Steps in developing the trip tables were:

- Aggregate all matrices from the SEMCOG TAZ system (1,505 TAZs) to the DRIC TAZ system (960 TAZs) using TransCAD's matrix aggregate routine.
- Remove all trips using the Ambassador Bridge, Detroit-Windsor Tunnel and the Blue Water Bridge, because these trips would be accounted for in the international trip tables. This was done by setting the value of all cells beginning or ending at the international crossings to zero.
- Interpolate and extrapolate the matrices to 2004, 2015, and 2035.
- Apply hourly factors (as published in SEMCOG model documentation), to convert the tables from peak periods to peak hours.

The resulting tables were used in the assignment models, and provided the U.S. background traffic for the model.

Appendix C provides a description of international and domestic freight movements in the SEMCOG region.

Canadian Domestic Trips

Canadian trip tables were developed from Windsor/Essex County and Ontario Ministry of Transport models by the Canadian consultant to represent the Canadian background traffic. The Canadian domestic trip tables represented the same years and peak hours as the U.S. trip tables, but were classified only as passenger cars and commercial vehicles.

The resulting tables were used in the assignment models, and provided the Canadian background traffic for the model.

SEMCOG Demographic Forecasts

In April 2007, SEMCOG reduced its forecasts of population and employment growth. The effects of these changes on international traffic are reported upon in Sections 6 of the *Level 2 Traffic Analysis Technical Report, Part 1: Travel Demand Model and Results, February 2008.*

2.5 Definition of the Sub-Area

Currently, the DRIC model uses the SEMCOG TAZ system for all of Wayne County. This is the subarea that was established in the P/N&F study. After the range of alternatives is defined for the Practical Alternatives, the consultant will assess the need to sub-divide SEMCOG TAZs in the area of the proposed new crossings in order to show a greater level of detail in the traffic simulation.

[1] Total commercial crossings do not include trucks carrying hazardous materials via the Detroit-Windsor Truck Ferry. The truck ferry handles an average of 50 trucks per day.

3. Description of Illustrative Alternatives

An illustrative alternative consists of a border crossing connected to a plaza on each side of the river that connects to the interstate/provincial highway network via a new limited-access, six-lane freeway. The "No Action" alternative, defined as "no new border crossing" in the Detroit River area, is the baseline against which the impacts of each illustrative alternative are measured.

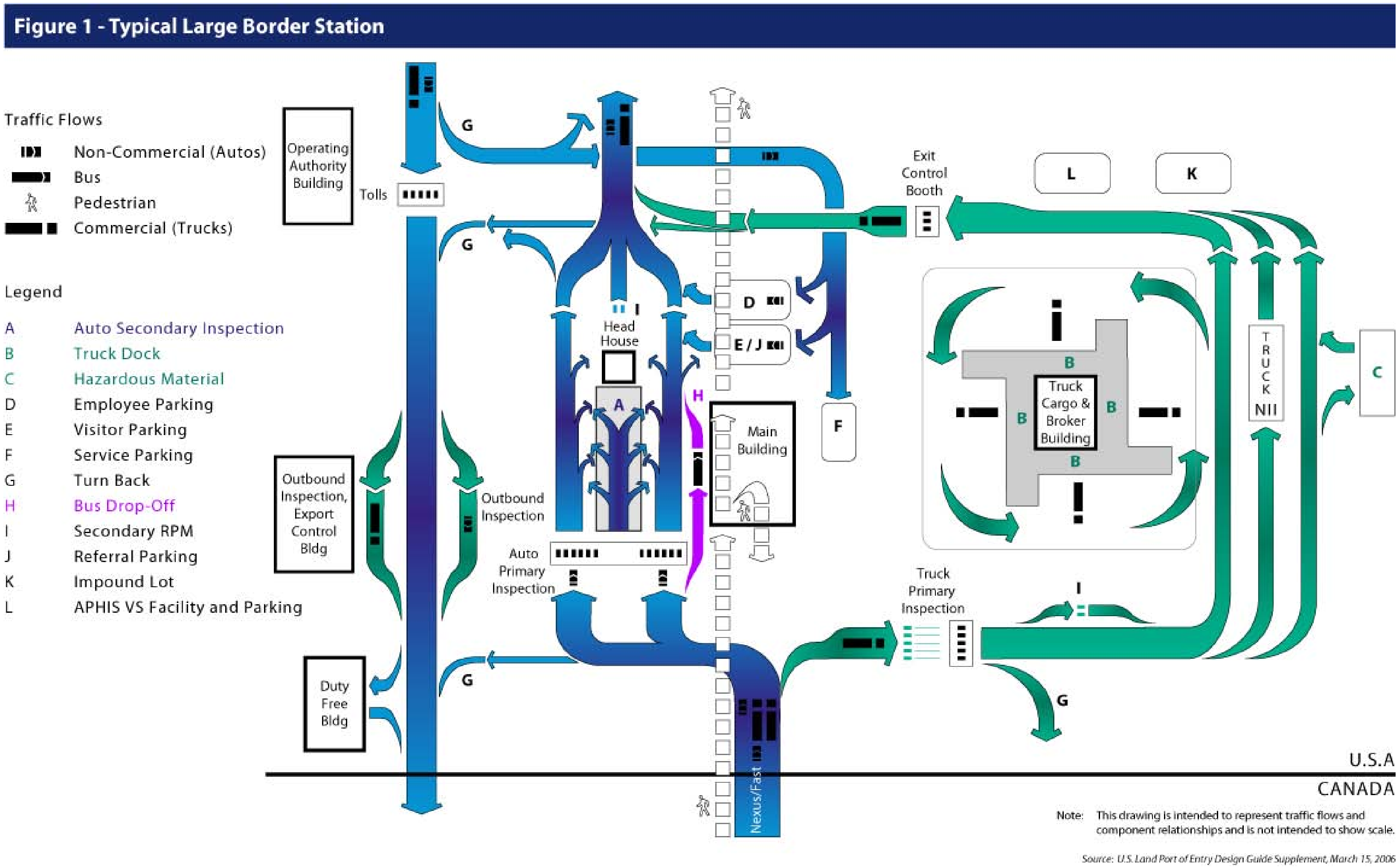
For the purposes of assessing travel demand impacts, new regional networks were coded to represent each alternative. With the exception of crossing X-13, which represents the specific proposal of the Detroit Rail Tunnel Partnership (DRTP) to convert the existing Detroit Rail Tunnel into a two-lane truck crossing, all new crossings and connecting routes are coded as six-lane limited-access facilities with characteristics established by the Highway Capacity Manual. This report details the U.S. components of the crossing alternatives. In all cases, the Canadian connections to Provincial Highway 401 are six lanes with limited access.

A brief definition of plazas, crossings, and routes is provided below. Appendix B provides a more detailed description of plazas and routes.

3.1 Definition of Plazas

Locating potential plaza sites on each side of the Detroit River was the first step in establishing alternatives. In consultation with the Department of Homeland Security/Customs and Border Protection Agency and the General Services Administration, the operational requirements of a typical plaza/border station have been defined (Figure 2). The minimum plaza area to accommodate these functions is between 80 and 100 acres. Larger plazas were also considered in the range of 150 to 180 acres to account for possible expansion of the crossing system with a design life of 100 years. Taking into consideration traffic impacts from the travel demand analysis performed for the Planning/Needs & Feasibility Study, the riverfront area between Grosse Ile on the south and Belle Isle on the north was surveyed for potential plaza locations. Aerial photography and Geographic Information System (GIS) data on housing, community/land use characteristics, combined with field review of this information, were used in the survey process. Areas with few structures, brownfields, or otherwise underutilized tracts of land were a first preference for locating plazas. However, to address the project's purpose and need, more densely developed and active areas were also included as sites. This requirement particularly applies in the central part of the study area from Ecorse Road upriver to Belle Isle.

Figure 2
Typical Plaza Concept



For the Illustrative Alternatives evaluation, no time or cost penalties are applied to the plazas, which are represented as nodes in the network. In this regard, all alternatives are treated equally, nullifying any plaza effect on travel demand. In addition to a connecting route to an interstate facility, each plaza alternative includes access to the local road system (non-freeway).

Fourteen illustrative plazas have been located for analysis (Figure 3), including the proposal of the Detroit International Bridge Company to expand the existing Ambassador Bridge plaza. The plazas are coded as follows: the five southern plazas in the Downriver area (S-1 through S-5), the four central plazas in the River Rouge/Delray area (C-1 through C-4), the four plazas in proximity of the interstate system defined by I-75 and I-96 (II-1 through II-4), and a plaza in the Belle Isle area (N-1).

3.2 Definition of Crossings

Once illustrative plaza sites on both sides of the border were located, fifteen river crossings were identified, X-1 through X-15. Figures 4a through 4d show the location of each crossing. Bridges are feasible at all crossing locations. Bridge types (suspension and cable-stay) were considered for each location based on the length of the crossing and the length of the navigable channel. Six-lane tunnels were deemed to be not feasible at any crossing location.

3.3 Definition of Alignments

The final component of each crossing alternative is the route connecting the plaza to the interstate highway system (Figures 5a through 5f). Plaza connections to highway facilities often include multiple alternative routes. All plazas connect with I-75, with the exception of: 1) Plazas II-3, which is connected to M-10, the John C. Lodge Expressway; and, 2) Plaza N-1, which connects with I-94. Plaza II-2 is connected to both I-75 and M-10 via separate routes. Plazas S-1 through S-4 have route alternatives that extend west beyond I-75 to I-275. Plazas S-5, C-1, and C-2 have alternative routes that extend beyond I-75 to I-94.

The interchanges of the new connecting routes to the local roadway system are shown in Figures 6a through 6f. Continuation of the connectivity of SEMCOG network roadway facilities was a requirement in the coding of the route/interchange alternatives.

A conceptual design for each interchange was prepared. However, extensive network coding of each interchange is deferred to the Practical Alternatives stage of evaluation. At this level of the analysis, full directional connections were added at interchanges between the new freeway link and the existing highway link, with the existing interchanges unchanged. This allows alternatives to be compared based on the characteristics of their location and length. The exception to this protocol is the alternative proposed by the DRTP, which is coded specifically as the proponent proposes.

Routes were established using geo-spatial and GIS computer applications. QUANTM, a geo-spatial terrain model, was used to generate alternate alignments between a specific plaza and freeway interchange with I-75/I-94 and/or I-275, based on terrain constraints, engineering design criteria, and "avoidance" areas. The latter are places which are protected by law (parks, National Register-eligible cultural/historic sites). Cemeteries, major utilities (such as power plants) and landfills were also avoided, to the extent possible.

GIS software (ArcView® 3.3 and ArcGIS® 9.1) was also used to shape the routes by examining the location of major community features such as schools, hospitals, and places of worship.

Figure 3
Detroit River International Crossing Study
Illustrative Plaza Sites

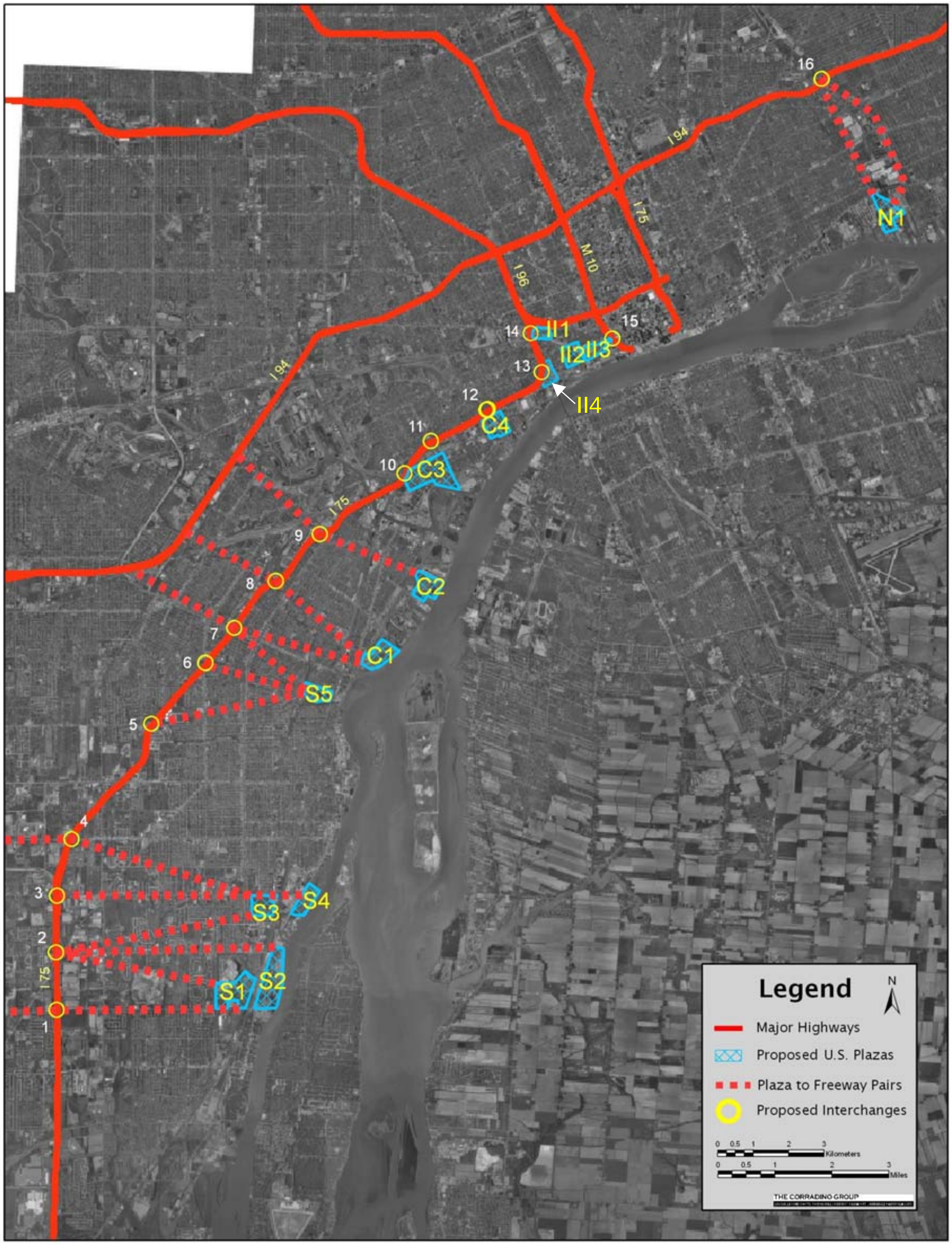
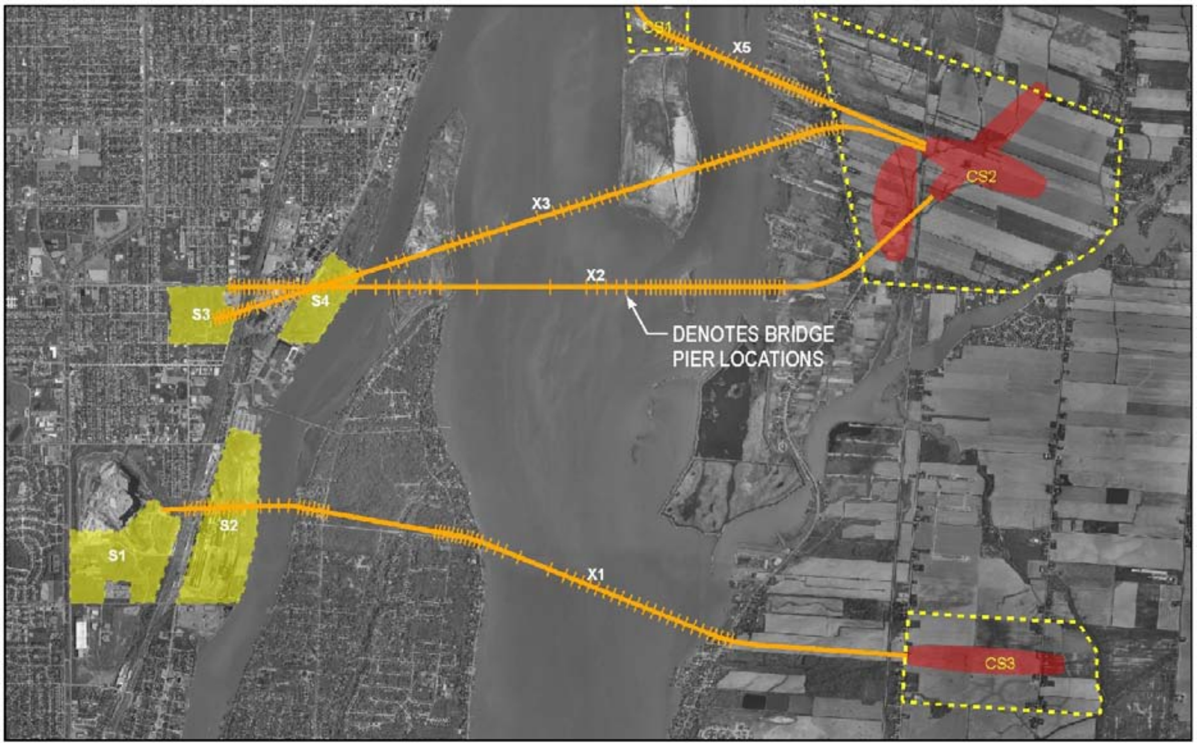
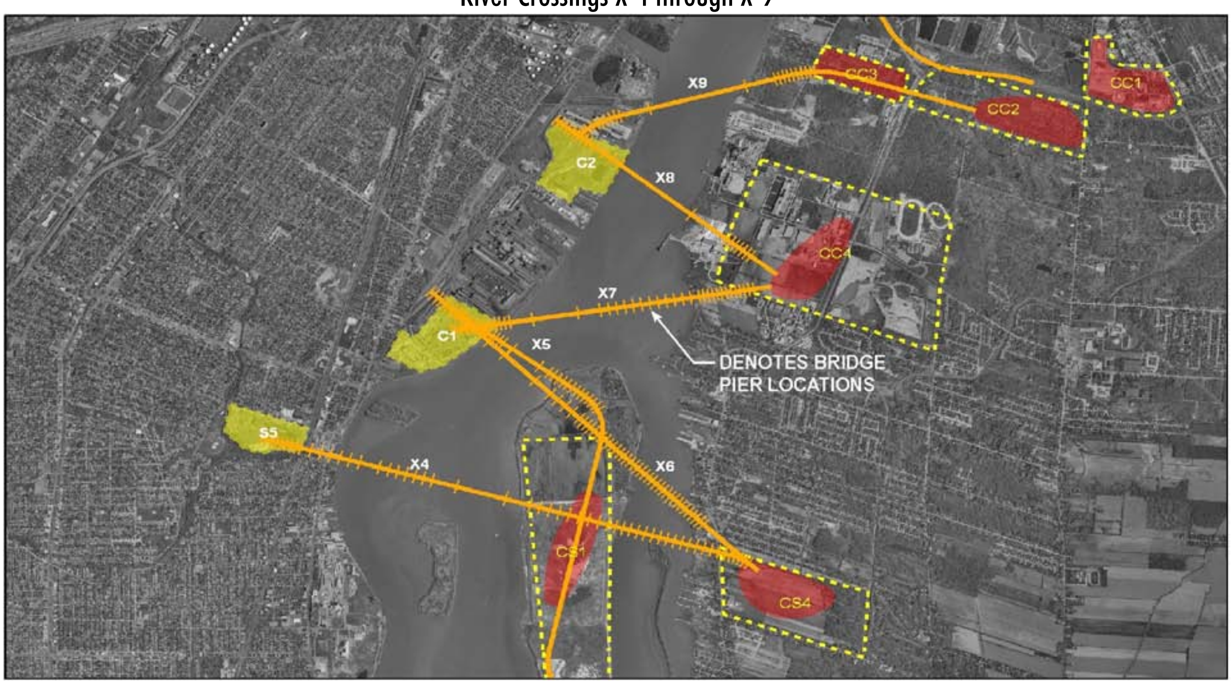


Figure 4a
Detroit River International Crossing Study
River Crossings X-1, X-2 and X-3



Source: Parsons Transportation Group

Figure 4b
Detroit River International Crossing Study
River Crossings X-4 through X-9



Source: Parsons Transportation Group

Figure 4c
Detroit River International Crossing Study
River Crossings X-10 through X-14

Source: Parsons Transportation Group

Figure 4d
Detroit River International Crossing Study
River Crossing X-15

Source: Parsons Transportation Group

Figure 5a
Detroit River International Crossing Study
Alternative Routes for Plazas S-1 through S-4

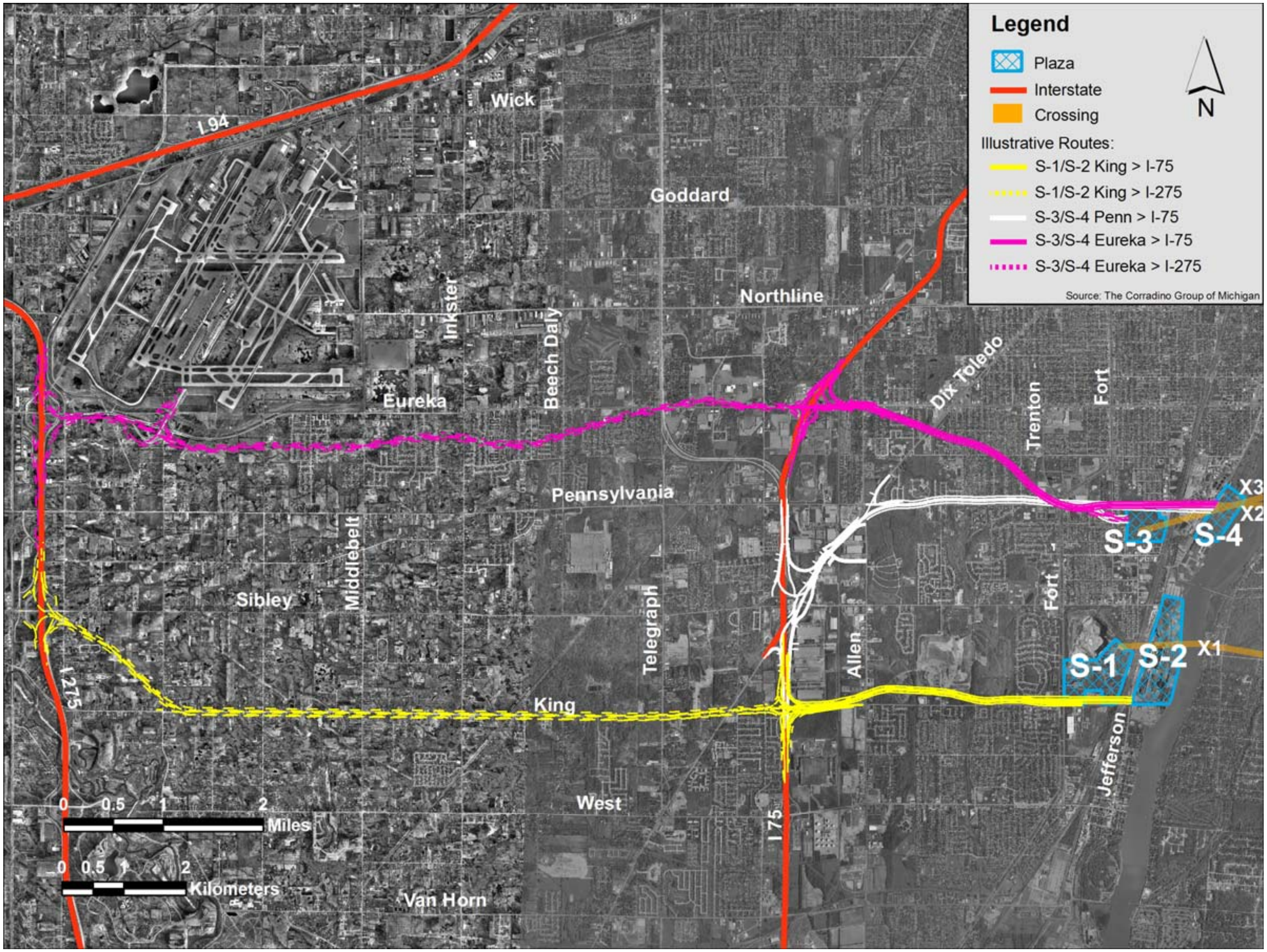


Figure 5b
Detroit River International Crossing Study
Alternative Routes for Plaza S-5

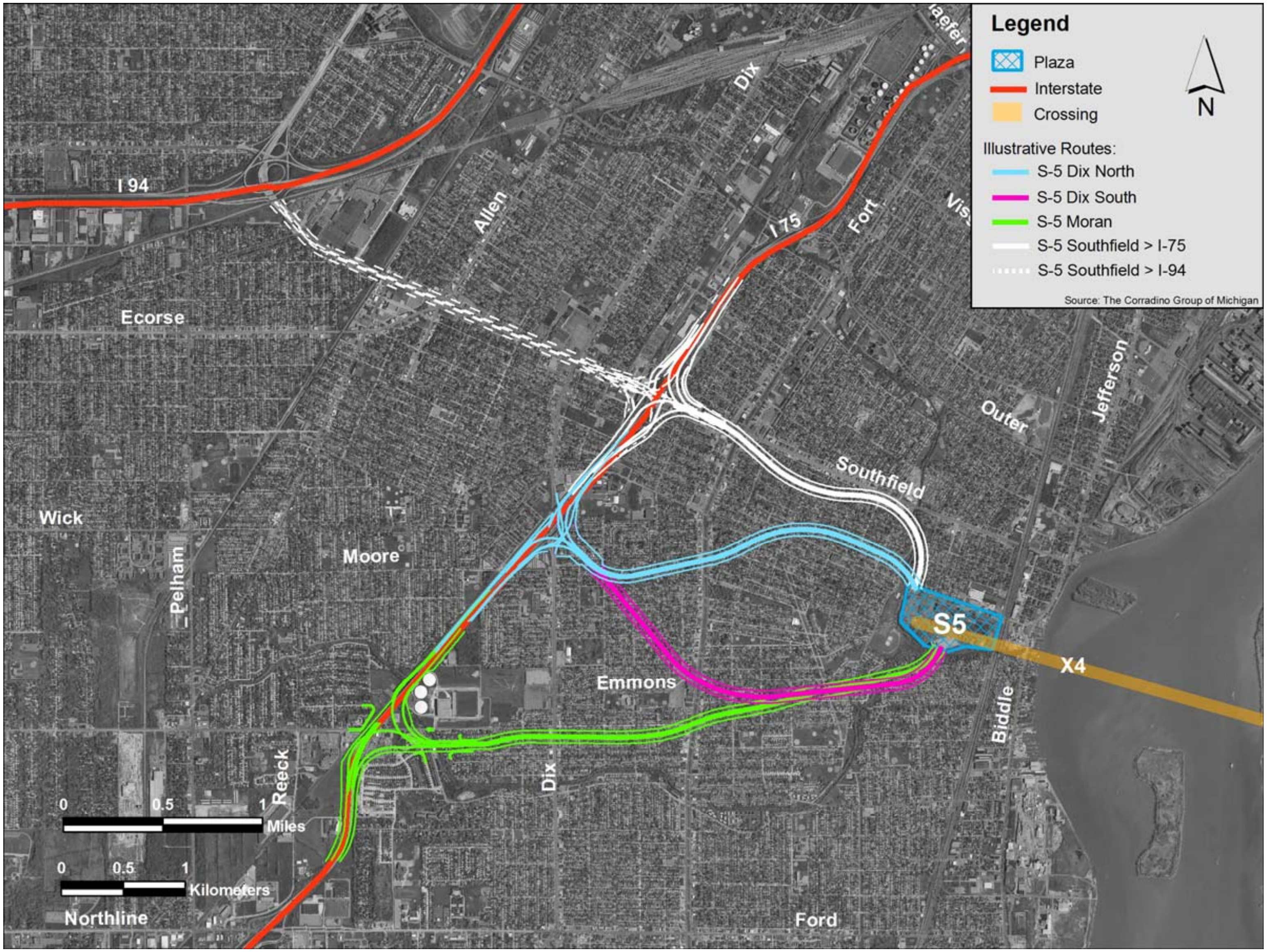


Figure 5c
Detroit River International Crossing Study
Alternative Routes for Plazas C-1 through C-2

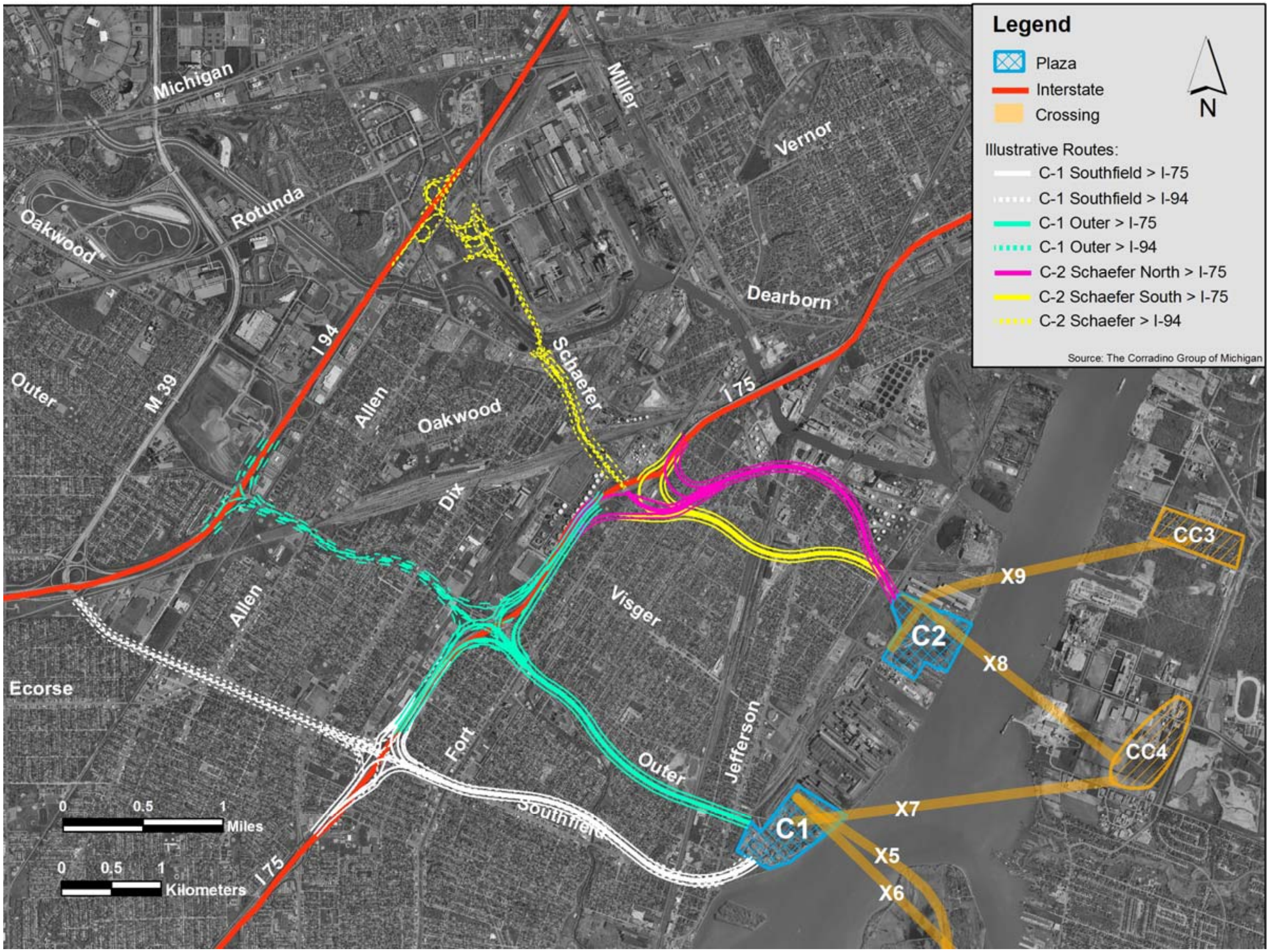


Figure 5d
Detroit River International Crossing Study
Alternative Routes for Plazas C-3 through C-4

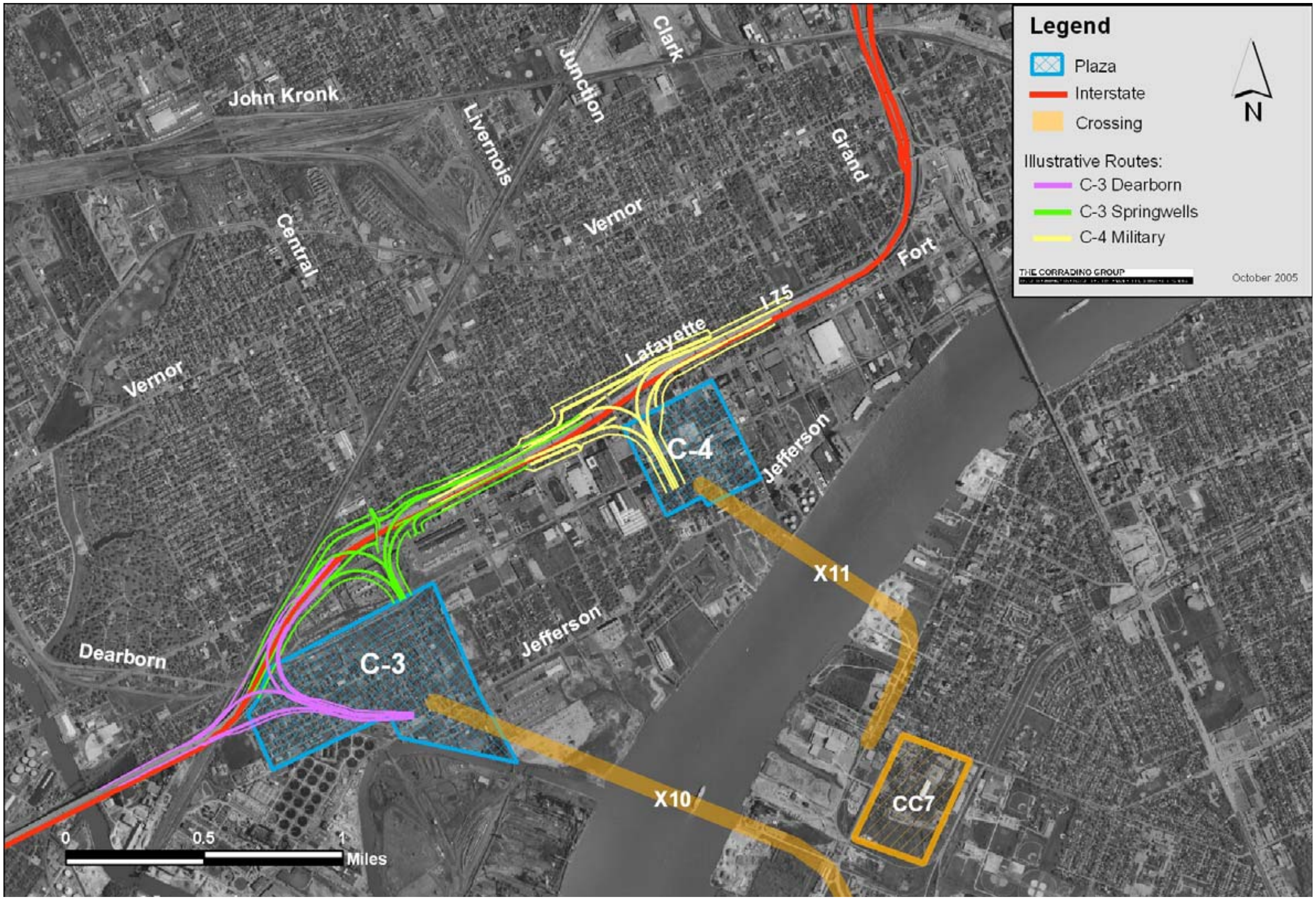


Figure 5e
Detroit River International Crossing Study
Alternative Routes for Plazas II-1 through II-4

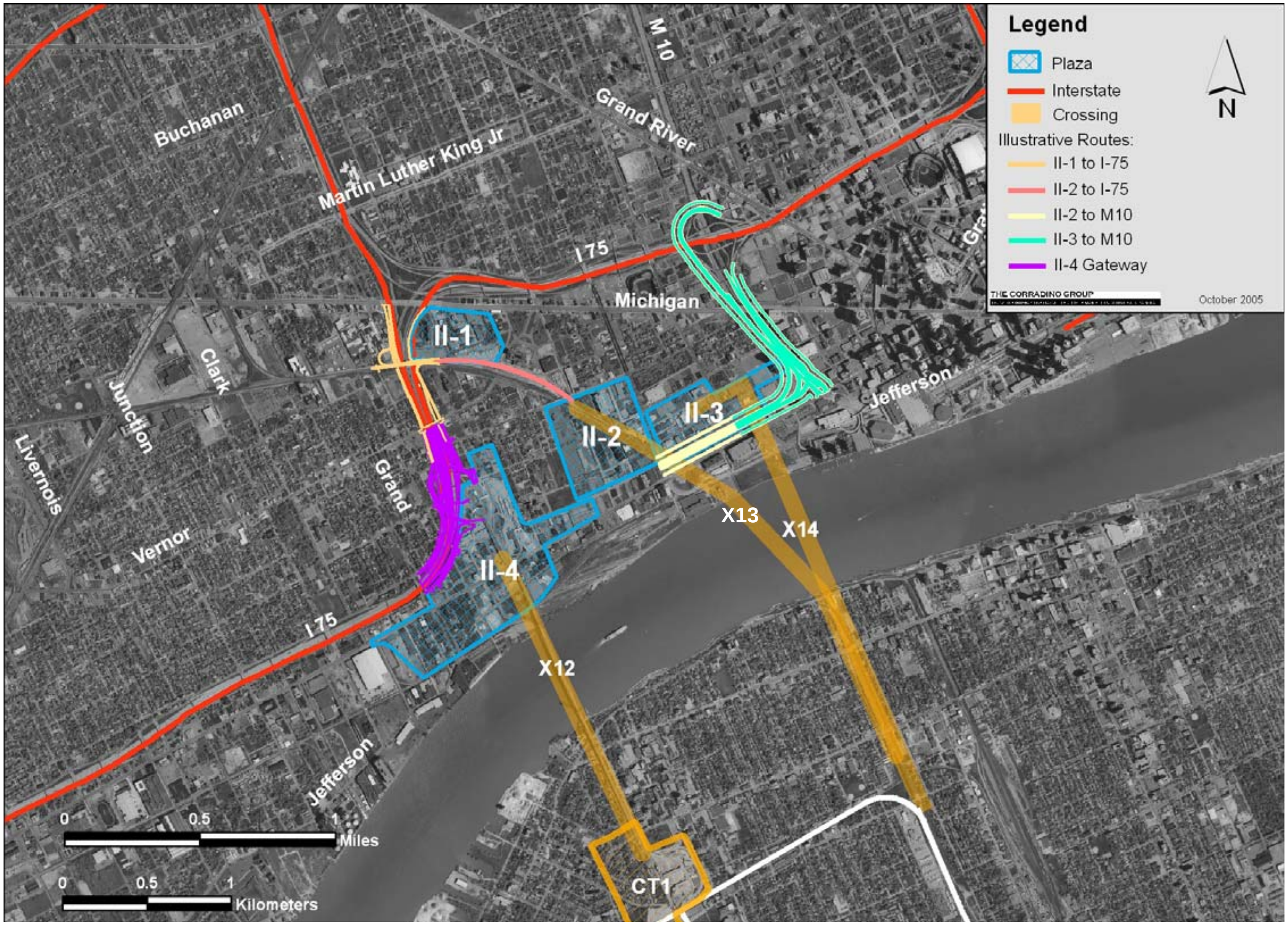


Figure 5f
Detroit River International Crossing Study
Alternative Routes for Plaza N-1

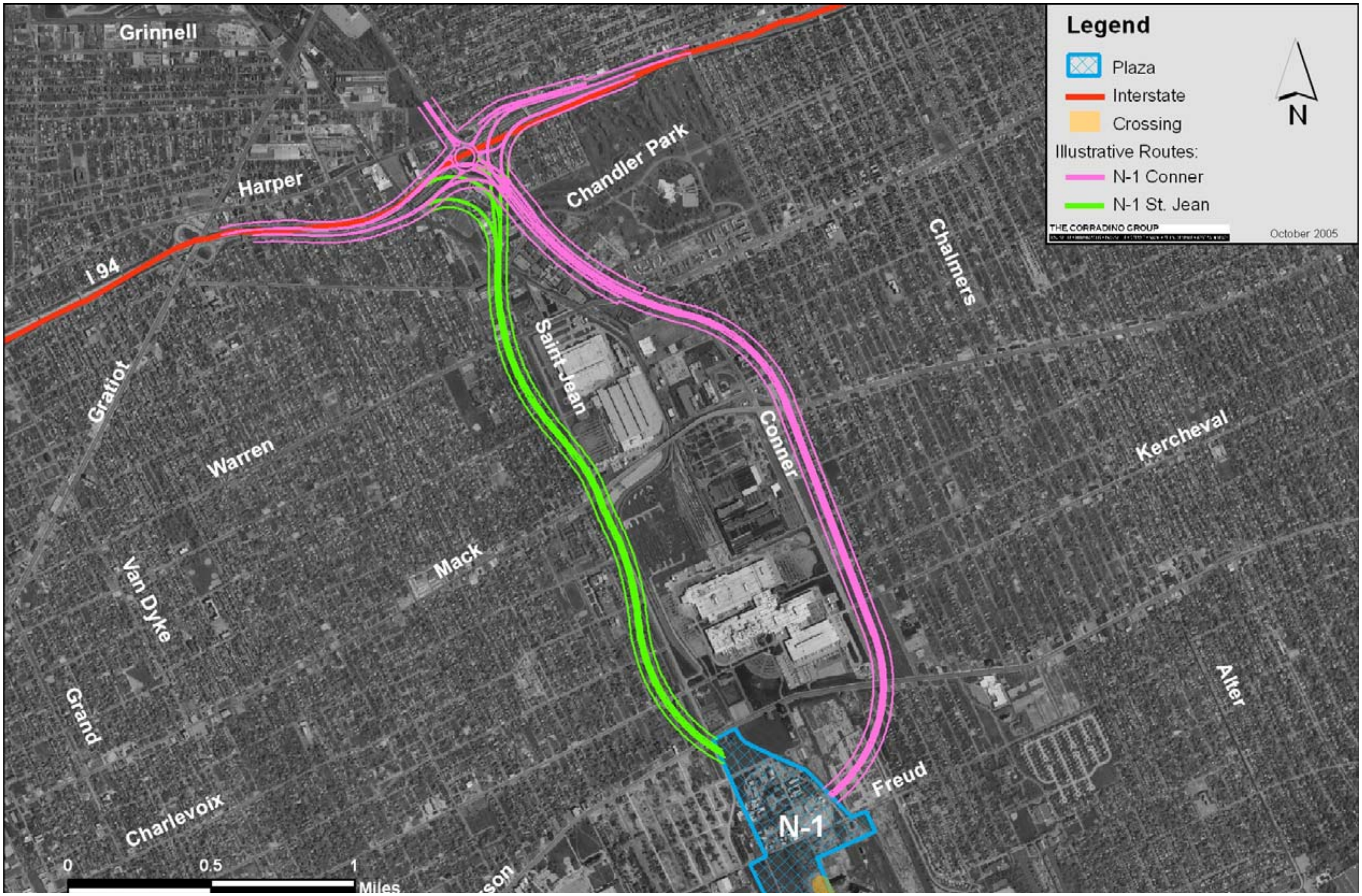


Figure 6a
Detroit River International Crossing Study
Alignments S-1 – S-4 Interchanges

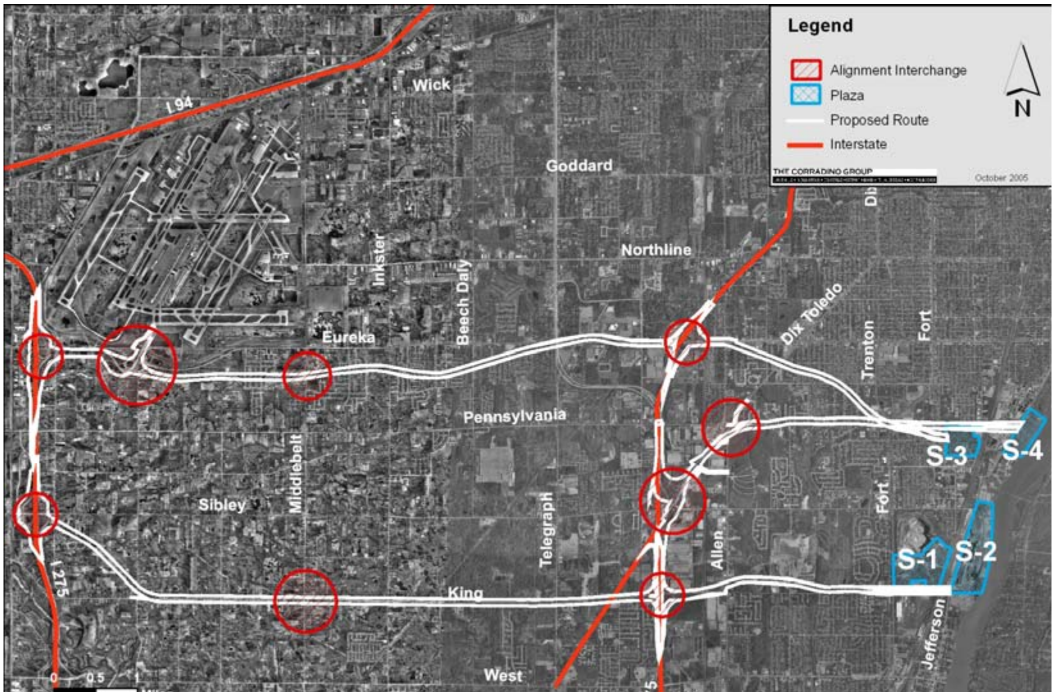


Figure 6b
Detroit River International Crossing Study
Alignment S-5 Interchanges

Figure 6c
Detroit River International Crossing Study
Alignment C-2 Interchanges

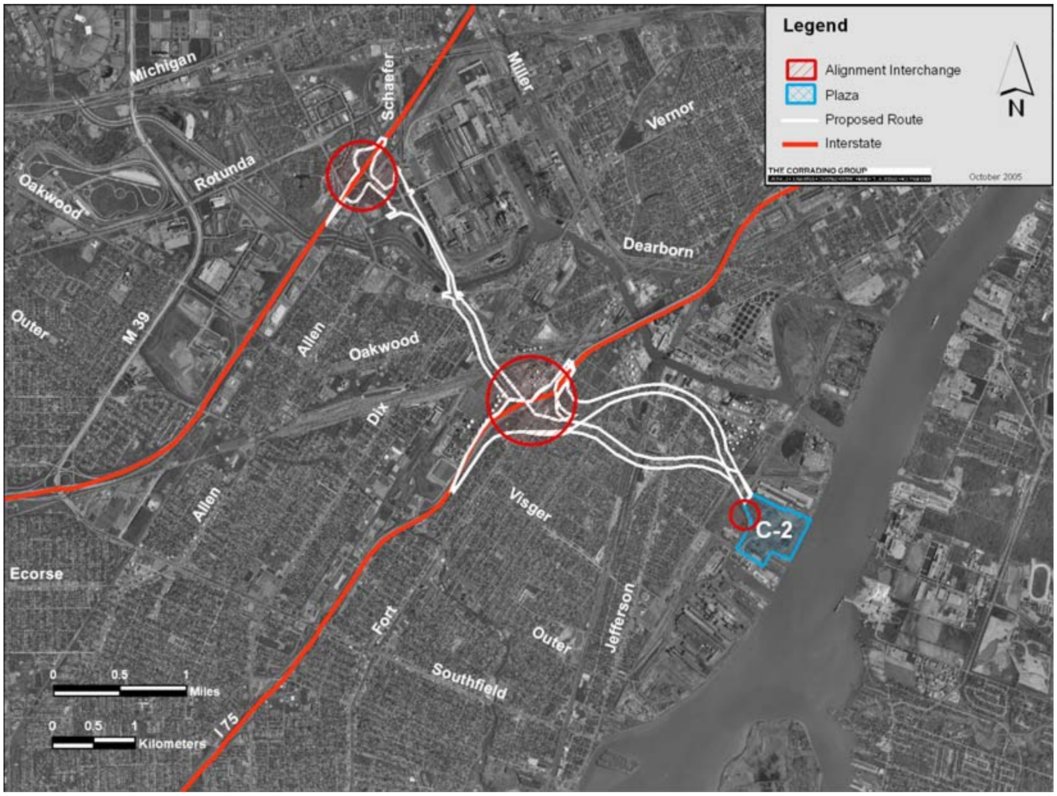


Figure 6d
Detroit River International Crossing Study
Alignments C-3 – C-4 Interchanges

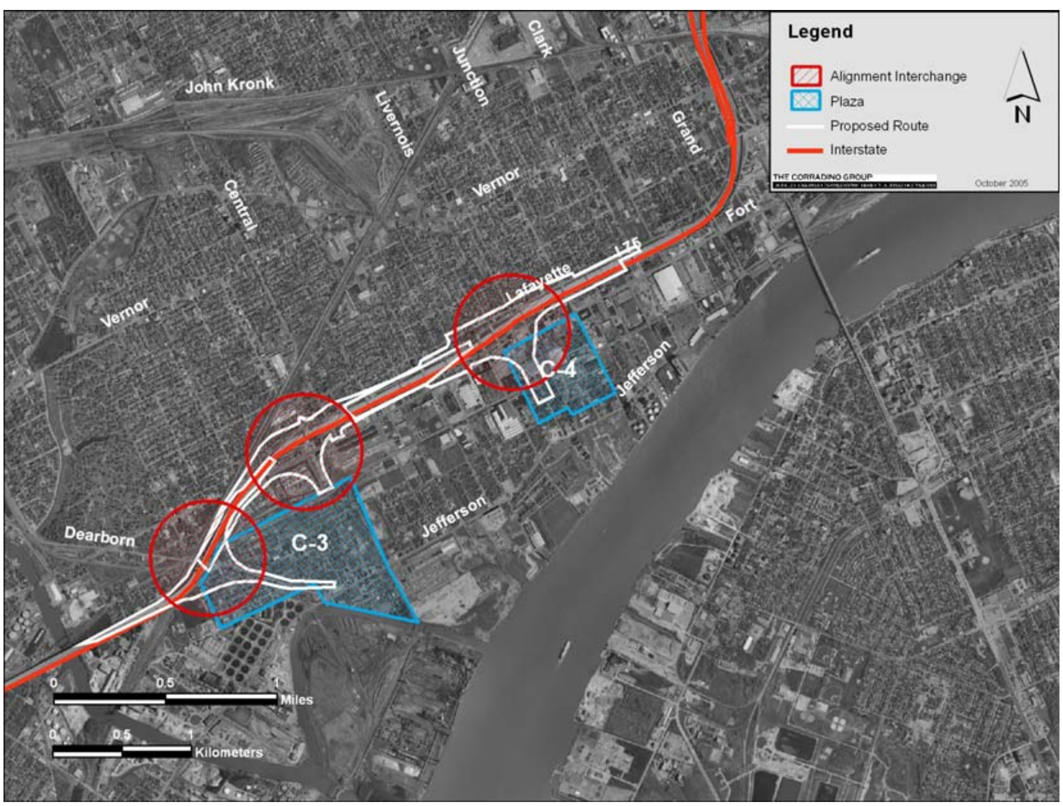


Figure 6e
Detroit River International Crossing Study
Alignments II-2 – II-4 Interchanges

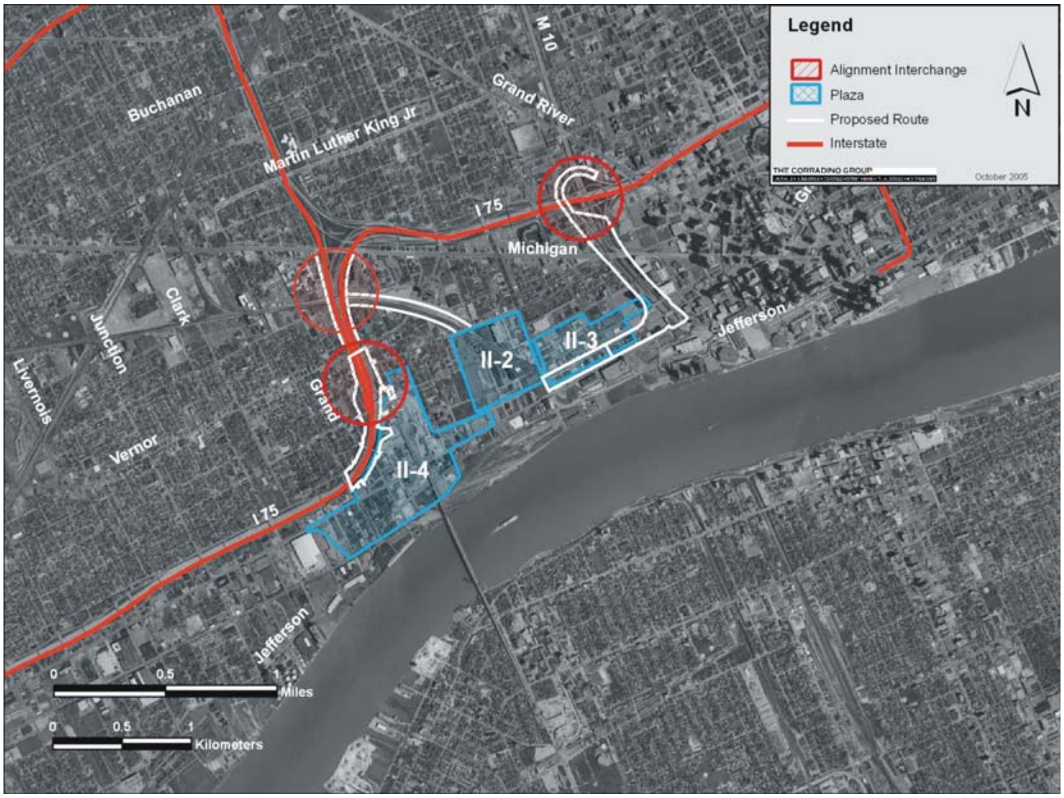
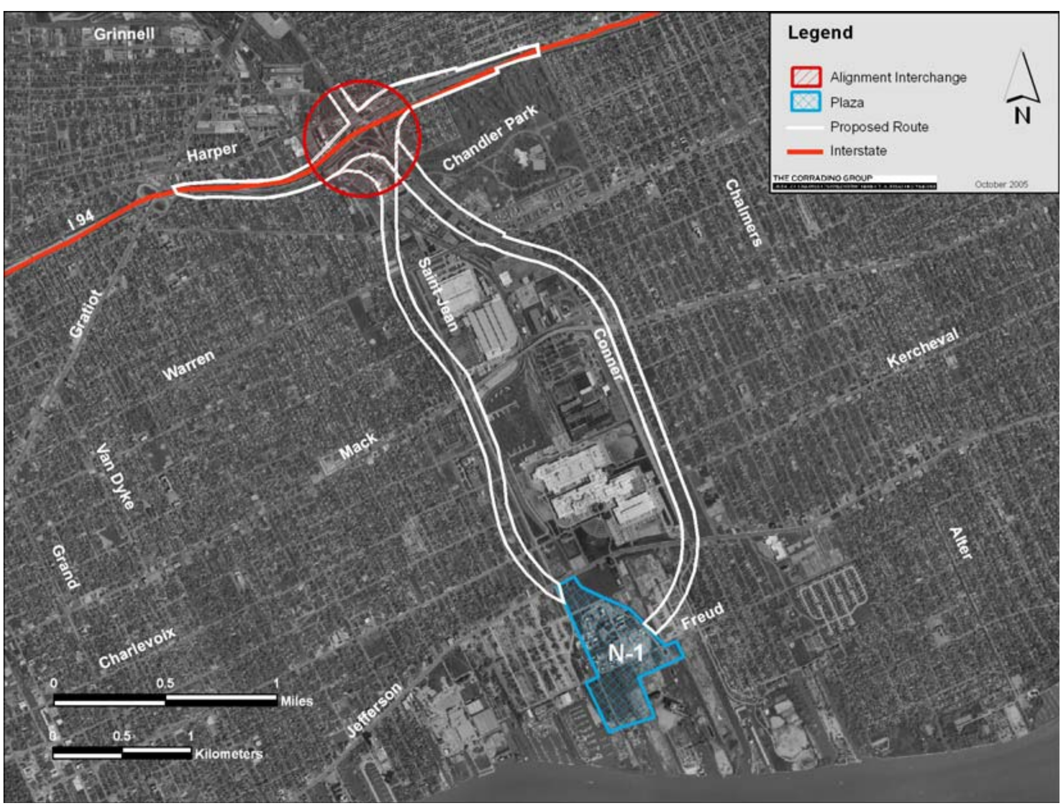


Figure 6f
Detroit River International Crossing Study
Alignment N-1 Interchanges



4. Description of Regional Mobility Measures of Effectiveness

The border crossing system is proposed to be built to handle the traffic demand for the long-range (2035) future and beyond. The Detroit River crossing and connections to the freeway system will be three lanes in each direction with interchanges appropriately spaced and designed to provide local access but not impede flow to/from the crossing. The plan for each component of the crossing system, including the plaza, is that it will have adequate capacity. Therefore, the "capacity" need is measured not by the crossing itself, but by the surrounding roadway system's response to the new crossing.

Measures used to define the system's ability to address the regional mobility need are provided both systemwide and by link. **Systemwide, vehicle miles and vehicles hours-of-travel (VMT and VHT)** are critical measures because, if the new crossing system does not save travel time and distance, then it is less likely to meet the project's need. However, there is not a direct correlation between VMT and VHT. In fact, it is very possible that an alternative could save vehicle hours traveled without improving vehicle miles of travel. Savings in travel time for international traffic is considered more significant than savings in distance traveled, especially for commercial traffic because time usually affects the cost of trade more than miles traveled.

VMT is calculated by multiplying the total number of vehicles on each link in the network by the length of that link. VMT for each link is then aggregated for the entire network for a specific period. VHT is calculated by multiplying the total number of vehicles on each link in the network by the travel time of that link and then aggregated for the entire network.

Link-specific data are also important in defining regional mobility. The analysis of the crossing system components focuses on twenty key links in the southeastern Michigan roadway system, including the existing crossings, to measure: (1) international travel by type; and, (2) overall congestion (international and all other traffic) calculated as the ratio of total peak hour volume-to-capacity on the roadway link (Figure 7 and Table 2). These measures allow an understanding of the degree to which the capacity of the network that serves the proposed crossing system meets future needs as influenced by international travel.

Another measure is the ability of the crossing system to provide redundancy in serving the region's mobility. This is measured by comparing the differences in the **vehicle miles traveled and vehicle hours of travel with the Ambassador Bridge closed for each alternative**. In addition, the effects of the closure of the Ambassador Bridge on the Detroit-Windsor Tunnel, in terms of total volume and volume-to-capacity measures, are presented for a sample of proposed alternatives. Likewise, model runs with the Detroit-Windsor Tunnel closed for a sample of proposed alternatives are presented to determine if a new crossing system could also maintain traffic in the event of a disruption at the Tunnel.

All of the travel demand model runs (about 100) of the illustrative alternatives are reported upon in this document for the PM period in 2035. The statistics reported are:

- Vehicle miles of travel (VMT) for international trips – This is the sum over all roadway links in the network of distance traveled multiplied by the number of international vehicles on the link. It is reported as the difference from the No Action alternative.
- Vehicle hours of travel (VHT) for international trips – This is the sum over all roadway links in the network of final congested travel time multiplied by the number of international vehicles on the link. It is reported as the difference from the No Action alternative.

- Ratio of Volume to Capacity (V/C) – The V/C ratio is defined as the directional one-hour volume divided by the directional one-hour capacity for links in the network.
- Crossing and Route Volumes – This is the total volume loaded on each crossing for the modeling period. Volumes are also reported for the connecting routes from a plaza to the interstate highway system.
- Diversion Due to Disruption – This is the systemwide difference of international vehicle VMT and VHT from the base No Action alternative with the Ambassador Bridge link removed from the computer model runs.

5. Presentation of Modeling Results

Table 1 presents differences in VMT and VHT with the addition of a new crossing (Sections 1 and 2). For alternatives with multiple crossing options, a range of values is provided. Also provided are the systemwide VMT and VHT with a new crossing added to the network but the Ambassador Bridge link removed (Section 3). Table 2 provides total two-way international volumes and the maximum directional V/C ratios for selected links in the network for each new crossing system. Figure 7 identifies the location of these links.

The following discussion of regional mobility is by area. The study area has been broken down into four smaller areas: downriver, central, I-75/I-96, and Belle Isle. Comparisons are only of the alternatives in that area. A comparison of all routes is presented at the end of this section of this report.

Downriver Area

Regional Analysis – Each Downriver Area crossing system would be associated with a savings in vehicle miles of travel in the year 2035 peak afternoon traffic hour compared to the No Action condition (where just the Ambassador Bridge and the Detroit-Windsor Tunnel are available crossings in the Detroit River area). Those reductions are typically less than one-half percent. On the other hand, peak vehicle hour savings range from 2.5 to 3 percent compared to the No Action condition. In terms of cost (not calculated here), vehicle hours will have a more significant effect on the overall efficiency of the transportation system for commerce and industry.

Another measure of regional travel change is the effect associated with the potential closure of the Ambassador Bridge while a new crossing is in operation. As can be seen from the data in Table 1/Section 3, all routes in the Downriver Area connected to Plazas S-1, S-2, S-3 or S-4 would be associated with an increase in 2035 PM peak hour international travel of about 10,000 vehicle miles or more, if the Ambassador Bridge were closed. Routes connected to Plaza S-5 are associated with almost 6,000 additional vehicle miles of travel if the Ambassador Bridge were closed. All Downriver Area crossing systems, except the S-5/Southfield Road connection, are expected to experience an increase in VHT, if the Ambassador Bridge were closed.

Table 3 illustrates that the Detroit-Windsor Tunnel would experience a 65 percent increase in traffic compared to the No Action Alternative if the Ambassador Bridge were closed; the volume-to-capacity ratio (V/C) would rise from 0.94 under No Action to 1.45. In other words, closing the Ambassador Bridge with a Downriver crossing in place would divert more traffic to the Detroit-Windsor Tunnel than the new crossing (demonstrated by O ovals around red numbers). The data in Table 3 also show if the Detroit-Windsor Tunnel were closed, the Ambassador Bridge would absorb more traffic and congestion than a new crossing Downriver compared to the No Action condition (demonstrated by ☐ boxes around red numbers). In doing so, the additional traffic would cause the capacity of the bridge to be exceeded. The delay on the Ambassador Bridge resulting from the congestion would not be great enough for the traffic to divert to a distant downriver alternative.

Link-by-Link Analysis – The analysis of those links listed in Table 2 and Figure 7 indicate the Downriver Area crossing systems would help reduce the traffic on the Ambassador Bridge and the Detroit-Windsor Tunnel and thereby reduce their expected peak hour congestion. However, the data also indicate that all the Downriver Area crossing systems, with the exception of S-5, would only carry about one lane of traffic in the peak direction during the 2035 PM peak hour. The DRIC Study concept is for a six-lane

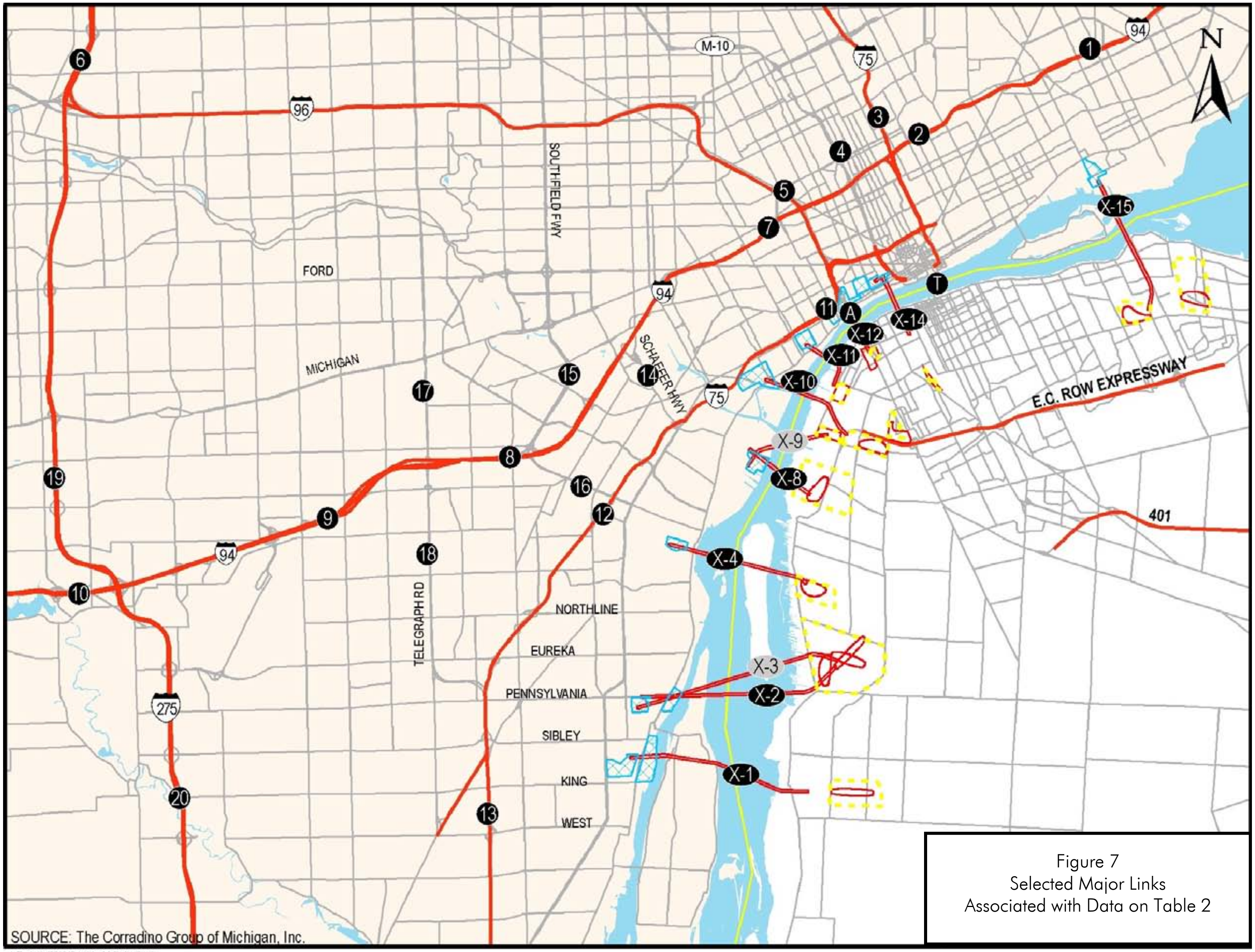


Figure 7
Selected Major Links
Associated with Data on Table 2

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Table 1
DRIC Traffic Analysis Report
Measures of Effectiveness

Measure of Effectiveness	Description/Units	Downriver Crossing Systems									
		S1	S1	S2	S2	S3		S3		S3	
		King/I-75 (X1)	King/I-275 (X1)	King/I-75 (X1)	King/I-275 (X1)	Penn/I-75 (X2, X3)		Eureka/I-75 (X2, X3)		Eureka/I-275 (X2, X3)	
1. VMT (int'l traffic only, PM Peak Hour for 2035)	No Action	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636		1,089,636		1,089,636	
	With New Crossing	1,086,266	1,086,489	1,086,271	1,086,502	1,083,738	1,084,774	1,084,565	1,085,504	1,084,428	1,085,365
	Difference from 2035 - No Action	-3,370	-3,147	-3,365	-3,134	-5,898	-4,862	-5,071	-4,132	-5,208	-4,271
	Percent Difference	-0.31%	-0.29%	-0.31%	-0.29%	-0.54%	-0.45%	-0.47%	-0.38%	-0.48%	-0.39%
2. VHT (int'l traffic only, PM Peak Hour for 2035)	No Action	22,113	22,113	22,113	22,113	22,113		22,113		22,113	
	With New Crossing	21,633	21,533	21,621	21,529	21,554	21,584	21,574	21,608	21,484	21,522
	Difference from 2035 - No Action	-480	-580	-492	-584	-559	-529	-539	-505	-629	-591
	Percent Difference	-2.17%	-2.62%	-2.22%	-2.64%	-2.53%	-2.39%	-2.44%	-2.28%	-2.85%	-2.67%
3. Diversion due to disruption at crossing	Difference of Int'l VMT with Amb Br. Closed and New Crossing Open	17,472	17,455	16,875	16,990	10,187	12,030	12,334	14,036	11,218	12,777
	Difference of Int'l VHT with Amb Br. Closed and New Crossing Open	758	559	737	532	366	436	379	433	212	288

Measure of Effectiveness	Description/Units	Downriver Crossing Systems										
		S4		S4		S4		S5	S5	S5	S5	S5
		Penn/I-75 (X2, X3)		Eureka/I-75 (X2, X3)		Eureka/I-275 (X2, X3)		Moran/I-75 (X4)	Dix South/ I-75 (X4)	Dix North/ I-75 (X4)	Southfield/ I-75 (X4)	Southfield/ I-94 (X4)
1. VMT (int'l traffic only, PM Peak Hour for 2035)	No Action	1,089,636		1,089,636		1,089,636		1,089,636	1,089,636	1,089,636	1,089,636	1,089,636
	With New Crossing	1,083,739	1,084,650	1,084,324	1,085,195	1,084,152	1,085,082	1,084,061	1,083,958	1,083,966	1,084,374	1,084,337
	Difference from 2035 - No Action	-5,897	-4,986	-5,312	-4,441	-5,484	-4,554	-5,575	-5,678	-5,670	-5,262	-5,299
	Percent Difference	-0.54%	-0.46%	-0.49%	-0.41%	-0.50%	-0.42%	-0.51%	-0.52%	-0.52%	-0.48%	-0.49%
2. VHT (int'l traffic only, PM Peak Hour for 2035)	No Action	22,113		22,113		22,113		22,113	22,113	22,113	22,113	22,113
	With New Crossing	21,548	21,568	21,566	21,597	21,477	21,504	21,541	21,516	21,516	21,514	21,457
	Difference from 2035 - No Action	-565	-545	-547	-516	-636	-609	-572	-597	-597	-599	-656
	Percent Difference	-2.55%	-2.47%	-2.47%	-2.33%	-2.88%	-2.75%	-2.59%	-2.70%	-2.70%	-2.71%	-2.97%
3. Diversion due to disruption at crossing	Difference of Int'l VMT with Amb Br. Closed and New Crossing Open	9,195	11,032	10,587	12,249	9,919	11,610	6,645	6,092	6,107	5,870	5,646
	Difference of Int'l VHT with Amb Br. Closed and New Crossing Open	332	407	325	399	179	257	95	45	50	-13	-107

Table 1 (continued)
DRIC Traffic Analysis Report
Measures of Effectiveness

Measure of Effectiveness	Description/Units	Central Area Crossing Systems													
		C1		C1		C1		C1		C2		C2		C2	
		Southfield/ I-75 (X5, X6, X7)		Southfield/I-94 (X5, X6, X7)		Outer/I-75 (X5, X6, X7)		Outer/I-94 (X5, X6, X7)		Schaefer South/I-75 (X8, X9)		Schaefer South/I-94 (X8, X9)		Schaefer North/I-75 (X8, X9)	
1. VMT (int'l traffic only, PM Peak Hour for 2035)	No Action	1,089,636		1,089,636		1,089,636		1,089,636		1,089,636		1,089,636		1,089,636	
	With New Crossing	1,082,050	1,087,943	1,082,276	1,087,935	1,083,753	1,088,940	1,083,561	1,088,794	1,084,651	1,085,257	1,085,500	1,085,734	1,084,980	1,085,532
	Difference from 2035 - No Action	-7,586	-1,693	-7,360	-1,701	-5,883	-696	-6,075	-842	-4,985	-4,379	-4,136	-3,902	-4,656	-4,104
	Percent Difference	-0.70%	-0.16%	-0.68%	-0.16%	-0.54%	-0.06%	-0.56%	-0.08%	-0.46%	-0.40%	-0.38%	-0.36%	-0.43%	-0.38%
2. VHT (int'l traffic only, PM Peak Hour for 2035)	No Action	22,113		22,113		22,113		22,113		22,113		22,113		22,113	
	With New Crossing	21,463	21,613	21,386	21,555	21,455	21,597	21,404	21,572	21,444	21,417	21,415	21,383	21,447	21,429
	Difference from 2035 - No Action	-650	-500	-727	-558	-658	-516	-709	-541	-669	-697	-698	-730	-666	-684
	Percent Difference	-2.94%	-2.26%	-3.29%	-2.52%	-2.97%	-2.33%	-3.21%	-2.45%	-3.03%	-3.15%	-3.16%	-3.30%	-3.01%	-3.09%
3. Diversion due to disruption at crossing	Difference of Int'l VMT with Amb Br. Closed and New Crossing Open	935	13,706	587	13,238	2,114	13,476	1,525	13,118	2,345	968	2,319	858	2,970	1,724
	Difference of Int'l VHT with Amb Br. Closed and New Crossing Open	-249	221	-360	113	-305	178	-347	108	-431	-436	-492	-486	-420	-416

Measure of Effectiveness	Description/Units	Central Area Crossing Systems							I-75/I-96 Area Crossing Systems					Belle Isle Area Crossing Systems	
		C2		C2		C3	C3	C4	II1	II2	II2	II3	II4	N1	N1
		Schaefer North/I-75 (X8, X9)		Schaefer North/I-94 (X8, X9)		Dearborn/I-75 (X10)	Springwells/ I-75 (X10)	Dragoon/I-75 (X11)	Rail line/I-75 (X13)	Rail line/I-75 (X13)	Lafayette/ M-10 (X14)	Lafayette/ M-10 (X14)	Gateway/I-75 (X12)	St.Jean/I-94 (X15)	Conner/I-94 (X15)
1. VMT (int'l traffic only, PM Peak Hour for 2035)	No Action	1,089,636		1,089,636		1,089,636	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636	1,089,636
	With New Crossing	1,084,980	1,085,532	1,085,823	1,085,936	1,087,503	1,088,365	1,089,045	1,088,426	1,088,121	1,088,719	1,089,075	1,091,580	1,091,683	1,091,674
	Difference from 2035 - No Action	-4,656	-4,104	-3,813	-3,700	-2,133	-1,271	-591	-1,210	-1,515	-917	-561	1,944	2,047	2,038
	Percent Difference	-0.43%	-0.38%	-0.35%	-0.34%	-0.20%	-0.12%	-0.05%	-0.11%	-0.14%	-0.08%	-0.05%	0.18%	0.19%	0.19%
2. VHT (int'l traffic only, PM Peak Hour for 2035)	No Action	22,113		22,113		22,113	22,113	22,113	22,113	22,113	22,113	22,113	22,113	22,113	22,113
	With New Crossing	21,447	21,429	21,407	21,400	21,424	21,425	21,371	21,864	21,827	21,343	21,340	21,396	21,509	21,509
	Difference from 2035 - No Action	-666	-684	-706	-713	-689	-688	-742	-249	-286	-770	-773	-717	-604	-604
	Percent Difference	-3.01%	-3.09%	-3.19%	-3.23%	-3.11%	-3.11%	-3.36%	-1.13%	-1.29%	-3.48%	-3.50%	-3.24%	-2.73%	-2.73%
3. Diversion due to disruption at crossing	Difference of Int'l VMT with Amb Br. Closed and New Crossing Open	2,970	1,724	-209	858	1,416	1,339	-23	-1,504	-1,728	1,311	1,185	1,701	13,372	13,401
	Difference of Int'l VHT with Amb Br. Closed and New Crossing Open	-420	-416	-527	-486	-549	-557	-709	9,074	8,390	-663	-667	-712	-160	-154

Table 2
DRIC Traffic Analysis Report
International Traffic Volume and Maximum Volume over Capacity (V/C) Ratios for Key Regional Links

2035 PM Peak Hour		No Action (A0) Int'l Volume	No Action (A0) Max V/C	Downriver Area Crossing Systems: S1 (A1) Int'l Volume	S1 (A1) Max V/C	S2 (A2) Int'l Volume	S2 (A2) Max V/C	S3 (A7) Int'l Volume	S3 (A7) Max V/C	S4 (A8) Int'l Volume	S4 (A8) Max V/C	S5 (A14) Int'l Volume	S5 (A14) Max V/C	Central Area Crossing Systems: C1 (A18c) Int'l Volume	C1 (A18c) Max V/C	C2 (A20a) Int'l Volume	C2 (A20a) Max V/C
N	New Crossing	#N/A	#N/A	1,397	0.34	1,419	0.34	1,602	0.38	1,630	0.38	1,923	0.44	2,372	0.52	2,575	0.56
A	Ambassador Bridge	3,694	1.12	2,708	0.98	2,692	0.97	2,588	0.94	2,566	0.94	2,358	0.85	2,016	0.75	1,850	0.64
T	Detroit River Tunnel	1,914	1.12	1,711	0.94	1,708	0.94	1,667	0.91	1,661	0.91	1,579	0.86	1,470	0.81	1,424	0.78
1	I-94 east of Conner	624	0.90	557	0.89	555	0.89	545	0.89	544	0.89	542	0.89	545	0.89	548	0.89
2	I-94 east of I-75	682	1.00	628	1.00	627	1.00	616	1.00	613	1.00	628	1.00	631	1.00	634	1.00
3	I-75 north of I-94	926	0.81	918	0.81	917	0.81	927	0.81	927	0.81	908	0.81	899	0.81	889	0.81
4	M-10 north of I-94	410	0.60	392	0.60	394	0.60	363	0.59	362	0.59	317	0.58	313	0.59	303	0.58
5	I-96 west of I-94	1,020	0.62	845	0.61	841	0.61	800	0.61	796	0.61	722	0.61	560	0.60	646	0.60
6	I-96 west of I-275	18	0.95	39	0.95	39	0.95	44	0.95	45	0.95	25	0.95	25	0.95	26	0.95
7	I-94 west of I-96	195	0.88	183	0.87	182	0.87	157	0.88	156	0.88	92	0.88	75	0.87	115	0.87
8	I-94 west of Southfield	527	0.80	197	0.77	196	0.77	160	0.75	160	0.75	936	0.84	371	0.82	818	0.80
9	I-94 east of Middlebelt	457	0.99	147	0.96	146	0.96	118	0.91	117	0.91	794	1.00	728	1.00	744	0.99
10	I-94 west of I-275	385	1.00	598	1.02	601	1.02	661	1.04	663	1.04	691	1.01	638	1.01	652	1.00
11	I-75 south of Ambassador	1,759	0.91	803	0.76	790	0.76	734	0.75	720	0.75	793	0.74	491	0.70	742	0.71
12	I-75 south of Southfield	1,025	0.97	481	0.96	472	0.96	458	0.97	445	0.97	1,014	1.00	1,010	0.98	1,032	0.98
13	I-75 south of King	939	0.99	1,029	1.02	1,023	1.00	933	0.99	887	0.98	939	0.99	935	0.99	948	0.99
14	Schaefer east of I-94	6	0.58	9	0.58	9	0.58	9	0.59	10	0.59	7	0.49	24	0.62	0	0.32
15	Southfield north of I-94	1	0.83	6	0.83	6	0.83	11	0.84	11	0.84	158	0.87	455	0.93	130	0.85
16	Southfield south of I-94	52	0.89	44	0.90	43	0.90	38	0.87	32	0.87	23	0.69	32	0.73	102	0.88
17	Telegraph north of I-94	0	0.66	9	0.66	9	0.66	8	0.66	6	0.66	9	0.64	0	0.66	1	0.66
18	Telegraph south of I-94	3	0.80	30	0.76	29	0.76	26	0.76	23	0.76	3	0.77	2	0.78	3	0.80
19	I-275 north of I-94	10	0.75	57	0.75	58	0.75	85	0.75	87	0.75	38	0.75	26	0.75	30	0.75
20	I-275 south of King	8	0.75	14	0.78	14	0.78	14	0.79	14	0.79	9	0.74	9	0.75	8	0.74

2035 PM Peak Hour		No Action (A0) Int'l Volume	No Action (A0) Max V/C	Central Area Crossing Systems: C3 (A24) Int'l Volume	C3 (A24) Max V/C	C4 (A26) Int'l Volume	C4 (A26) Max V/C	I-75/I-96 Area Crossing Systems: II1 (A28) Int'l Volume	II1 (A28) Max V/C	II2 (A30) Int'l Volume	II2 (A30) Max V/C	II3 (A31) Int'l Volume	II3 (A31) Max V/C	II4 (A27) Int'l Volume	II4 (A27) Max V/C	Belle Isle Area Crossing Systems: N1 (A32) Int'l Volume	N1 (A32) Max V/C
N	New Crossing	#N/A	#N/A	2,676	0.56	3,937	0.77	601	0.78	3,614	0.70	3,697	0.71	4,494	0.80	1,980	0.37
A	Ambassador Bridge	3,694	1.12	1,736	0.59	628	0.22	3,311	1.10	1,154	0.40	1,082	0.36	149	0.12	2,484	0.78
T	Detroit River Tunnel	1,914	1.12	1,402	0.77	1,251	0.70	1,825	1.02	1,039	0.57	1,028	0.57	1,145	0.66	1,254	0.72
1	I-94 east of Conner	624	0.90	559	0.89	562	0.89	591	0.90	578	0.89	579	0.89	574	0.89	665	0.87
2	I-94 east of I-75	682	1.00	620	1.00	639	0.99	654	1.00	685	0.99	690	1.00	649	0.99	1,223	1.00
3	I-75 north of I-94	926	0.81	893	0.81	885	0.81	914	0.81	899	0.81	903	0.81	903	0.81	796	0.81
4	M-10 north of I-94	410	0.60	372	0.60	338	0.58	398	0.60	689	0.64	716	0.64	348	0.59	469	0.62
5	I-96 west of I-94	1,020	0.62	764	0.62	870	0.62	1,114	0.62	879	0.62	851	0.62	1,140	0.62	899	0.62
6	I-96 west of I-275	18	0.95	24	0.95	23	0.95	20	0.96	19	0.95	19	0.95	22	0.95	20	0.95
7	I-94 west of I-96	195	0.88	76	0.87	66	0.86	218	0.89	305	0.89	412	0.90	75	0.87	366	0.89
8	I-94 west of Southfield	527	0.80	630	0.81	609	0.81	515	0.80	496	0.80	516	0.80	523	0.81	532	0.80
9	I-94 east of Middlebelt	457	0.99	680	0.99	654	0.99	445	0.99	441	0.99	439	0.99	496	0.99	458	0.99
10	I-94 west of I-275	385	1.00	592	1.00	578	1.00	373	1.00	370	1.00	367	1.00	422	1.00	386	1.00
11	I-75 south of Ambassador	1,759	0.91	808	0.70	1,967	0.77	1,581	0.87	732	0.77	742	0.78	2,146	1.01	1,469	0.87
12	I-75 south of Southfield	1,025	0.97	1,040	0.98	1,037	0.97	1,031	0.97	1,032	0.97	1,031	0.98	1,035	0.97	1,025	0.97
13	I-75 south of King	939	0.99	953	0.99	950	0.99	945	0.99	947	0.99	946	0.99	948	0.99	940	0.99
14	Schaefer east of I-94	6	0.58	8	0.61	7	0.61	2	0.57	1	0.57	1	0.57	7	0.61	3	0.57
15	Southfield north of I-94	1	0.83	13	0.82	1	0.82	1	0.83	1	0.83	1	0.84	1	0.83	1	0.83
16	Southfield south of I-94	52	0.89	206	0.91	204	0.91	56	0.89	74	0.90	49	0.89	96	0.90	49	0.89
17	Telegraph north of I-94	0	0.66	0	0.66	0	0.66	0	0.66	0	0.66	0	0.66	0	0.66	0	0.66
18	Telegraph south of I-94	3	0.80	1	0.81	1	0.81	2	0.81	2	0.80	2	0.80	1	0.81	3	0.80
19	I-275 north of I-94	10	0.75	27	0.75	15	0.75	10	0.75	9	0.75	9	0.75	13	0.75	10	0.75
20	I-275 south of King	8	0.75	8	0.75	8	0.75	8	0.75	8	0.75	8	0.75	7	0.75	8	0.75

Note: Model runs were made for multiple combinations of plaza, crossing and interchange components. Labels in parentheses ((A1),(A2), etc.) correspond to the specific model alternative presented.

Table 3
DRIC Traffic Analysis Report
Impact of Closing Ambassador Bridge or the Detroit-Windsor Tunnel

All Crossings Open

Crossing	No Action		New Crossing Downriver			New Crossing in Central Area			New Crossing in I-75/I-96 Area			New Crossing in Belle Isle Area		
	Total Volume	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**
NEW	No Action		S3/X3	1,419	0.34	C4/X11	3,937	0.77	II3/X14	3,697	0.71	N1/X15	1,980	0.37
AMB	3,694	1.12	AMB	2,692	0.97	AMB	628	0.22	AMB	1,082	0.36	AMB	2,484	0.78
DWT	1,914	1.12	DWT	1,708	0.94	DWT	$\boxed{1,251}$	$\boxed{0.70}$	DWT	1,028	0.57	DWT	1,254	0.72

Ambassador Bridge Closed

Crossing	No Action		New Crossing Downriver			New Crossing in Central Area			New Crossing in I-75/I-96 Area			New Crossing in Belle Isle Area		
	Total Volume	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**
NEW	No Action		S3/X3	2,982	0.65	C4/X11	4,380	0.82	II3/X14	4,430	0.83	N1/X15	3,355	0.68
AMB	Closed		AMB	Closed		AMB	Closed		AMB	Closed		AMB	Closed	
DWT	4,619	2.46	DWT	2,829	1.45	DWT	$\boxed{1,440}$	$\boxed{0.79}$	DWT	1,376	0.73	DWT	2,312	1.19

Detroit-Windsor Tunnel Closed

Crossing	No Action		New Crossing Downriver			New Crossing in Central Area			New Crossing in I-75/I-96 Area			New Crossing in Belle Isle Area		
	Total Volume	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**	**Crossing**	**Total Volume**	**V/C**
NEW	No Action		S3/X3	2,051	0.46	C4/X11	4,272	0.81	II3/X14	4,121	0.76	N1/X15	2,414	0.45
AMB	5,574	1.911	AMB	$\boxed{3,784}$	$\boxed{1.41}$	AMB	$\boxed{1,527}$	$\boxed{0.59}$	AMB	$\boxed{1,671}$	$\boxed{0.61}$	AMB	$\boxed{3280}$	$\boxed{1.01}$
DWT	Closed		DWT	Closed		DWT	Closed		DWT	Closed		DWT	Closed	

Source: The Corradino Group of Michigan

connecting road facility (three in each direction) to accommodate traffic in the 30-year horizon, and beyond.

Another important characteristic to examine is the traffic change at locations throughout the freeway system (Table 2 and Figure 7). The only significant difference from the No Action condition would occur at I-75 south of the Ambassador Bridge (Point 11). A new Downriver crossing would draw enough traffic to reduce the expected congestion in 2035 at that location from a volume-to-capacity ratio of over 90 percent to one of approximately 75 percent. This would be caused largely by the shift in the international trucks using I-75 to travel to and from areas south of the DRIC study area.

<u>Central Area</u>

Regional Analysis – The routes in the Central Area have the ability to reduce vehicle miles of international travel by less than one-half percent compared to the No Action condition. They have the potential of reducing by 2.5 to 3.5 percent the vehicle hours of international travel in the 2035 afternoon peak hour. If the Ambassador Bridge were closed, the amount of vehicle hours of travel would range from an increase of 221 hours to a decrease of 709 hours, depending upon the alternative.

Table 3 indicates if the Ambassador Bridge were closed, the Detroit-Windsor Tunnel would experience a 15 percent increase in traffic compared to the No Action condition (demonstrated by ☐ rectangles around blue numbers). More of the traffic from the "closed" Ambassador Bridge would divert to the new crossing. If the Detroit-Windsor Tunnel were closed and a Central Area crossing were in place, the majority of the diverted 2035 PM peak hour traffic would use the Ambassador Bridge rather than the proposed new crossing (demonstrated by ☐ boxes around blue numbers). The increased traffic on each crossing would not cause its capacity to be exceeded, as measured by the volume-to-capacity ratio.

Link-by-Link Analysis – The data in Table 2 indicate that the crossings in the Central Area would attract significant traffic from the existing river crossings, thus reducing congestion on them. In particular, the C4/X-11 crossing proves to be a much faster route between I-75 (particularly to/from the south) and Canadian Highway 401. This is largely due to the introduction of direct freeway access between Highway 401 and the proposed new crossing. As a result, the Ambassador Bridge would lose almost all I-75 traffic south of the crossing area, (particularly truck traffic), and a substantial portion of traffic arriving from I-96 and I-75 north of the crossing area. Future refinement of the Practical Alternatives, including plaza configuration and its interchange connection to I-75, will address the balance between a proposed new crossing and the Ambassador Bridge. These results represent a direct although simplistic comparison with the other Illustrative Alternatives.

For all central area crossing alternatives, the new crossing would require at least two lanes in the peak direction in the 2035 peak hour. The system associated with the Plaza C-4, with a connection to I-75 at Dragoon, would have the most significant effect of reducing traffic on the existing border crossing facilities.

All Central Area alternatives have the ability to reduce peak-direction congestion in the area of I-75 south of the Ambassador Bridge by 15 to 20 percent.[2] Another interesting effect with a new

[2] While total <u>two-way</u> international volume increases on I-75 south of Ambassador Bridge for Alternative C-4, the actual <u>peak direction</u> volume-to-capacity ratio (Max V/C) is lower, when compared to the No Action Alternative.

connection paralleling Schafer Road to I-94 is the reduction of thru trips on Schaefer Road. In these alternatives, the concept of building the freeway connection from the plaza to I-75, and then on to I-94, would leave Schaefer Road freed up to accommodate non-international/local traffic, such as that associated with activities at the Ford Rouge Plant.

I-75/I-96 Area

Regional Analysis – The connection of Plazas II-2 and II-3 to the Lodge Freeway and II-4 to I-75 would experience savings of between 3 to 3.5 percent in vehicle hours of international travel in the 2035 afternoon peak hour. However, the DRTP two-lane truck tunnel (one lane in each direction) to either Plaza II-1 or II-2 with a connection to I-75 via an existing rail right-of-way would save virtually no vehicle miles of travel and only about one percent of vehicle hours of travel in the 2035 afternoon peak. Additionally, these alternatives would not be able to accommodate the future (2035) international afternoon peak hour, if the Ambassador Bridge were closed. In that case, almost 9,000 vehicle hours of additional travel in the peak hour would be experienced if the Ambassador Bridge were closed and the diverted traffic had to be accommodated by a connecting route limited to one lane in each direction. This would not be the case with the route connections of Plazas II-2 and II-3 to the Lodge Freeway or the connection of Plaza II-4 to I-75. Each of these alternatives would contribute to the savings of 600 to 700 vehicle hours of travel, if the Ambassador Bridge were closed.

Table 3 indicates, if the Ambassador Bridge were closed, the Detroit-Windsor Tunnel would experience a 34 percent increase in traffic compared to the No Action conditions (demonstrated by O ovals around green numbers). More of the traffic from the "closed" Ambassador Bridge would divert to the new crossing than to the tunnel. If the Detroit-Windsor Tunnel were closed and a new crossing were available in the I-75/I-96 Area, the majority of the diverted 2035 PM peak hour traffic would use the Ambassador Bridge rather than the new proposed crossing (☐ boxes around green numbers). The increased traffic on each crossing would not cause its capacity to be exceeded, as measured by the volume-to-capacity ratio.

Link-by-Link Analysis – The inability of the connection of Plaza II-1 to I-75 to accommodate future traffic is also demonstrated by data on Table 2. Specifically, the II-1 alternative, which is the Detroit River Tunnel Partnership's truck tunnel proposal, would not provide a competitive alternative to the present Ambassador Bridge in terms of time or capacity. Therefore the DRTP proposal would not draw a significant amount of international traffic from the Ambassador Bridge. The Ambassador Bridge's congestion (V/C) in 2035 is virtually unaffected by the DRTP proposal. There would also be very little change in the Detroit-Windsor Tunnel's congestion. Likewise, the DRTP proposal would have little positive effect on the freeway system, including I-75 south of the Ambassador Bridge. The other connecting routes in the I-75/I-96 Area reduce congestion on the Ambassador Bridge. All other routes except for the II-4 route would have some positive effect on I-75 south of the Ambassador Bridge.

Table 2 shows that Alternative II-4, which is a second span of the Ambassador Bridge, would take most of the traffic from the original Bridge. This is because the proposed crossing has greater capacity and shorter crossing times than the present configuration for the Ambassador Bridge. Future refinement of the Practical Alternatives, including plaza configuration and its interchange connection to I-75, will address the balance between a proposed new crossing and the Ambassador Bridge. Again, these results represent a direct although simplistic comparison with the other Illustrative Alternatives.

Belle Isle Area

Regional Analysis – The Belle Isle connecting routes would experience virtually no change in vehicle miles of travel for international traffic in the 2035 afternoon peak, compared to the No Action condition, whether St. Jean or Conner were used. The savings would be about 2.7 percent in vehicle hours of travel, which is among the lowest for all crossing systems analyzed. Under the condition that the Ambassador Bridge is shut for an extended period of time, the Belle Isle Area route connections would not effectively serve the diverted travel, as typified by an increase of over 13,000 VMT experienced by the diverted traffic.

Table 3 indicates, if the Ambassador Bridge were closed, the Detroit-Windsor Tunnel would experience almost a doubling of traffic compared to the No Action condition (demonstrated by O ovals around orange numbers). Despite this, the majority of the diverted traffic from the "closed" Ambassador Bridge would go to the new crossing. If the Detroit-Windsor Tunnel were closed and a new crossing were available in the Belle Isle Area, the majority of the diverted 2035 PM peak hour traffic would use the Ambassador Bridge rather than the new proposed crossing (demonstrated by □ boxes around orange numbers). The increased traffic on the new crossing would not cause its capacity to be exceeded. It would cause the capacity of the Ambassador Bridge to be reached, as measured by the volume-to-capacity ratio.

Link-by-Link Analysis – The link-by-link data for the Belle Isle crossing system, including connecting route, indicate it would have a positive effect on relieving congestion on the Ambassador Bridge and the Detroit-Windsor Tunnel under normal conditions. However, it would have no significant effect on I-75 or other freeways in the area except I-94. I-94 in the vicinity of the new crossing will be improved by 2035 from today's conditions and would not be significantly affected by the shift of the international traffic.

Overall Results

Overall, model results indicate that the DRTP proposal does not address the regional mobility needs of the project. The performances of river crossing systems in the Downriver and Belle Isle Areas are clearly lower than crossing systems in the area from Plaza C-1 to the Lodge Freeway at Plaza II-3.

6. Conclusions

The intent of modeling travel demand for the Illustrative Alternatives Evaluation was to perform fundamental comparisons of a wide range of alternatives that, as previously stated, all meet the capacity needs as a crossing system (except the DRTP proposal), but may affect the regional network differently. The modeling at this stage was simplified to ensure consistency with this intention.

Considered together, the results of all travel demand modeling runs demonstrate that any new link in the crossing system will improve the efficiency of the regional highway network in terms of VMT and VHT. Further, efficiency of the highway network system increases as the crossing link moves closer to the core of the network, due to closer proximity to access points of all major roadway facilities. This indicates that while international trucks with southern destinations may gain the most benefit from a southern crossing, such a crossing does not best serve the majority of international traffic. The lower performance of the DRTP alternative suggests that capacity is more important than location in addressing regional mobility. A new six-lane facility provides more than enough crossing capacity to meet crossing demand for the 2035 PM peak hour.

The travel demand modeling also illustrates that a new crossing in close proximity to the existing crossings, both the Ambassador Bridge and the Detroit-Windsor Tunnel, will divert the most traffic from them, as the model recognizes the increasing utility of a faster, higher-capacity crossing.

The model results also reinforce the fact that domestic volume on the major regional facilities far exceeds international traffic, and outside of a few specific links on I-75, total volumes and V/C ratios will not be significantly affected by the location of a new crossing.

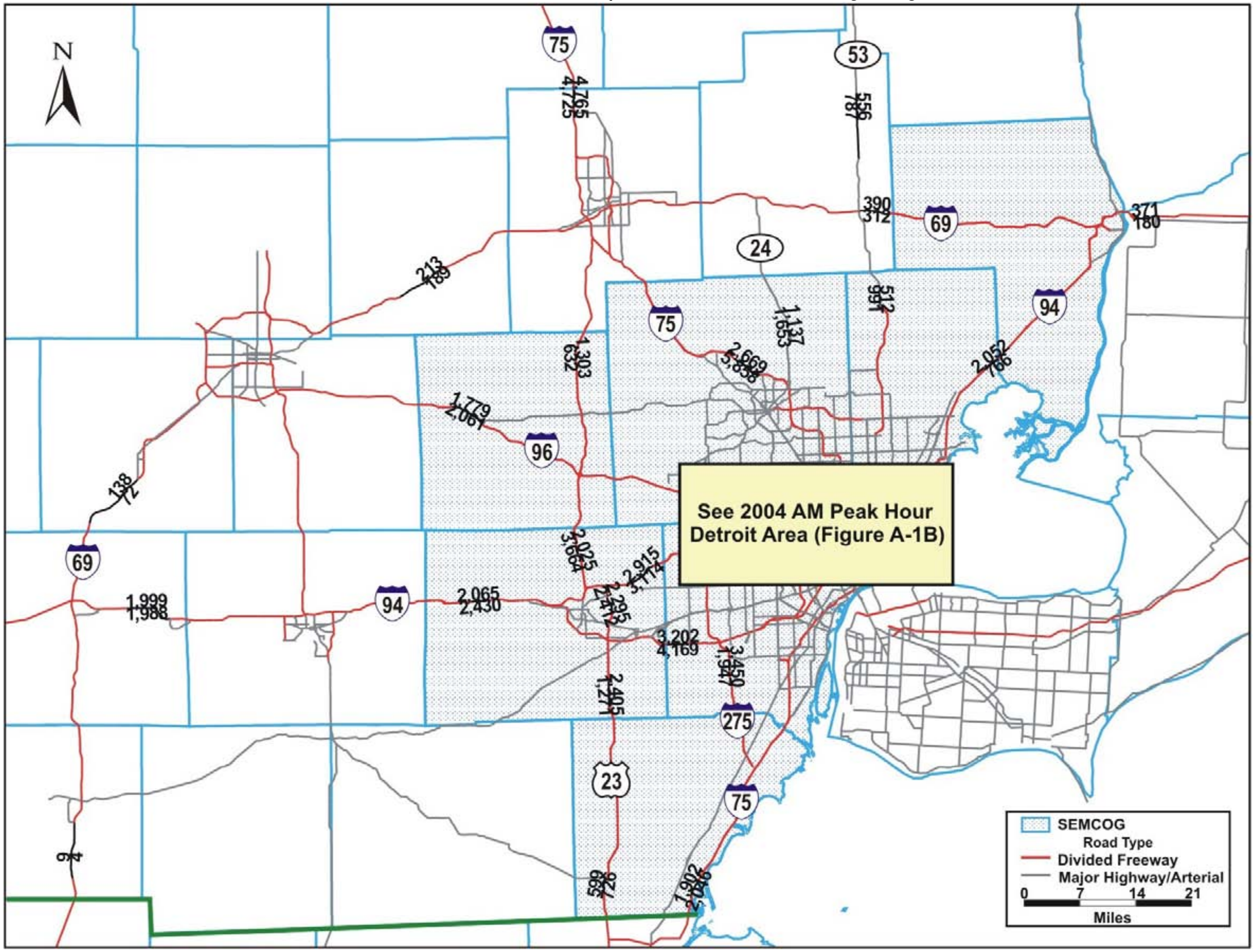
Appendix A

2004 and 2035 PM Peak Hour Base Volumes

(Additional Detailed International Volumes are available on CD by Request.)

Figure A-1A

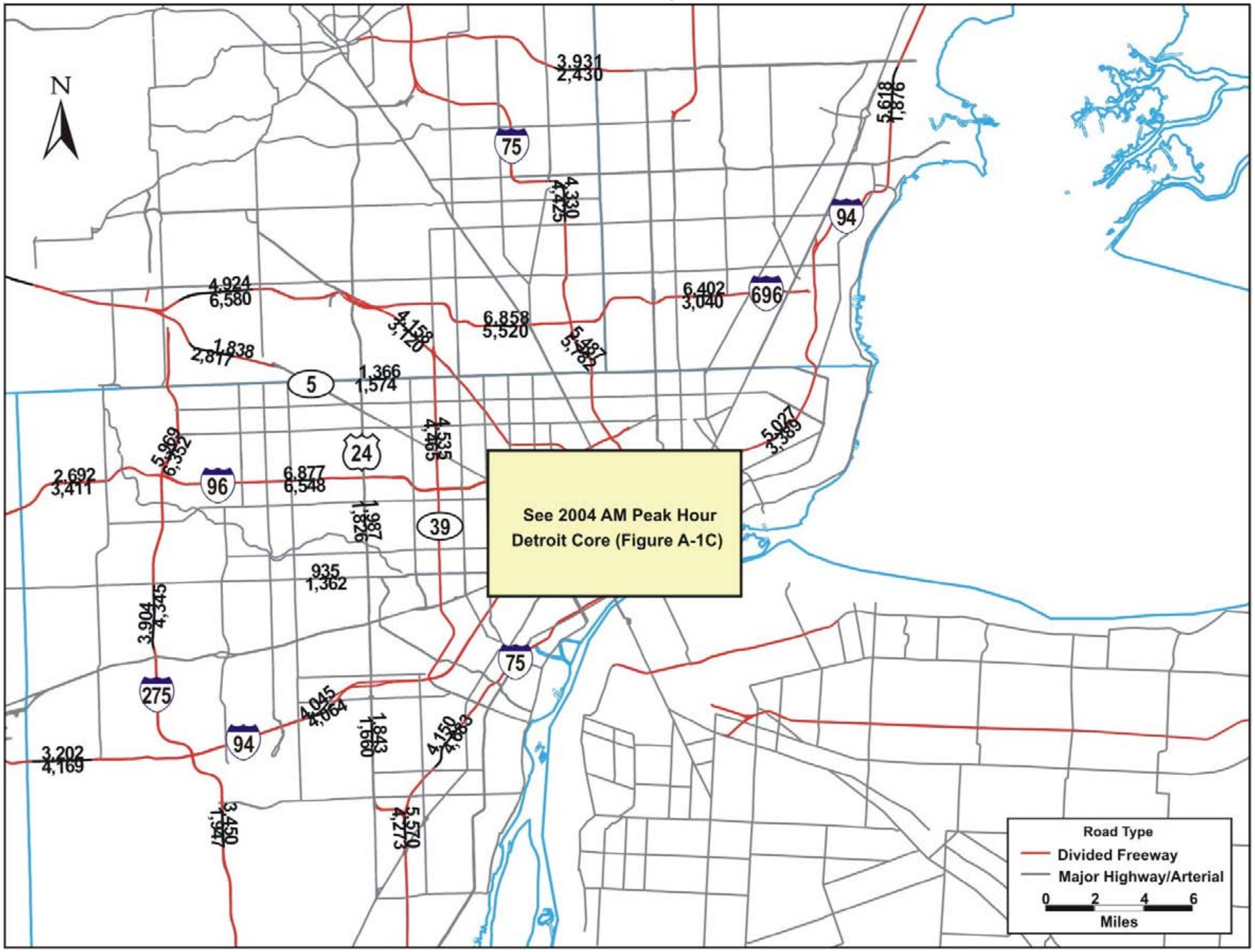
2004 AM Peak Hour Total Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

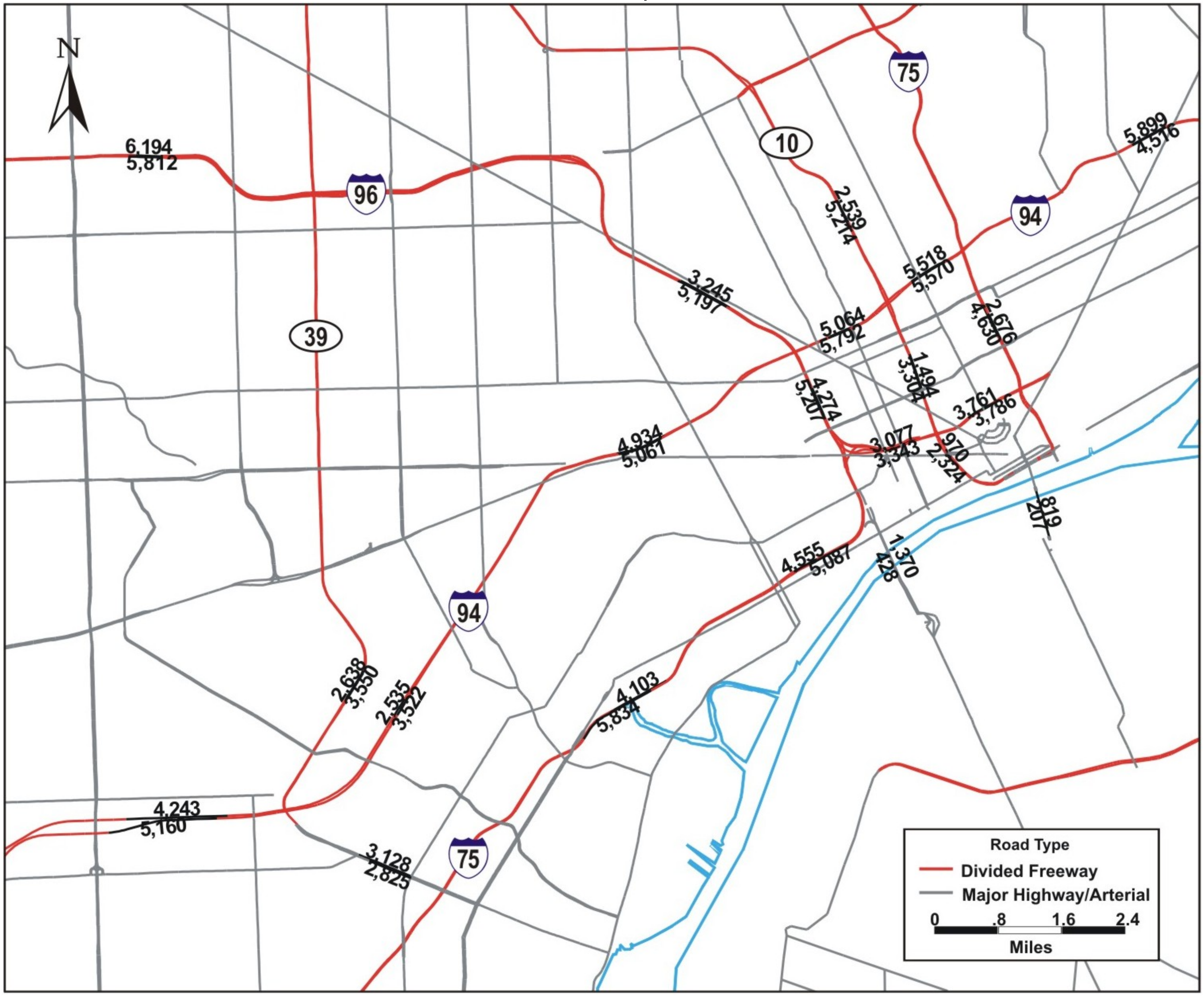
Figure A-1B

2004 AM Peak Hour Total Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

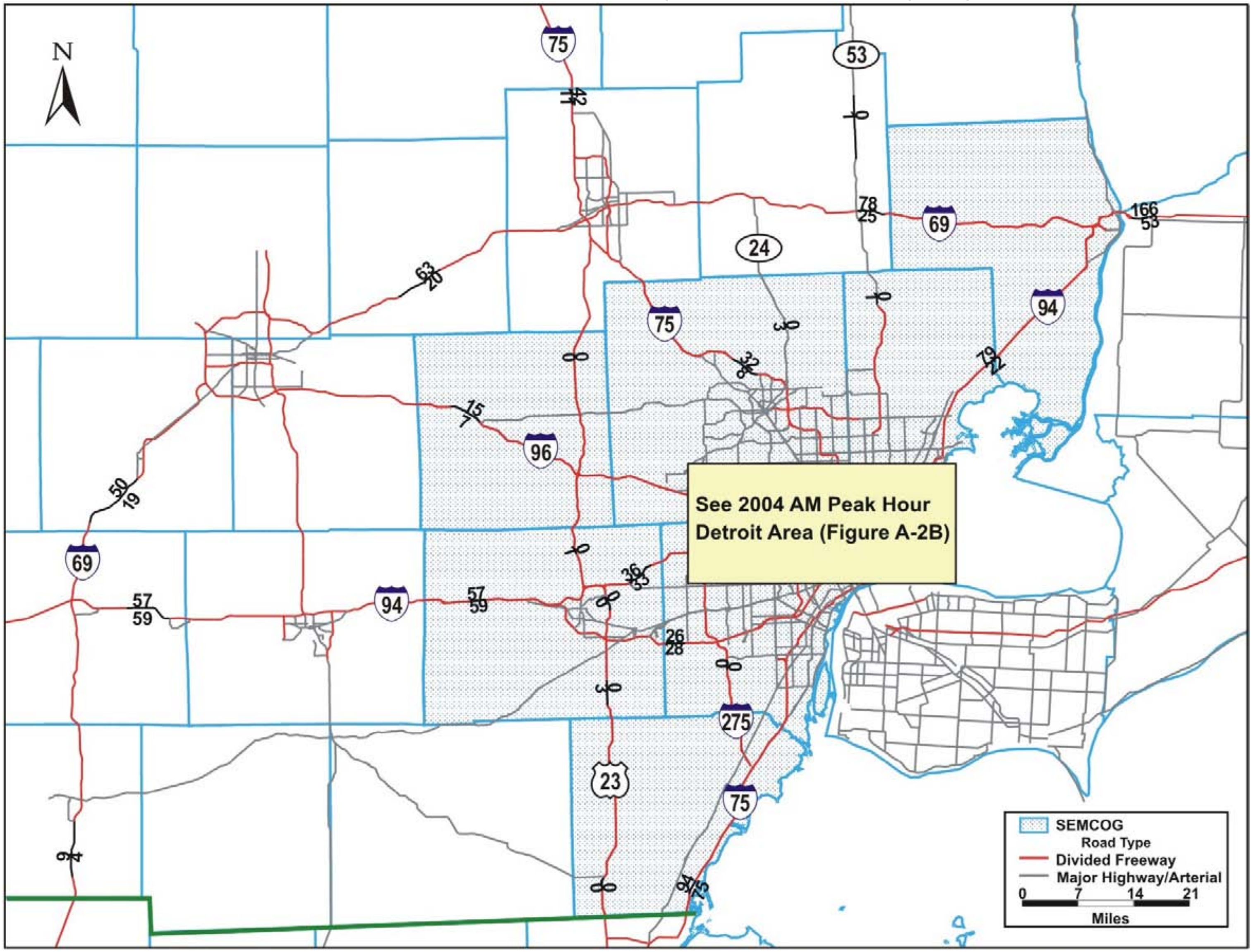
Figure A-1C
2004 AM Peak Hour Total Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

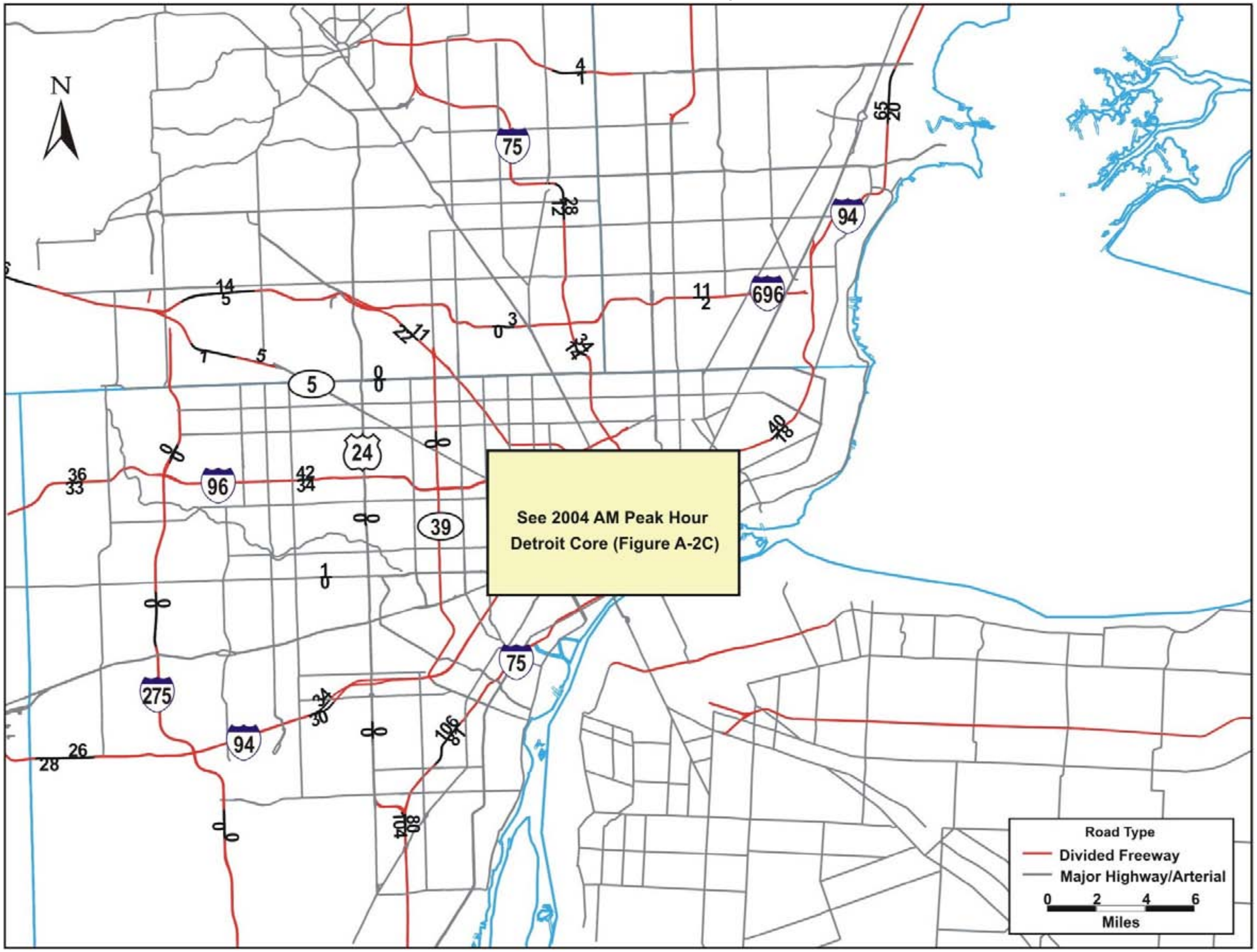
Figure A-2A

2004 AM Peak Hour International Truck Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

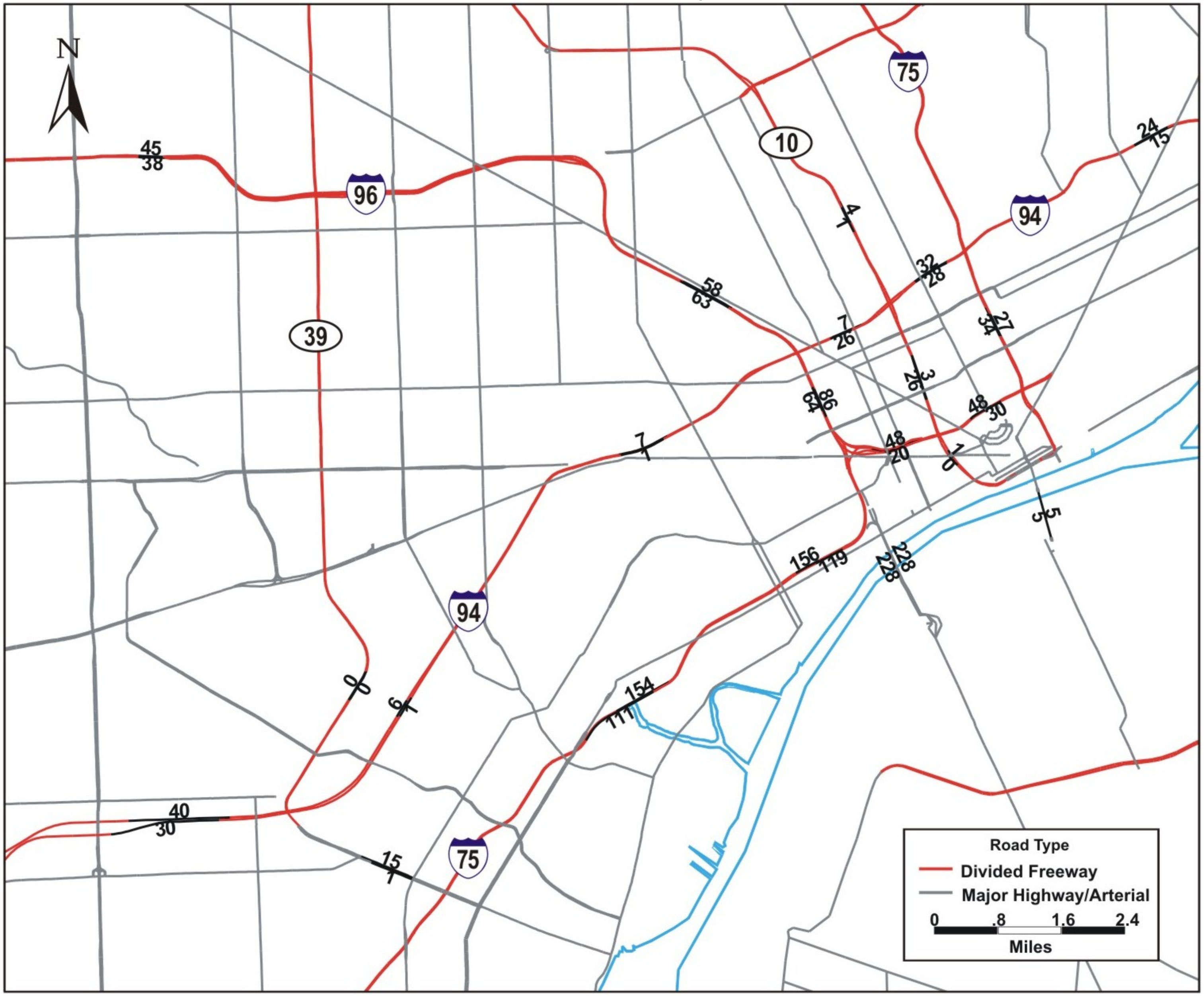
Figure A-2B
2004 AM Peak Hour International Truck Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

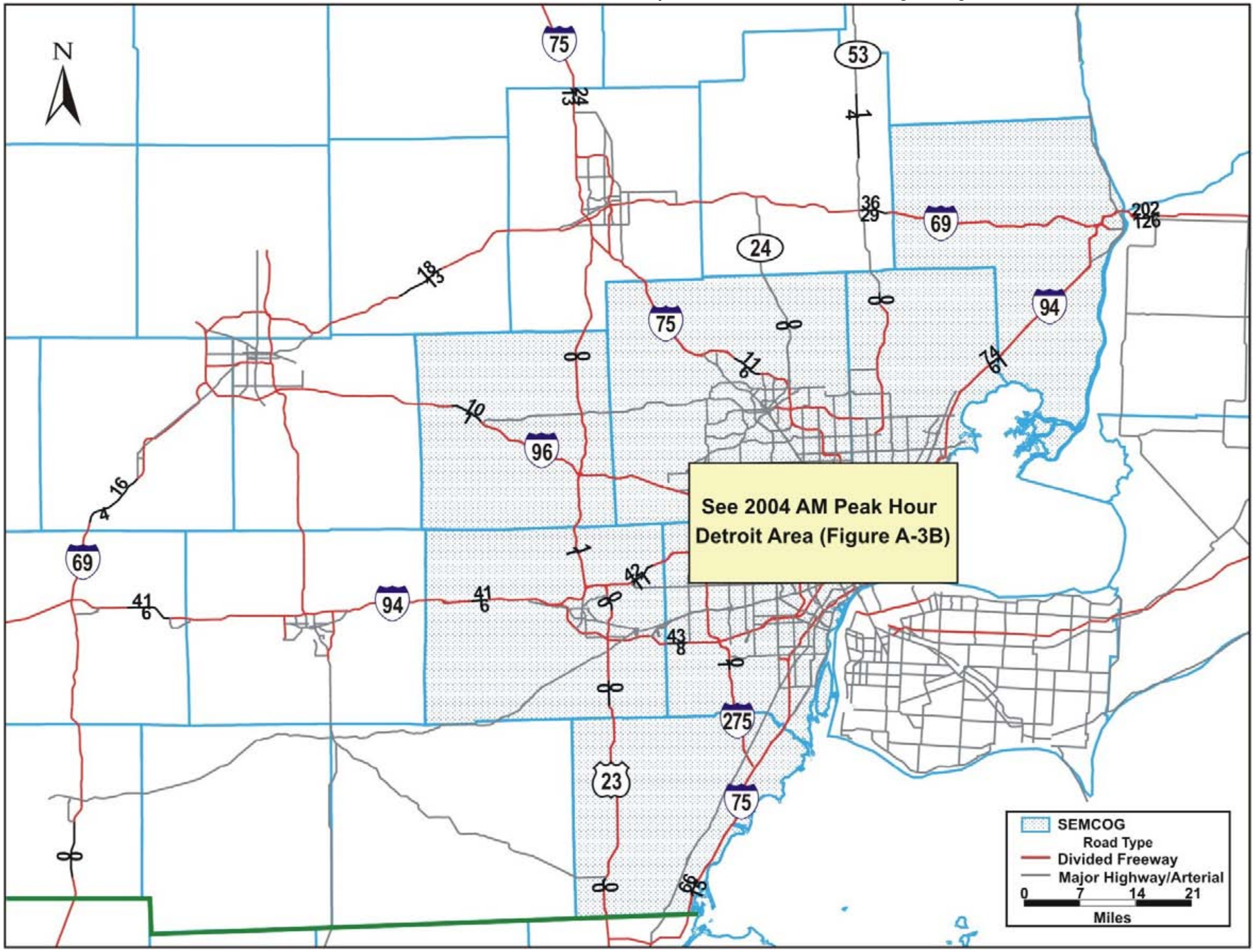
Figure A-2C

2004 AM Peak Hour International Truck Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

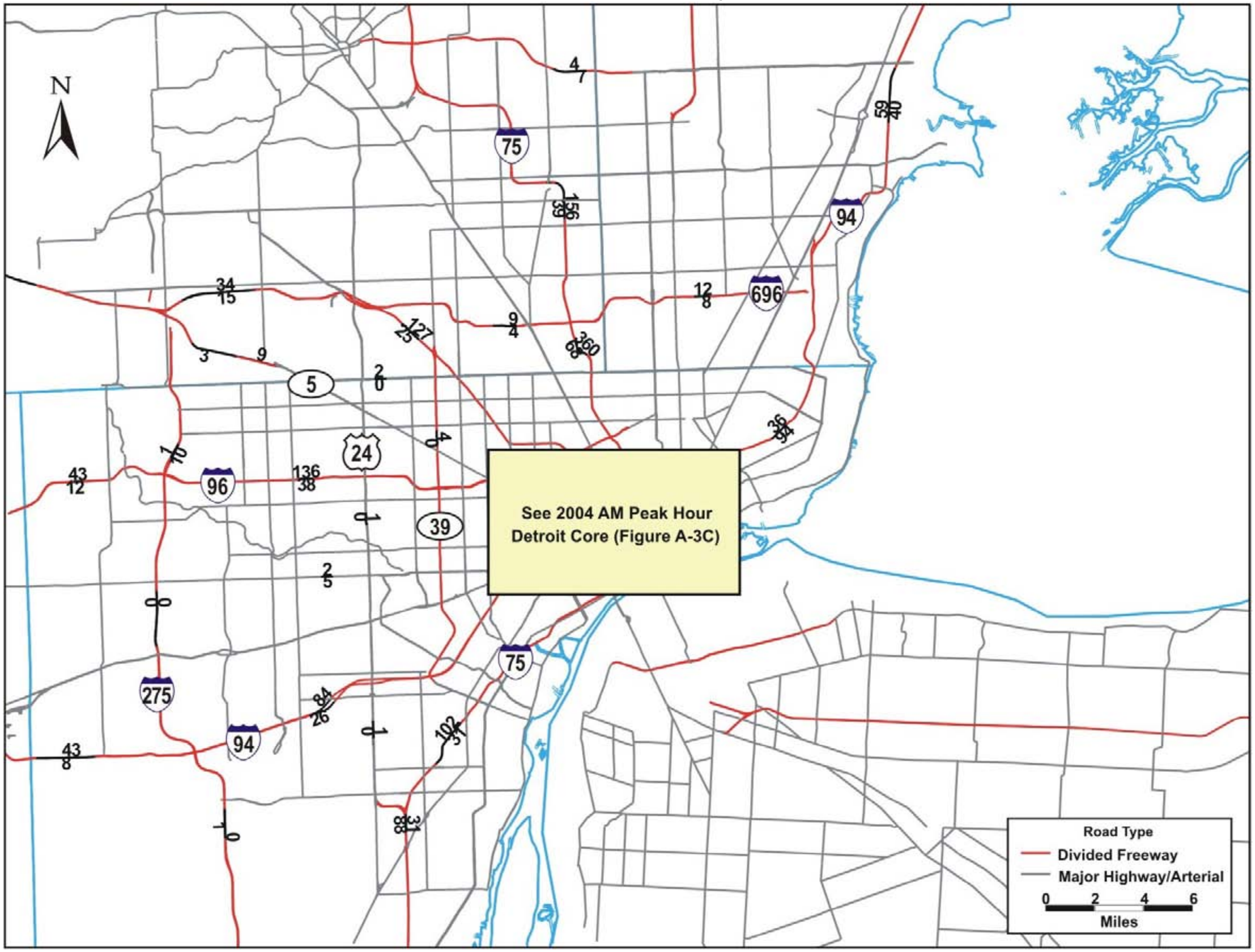
Figure A-3A
2004 AM Peak Hour International Car Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure A-3B

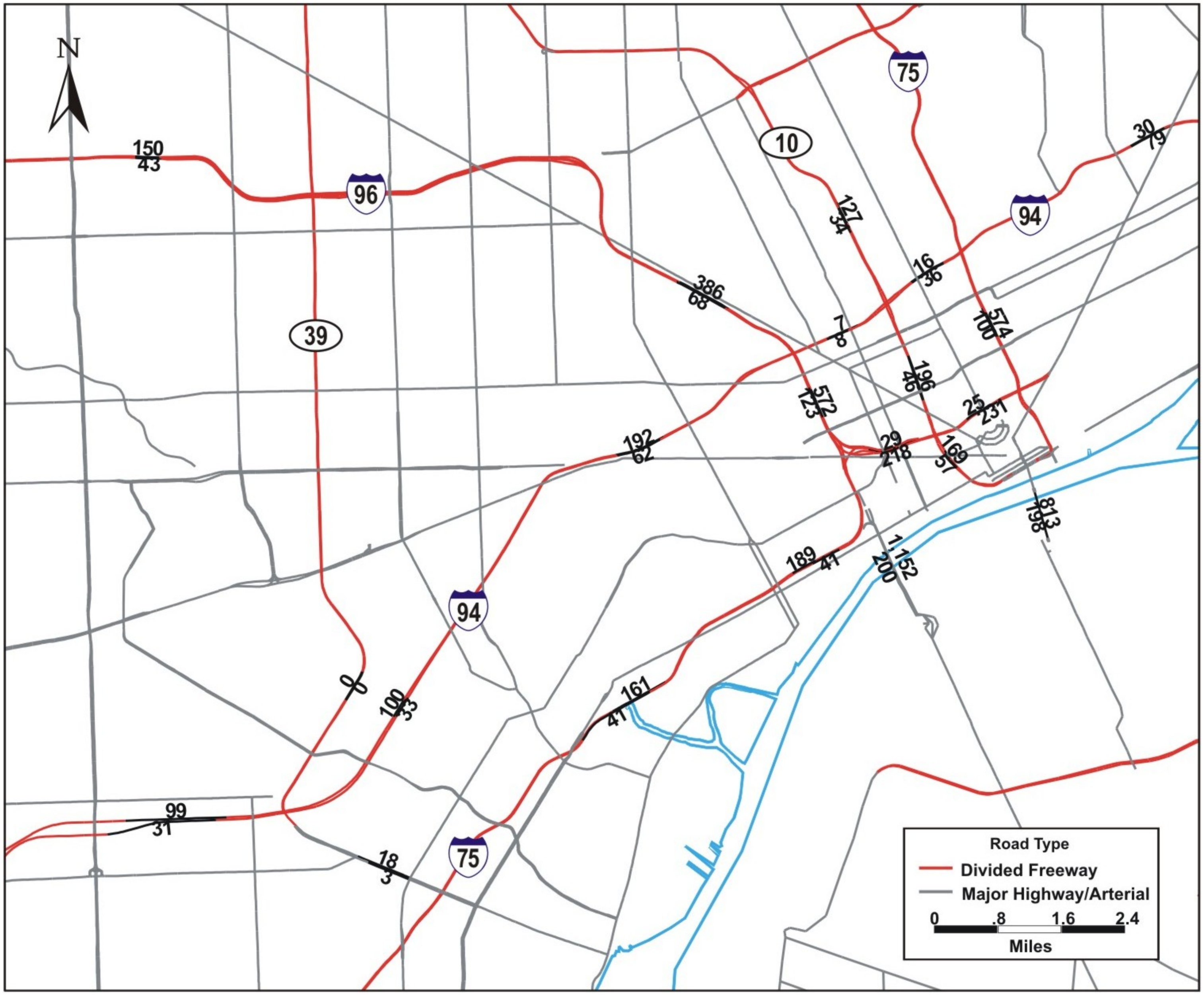
2004 AM Peak Hour International Car Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure A-3C

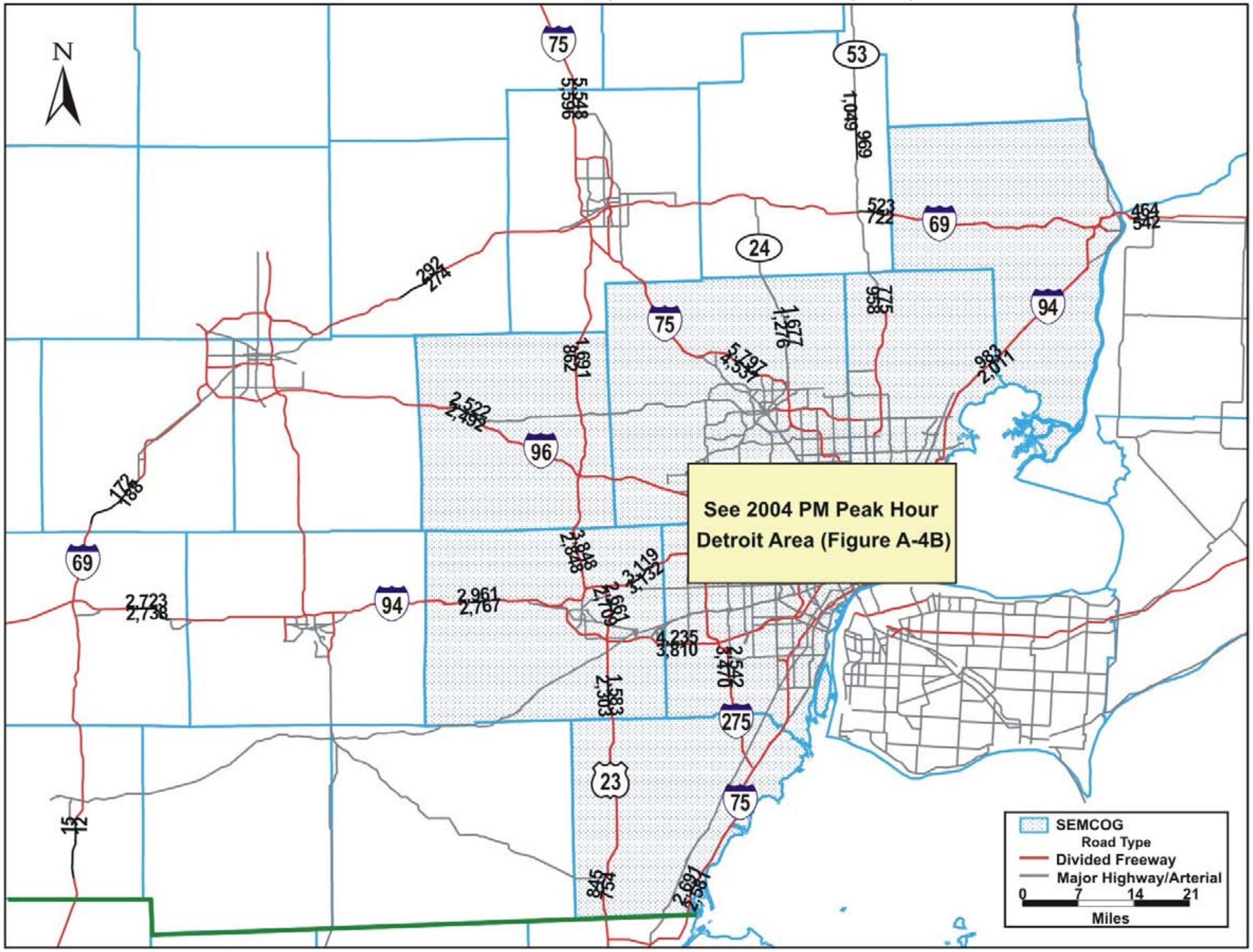
2004 AM Peak Hour International Car Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-4A

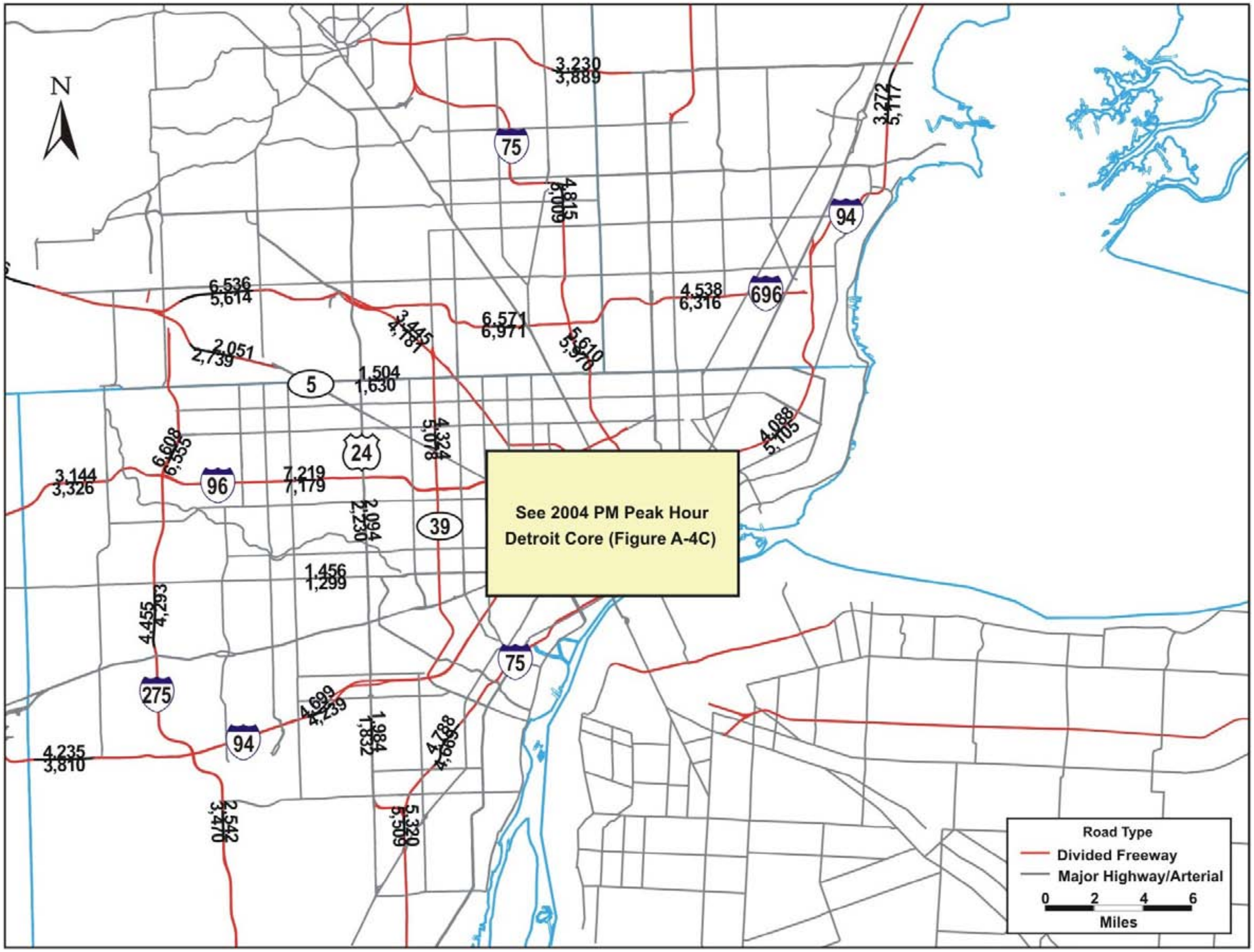
2004 PM Peak Hour Total Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure A-4B

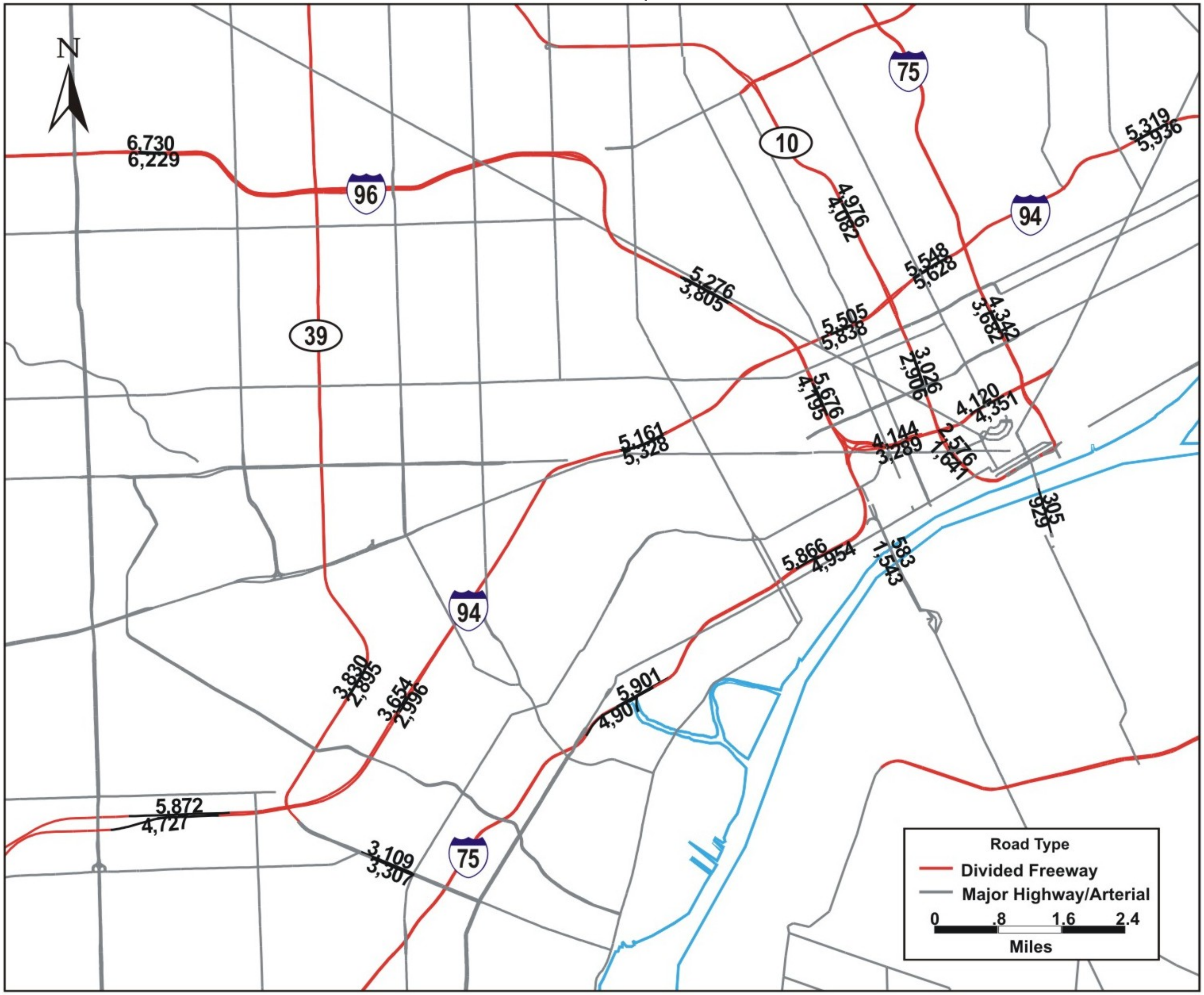
2004 PM Peak Hour Total Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

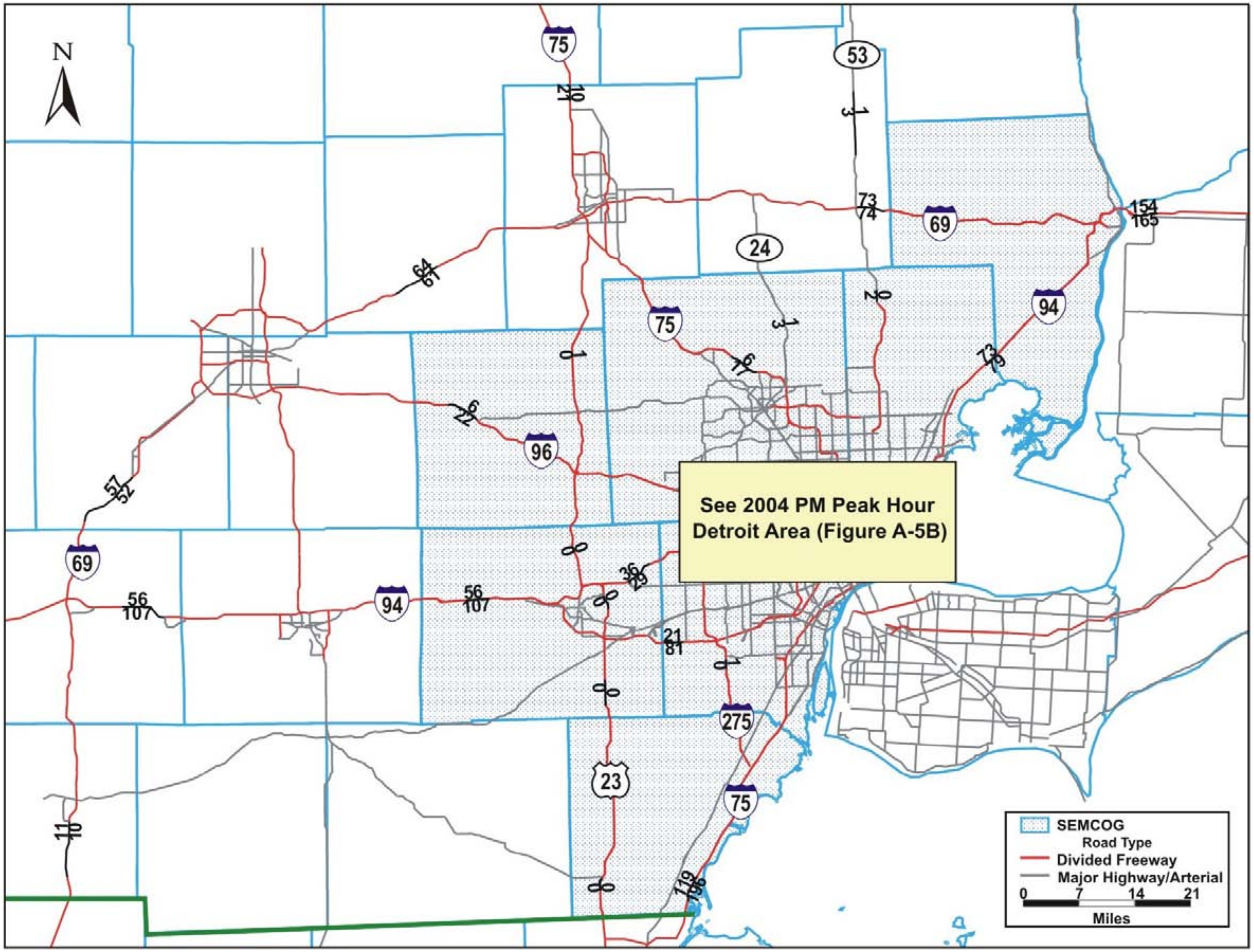
Figure A-4C

2004 PM Peak Hour <u>Total Volume by Direction</u> – <u>Detroit Core</u>



Source: The Corradino Group of Michigan, Inc.

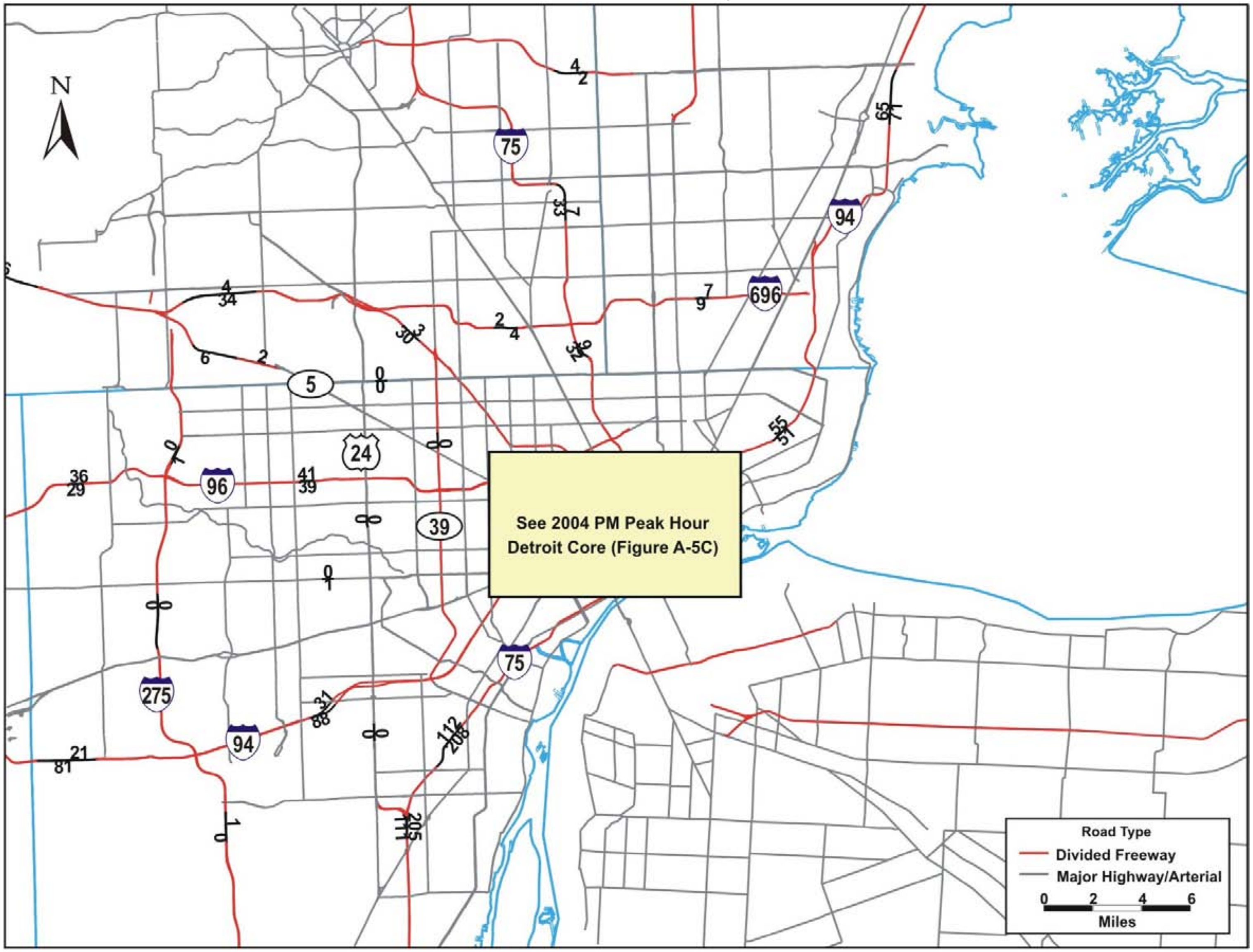
Figure A-5A
2004 PM Peak Hour International Truck Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure A-5B

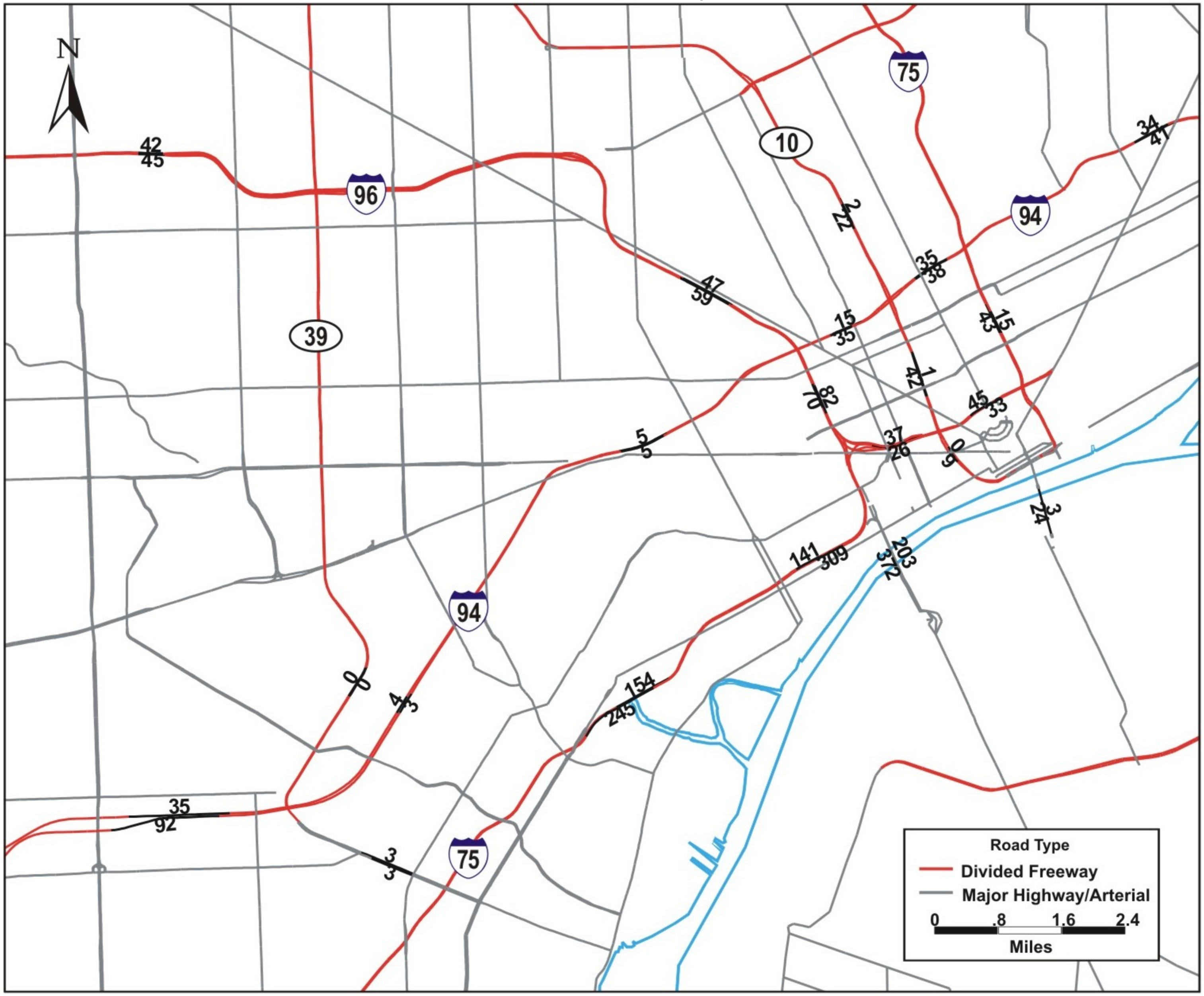
2004 PM Peak Hour International Truck Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure A-5C

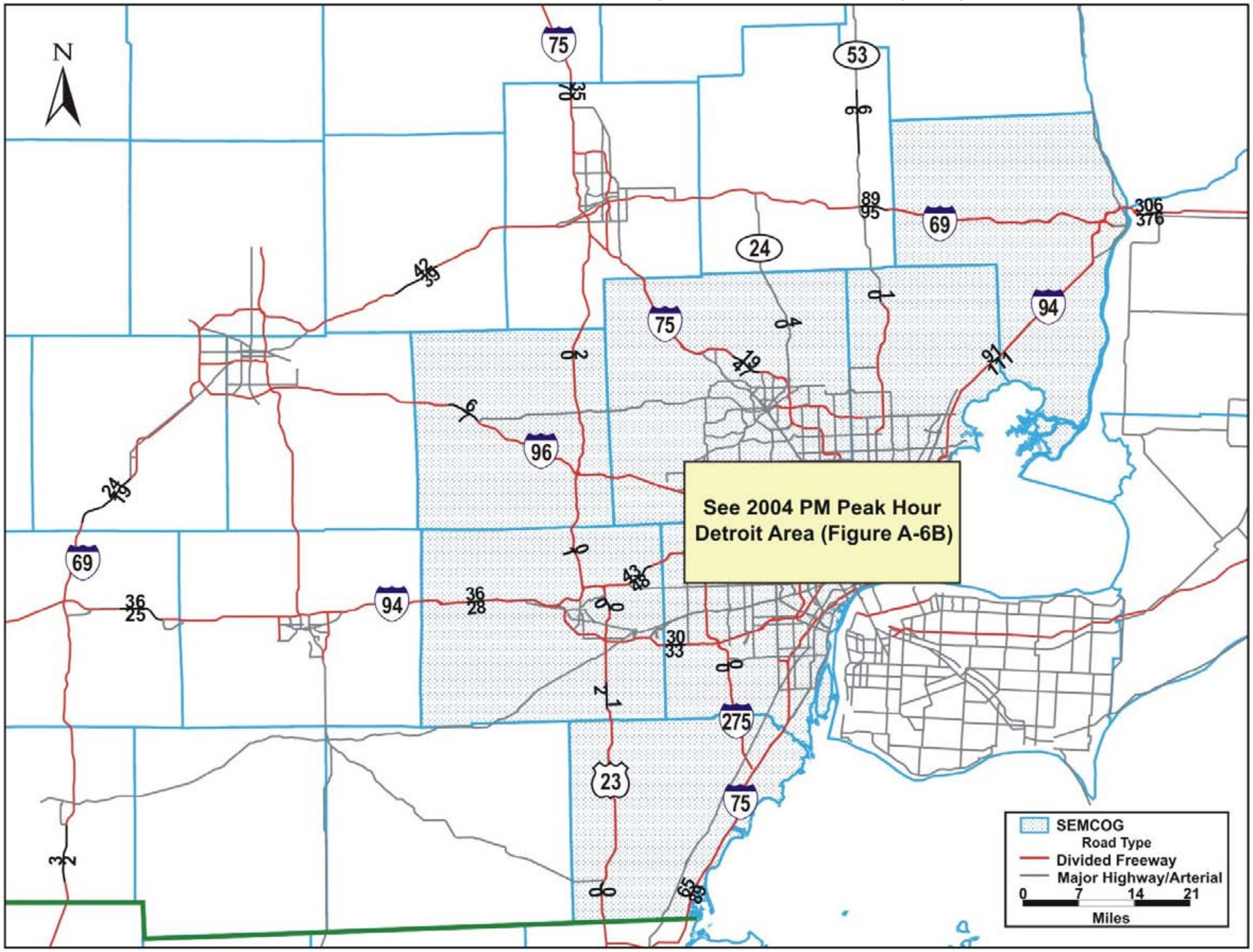
2004 PM Peak Hour International Truck Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-6A

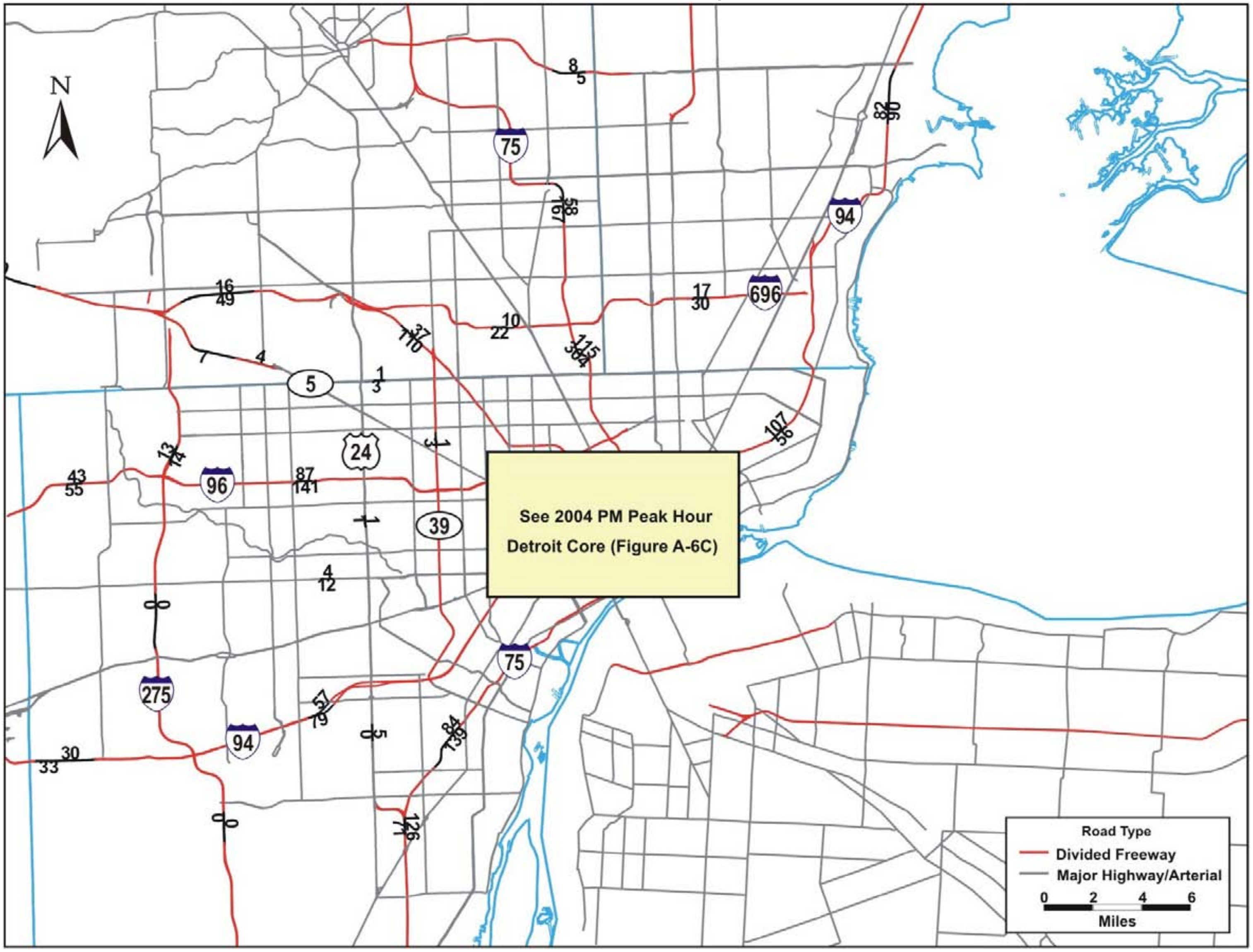
2004 PM Peak Hour International Car Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure A-6B

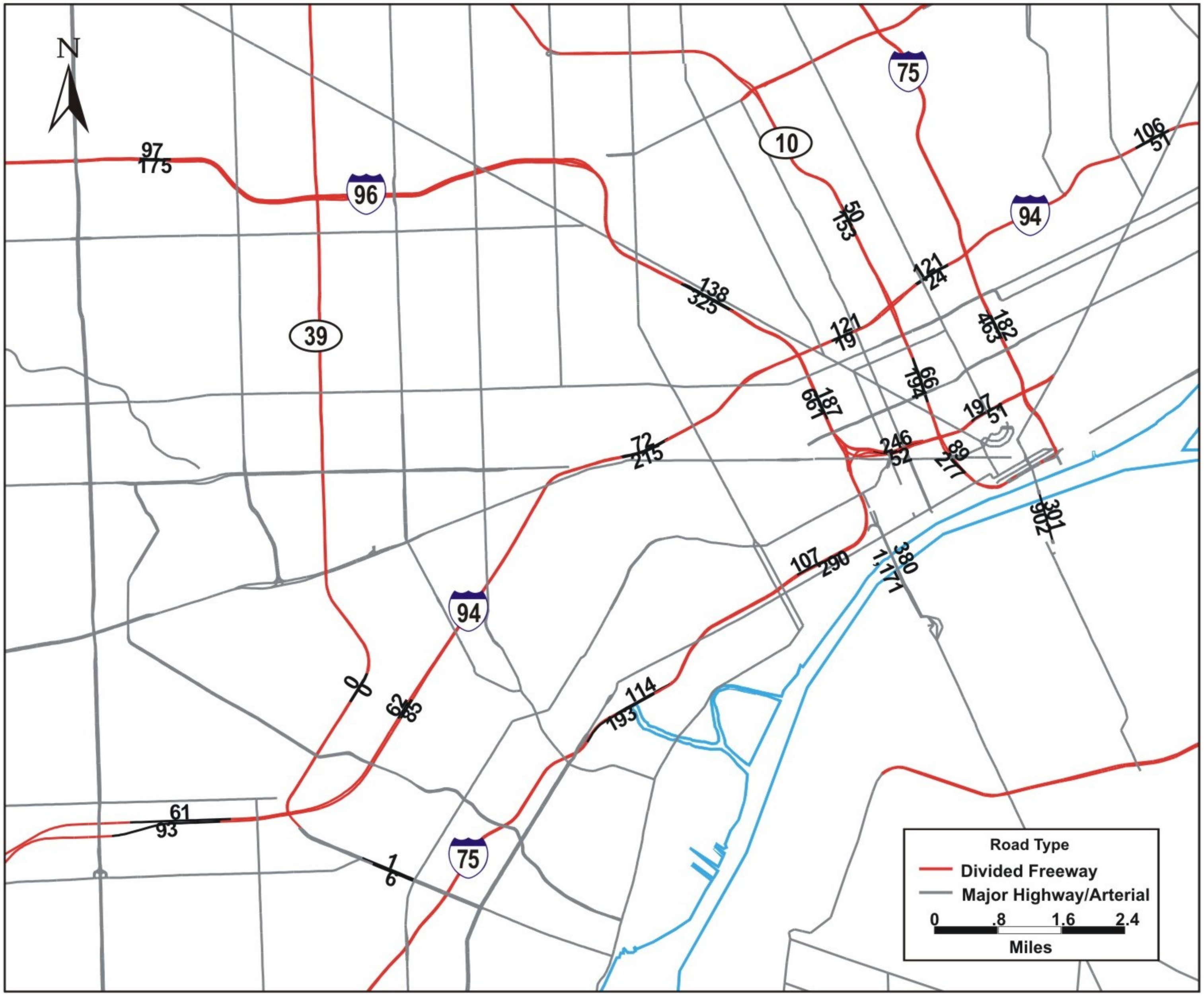
2004 PM Peak Hour <u>International Car Volume by Direction</u> – <u>Detroit Area</u>



Source: The Corradino Group of Michigan, Inc.

Figure A-6C

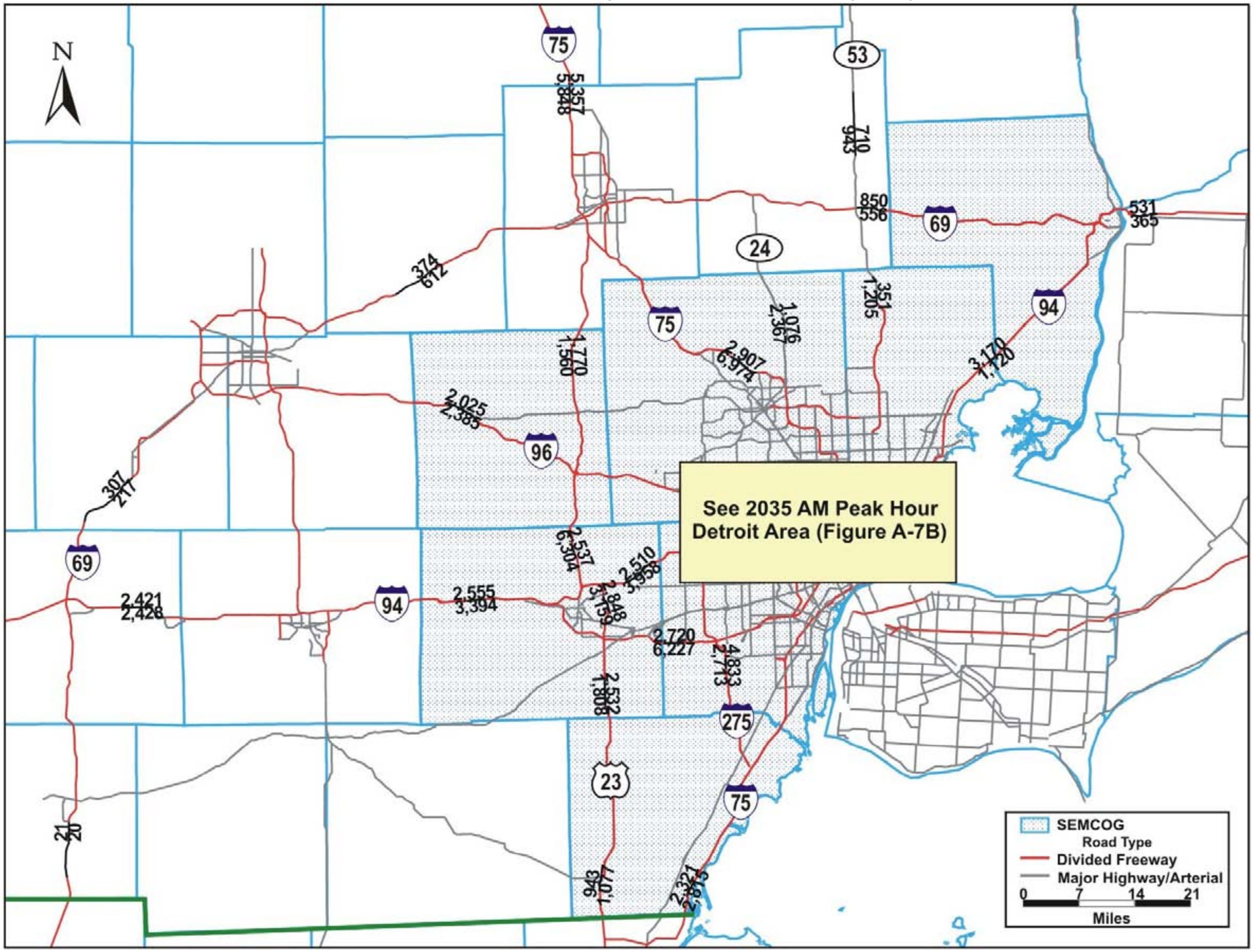
2004 PM Peak Hour International Car Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-7A

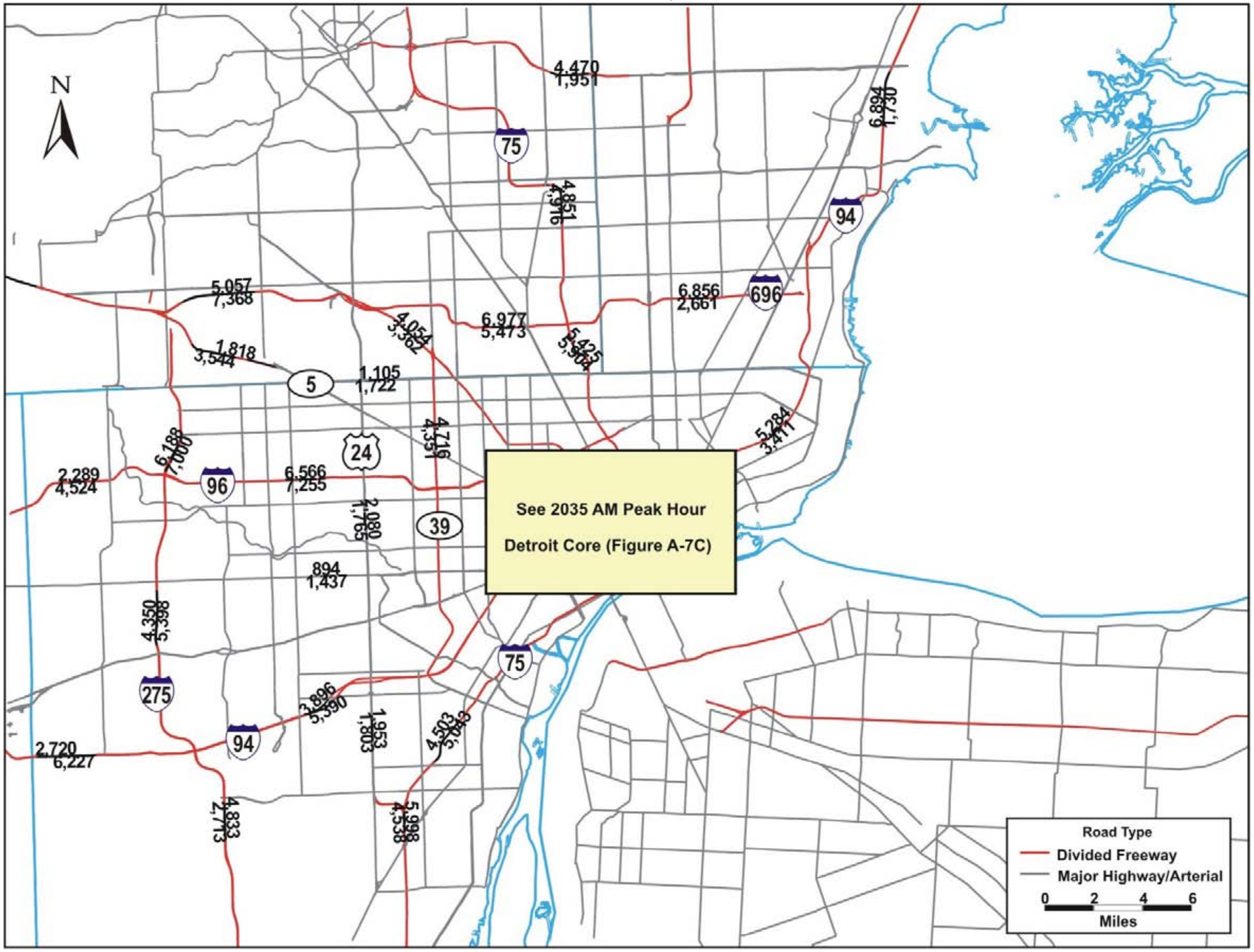
2035 AM Peak Hour <u>Total Volume by Direction</u> – <u>Southeast Michigan Region</u>



Source: The Corradino Group of Michigan, Inc.

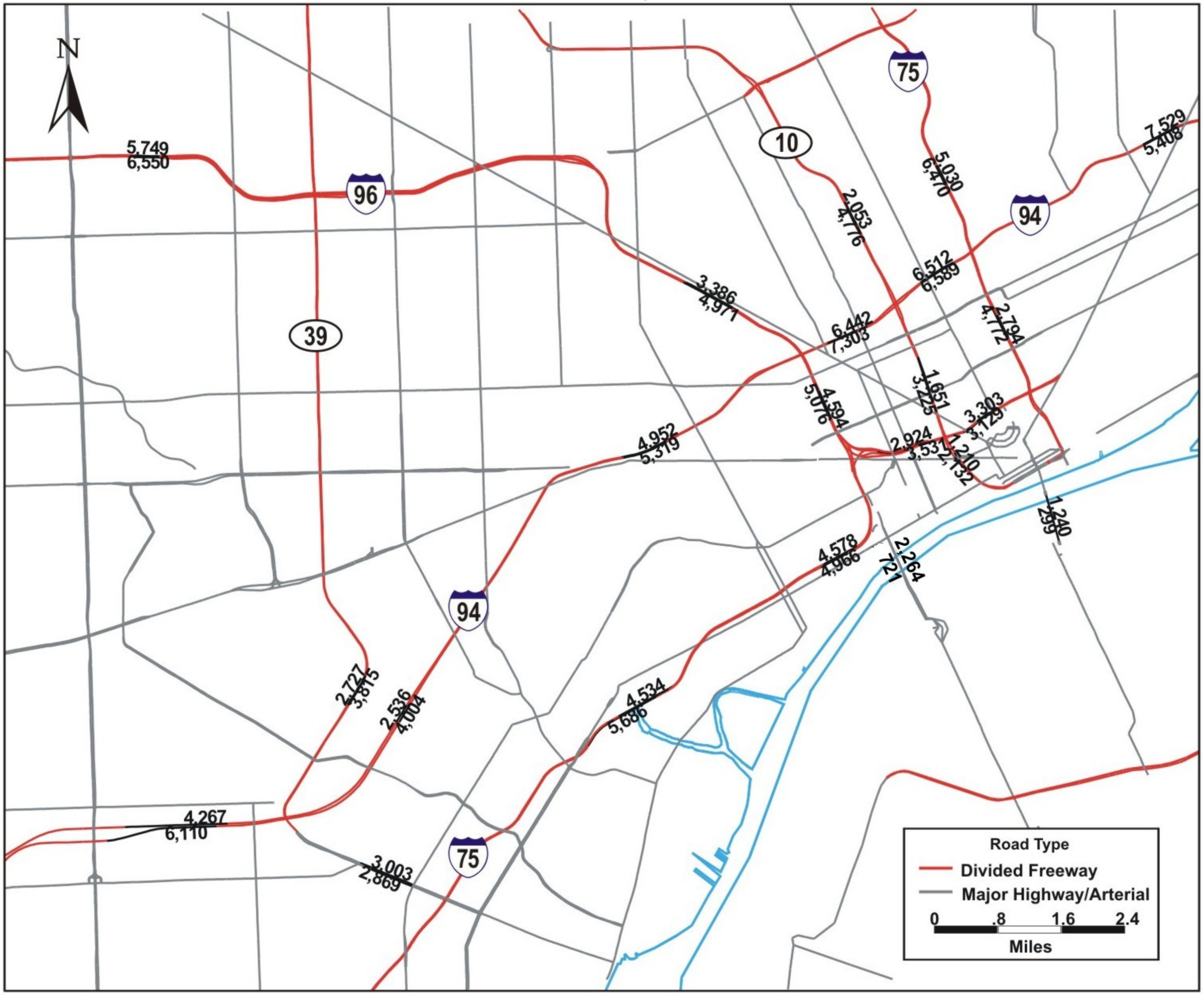
Figure A-7B

2035 AM Peak Hour Total Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

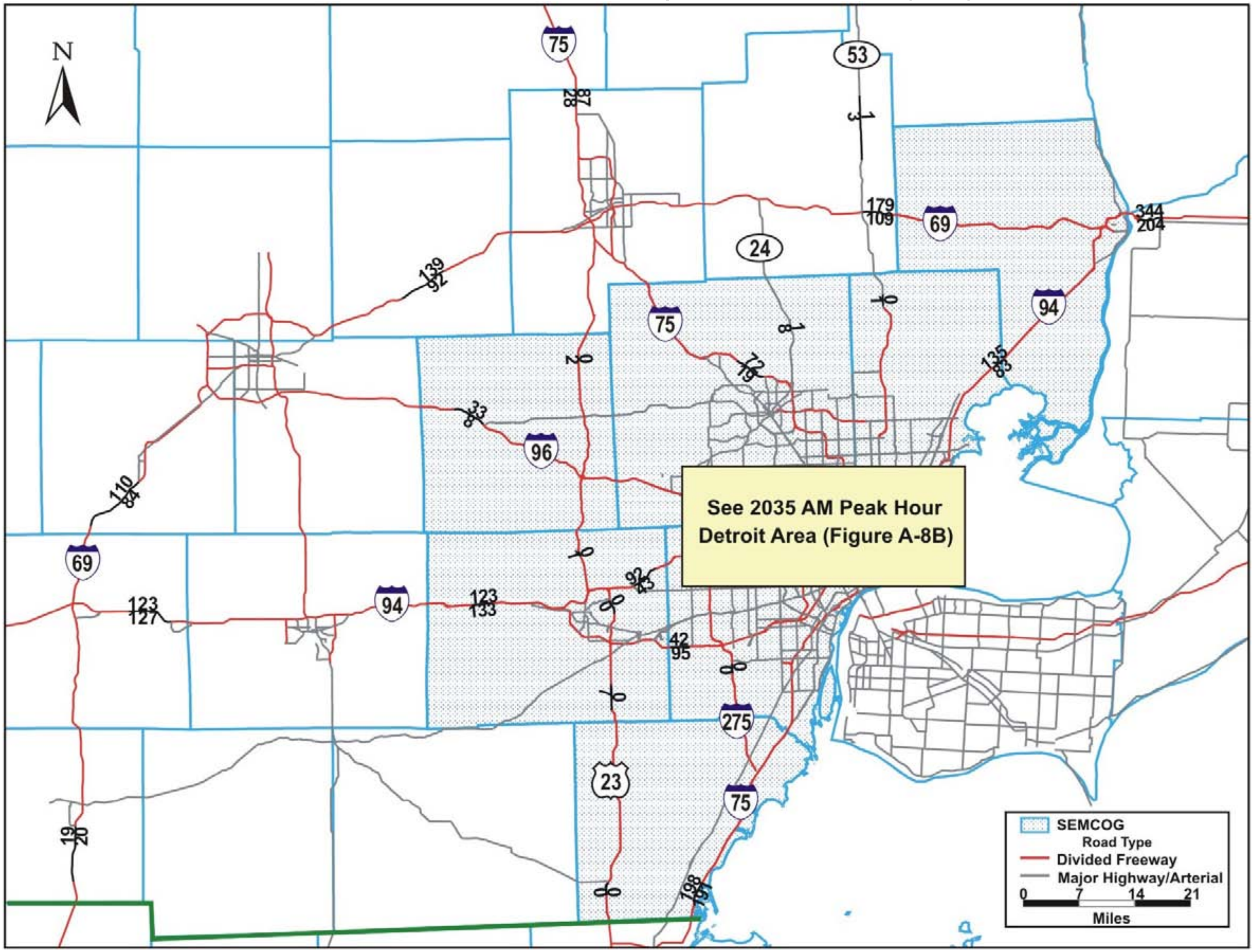
Figure A-7C
2035 AM Peak Hour Total Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-8A

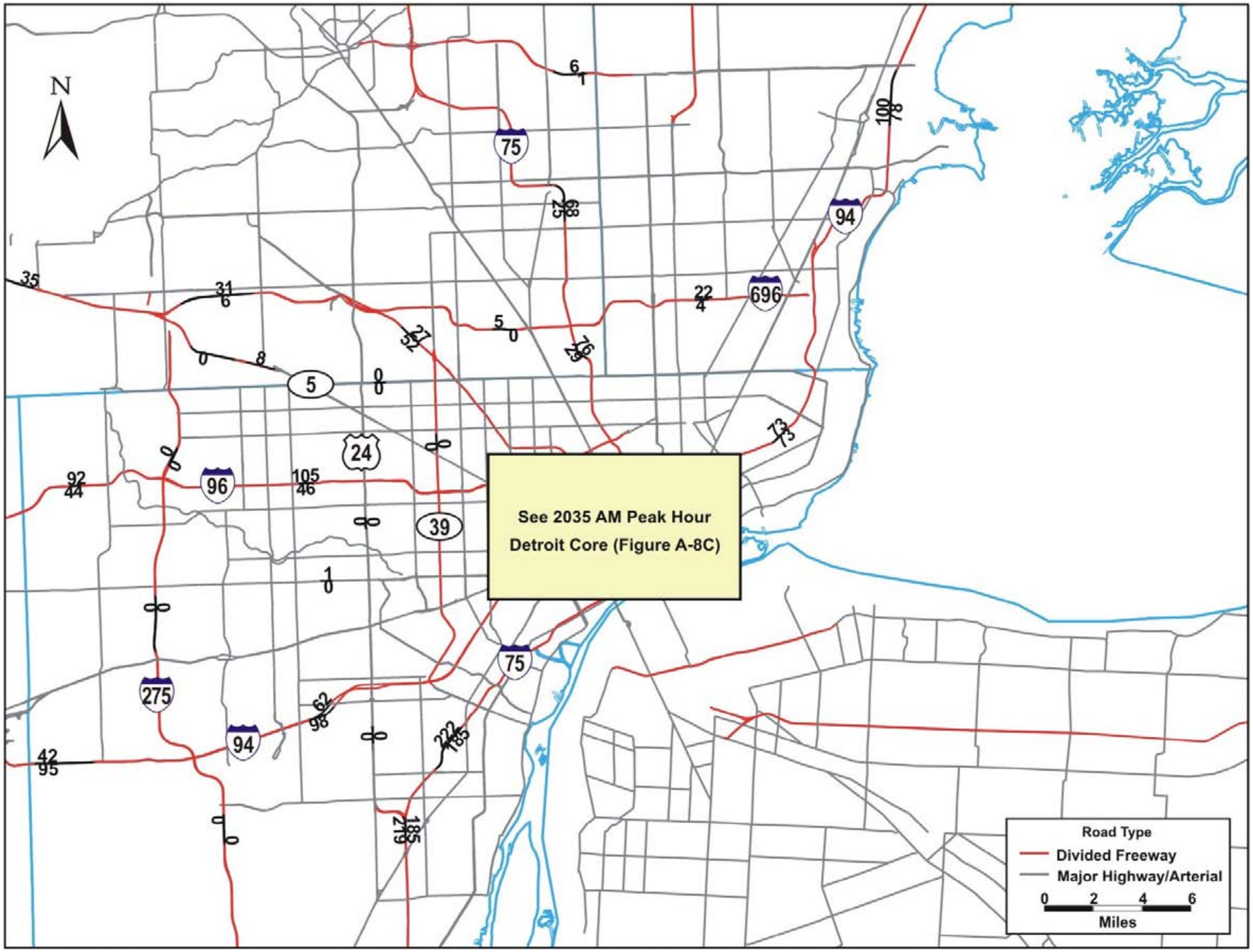
2035 AM Peak Hour International Truck Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

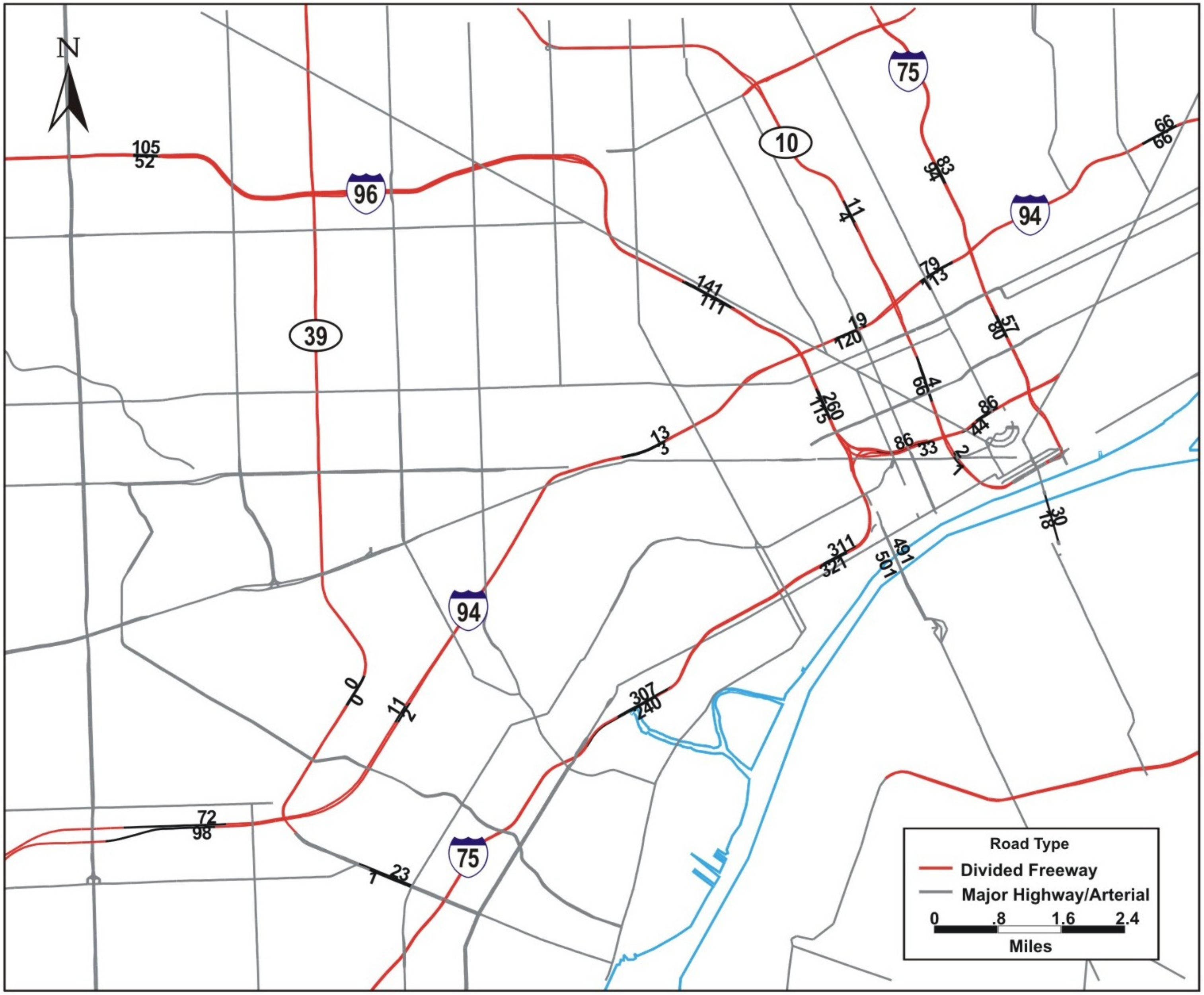
Figure A-8B

2035 AM Peak Hour International Truck Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

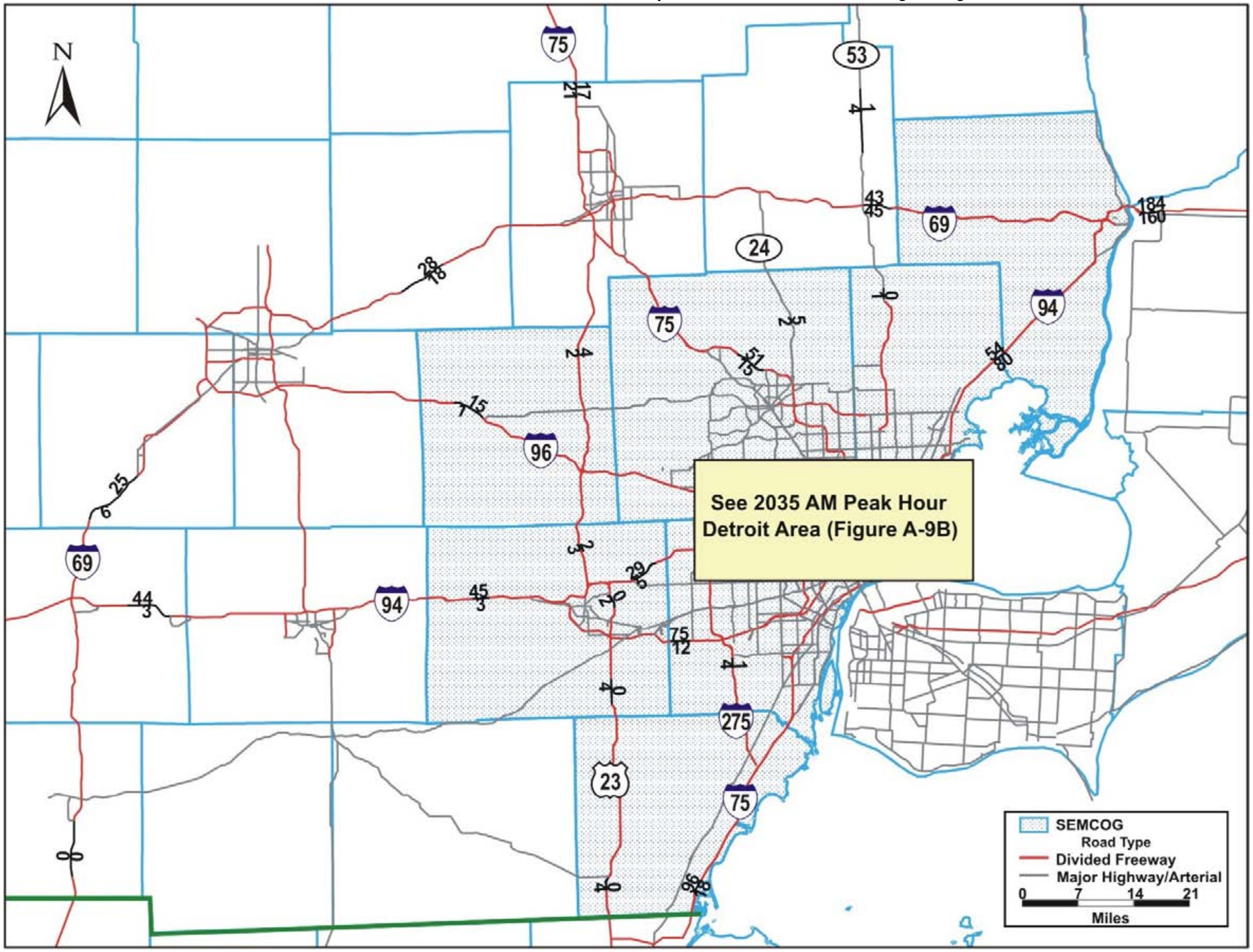
Figure A-8C
2035 AM Peak Hour International Truck Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

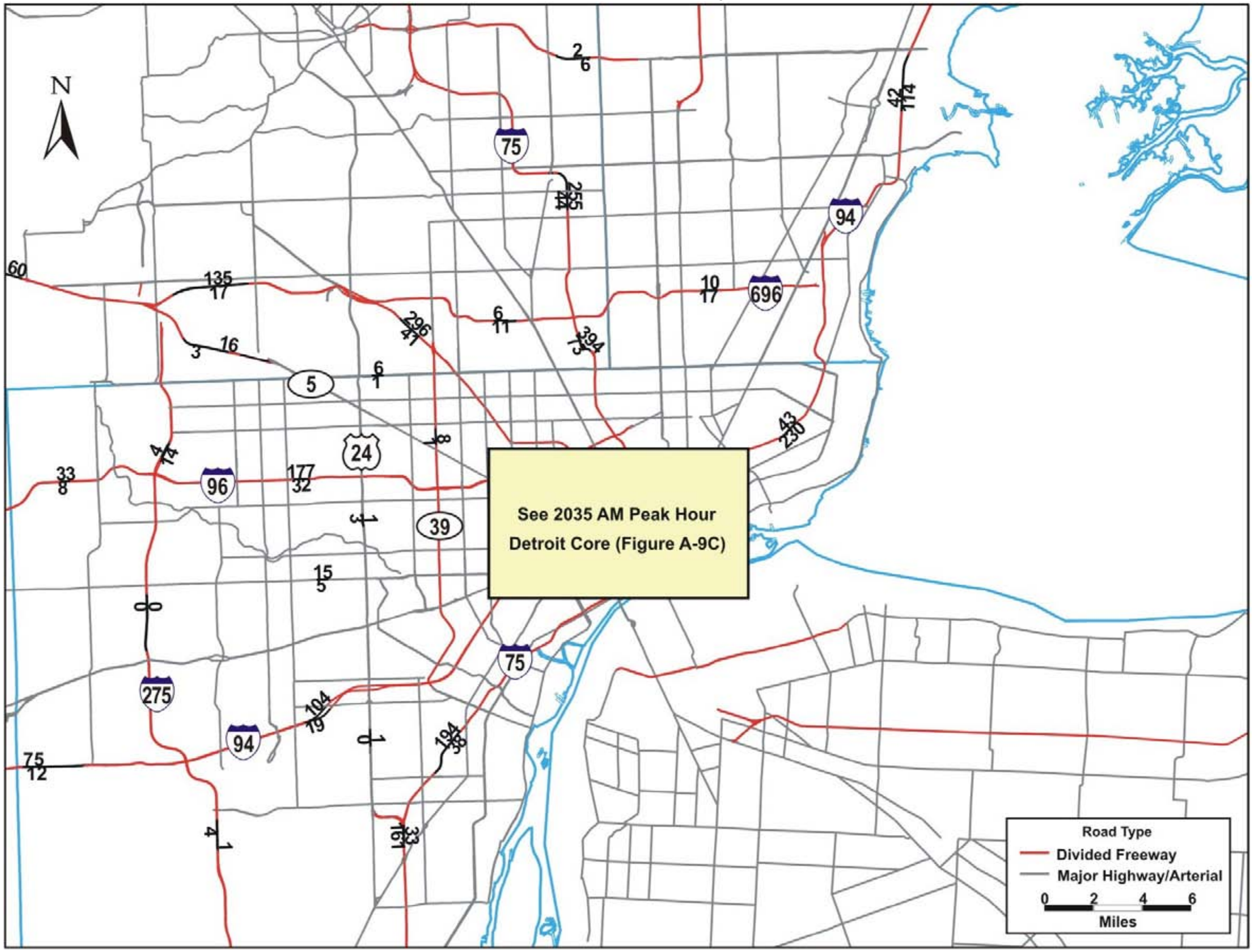
Figure A-9A

2035 AM Peak Hour International Car Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

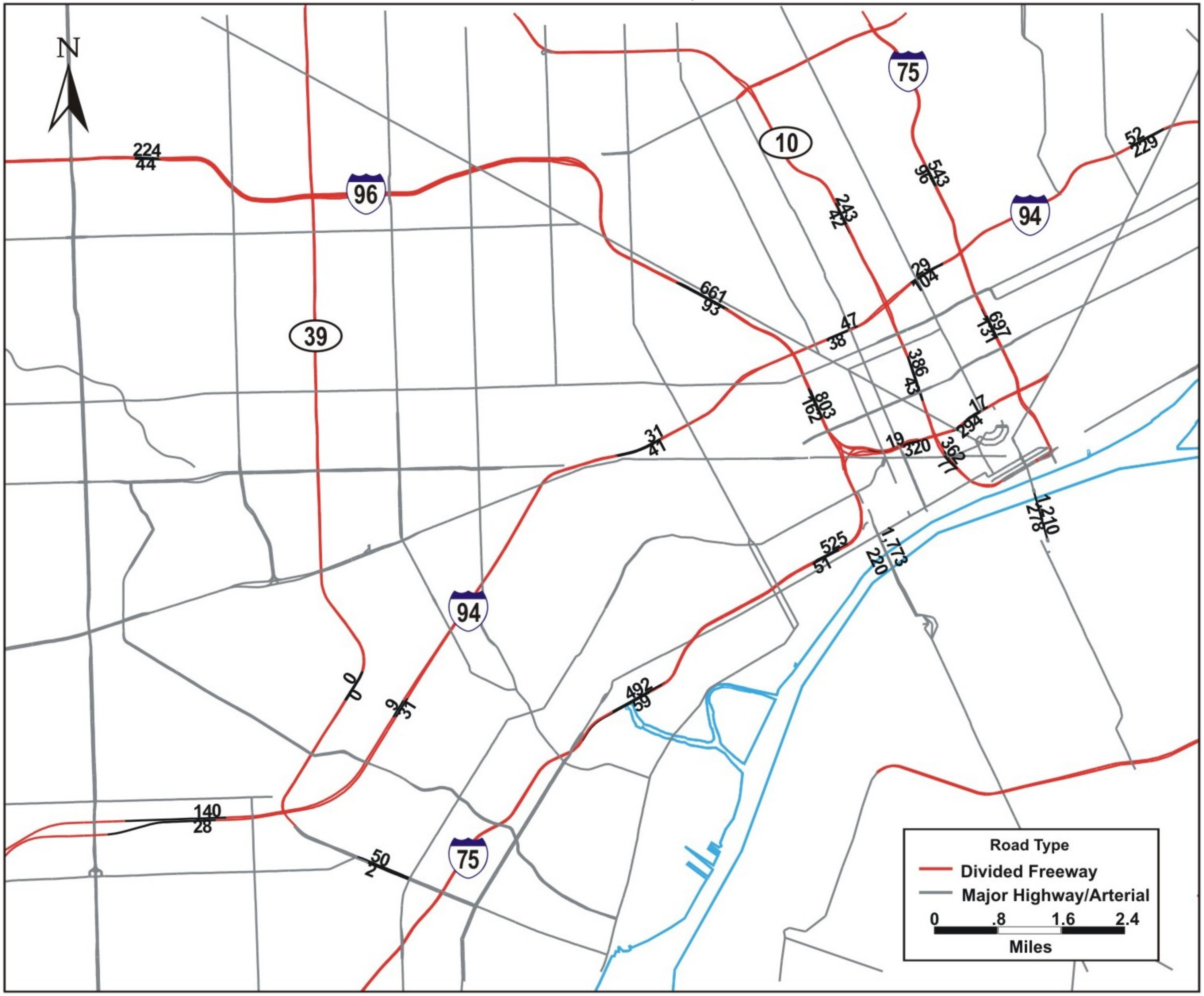
Figure A-9B
2035 AM Peak Hour International Car Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure A-9C

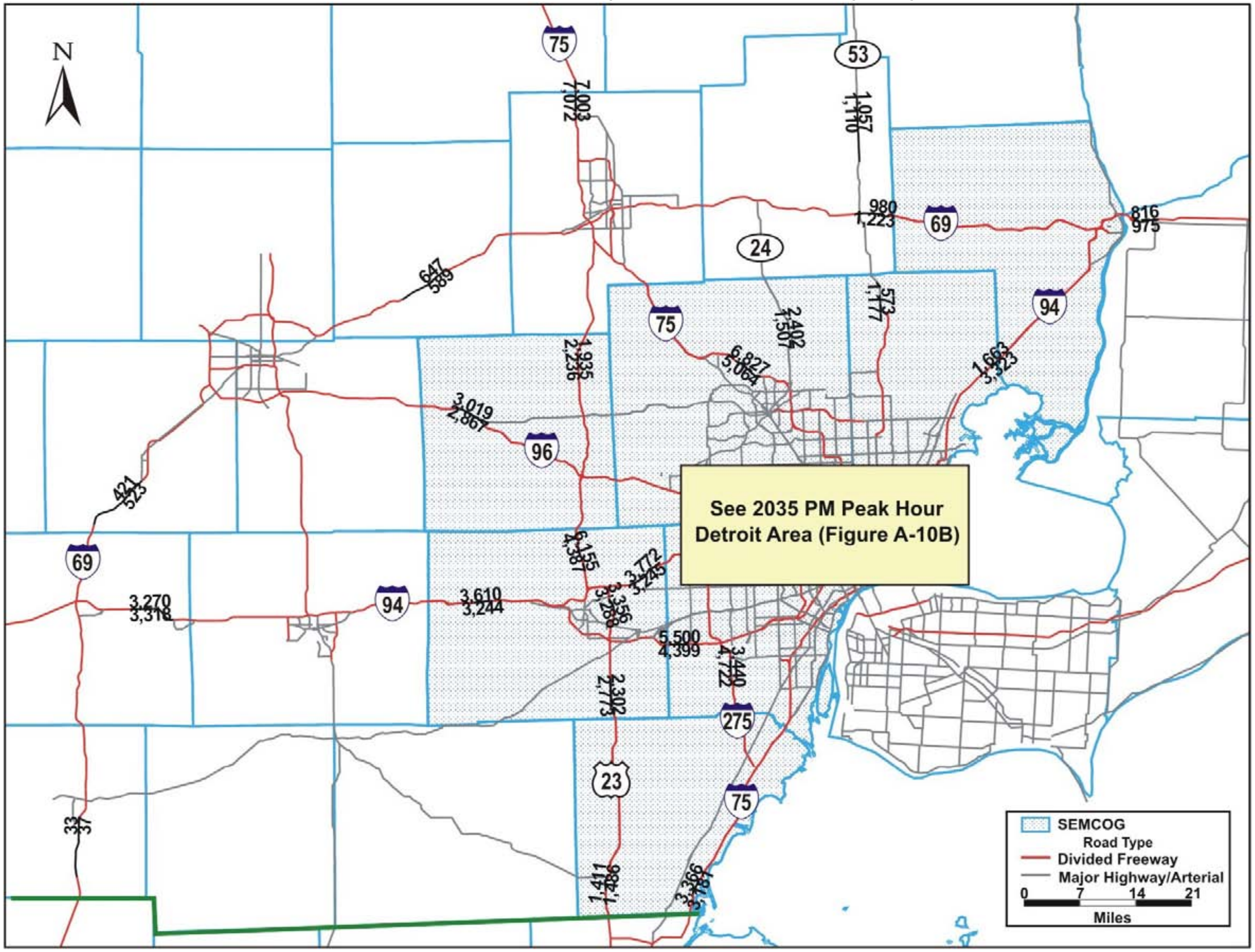
2035 AM Peak Hour <u>International Car Volume by Direction</u> – <u>Detroit Core</u>



Source: The Corradino Group of Michigan, Inc.

Figure A-10A

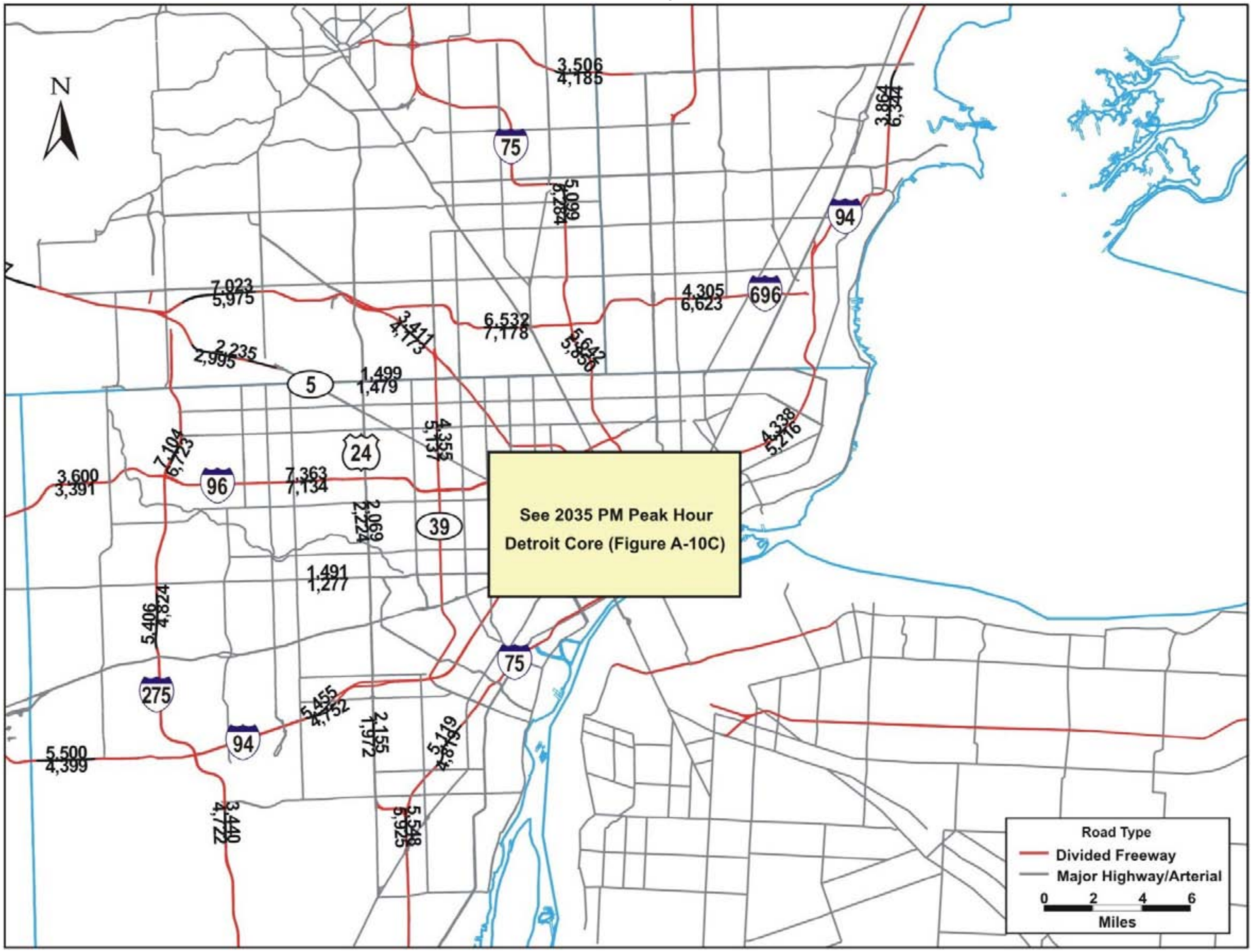
2035 PM Peak Hour Total Volume by Direction – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure A-10B

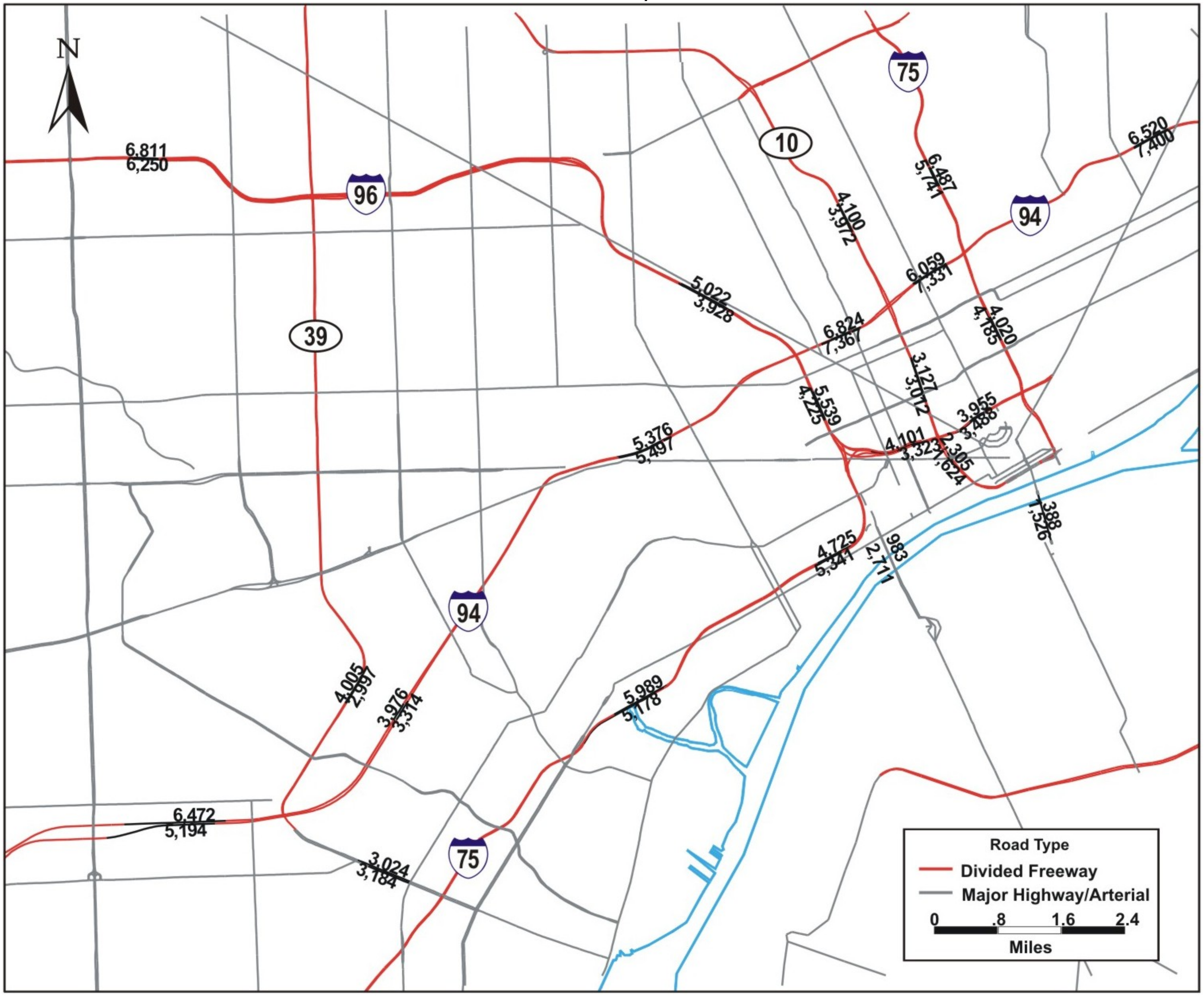
2035 PM Peak Hour <u>Total Volume by Direction</u> – <u>Detroit Area</u>



Source: The Corradino Group of Michigan, Inc.

Figure A-10C

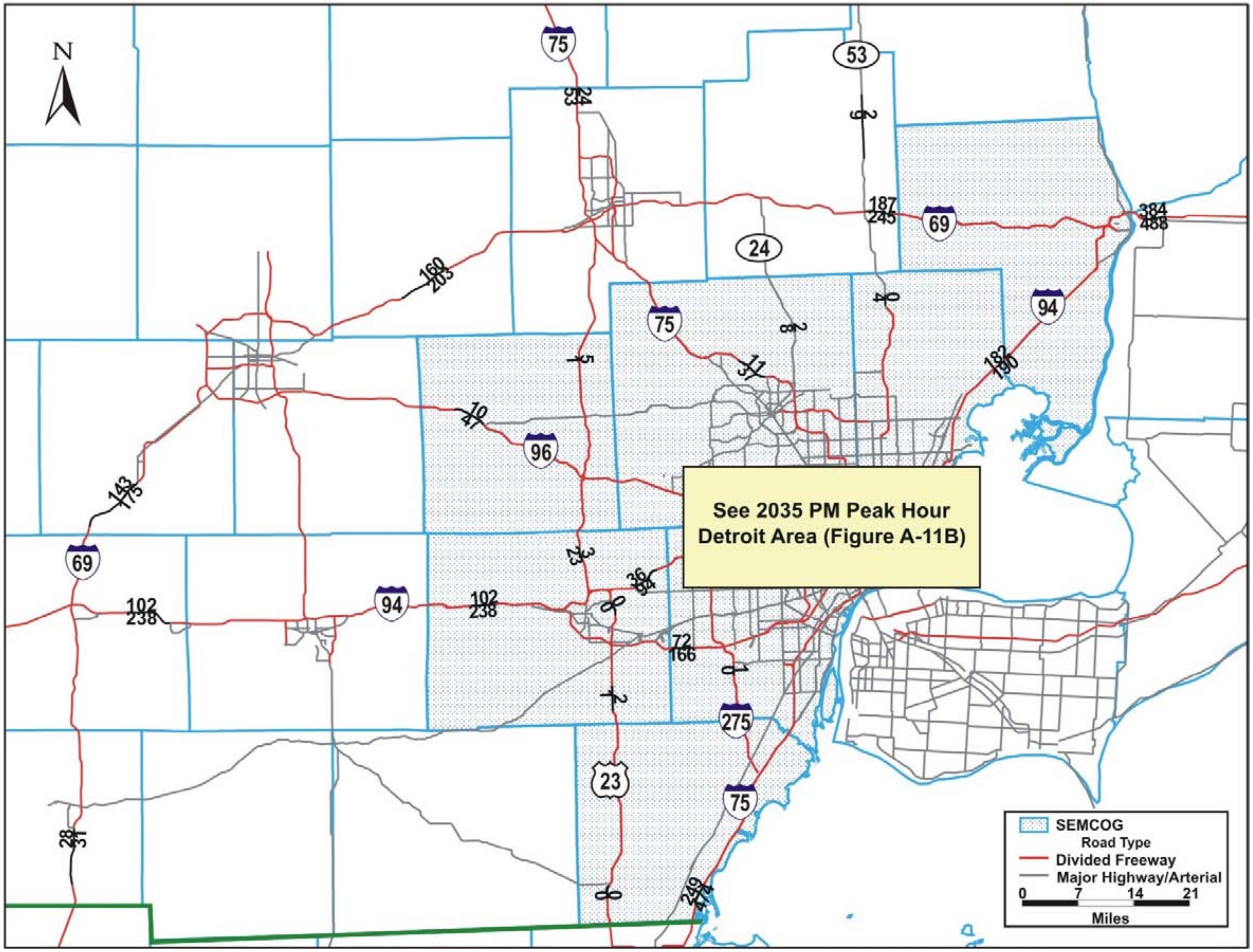
2035 PM Peak Hour Total Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-11A

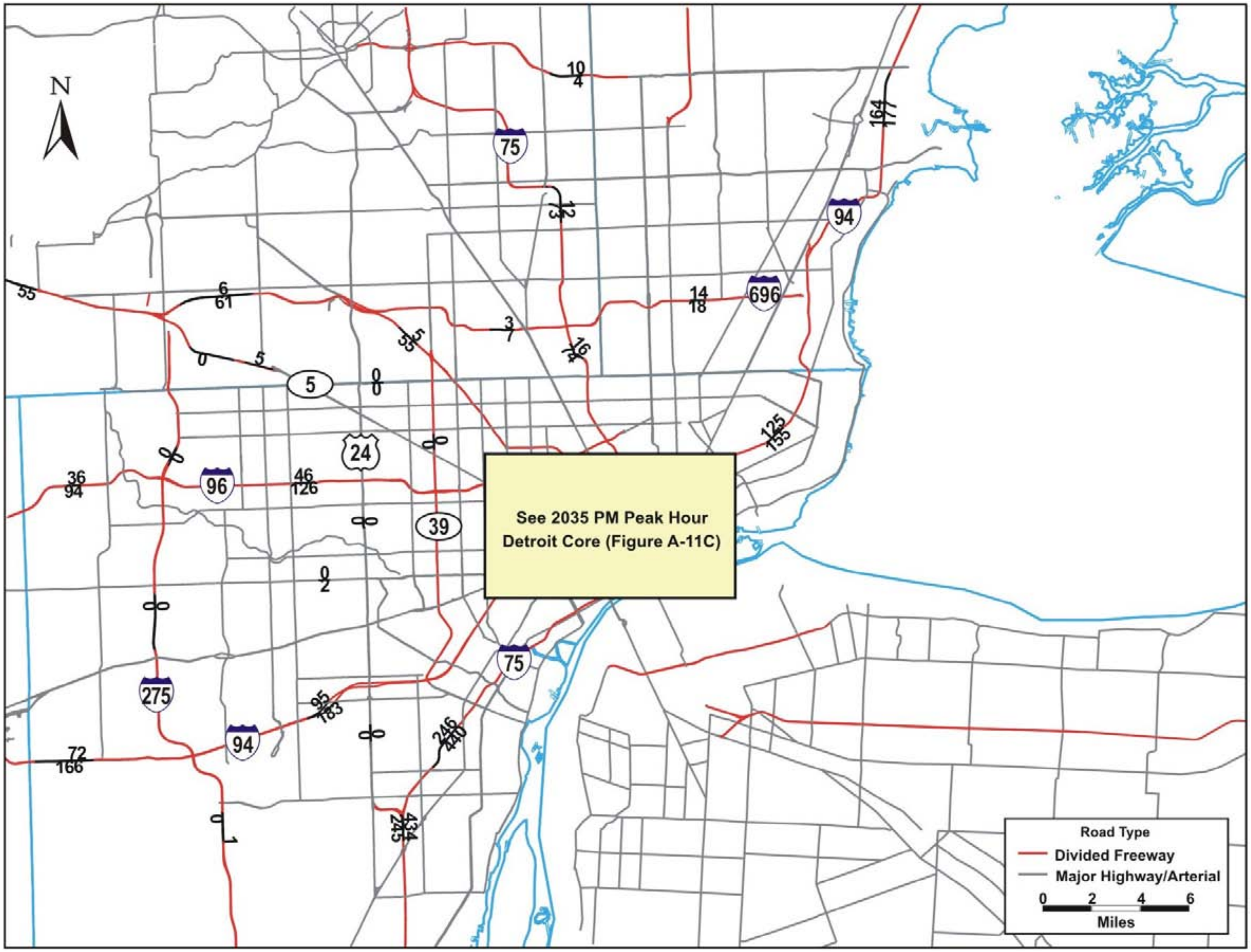
2035 PM Peak Hour <u>International Truck Volume by Direction</u> – <u>Southeast Michigan Region</u>



Source: The Corradino Group of Michigan, Inc.

Figure A-11B

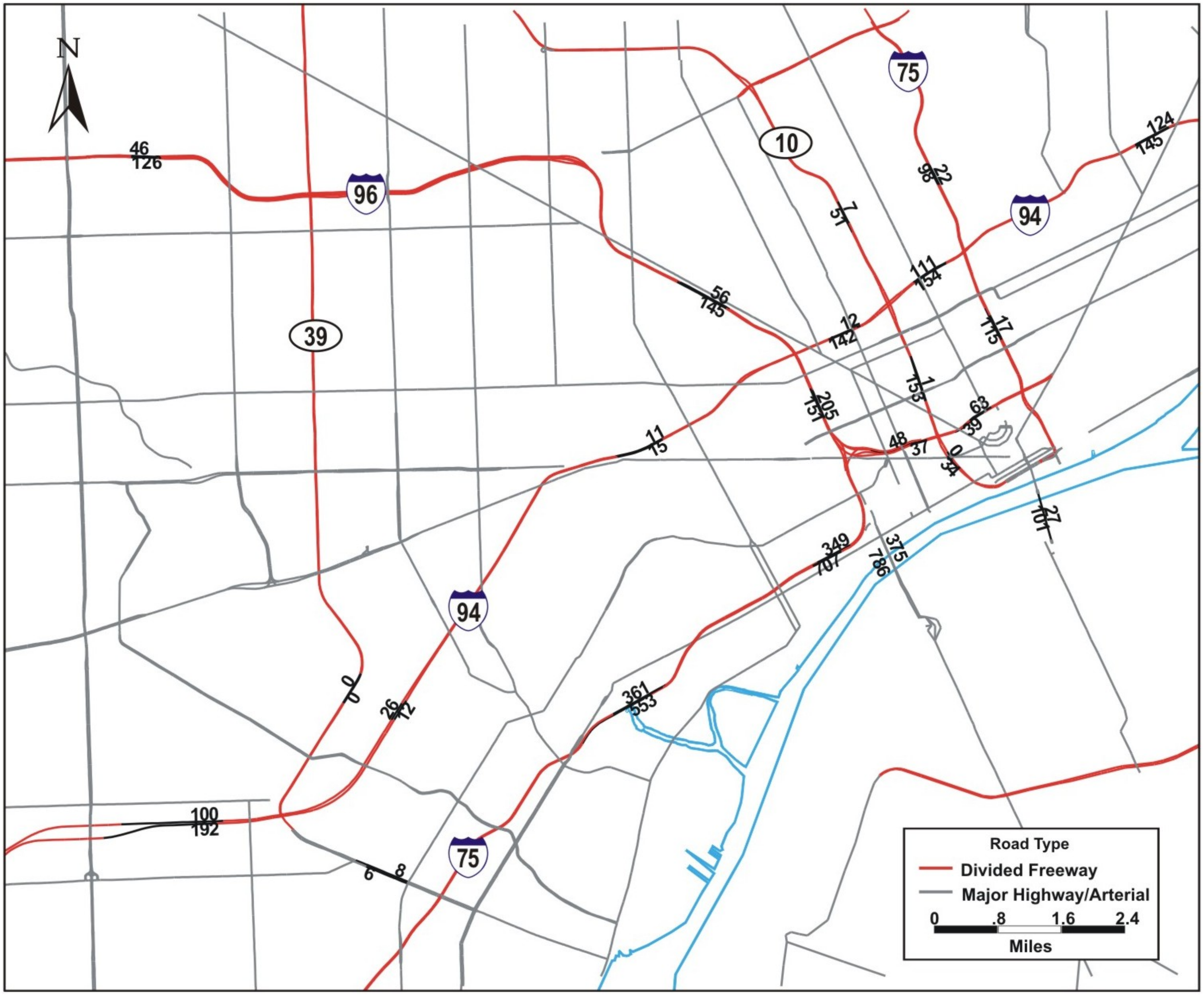
2035 PM Peak Hour International Truck Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure A-11C

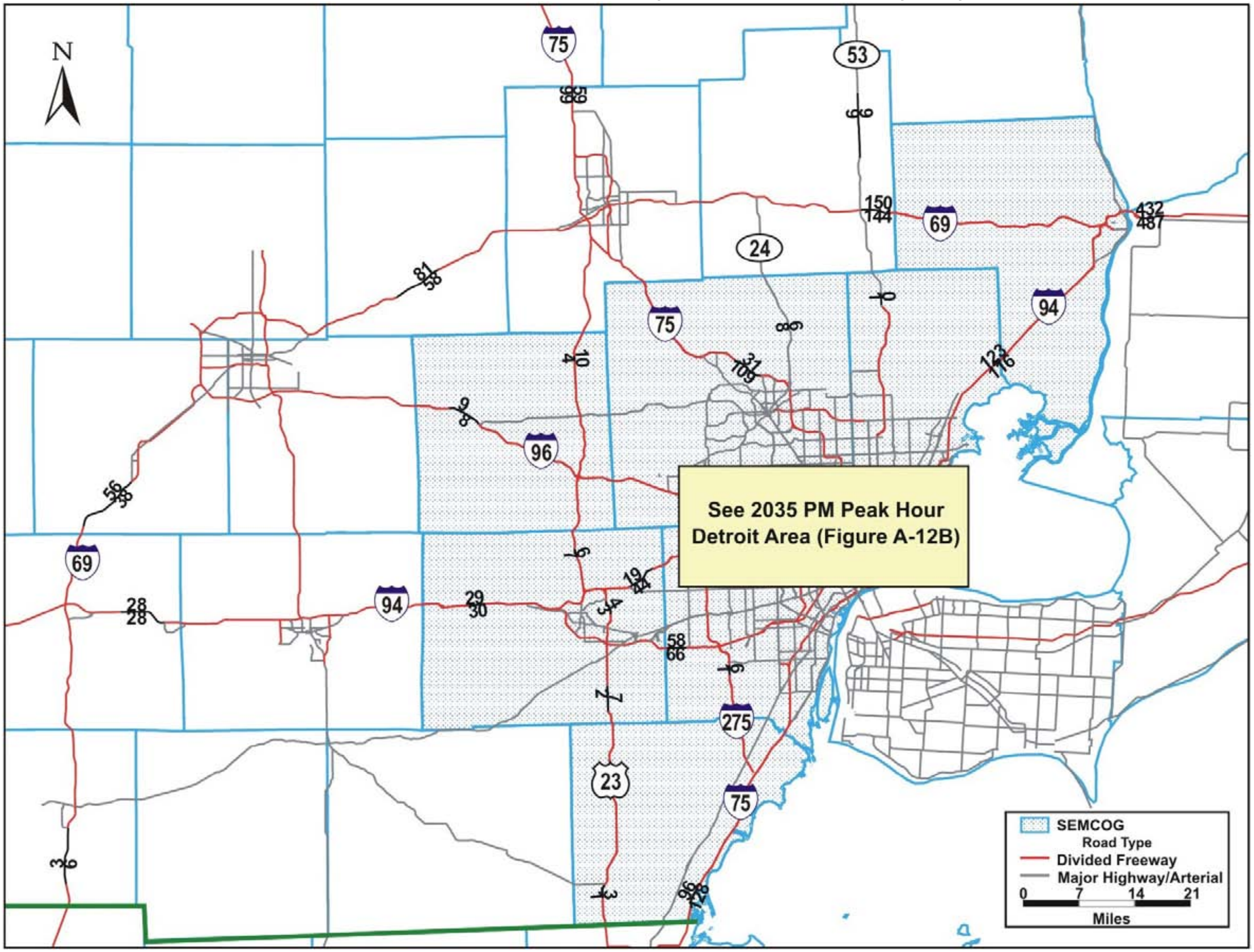
2035 PM Peak Hour International Truck Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure A-12A

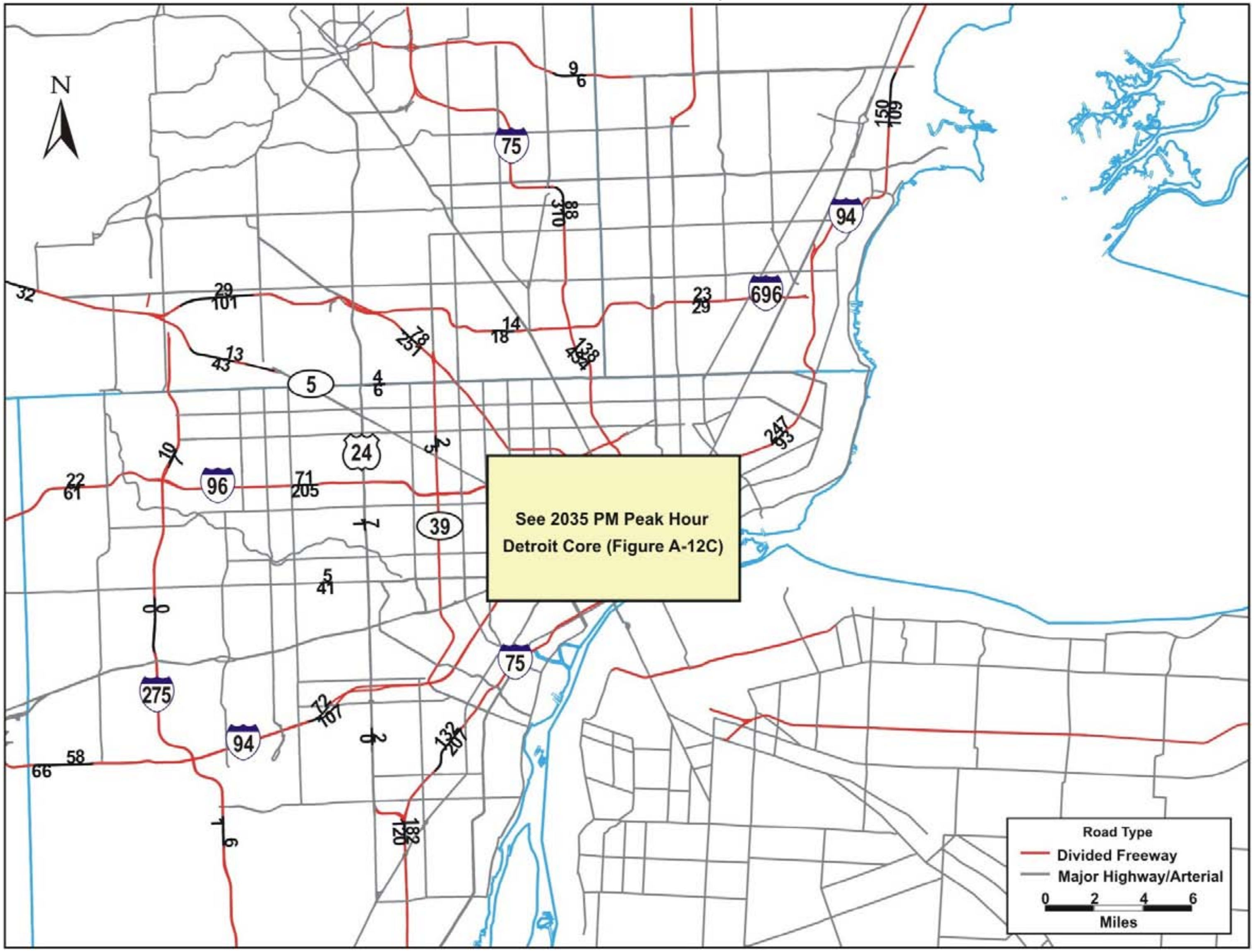
2035 PM Peak Hour <u>International Car Volume by Direction</u> – <u>Southeast Michigan Region</u>



Source: The Corradino Group of Michigan, Inc.

Figure A-12B

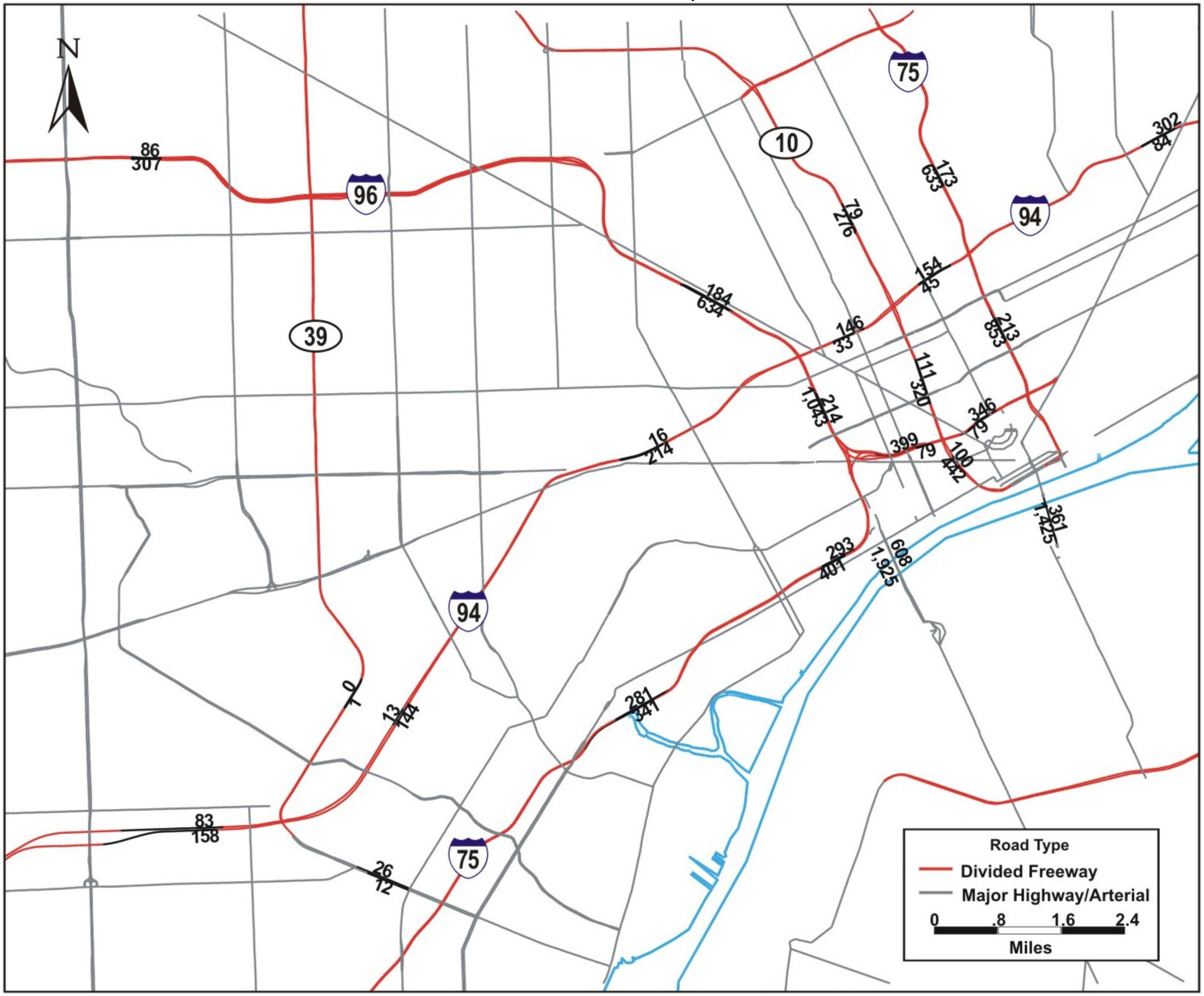
2035 PM Peak Hour International Car Volume by Direction – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure A-12C

2035 PM Peak Hour International Car Volume by Direction – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Appendix B

Overview of Plazas and Routes Connecting them to the Freeway System

Plaza S1 Quarry on North Side of King Road

Location: Northeast corner of Fort Street and King Street; City of Trenton
Plaza Size: Approximately 173 acres

This site consists primarily of access roads and staging areas which service the active limestone quarry located immediately to the north. (The active quarry is not included in this analysis.) An active electric power facility is located on the south side of the subject site. A large, vacant industrial building is located on the west side of the site, east of Fort Street. There are four active rail lines and an above grade electric transmission line on the east side of the site. A single-family residential area with a school, a park, and three places of worship are located to the northeast of the site. This neighborhood is buffered from the subject site by a wooded, natural area.

On the south side of King Street, across from the subject site is a large office building and an open field. The west side of Fort Street consists of a single-family residential development and commercial development, the latter being a function of major intersections.

Plaza S-1 is connected to River Crossing X-1.

<u>Alternative S1/Route 1 – King Road</u>

For the purposes of assessing travel demand, the King Road route is being considered as two distinct options: 1) Segment A, from the plaza to I-75; and, 2) Segments A and B combined, from the plaza to I-275.

Segment A: The potential alignment is approximately 2.90 miles long and roughly parallels along the north side of King Road. This alignment intersects commercial development, residential, and undeveloped land. The alignment avoids the Riverview golf course and skirts the main area of the landfill. This potential alignment will require a new fully directional interchange at I-75.

Segment B: The potential alignment is approximately 7.80 miles long aligned with the existing King Road from I-75 to Vining Road before it bends diagonally to the interchange at I-275 and Sibley Road. The alignment intersects commercial development, residential uses and undeveloped land. This potential alignment will require a new fully directional interchange at I-75 and King Road and also reconstruction of the interchange at I-275 and Sibley Road.

Plaza S2 **McLouth Steel**

Location: East side of Jefferson Avenue, north of King Street, west of the Detroit River; City of Trenton
Plaza Size: Approximately 217 acres

This site consists of several vacant industrial buildings formerly associated with steel production. The buildings on the site are in various stages of disrepair. The site abuts the Detroit River on its east property line. Immediately to the north of the site are docking facilities and a rail line. There is a viable industry on the west side of Jefferson, across from the subject site.

This plaza is connected to River Crossing X-1.

Alternative S2/Route 1 – King Road

For the purposes of assessing travel demand, the King Road route is being considered as two distinct options: 1) Segment A, from the plaza to I-75; and, 2) Segments A and B combined, from the plaza to I-275.

Segment A: The potential alignment is approximately 2.90 miles long and roughly parallels along the north side of King Road. This alignment intersects commercial development, residential, and undeveloped land. The alignment avoids the Riverview golf course and skirts the main area of the landfill. This potential alignment will require a new fully directional interchange at I-75**.**

Segment B: The potential alignment is approximately 7.80 miles long aligned with the existing King Road from I-75 to Vining Road before it bends diagonally to the interchange at I-275 and Sibley Road. The alignment intersects commercial development, residential uses and undeveloped land. This potential alignment will require a new fully directional interchange at I-75 and King Road and also reconstruction of the interchange at I-275 and Sibley Road.

Plaza S3 — Atofina Chemical Co. West

Location: South of Pennsylvania Road, west of Longsdorf Street; City of Riverview

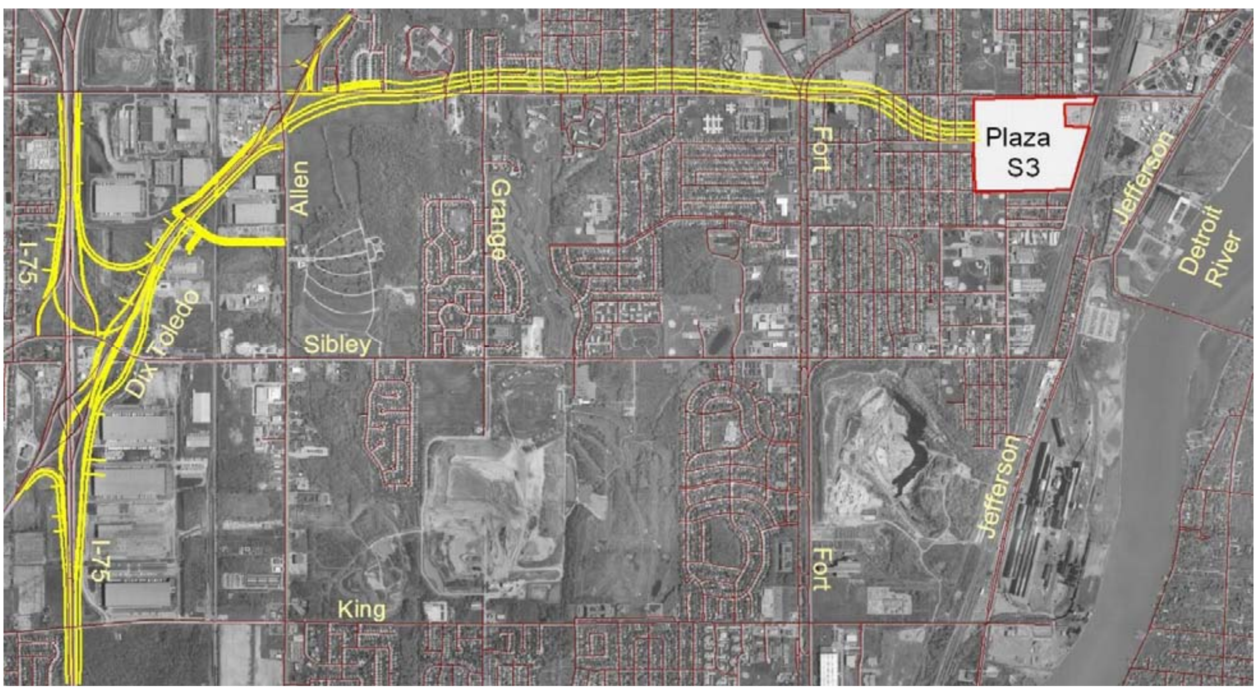
Plaza Size: Approximately 85 acres

This site is primarily natural with few, if any, structures. An electric power facility is adjacent to its northeastern border. The site’s western property line is adjacent to a residential neighborhood consisting of single-family detached housing. A series of active rail lines are immediately to the east of the site. South of Colvin Street is a single-family residential neighborhood.

This plaza is connected to River Crossings X-2 and X-3.

<u>Alternative S3/Route 1 – Pennsylvania Road to I-75/Sibley Road</u>

Route: This potential alignment is approximately 4.00 miles long along the north side of Pennsylvania Road. This alignment intersects existing retail, residential, and undeveloped land. This potential route will require reconstruction of Dix/Toledo Road from Pennsylvania to the I-75 interchange and reconstruction of the I-75/Dix/ Toledo/Sibley interchange.



Detroit River International Crossing Study

Plaza S4 **Atofina Chemical Co. East**

Location: East of Biddle Avenue, south of Wyandotte Shores Golf Club; City of Wyandotte

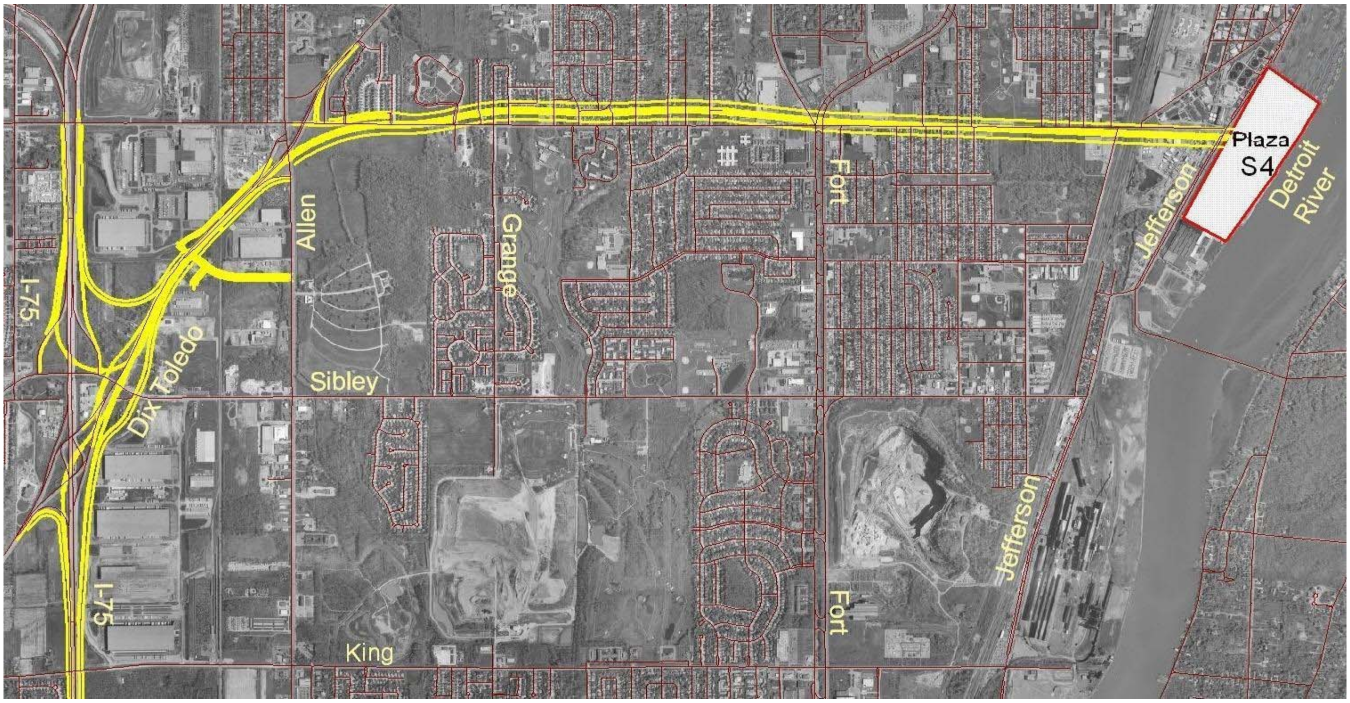
Plaza Size: Approximately 85 acres

This site consists of vacant land and the Pride Material Processing Facility, the latter having limited operations. The site's eastern property line has ample frontage on the Detroit River. Immediately to the north is the Wyandotte Shores Golf Club and northwest of the site is the Wayne County Wastewater Treatment Plant.

This plaza is connected to River Crossings X-2 and X-3.

<u>Alternative S4/Route 1 – Pennsylvania Road to I-75/Sibley Road</u>

Route: This potential alignment is approximately 4.80 miles long along the north side of Pennsylvania Road. This alignment intersects existing retail and residential uses, and undeveloped land. This potential route will require reconstruction of Dix/Toledo Road from Pennsylvania to I-75 and reconstruction of the I-75/Dix/Toledo/Sibley interchange.



Plaza S3 **Atofina Chemical Co. West**

Location: South of Pennsylvania Road, west of Longsdorf Street; City of Riverview
Plaza Size: Approximately 85 acres

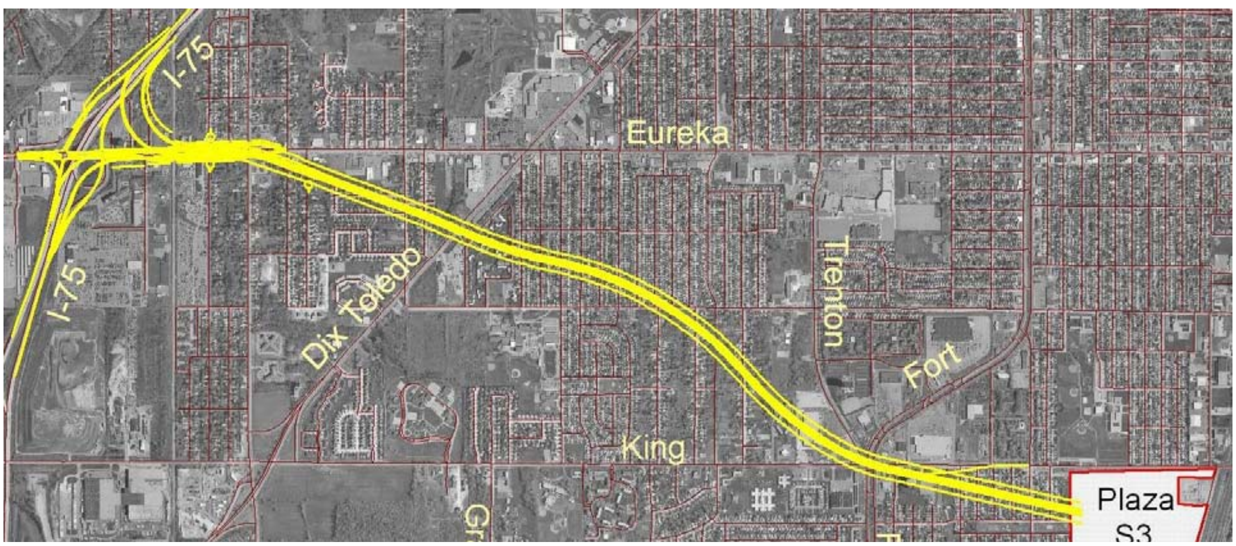
This site is primarily natural with few, if any, structures. An electric power facility is adjacent to its northeastern border. The site's western property line is adjacent to a residential neighborhood consisting of single-family detached housing. A series of active rail lines are immediately to the east of the site. South of Colvin Street is a single-family residential neighborhood.

This plaza is connected to River Crossings X-2 and X-3.

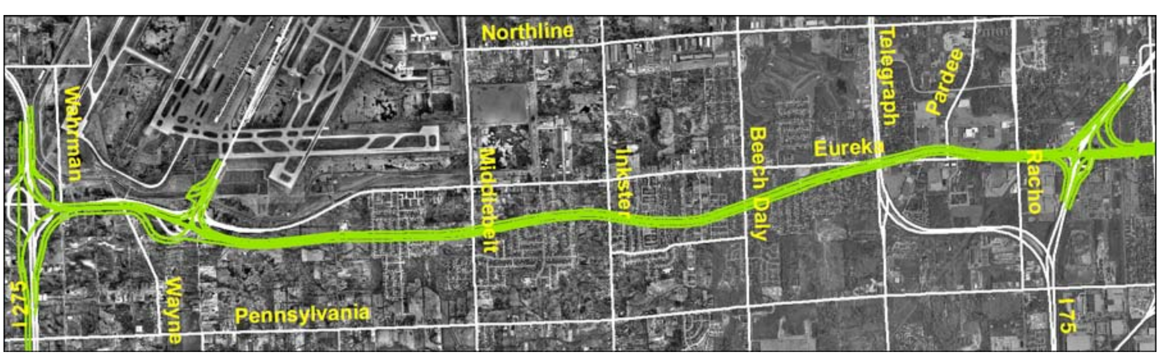
<u>Alternative S3/Route 2 – Eureka Road</u>

For the purposes of assessing travel demand, the Eureka Road route is being considered as two distinct options: 1) Segment A, from the plaza to I-75; and, 2) Segments A and B combined, from the plaza to I-275.

Segment A: This potential alignment is approximately 3.60 miles long and progresses at a diagonal to connect the plaza to the interchange at I-75 and Eureka Road. The alignment intersects primarily residential areas with some retail, commercial and industrial. This potential route will require the reconstruction of the I-75 and Eureka interchange.



Segment B: This potential alignment is approximately 7.80 miles long and is primarily on the south side of Eureka Road. The alignment intersects residential area with some retail and commercial uses. This potential route will require the reconstruction of the I-75 and Eureka interchange and also the construction of an interchange at Eureka and the Airport Road.



Plaza S4 **Atofina Chemical Co. East**

Location: East of Biddle Avenue, south of Wyandotte Shores Golf Club; City of Wyandotte
Plaza Size: Approximately 85 acres

This site consists of vacant land and the Pride Material Processing Facility, the latter having limited operations. The site's eastern property line has ample frontage on the Detroit River. Immediately to the north is the Wyandotte Shores Golf Club and northwest of the site is the Wayne County Wastewater Treatment Plant.

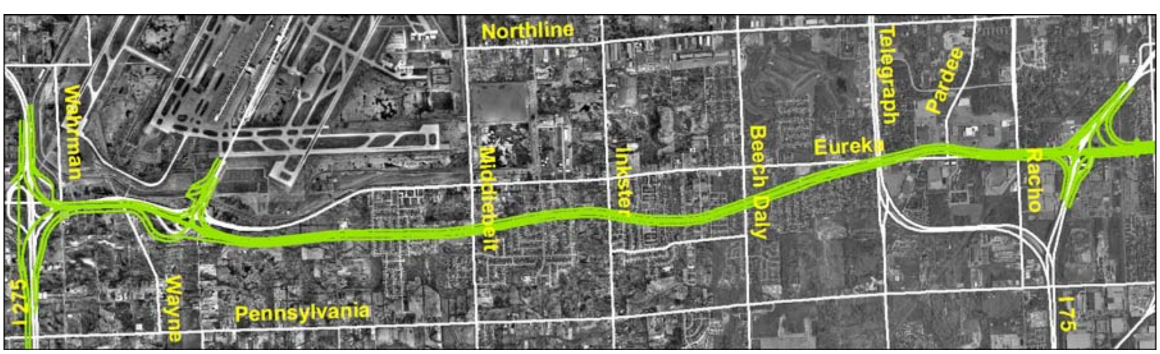
This plaza is connected to River Crossings X-2 and X-3.

<u>Alternative S4/Route 2 – Eureka Road</u>

For the purposes of assessing travel demand, the Eureka Road route is being considered as two distinct options: 1) Segment A, from the plaza to I-75; and, 2) Segments A and B combined, from the plaza to I-275.

Segment A: This potential alignment is approximately 4.35 miles long and progresses along Pennsylvania Road then at a diagonal from Fort Street to the interchange at I-75 and Eureka Road. The alignment intersects primarily residential area with some retail, commercial and industrial. This potential route will require the reconstruction of the I-75 and Eureka interchange.

Segment B: This potential alignment is approximately 7.80 miles long and travels on the south side of Eureka Road. The alignment intersects primarily residential area with some retail, commercial and a school. This potential route will require the reconstruction of the I-75 and Eureka interchange and also the construction of an interchange at Eureka and the Airport Road.



Plaza S5 **Michigan Steel Works Co.**

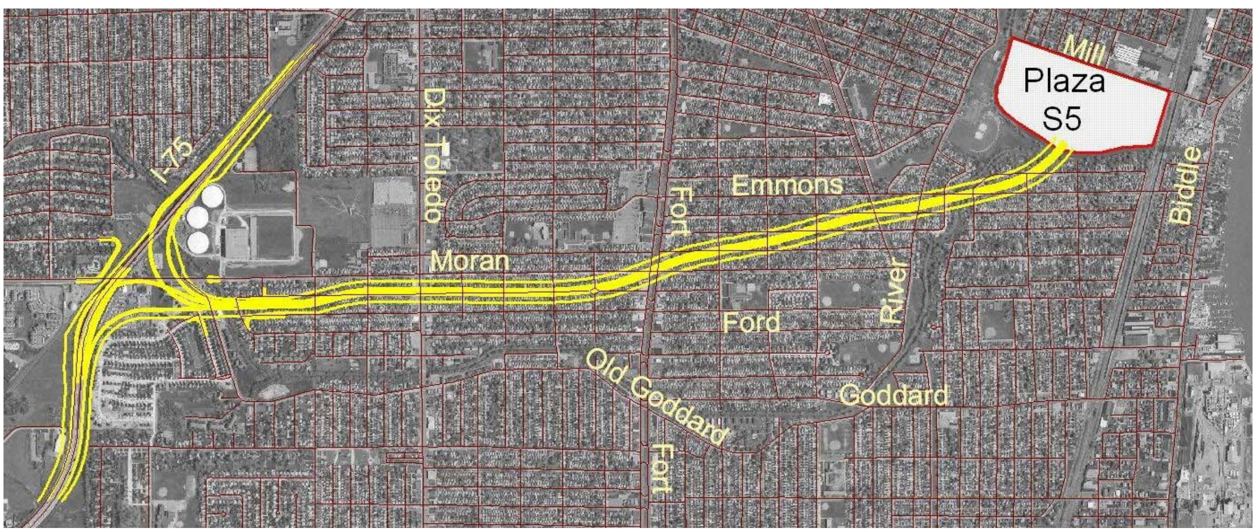
Location: South of Mill Street, west of Biddle/W. Jefferson Avenue; City of Ecorse
Plaza Size: Approximately 70 acres

This is the site of the former Michigan Steel Works Company. It consists of large, vacant buildings that were used for the production of steel. The buildings are in very poor condition. To the north of Mill Street are small houses on small urban lots. East of 4th Street and south of Suburban Street is an industrial building occupied by the Crown Group. The east side of the site borders active rail lines and an above grade electric line. The site abuts Council Point Park on the west.

This plaza is connected to River Crossing X-4.

<u>Alternative S5/Route 1 – Moran</u>

Route: This potential alignment is approximately 2.85 miles long and diagonally crosses over the Ecorse River from the plaza and then more or less parallels Moran to an interchange with I-75.



Plaza S5 Michigan Steel Works Co.

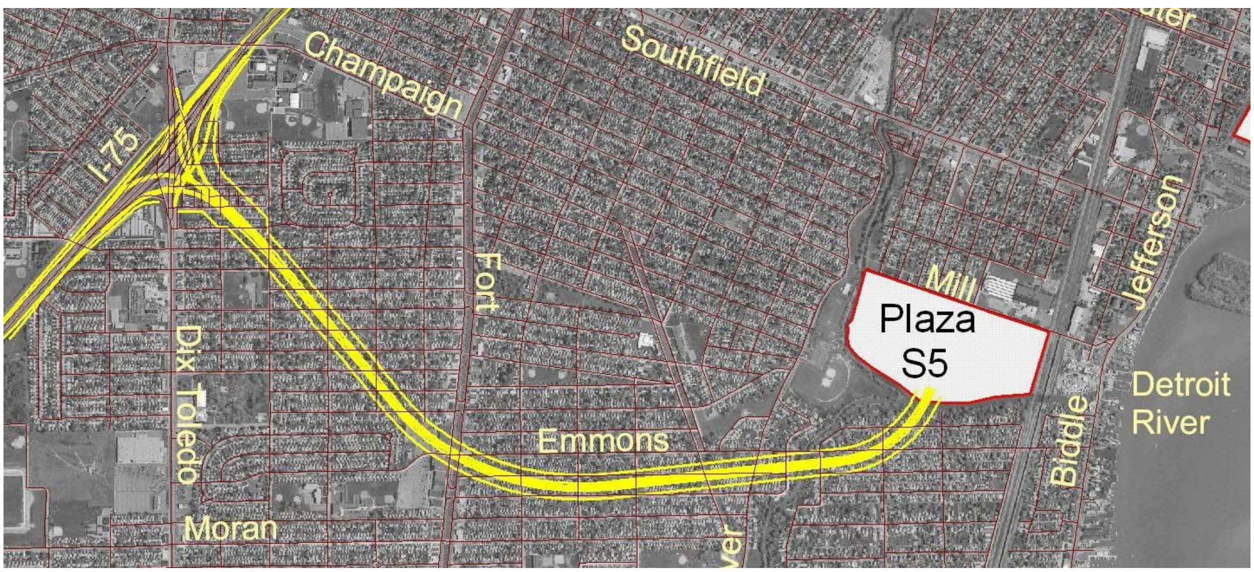
Location: South of Mill Street, west of Biddle/W. Jefferson Avenue; City of Ecorse
Plaza Size: Approximately 70 acres

This is the site of the former Michigan Steel Works Company. It consists of large, vacant buildings that were used for the production of steel. The buildings are in very poor condition. To the north of Mill Street are small houses on small urban lots. East of 4th Street and south of Suburban Street is an industrial building occupied by the Crown Group. The east side of the site borders active rail lines and an above grade electric line. The site abuts Council Point Park on the west.

This plaza is connected to River Crossing X-4.

<u>Alternative S5/Route 2 – Interchange at I-75/Dix South</u>

Route: This potential alignment is approximately 2.25 miles long crossing the Ecorse River and more or less paralleling Emmons before it bends diagonally to the north ending at an interchange with I-75 at Dix South.



Detroit River International Crossing Study

Plaza S5 **Michigan Steel Works Co.**

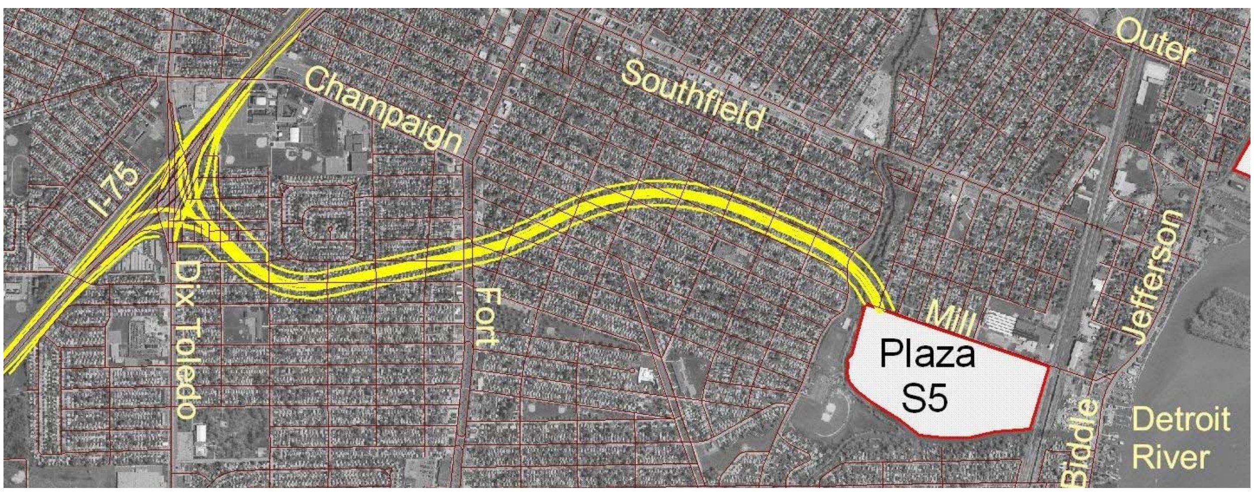
Location: South of Mill Street, west of Biddle/W. Jefferson Avenue; City of Ecorse
Plaza Size: Approximately 70 acres

This is the site of the former Michigan Steel Works Company. It consists of large, vacant buildings that were used for the production of steel. The buildings are in very poor condition. To the north of Mill Street are small houses on small urban lots. East of 4th Street and south of Suburban Street is an industrial building occupied by the Crown Group. The east side of the site borders active rail lines and an above grade electric line. The site abuts Council Point Park on the west.

This plaza is connected to River Crossing X-4.

<u>Alternative S5/Route 3 – I-75/Dix North</u>

Route: This potential alignment is approximately 2 miles long and weaves through local road system crossing over the Ecorse River then bending south to roughly parallel Cleveland Street crossing Fort Street at Mayflower ending at an interchange with I-75 at Dix South.



Plaza S5 Michigan Steel Works Co.

Location: South of Mill Street, west of Biddle/W. Jefferson Avenue; City of Ecorse
Plaza Size: Approximately 70 acres

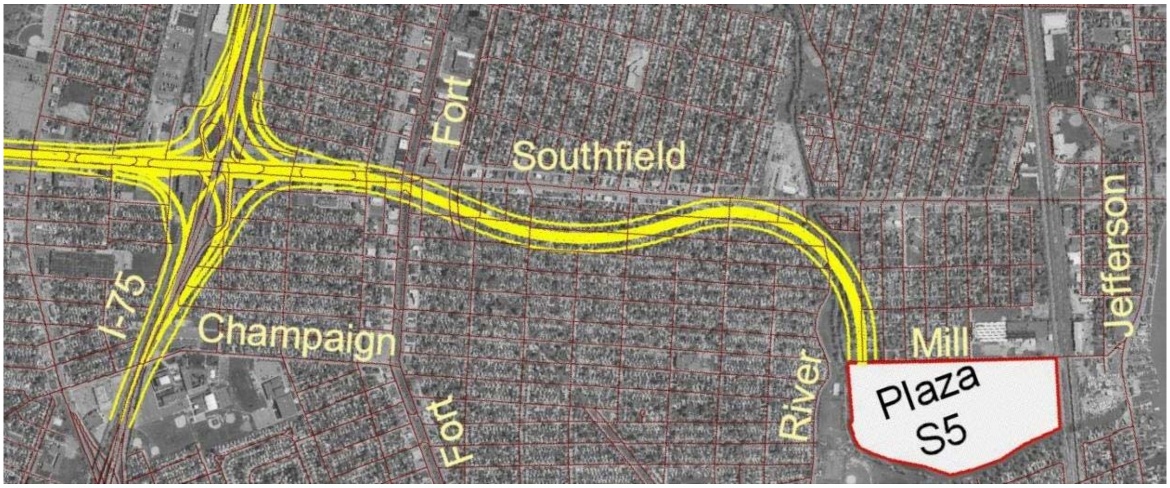
This is the site of the former Michigan Steel Works Company. It consists of large, vacant buildings that were used for the production of steel. The buildings are in very poor condition. To the north of Mill Street are small houses on small urban lots. East of 4th Street and south of Suburban Street is an industrial building occupied by the Crown Group. The east side of the site borders active rail lines and an above grade electric line. The site abuts Council Point Park on the west.

This plaza is connected to River Crossing X-4.

<u>Alternative S5/Route 4 – Southfield Road</u>

For the purposes of assessing travel demand, the Southfield Road route is being considered as two distinct options: 1) Segment A, from the plaza to I-75; and, 2) Segments A and B combined, from the plaza to I-94.

Segment A: This potential alignment is approximately 1.75 miles long crossing over the Ecorse River then paralleling Southfield Road to an interchange with I-75. The alignment attempts to avoid extensive impacts to the commercial center on Southfield Road. This potential site will require extensive reconstruction of the I-75 and Southfield interchange.



Segment B: This potential alignment would convert Southfield Highway to a limited access facility between I-75 and the I-94 interchange.

Detroit River International Crossing Study

Plaza C1 US Steel South

Location: East side of Jefferson Avenue; City of Detroit
Plaza Size: Approximately 112 acres

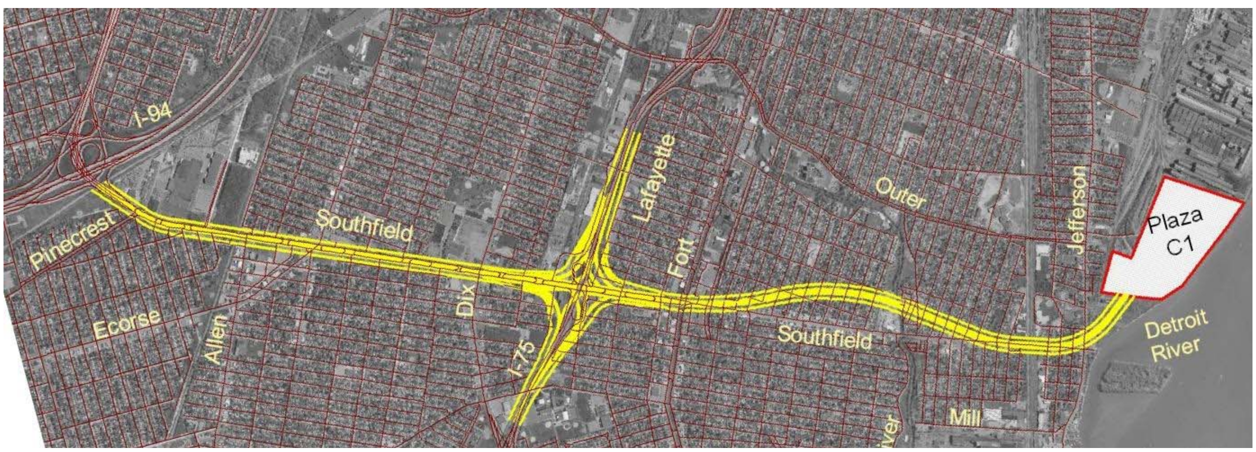
This site is part of the existing and operating US Steel complex. Its east property line fronts on the Detroit River. The subject site is active in what appears to be a mineral extraction operation relating to the production facility. Immediately to the west of the site is a series of active rail lines and to the south of the site is an area of primarily undeveloped land.

This plaza is connected to River Crossings X-5, X-6 and X-7.

<u>Alternative C1/Route 1 – Southfield Road</u>

Route: This potential route is about 4.5 miles long extending from the plaza along Southfield Road to I-75 north of the business core along Southfield Road then to I-94.

For the purposes of assessing travel demand, this route is being considered as two options: 1) from the plaza to I-75; and, 2) from the plaza to I-94, with the existing Southfield Highway converted to a limited access facility.



Detroit River International Crossing Study

Plaza C1 US Steel South

Location: East side of Jefferson Avenue; City of Detroit
Plaza Size: Approximately 112 acres

This site is part of the existing and operating US Steel complex. Its east property line fronts on the Detroit River. The subject site is active in what appears to be a mineral extraction operation relating to the production facility. Immediately to the west of the site is a series of active rail lines and to the south of the site is an area of primarily undeveloped land.

This plaza is connected to River Crossings X-5, X-6 and X-7.

Alternative C1/Route 2 – Outer Drive

Route: This potential route is about 4 miles long and uses an alignment close to Outer Drive in moving between I-75 and I-94. The interchanges with I-94 and I-75 would be rebuilt.

For the purposes of assessing travel demand, this route is being considered as two options: 1) from the plaza to I-75; and, 2) from the plaza to I-94.

Plaza C2 **US Steel North**

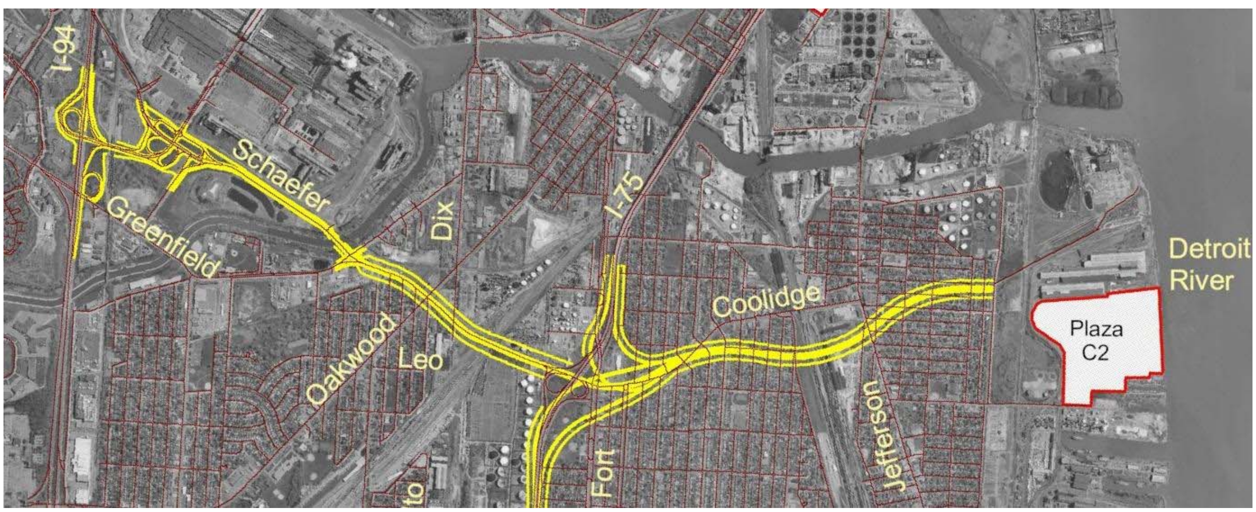
Location: East side of Marlon Avenue; City of Wyandotte
Plaza Size: Approximately 110 acres

This plaza site is part of the existing and operating U.S. Steel complex and is immediately north of the main plant. Its east property line fronts on the Detroit River. The west side of the site is bordered by rail and undeveloped land. To the north of the site is the U.S. Steel rolling mill. The river crossings (X-8 and X-9) tying into this plaza site will require the rolling mill to be relocated and replaced new by the project.

<u>Alternative C2/Route 1 – Schaefer Road South</u>

Route: This proposed route is about four miles long and provides a new alignment from the plaza near the Belanger Park entrance to the existing I-75/Schaefer Road interchange on the south side of Coolidge and Schaefer. The alignment could extend west from I-75 to I-94 connecting on the west side of the Rouge plant.

For the purposes of assessing travel demand, this route is being considered as two options: 1) from the plaza to I-75; and, 2) from the plaza to I-94.



Plaza C2 **US Steel North**

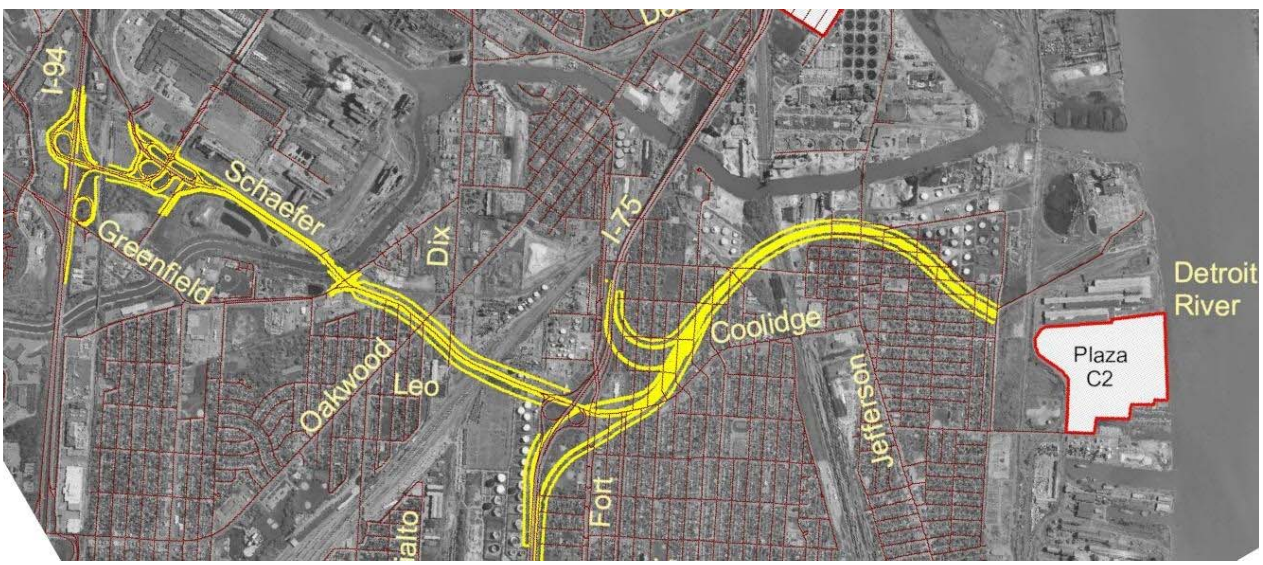
Location: East side of Marlon Avenue; City of Wyandotte
Plaza Size: Approximately 110 acres

This plaza site is part of the existing and operating U.S. Steel complex and is immediately north of the main plant. Its east property line fronts on the Detroit River. The west side of the site is bordered by rail and vacant land. To the north of the site is the U.S. Steel rolling mill. The river crossings (X-8 and X-9) connecting to this plaza site will require the rolling mill to be relocated and replaced new by the project.

<u>Alternative C2/Route 2 – Schaefer Road North</u>

Route: This proposal is about 4.5 miles long and moves in a semi-circular path north of Coolidge and Schaefer to minimize the residential property acquisitions. After the Schaefer Road interchange with I-75, it then follows Schaefer Road to its interchange with I-94.

For the purposes of assessing travel demand, this route is being considered as two options: 1) from the plaza to I-75; and, 2) from the plaza to I-94.



Detroit River International Crossing Study

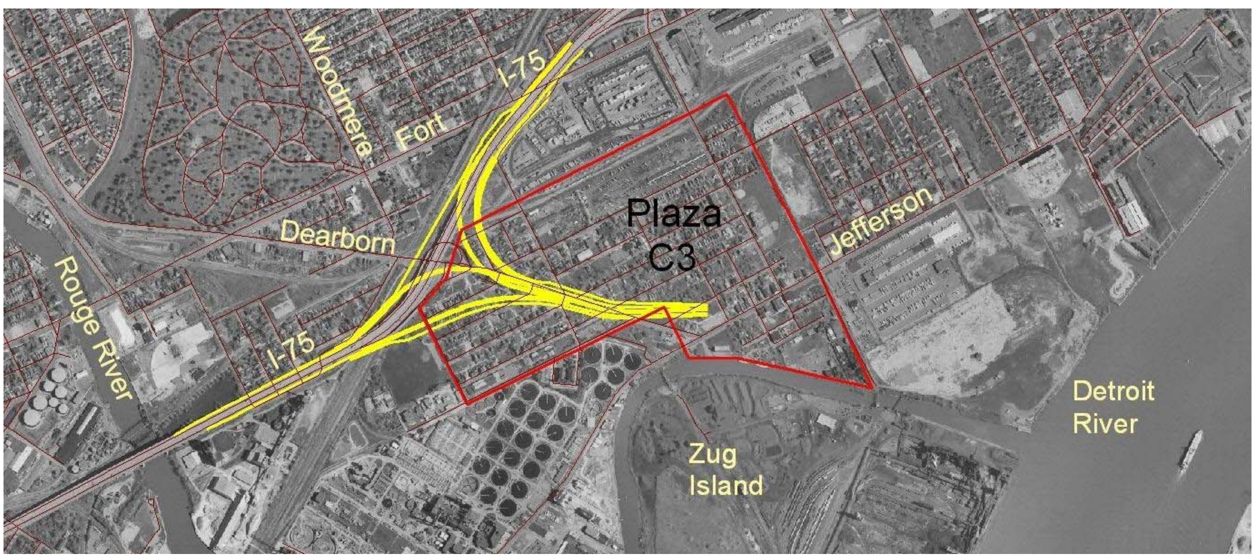
Plaza C3　　**Delray West**

Location: South of Rail Way Road, west of West End Street, east of Dearborn Street; City of Detroit
Plaza Size: Approximately 206.31 acres

This area contains primarily single-family homes on small residential lots. There are also a number of vacant lots. The area includes mixed uses consisting of small neighborhood commercial business. There is an active rail line that forms the northern edge of the potential plaza site. The river crossing to which the plaza would be connected is X-10.

Alternative C3/I-75 at Dearborn

The plaza would be connected to I-75 at the existing Dearborn Road interchange, providing a full interchange with I-75.



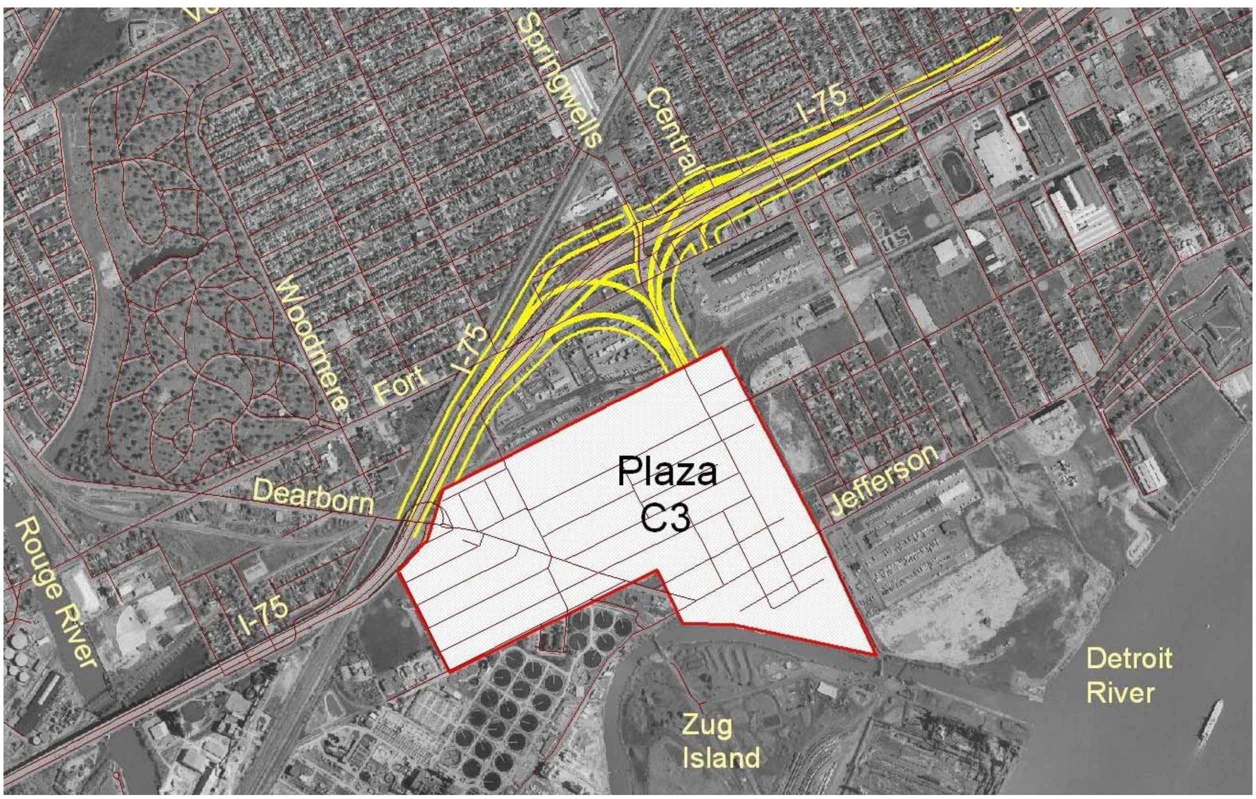
Plaza C3 **Delray West**

Location: South of Rail Way Road, west of West End Street, east of Dearborn Street; City of Detroit
Plaza Size: Approximately 206.31 acres

This area contains primarily single-family homes on small residential lots. There are a number of vacant lots. The area includes mixed uses consisting of small neighborhood commercial business. There is an active rail line that forms the northern edge of the potential plaza site. The river crossing to which the plaza would be connected is X-10.

Alternative C3/I-75 at Springwells

The plaza would be connected to I-75 at Springwells Avenue.



Plaza C4 **Delray East**

Location: South of Rail Way Road, west of Junction Street, east of Livernois Avenue, north of West Jefferson Avenue; City of Detroit
Plaza Size: Approximately 83.76 acres

This area contains a limited number of single-family homes on small residential lots. There are vacant lots scattered throughout the area. An active rail line would be redirected to form the northern boundary of the potential site. A number of businesses are in the area. Crossing X-11 would connect to the plaza.

Alternative C4/Dragoon

The plaza would be connected with "flyovers" to I-75 east of Dragoon.

Detroit River International Crossing Study

Plaza II-1 **I-75/Michigan Avenue**

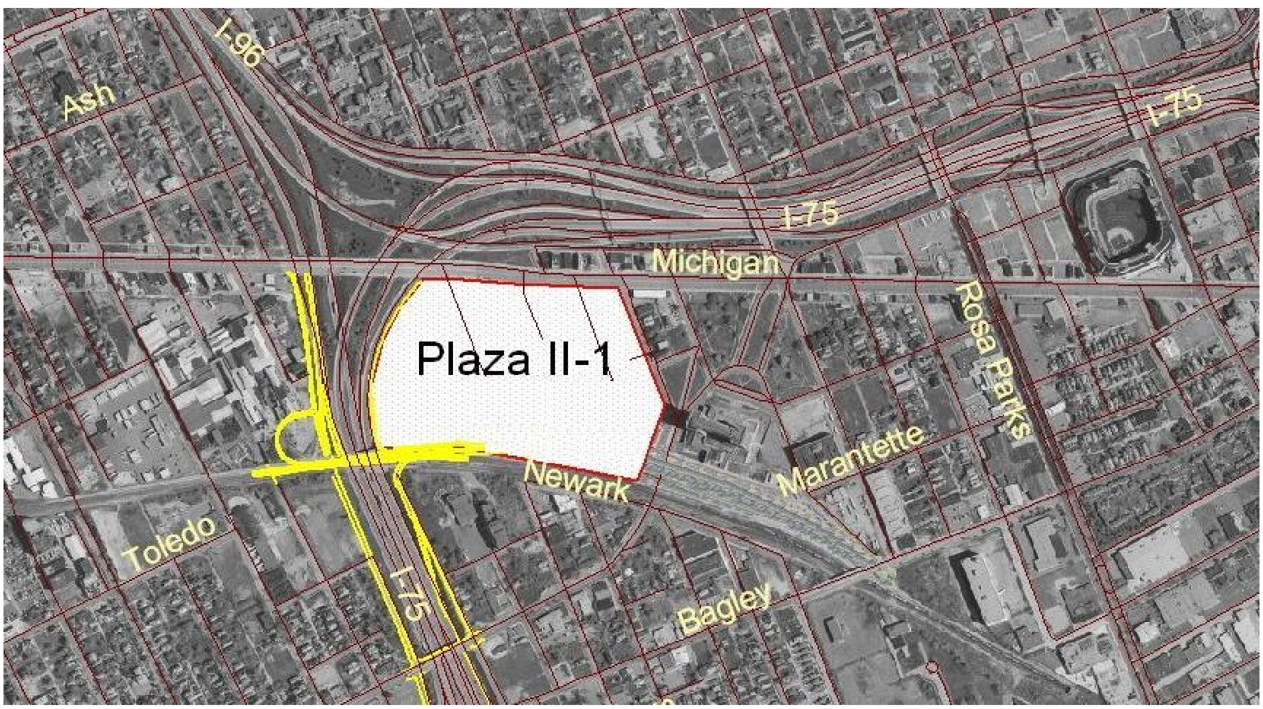
Location: Southeast corner of I-75 and Michigan Avenue; City of Detroit
Plaza Size: Approximately 38 acres

This site consists of several vacant industrial buildings. It is also the site of United Community Hospital. It is bordered by rail lines on the east, I-75 to the south, and Michigan Avenue on the west. Roosevelt Park is close to its northern boundary line. This site also contains the rail tunnel to Canada.

This plaza is connected to River Crossing X-13.

<u>Alternative II-1/Truck-Only Plaza</u>

Accommodates the DRTP proposal to use the existing twin rail tubes as a truck-only crossing and provide access to I-75/I-96 via the existing rail line right-of-way.



Plaza II-2 Rosa Parks Boulevard/Bagley Street

Location: South of Rosa Parks Boulevard, east of Bagley Street, west of Lafayette Boulevard, north of 16th Street; City of Detroit

Plaza Size: Approximately 73 acres

This site consists of several vacant industrial structures and some active industrial buildings. The site is in the Corktown neighborhood with numerous renovated properties. West of Bagley Street is a United States Postal Facility and east of Lafayette Street is a building housing community mental health services. The plaza is connected to Crossing X-14 or Crossing X-13 as an alternative plaza location for the DRTP concept.

<u>Alternative II-2 to M-10 @ Lafayette</u>

This alternative is connected by way of Crossing X-14, which is considered a bridge linking the DRTP-owned right-of-way on each side of the Detroit River. The crossing would have a main span of about 5,600 feet, one of the longest, which would affect its cost. Access is provided from Plaza II-2 to M-10 by way of an alignment parallel to Lafayette Boulevard. If Plaza II-2 is used for the DRTP concept, access would be provided to I-75 via the existing rail line right-of-way.

Plaza II-3 Rosa Parks Boulevard/Porter Street

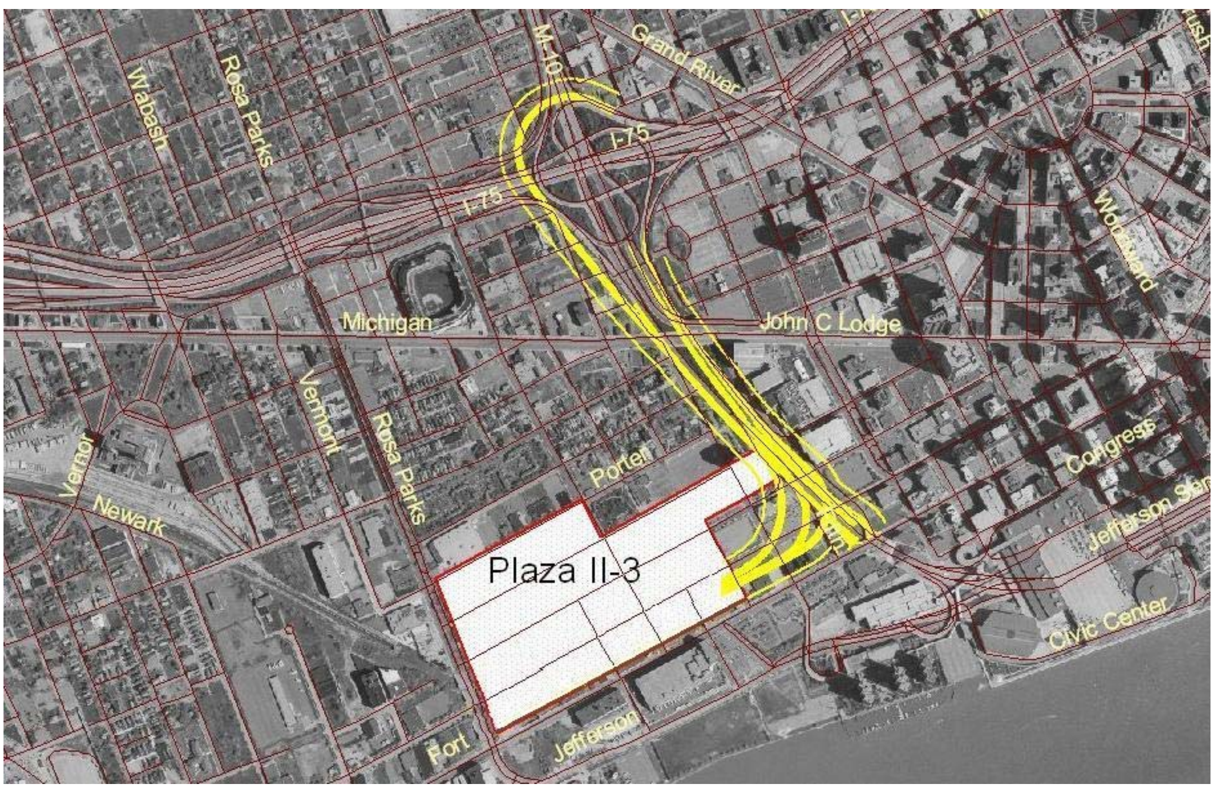
Location: East of Rosa Parks Boulevard, north of Fort Street, south of Porter Street, west of U.S. 10; City of Detroit

Plaza Size: Approximately 63 acres

This site consists of several occupied government office and commercial buildings along with a number of vacant buildings. South of Fort Street is a United States Postal Facility and parking lots serving existing businesses. North of the site are additional occupied office and commercial buildings.

Alternative II-3 to M-10 @ Lafayette

This alternative is connected by way of Crossing X-14, which is considered a bridge linking the DRTP-owned right-of-way on each side of the Detroit River. Access is then provided to M-10 by way of an alignment parallel to Lafayette Boulevard.



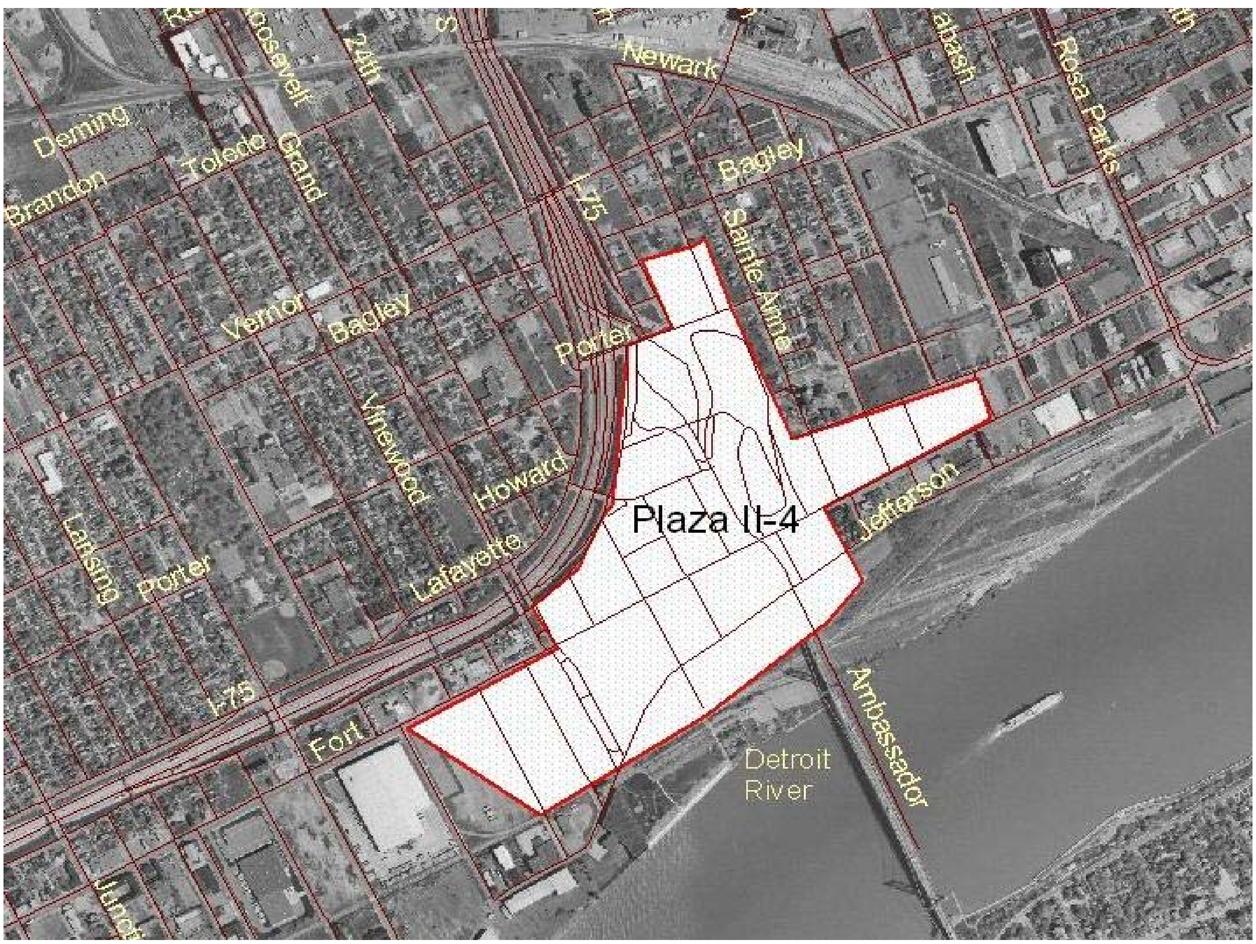
Plaza: II4 - Expanded Ambassador Bridge Plaza

Location: East of I-75, south of Bagley Street, west of St. Anne Street to Fort Street, juts out to 16th Street at Fort Street and Jefferson Avenue, north of Jefferson Avenue, and east of Scottien Street.
Plaza Size: Approximately 160 acres

This site consists of the existing U.S. Custom plaza for the Ambassador Bridge (about 30± acres), parkland, vacant industrial structures with some active industrial buildings. Adjacent to the south side of the site is an active rail line. The potential plaza abuts industrial to the north, residential and industrial to the east, railway and parkland to the south and I-75 freeway to the west. It is served by the proposed second span of the Ambassador Bridge.

<u>Alternative II-4 (Ambassador Bridge Extended Plaza) to I-75</u>

This route is a direct connection of Plaza II-4 to I-75.



Detroit River International Crossing Study

Plaza N1 **Jefferson/Conner Street**

Location: East of East Jefferson Avenue, south of Conner Street, north of St. Jean; City of Detroit
Plaza Size: Approximately 111 acres

This site consists of large, vacant parcels interspersed with vacant industrial buildings as well as existing fully operational industries. There are also sites used for outdoor storage of boats and vehicles. To the east of the site is the Detroit New Water Treatment Plant along with the Detroit Edison Power Generating Plant. North of Conner Street are single-family dwellings mixed with several vacant residential lots. There are vacant parcels to the south and west sides of the site.

This plaza is connected to River Crossing X-15.

<u>Alternative N1/Route 1 – St. Jean Street</u>

Route: This proposal is about 2.5 miles long and connects the plaza to I-94 at the existing interchange at Conner via Saint Jean Street on the west side of the Chrysler Plant. It utilizes a modern roundabout interchange to serve local traffic as well as the freeway-to-freeway movements.

Plaza N1 **Jefferson/Conner Street**

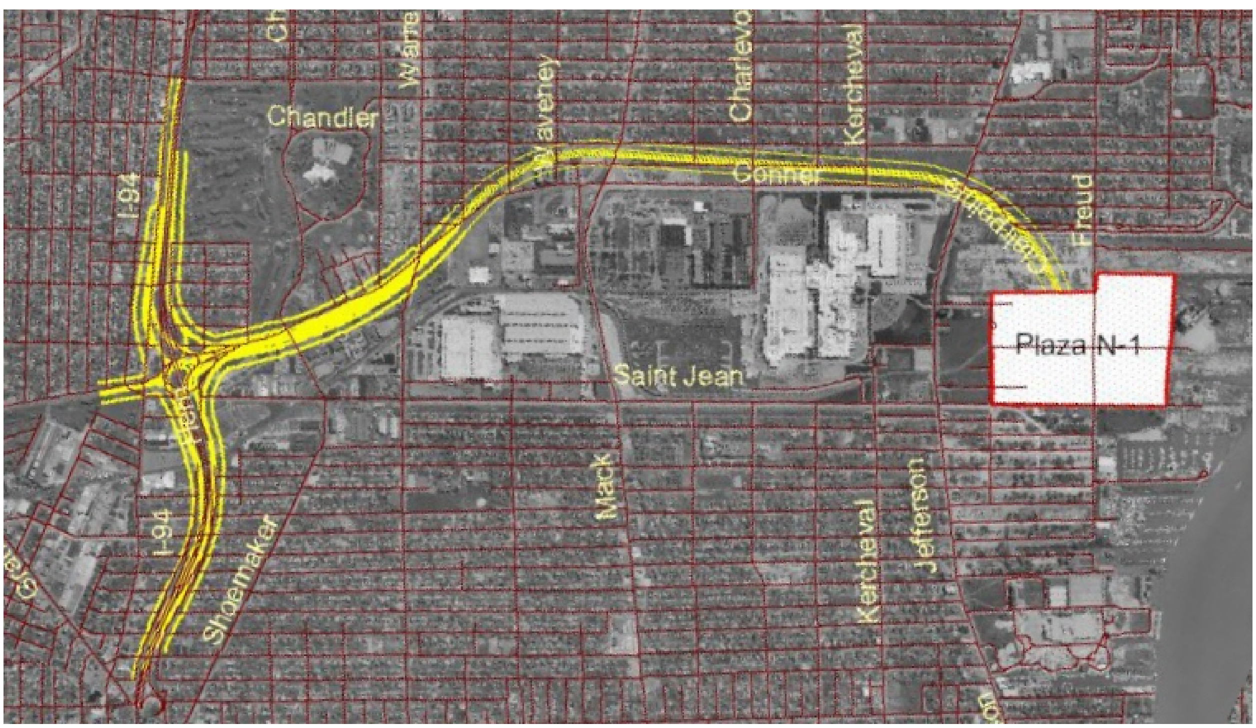
Location: East of East Jefferson Avenue, south of Conner Street, north of St. Jean; City of Detroit
Plaza Size: Approximately 111 acres

This site consists of large, vacant parcels interspersed with vacant industrial buildings as well as existing fully operational industries. There are also sites used for outdoor storage of boats and vehicles. To the east of the site is the Detroit New Water Treatment Plant along with the Detroit Edison Power Generating Plant. North of Conner Street are single-family dwellings mixed with several vacant residential lots. There are vacant parcels to the south and west sides of the site.

This plaza is connected to River Crossing X-15.

<u>Alternative N1/Route 2 – Conner Street</u>

Route: This proposal is about 2.5 miles long and connects the plaza to I-94 at the existing interchange at Conner via Connor on the east side of the Chrysler Plant. It utilizes a modern roundabout interchange to serve local traffic as well as the freeway-to-freeway movements.



Appendix C

Freight Movement Overview

APPENDIX C
FREIGHT MOVEMENT OVERVIEW

1. Introduction

Appendix C provides an overview of the most heavily used truck routes in the SEMCOG network. The network area is generally bounded by I-69 on the north and west, I-80/I-90 on the south, and the Canadian Border on the east. Minor state and local routes serving Lansing and Flint, as well as portions of Tuscola County, Sanilac County, Lapeer County, and St. Clair County are also included in the network. The facilities that distribute external trips include the following:

- The Blue Water Bridge to Canada at Port Huron, MI;
- The Detroit Windsor Tunnel to Canada at Detroit;
- The Ambassador Bridge to Canada at Detroit;
- I-75 and U.S. 23 to Ohio and the eastern and southern states;
- I-69 to Indiana; and,
- I-94 to Illinois and the northwest states.

External stations serve the following regions of Michigan:

- Sanilac County and eastern Huron County;
- Lapeer, Tuscola and western Huron County;
- Flint, Bay City, Saginaw and northern Michigan;
- Lansing and western Michigan;
- Jackson and southwestern Michigan; and,
- Lenawee County.

Tables C-1 and C-2 provide volumes of international trucks at the border crossings and at external links in the SEMCOG network for the 2004 AM and PM peak hours. Figures C-1A through C-4C present <u>international truck movements</u> and <u>domestic truck movements</u> during the 2004 AM and PM peak hours. These are model-assigned volumes. These assignments present the total flow of truck movements for two distinct border-crossing areas (Port Huron and Detroit). The international truck volumes on the network represent all trucks coming to and from the Detroit River Crossings and Port Huron. Truck volumes on main-line freeways directly adjacent to any individual crossing will carry larger volumes than the crossing itself because of this. For example, some northbound trucks on I-75 south of Detroit cross at Port Huron, not in Detroit.

1.1 International Truck Movements

1.1.1 2004 AM Peak Hour - U.S. Bound Trips

As presented in Table C-1, 399 trucks cross into the U.S. in the 2004 AM peak hour assignment. Two-hundred and thirty-three trucks cross in Detroit, of which 228 cross via the Ambassador Bridge and five at the Detroit-Windsor Tunnel (Figure C-1C) (○ red oval). One hundred and sixty-six trucks cross the Blue Water Bridge (○ red oval). It can be seen by viewing Figure C-1D in Attachment 1 to this appendix that of the 228 trucks crossing the Ambassador Bridge, 125 travel on Fort Street to southbound I-75, and 99 trucks proceed to the I-96/I-75 interchange. Sixty-eight Detroit trucks ultimately leave the region via southbound I-75, and 55 trucks exit the region via westbound I-94 (○ blue oval). Thirty-two trucks are destined for Flint/Northern Michigan, and 13 trucks are destined for other regions in the state (□ red box). Sixty-five trucks have local destinations in the Southeastern Michigan region (□ blue box).

Table C-1
International Truck Volumes at External Links:
2004 AM Peak Hour

		Canada to U.S.			U.S. to Canada		
Crossing	**Connects with:**	**Detroit Crossings**	**Bluewater**	**Total**	**Detroit Crossings**	**Bluewater**	**Total**
Blue Water Bridge	Sarnia, PH 402	na	166	166	na	53	53
Det.-Windsor Tunnel	Windsor, PH 401	5	na	5	5	na	5
Ambassador Bridge	Windsor, PH 401	228	na	228	228	na	228
Total Crossing Volume		233	166	**399**	233	53	**286**
		External to Southeast Michigan			**External to Southeast Michigan**		
External Routes	**Connects with:**	**Detroit Crossings**	**Bluewater**	**Total**	**Detroit Crossings**	**Bluewater**	**Total**
I-75 South	Ohio & beyond	68	27	95	60	14	74
I-69 South	Indiana & beyond	0	9	9	0	4	4
I-94 West	Illinois & beyond	55	39	94	54	13	67
External Stations							
Sanilac Co./eastern Huron Co.		1	1	2	0	0	0
Lapeer, Tuscola, & western Huron Cos.		0	0	0	2	1	3
Flint/Northern MI		32	11	43	8	3	11
Lansing/Western MI		7	1	8	15	13	28
Jackson/Southwestern MI		5	2	7	3	2	5
Lenawee County		0	0	0	2	2	4
Total with O/D outside SE Michigan		168	90	**258**	144	52	**196**
Percent with O/D outside SE Michigan		72%	54%	**65%**	62%	98%	**69%**
Total with O/D in SE Michigan		65	76	**141**	89	1	**90**
Percent with O/D in SE Michigan		28%	46%	**35%**	38%	2%	**31%**

Source: The Corradino Group of Michigan

By viewing Figure C-1A it can be seen that trucks crossing into the U.S. at the Blue Water Bridge in the 2004 AM peak hour are relatively evenly split between westbound I-69 (78) and southbound I-94 (79). In Table C-1, 39 Blue Water Bridge trucks leave the region using westbound I-94, 27 trucks exit the region via southbound I-75, and 9 trucks exit via southbound I-69 (△ red triangle). Seventy-six Blue Water trucks are destined for the Southeastern Michigan region (△ blue triangle). Fifteen trucks are destined for other regions in the state (▽ blue wedge).

1.1.2 2004 AM Peak Hour - Canadian Bound Trips

Table C-1 shows in the 2004 AM peak hour that 233 trucks cross into Canada from Detroit (228 via the Ambassador Bridge and five at the Detroit-Windsor tunnel) (Figure C-1C); 53 trucks cross over the Blue Water Bridge (Figure C-1A) (○ green oval). Sixty trucks crossing into Canada via Detroit arrive from outside the region via northbound I-75, while 54 trucks arrive from eastbound I-94 (○ black oval). Eighty-nine trucks crossing into Canada from Detroit originate locally in the Southeastern Michigan region (□ green box). Fifteen trucks originate from Lansing and western Michigan, and 15 trucks originate from other regions in the state (□ black box). By referring to Figure C-1D in Attachment 1 to this appendix it can be seen that 121 trucks approach the Ambassador Bridge from northbound I-75, while 107 trucks approach from the I-96/I-75 interchange (○ red circles, Figure C-1D).

All but one of the 53 trucks in the AM peak hour crossing into Canada over the Blue Water Bridge originate from outside the Southeastern Michigan region (△ green triangles). Fourteen trucks enter Michigan via northbound I-75, 13 trucks enter via eastbound I-94, and four trucks enter via northbound I-69 (△ black triangle). Thirteen trucks originate in Lansing and western Michigan and eight originate from other regions of the state (▽ red wedge). By referring to Figure C-1A in Attachment 1 of this appendix, it can be seen that 22 trucks approach the Blue Water Bridge from northbound I-94, and 25 trucks approach from eastbound I-69 (Figure C-1A).

1.1.3 2004 PM Peak Hour - U.S. Bound Trips

Table C-2 shows that the 2004 PM peak hour volumes of international trucks crossing into the U.S. from Canada totals 360. Two hundred and three trucks cross at the Ambassador Bridge; three trucks cross at the Detroit-Windsor Tunnel (Figure C-3C) (○ red oval); and, 154 trucks cross at the Blue Water Bridge (Figure C-3A) (○ red oval). By referring to Figure C-3D it can be seen that, of the 203 trucks crossing via the Ambassador Bridge, 104 travel Fort Street to southbound I-75, and 61 trucks proceed to the I-96/I-75 interchange. Twenty-five trucks continue south on Fort Street (Figure C-3D). As shown in Table C-2, 76 Detroit trucks ultimately leave the region via southbound I-75, and 49 trucks exit the region via westbound I-94 (○ blue oval). Sixty trucks have local destinations in the Southeastern Michigan region (□ blue box), and 21 trucks have destinations in other regions of the state (□ red box).

By viewing Figure C-3A it can be seen that trucks crossing into the U.S. at the Blue Water Bridge are split between westbound I-69 (73) and southbound I-94 (73) (Figure C-3A). As seen in Table C-2, 43 Blue Water Bridge trucks leave the region using westbound I-94, 43 trucks exit the region via southbound I-75, and 11 trucks exit via southbound I-69 (△ red triangle). Thirty-eight of the Blue Water Bridge trucks are destined for the Southeastern Michigan region (△ blue triangle) while 19 trucks are destined for other regions in the state (▽ blue wedge).

Table C-2
International Truck Volumes at External Links:
2004 PM Peak Hour

		Canada to U.S.			U.S. to Canada		
Crossing	**Connects with:**	**Detroit Crossings**	**Bluewater**	**Total**	**Detroit Crossings**	**Bluewater**	**Total**
Blue Water Bridge	Sarnia, PH 402	na	154	154	na	165	165
Det.-Windsor Tunnel	Windsor, PH 401	3	na	3	24	na	24
Ambassador Bridge	Windsor, PH 401	203	na	203	372	na	372
Total Crossing Volume		206	154	**360**	396	165	**561**
		External to Southeast Michigan			**External to Southeast Michigan**		
External Routes	**Connects with:**	**Detroit Crossings**	**Bluewater**	**Total**	**Detroit Crossings**	**Bluewater**	**Total**
I-75 South	Ohio & beyond	76	43	119	147	49	196
I-69 South	Indiana & beyond	0	11	11	0	10	10
I-94 West	Illinois & beyond	49	43	92	83	38	121
External Stations							
Sanilac Co./eastern Huron Co.		0	1	1	1	0	1
Lapeer, Tuscola, & western Huron Cos.		1	1	2	4	2	6
Flint/Northern MI		6	7	13	17	8	25
Lansing/Western MI		6	7	13	22	9	31
Jackson/Southwestern MI		7	2	9	24	5	29
Lenawee County		1	1	2	1	1	2
Total with O/D outside SE Michigan		146	116	**262**	299	122	**421**
Percent with O/D outside SE Michigan		71%	75%	**73%**	76%	74%	**75%**
Total with O/D in SE Michigan		60	38	**98**	97	43	**140**
Percent with O/D in SE Michigan		29%	25%	**27%**	24%	26%	**25%**

Source: The Corradino Group of Michigan

1.1.4 2004 PM Peak Hour - Canadian Bound Trips

Table C-2 shows that 396 trucks cross into Canada from Detroit (372 via the Ambassador Bridge and 24 by using the Detroit-Windsor Tunnel) (○ green oval) (Figure C-3C). One hundred sixty-five trucks cross over the Blue Water Bridge (○ green oval) (Figure C-3A). One hundred and forty-seven trucks crossing into Canada via Detroit arrive from outside the region via northbound I-75, and 83 trucks arrive from eastbound I-94 (○ black oval). Ninety-seven trucks crossing into Canada from Detroit originate locally in the Southeastern Michigan region (□ green box), 24 trucks originate from Jackson and southwestern Michigan, 22 trucks originate from Lansing and western Michigan, and 23 trucks originate from other regions in the state (□ black box). By viewing Figure C-3D in Attachment 1 of this appendix, it can be seen that two hundred and seventy trucks approach the Ambassador Bridge from northbound I-75, while 102 trucks approach from the I-96/I-75 interchange.

Forty-nine trucks crossing into Canada via the Blue Water Bridge enter Michigan via northbound I-75, 38 trucks enter via eastbound I-94, and 10 enter via northbound I-69 (△ black triangle). Forty-three trucks crossing into Canada from the Blue Water Bridge originate locally in the Southeastern Michigan region (△ green triangle), and 25 trucks originate from the other regions in the state (▽ red wedge). Seventy-nine trucks approach the Blue Water Bridge from northbound I-94, while 74 trucks approach from eastbound I-69 (Figure C-3A).

It is important to note that in the Detroit area the model does not assign eastbound international traffic to I-94 beyond Oakwood Boulevard. Instead, truck traffic diverts to Oakwood and then to either Schaefer Highway or Fort Street to connect to I-75. This occurs because the route to the Ambassador Bridge via Oakwood and I-75 is shorter and faster (7.94 miles; 10.24 minutes) than the route via I-94 and I-96 (9.65 miles; 12.53 minutes). In reality, truck restrictions on Oakwood and other factors, including a driver bias toward remaining on the interstate system, limit the number of "crossovers" between I-94 and I-75. Future model runs for the evaluation of Practical Alternatives will address this issue by restricting the ability of international trucks to use "crossover" routes between I-94 and I-75.

1.3 Domestic Truck Movements

Domestic truck trips during the 2004 PM Peak Hour total 52,667, far outnumbering total international trips (1,606–U.S.-bound and Canada-bound trips combined). The domestic truck trip table was taken from the SEMCOG model and, therefore, is centered within the Southeastern Michigan region (Figures C-2A and C-4A). I-75 and U.S. 23 on the southeastern border of the state represent the largest external points of entry to the region. I-75 north of Flint is the next largest gateway, and I-94 west of Ann Arbor is the western gateway.

The majority of domestic truck traffic occurs in the central portion of the network, particularly within Wayne and Oakland counties. Due to their high capacities and relatively high speeds, the interstate routes, and other limited-access highways, act as the backbone of the domestic truck distribution system. However, arterials are also used significantly. Within Wayne and Oakland counties, the routes with the greatest domestic truck volumes during the 2004 PM peak hour are: a) the core sections of I-75, I-94, M-39 (Southfield Freeway) and I-275; b) I-96 between the Southfield Expressway and I-696; and, c) I-696 between the I-75 and I-96 (Figures C-4B and C-4C). Each of these routes carry more than 300 domestic trucks in each direction during the PM peak hour. All other limited-access routes carry no fewer than 200 trucks in each direction.

The arterials that carry more than 100 domestic trucks in each direction for significant distances are: Telegraph Road, between I-96 and Pontiac; Dequindre Road between I-696 and Big Beaver Road; Mound Road between 8-Mile Road and M-59; and Big Beaver Road between I-75 and Van Dyke Road. Short links surrounding major industrial centers (for example, the Daimler Chrysler Plant in Auburn Hills and the Ford Rouge Plant in Dearborn) and connectors to freeway routes (such as Southfield Road between I-94 and I-75, and Davison Street between I-96 and the Lodge Expressway) carry more than 100 domestic trucks in each direction in the PM peak hour. While these volumes are high, they are a small portion of the total traffic when the high volumes of passenger cars on these facilities are taken into account.

1.4 Capacity Constraints and the Freight Network

Figure C-5 demonstrates that the majority of network links operating over capacity in the 2004 PM peak hour are found in Oakland County which is somewhat detached from the main international truck activity. However, there are specific links within the Detroit core area which could affect freight mobility. Of most importance to international freight are: 1) the ramps and local road links at or over capacity at the Ambassador Bridge; and, 2) connecting ramps at the I-75/I-96 interchange and at the I-94/I-96 interchange. I-94 between I-96 and Conner Avenue is generally over capacity in 2004. But, much of this section of freeway will be improved in the next 10 to 20 years.

As previously mentioned, freight mobility for international trucks traveling to or from the west via I-94 is influenced by the longer (in distance and time) route from I-94 in the Dearborn area to the Ambassador Bridge. Traffic crosses over from I-94 to I-75 via arterials, like Oakwood. As previously noted, local restrictions and other factors limit the actual amount of such crossovers. Therefore, future model runs for the evaluation of Practical Alternatives will restrict the ability of international trucks to use “crossover” routes between I-94 and I-75.

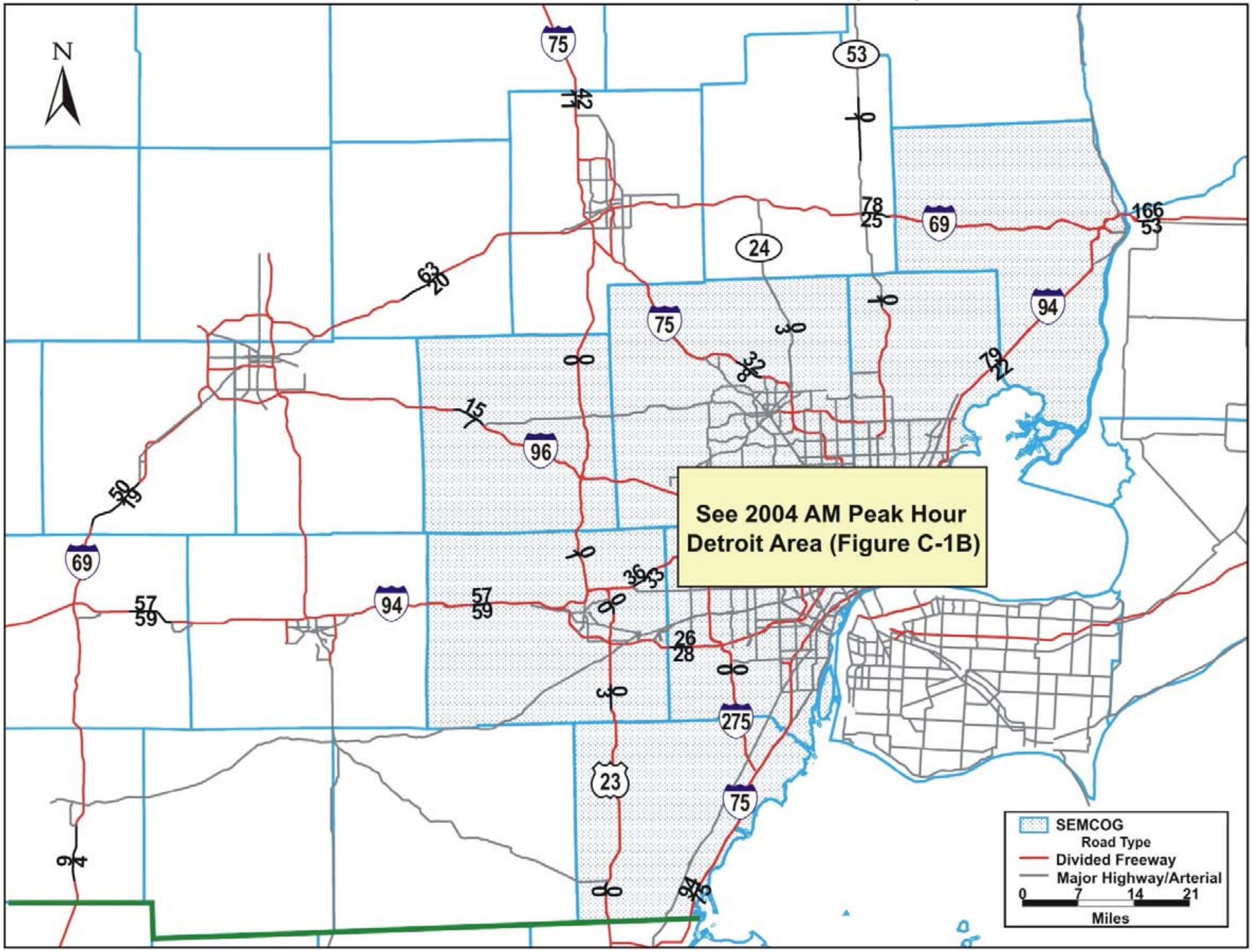
1.5 Changes in Rail Freight

As discussed in the DRIC *Travel Demand Model Update*, which was released in September, 2005, trends in rail freight movement suggest that growth in rail modes, while strong and increasing, are the result of the opening of new markets, particularly in California and Canada which then serve markets overseas. Therefore, it is predicted that changes in rail freight will not materially affect truck freight movements. Sensitivity tests described in the *Model Update Report* found on the project Web site, www.partnershipborderstudy.com, further reinforce the conclusion that, even with tests of very high growth in truck/rail intermodal movements, a new Detroit River Area border crossing is needed by the forecast horizon of 2035.

Attachment 1

Figure C-1A

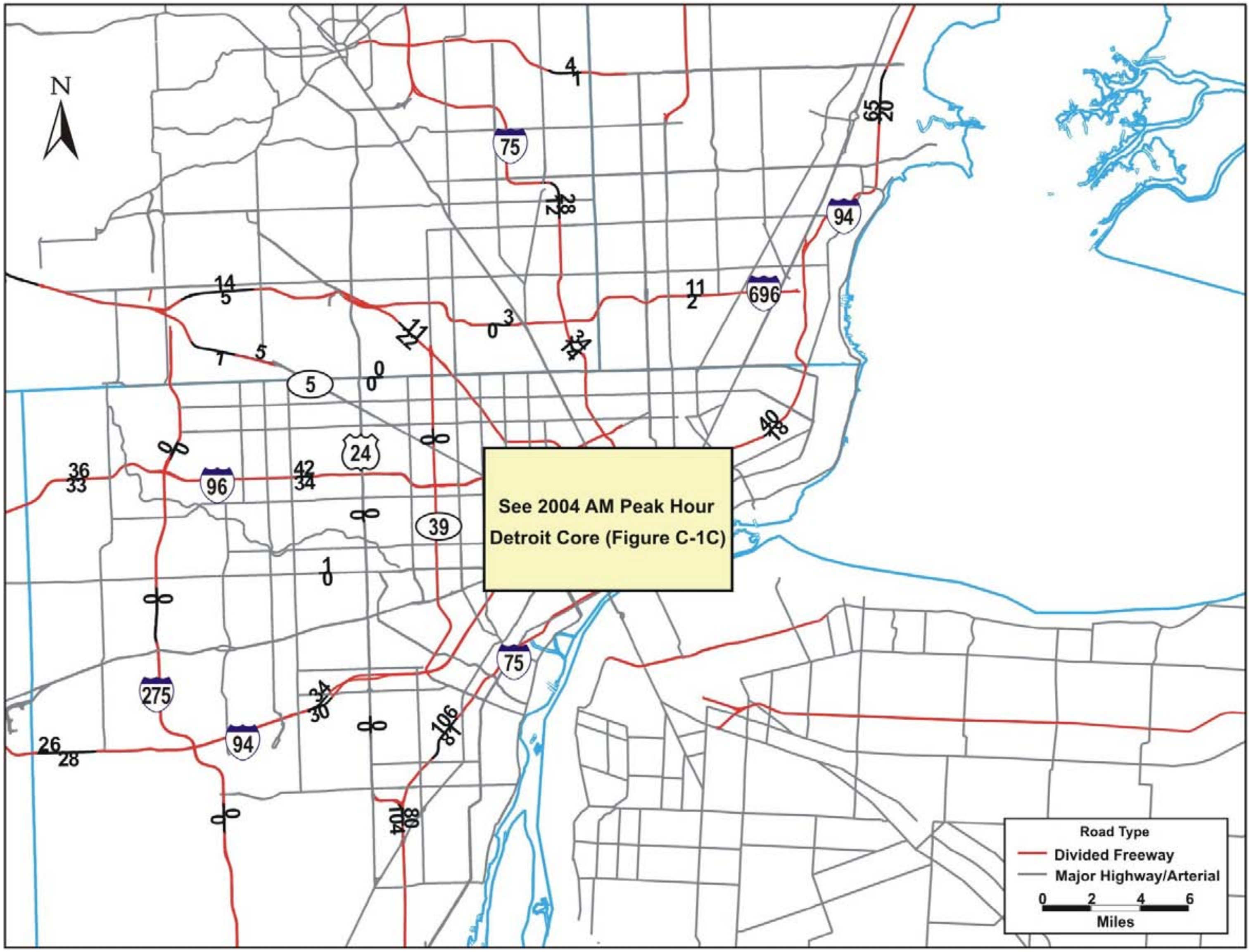
2004 AM Peak Hour International Truck Volume – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure C-1B

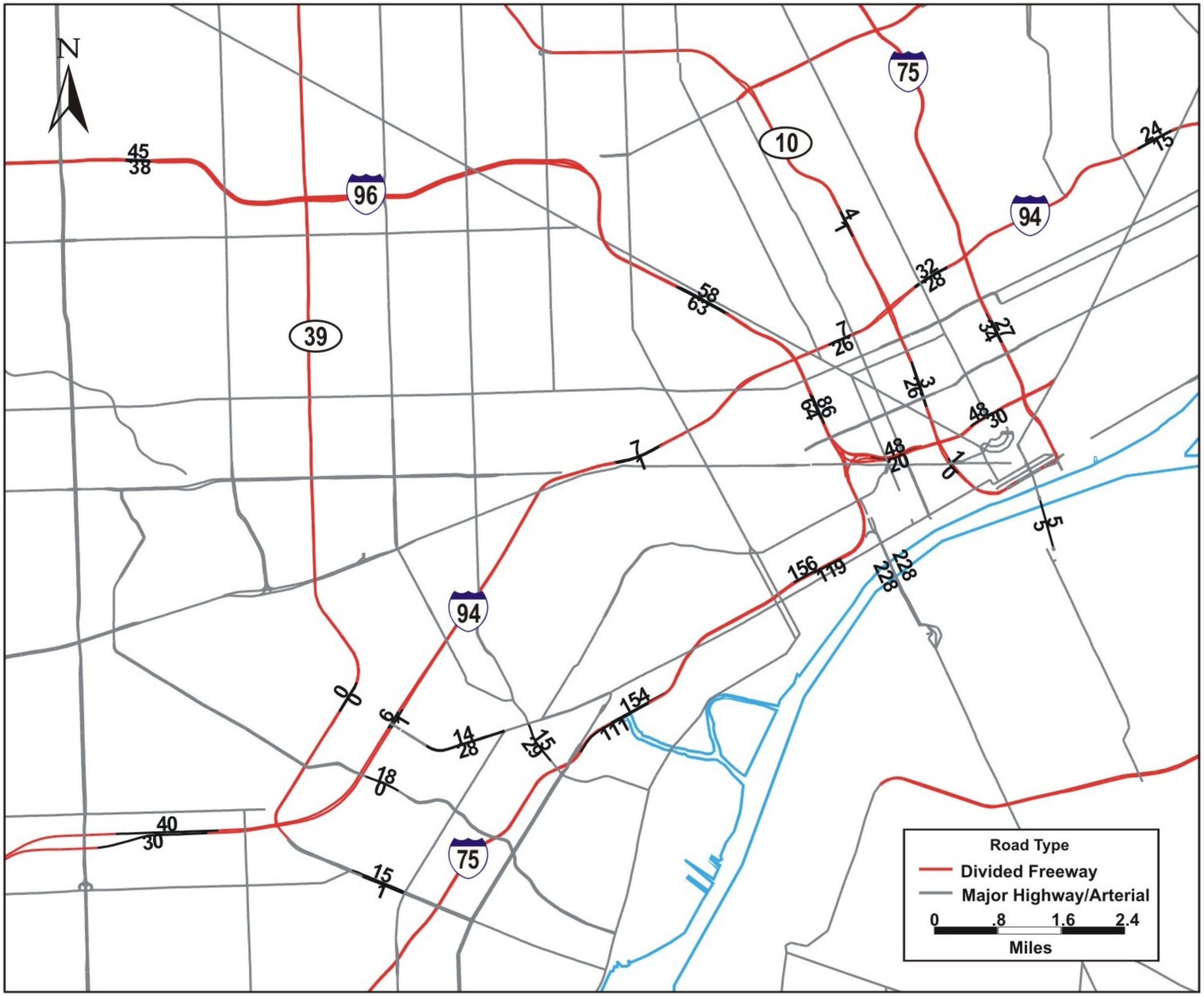
2004 AM Peak Hour International Truck Volume – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure C-1C

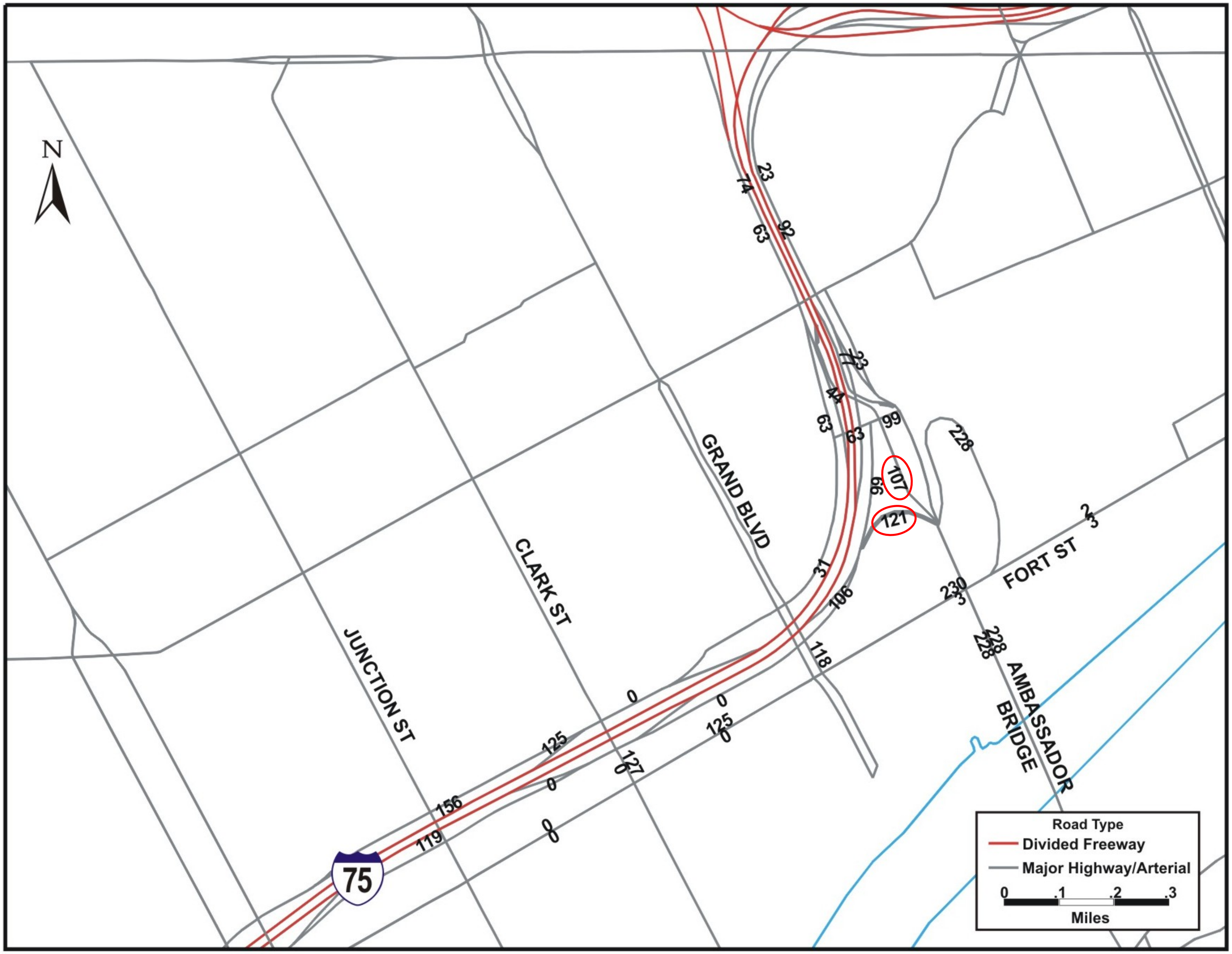
2004 AM Peak Hour International Truck Volume – Detroit Core



Source: The Corradino Group of Michigan, Inc.

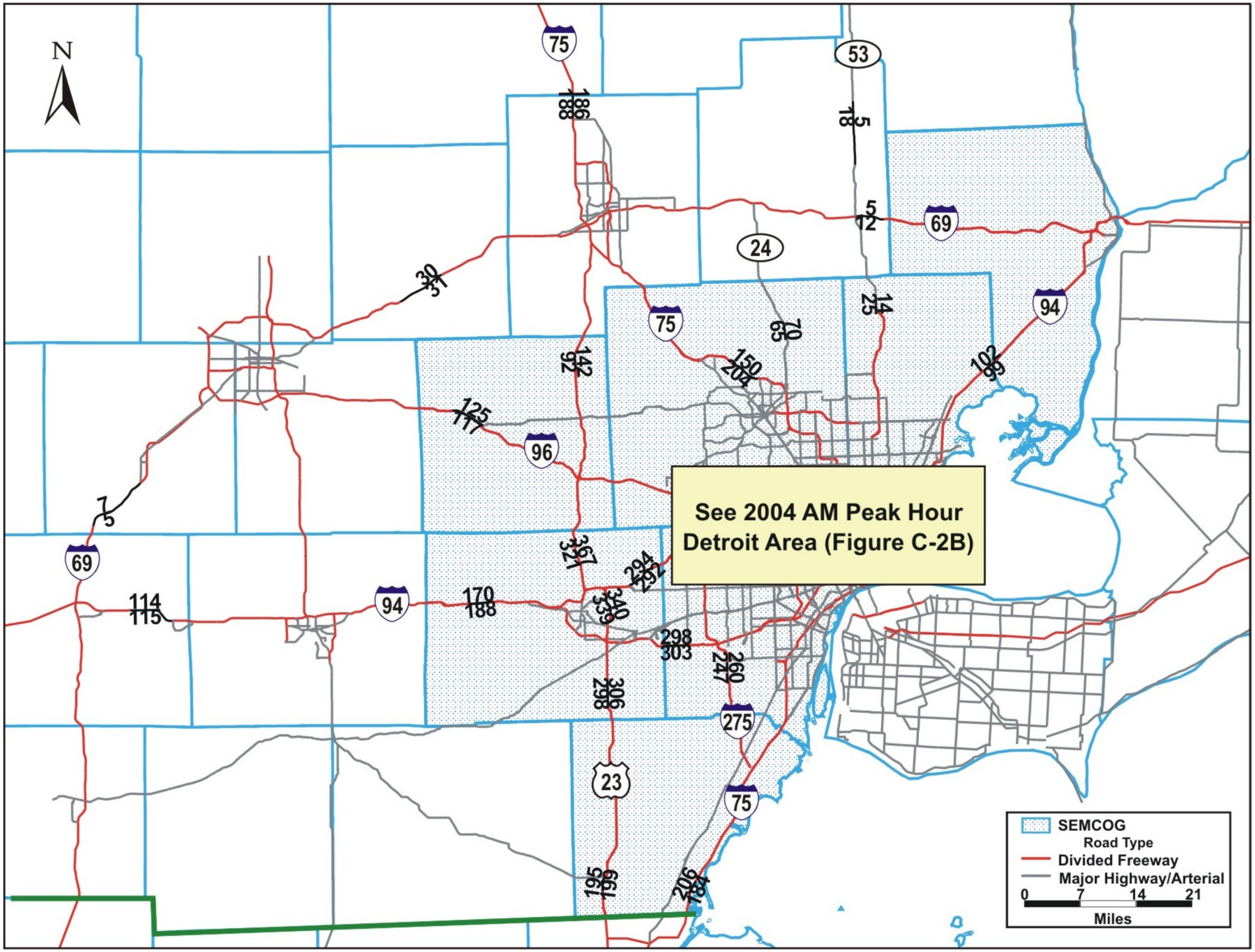
Figure C-1D

2004 AM Peak Hour International Truck Volume – Fort Street



Source: The Corradino Group of Michigan, Inc.

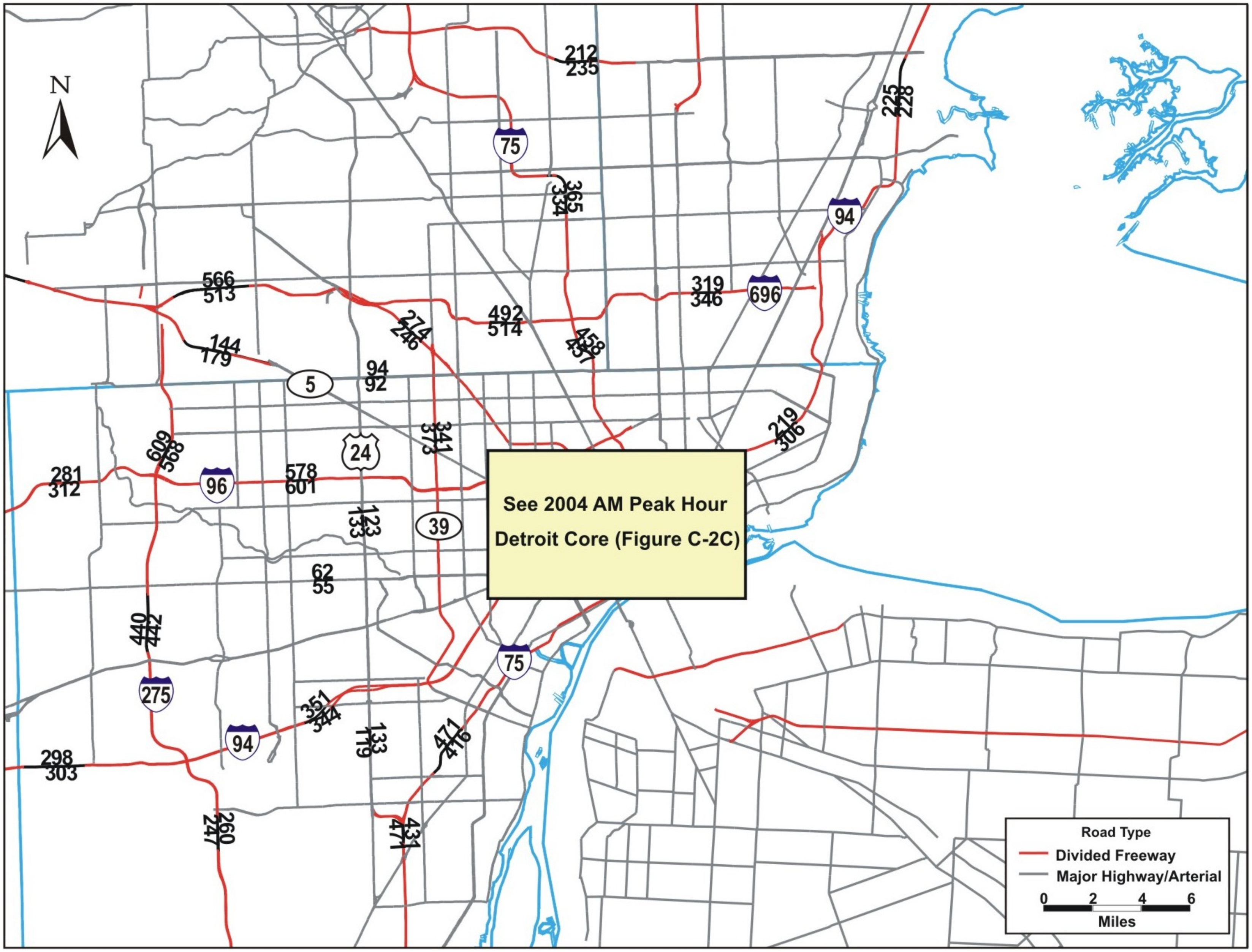
Figure C-2A
2004 AM Peak Hour Domestic Truck Volume – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

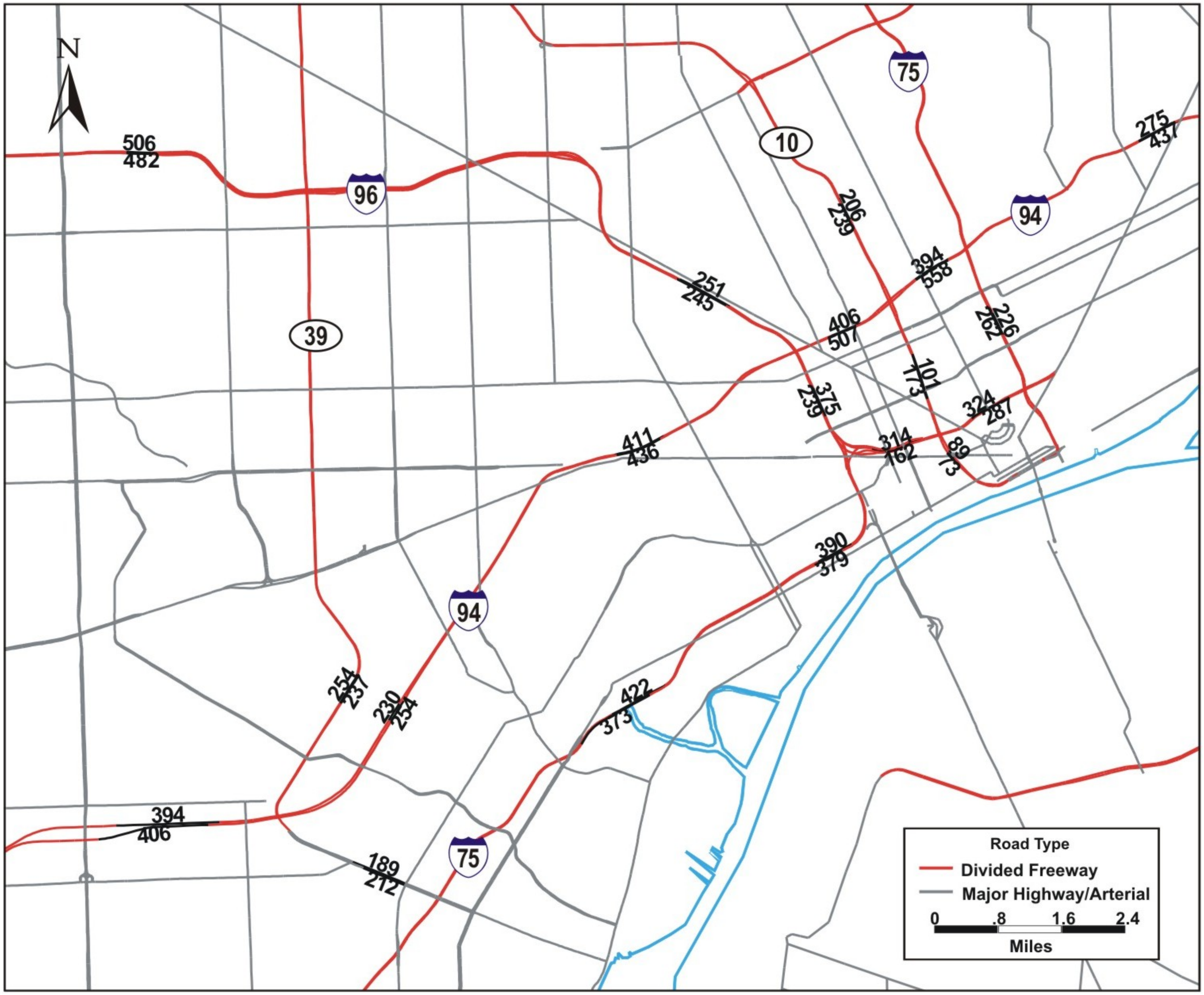
Figure C-2B

2004 AM Peak Hour Domestic Truck Volume – Detroit Area



Source: The Corradino Group of Michigan, Inc.

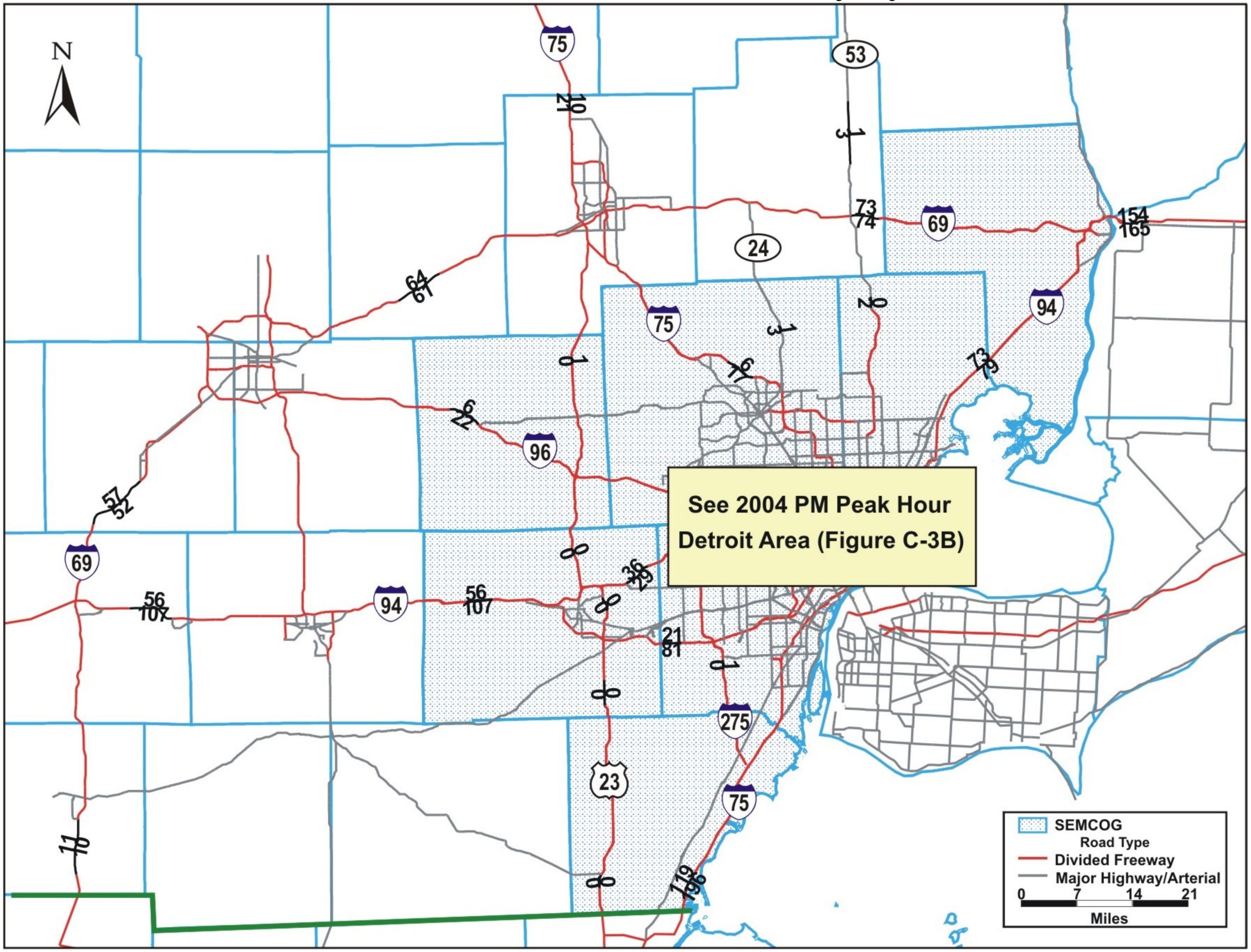
Figure C-2C
2004 AM Peak Hour Domestic Truck Volume – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure C-3A

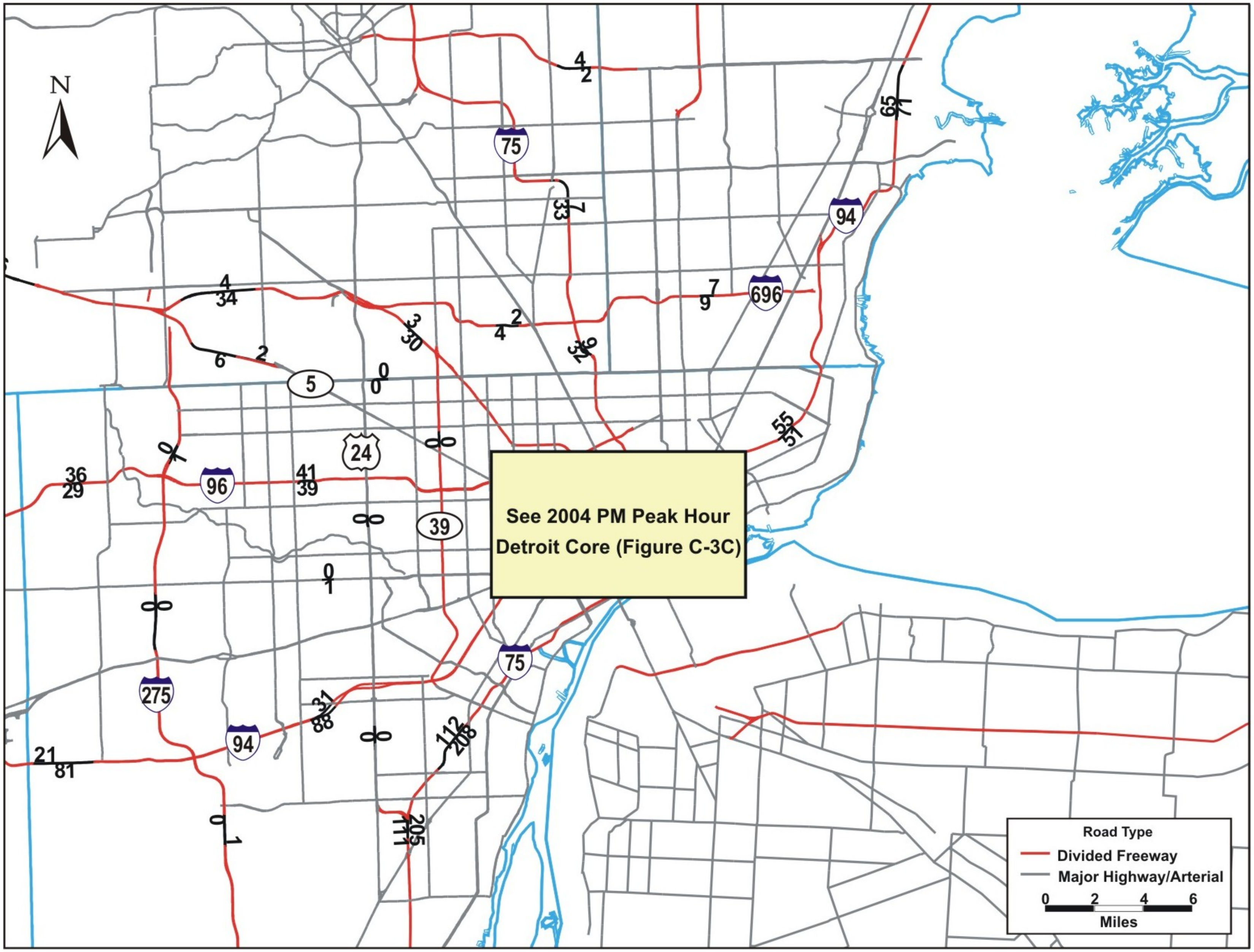
2004 PM Peak Hour <u>International Truck Volume</u> – <u>Southeast Michigan Region</u>



Source: The Corradino Group of Michigan, Inc.

Figure C-3B

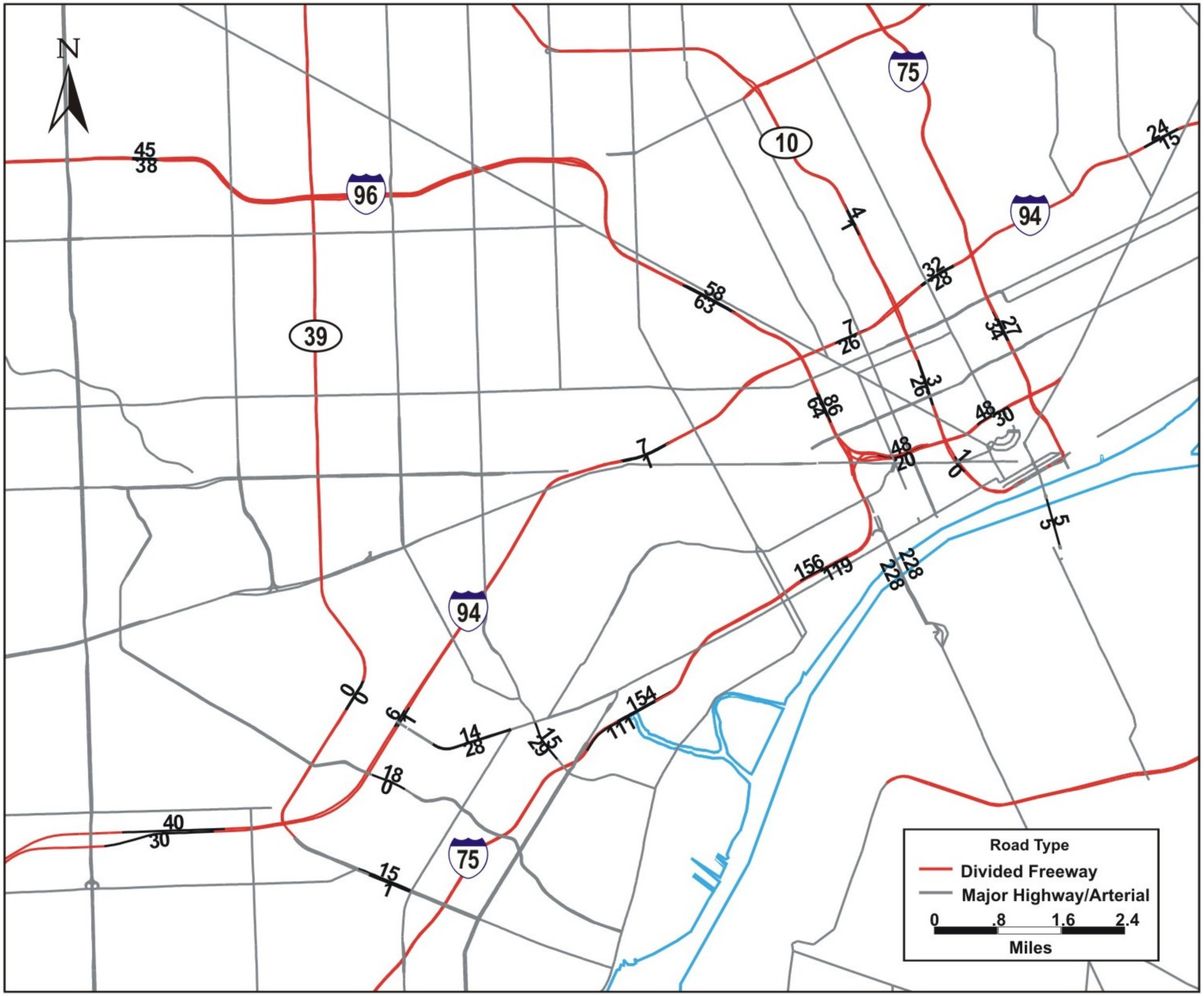
2004 PM Peak Hour International Truck Volume – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure C-3C

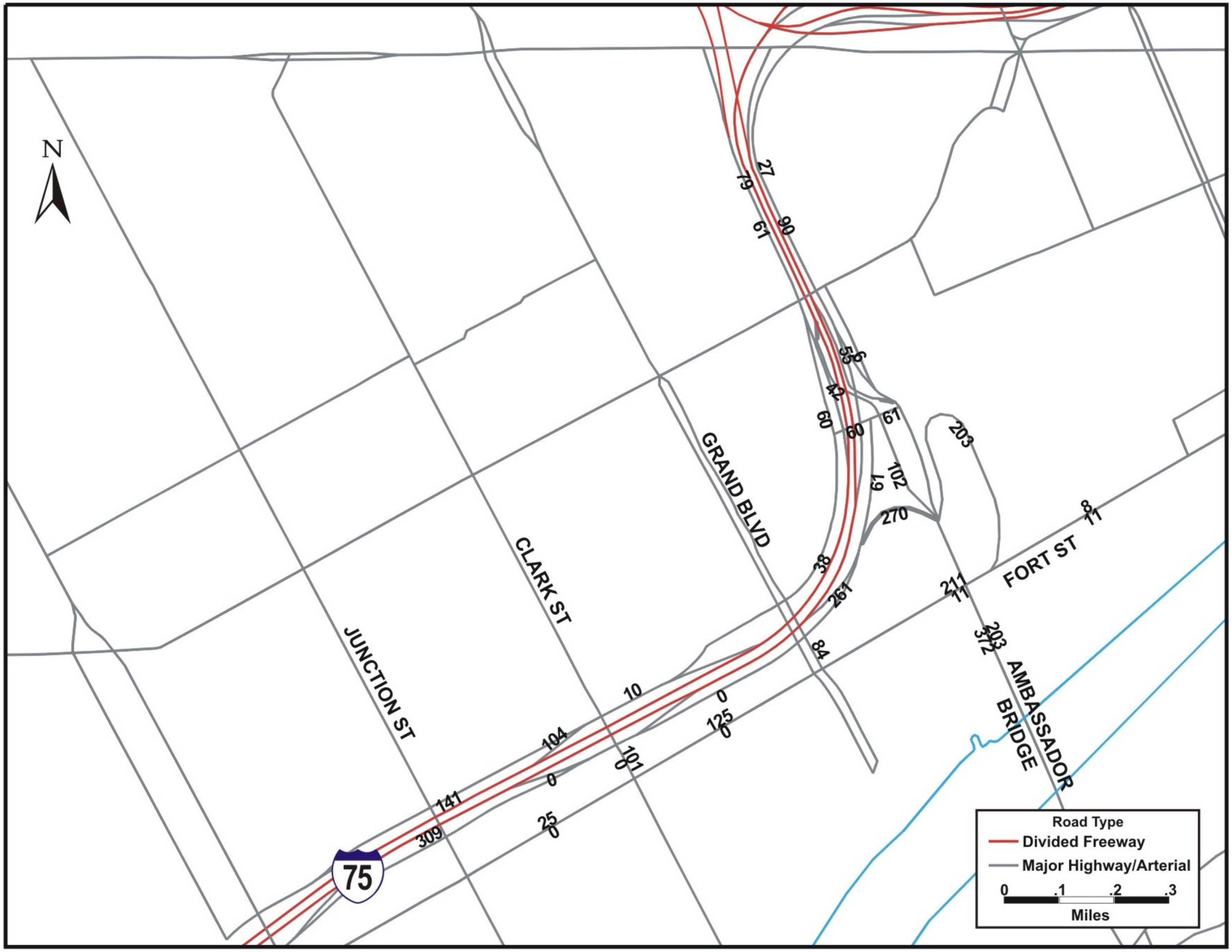
2004 PM Peak Hour International Truck Volume – Detroit Core



Source: The Corradino Group of Michigan, Inc.

Figure C-3D

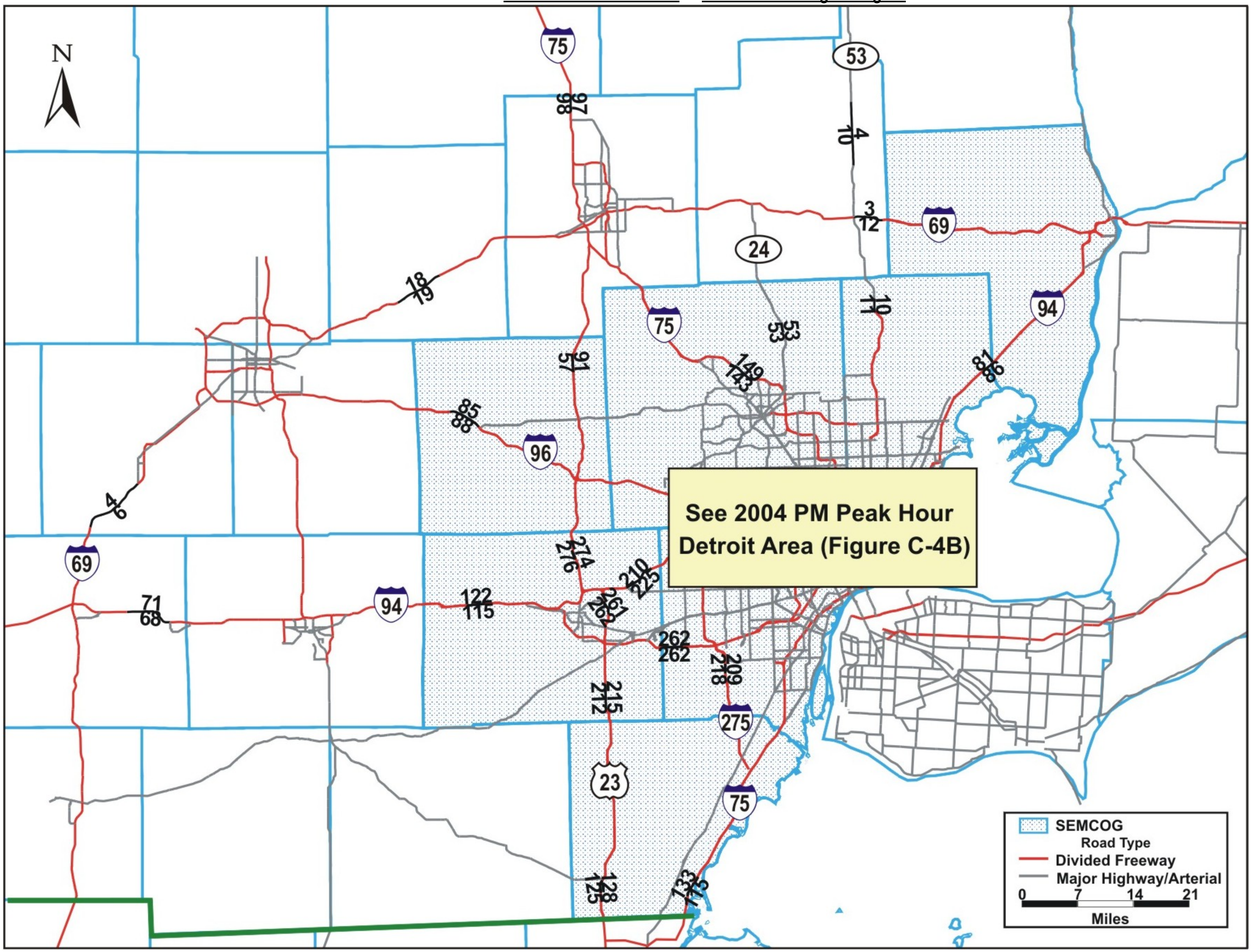
2004 PM Peak Hour International Truck Volume – Fort Street



Source: The Corradino Group of Michigan, Inc.

Figure C-4A

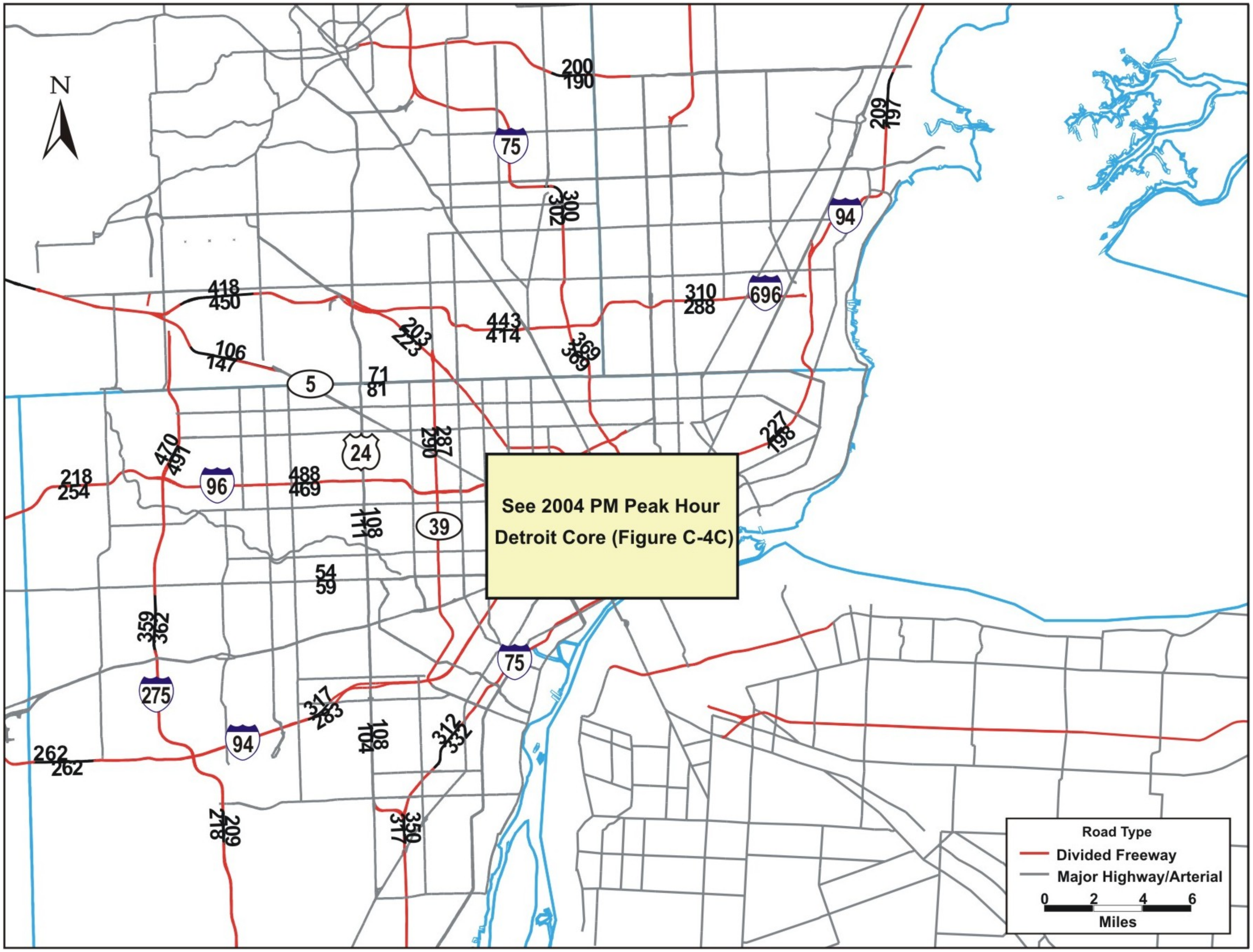
2004 PM Peak Hour Domestic Truck Volume – Southeast Michigan Region



Source: The Corradino Group of Michigan, Inc.

Figure C-4B

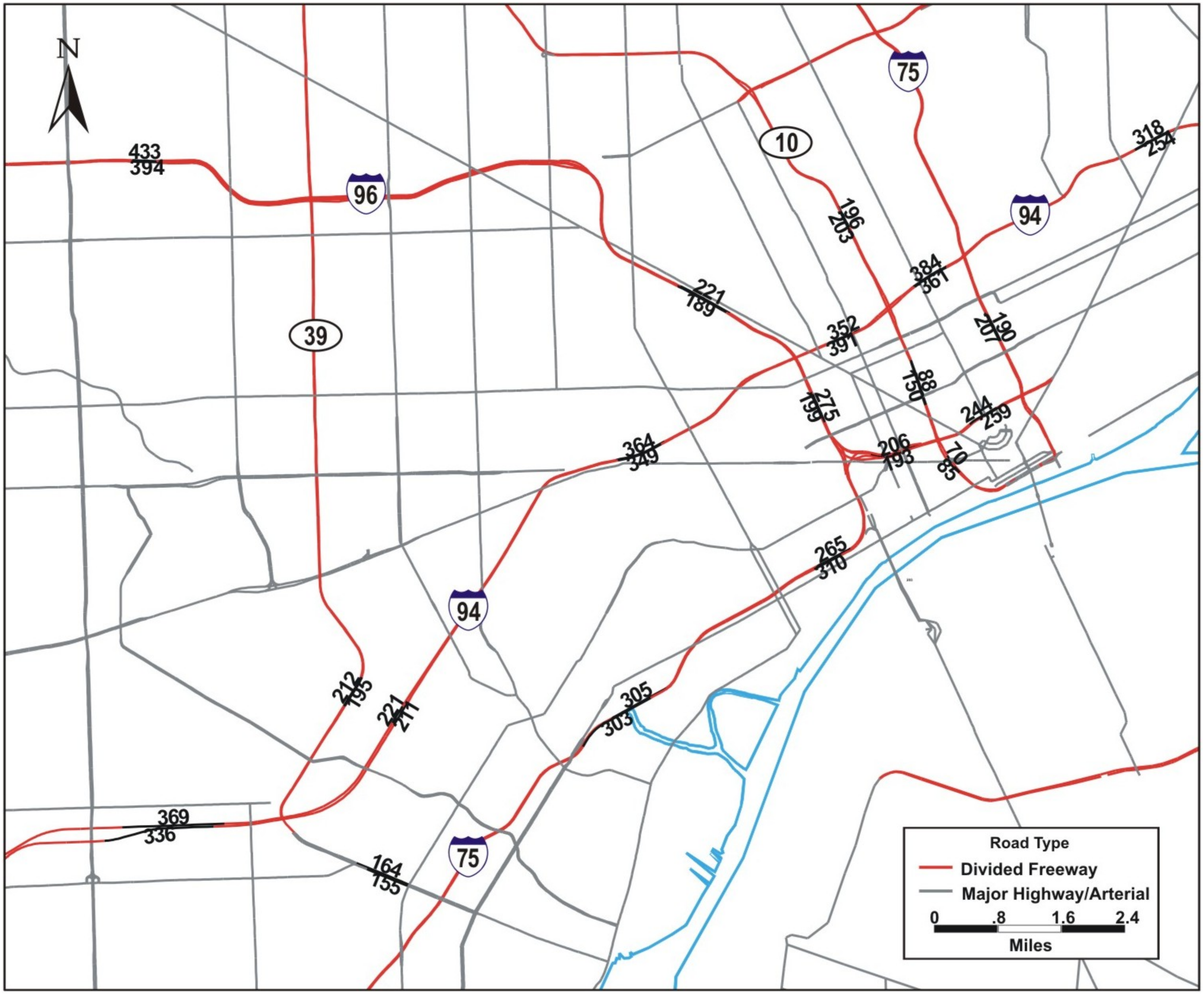
2004 PM Peak Hour Domestic Truck Volume – Detroit Area



Source: The Corradino Group of Michigan, Inc.

Figure C-4C

2004 PM Peak Hour Domestic Truck Volume – Detroit Core



Source: The Corradino Group of Michigan, Inc.

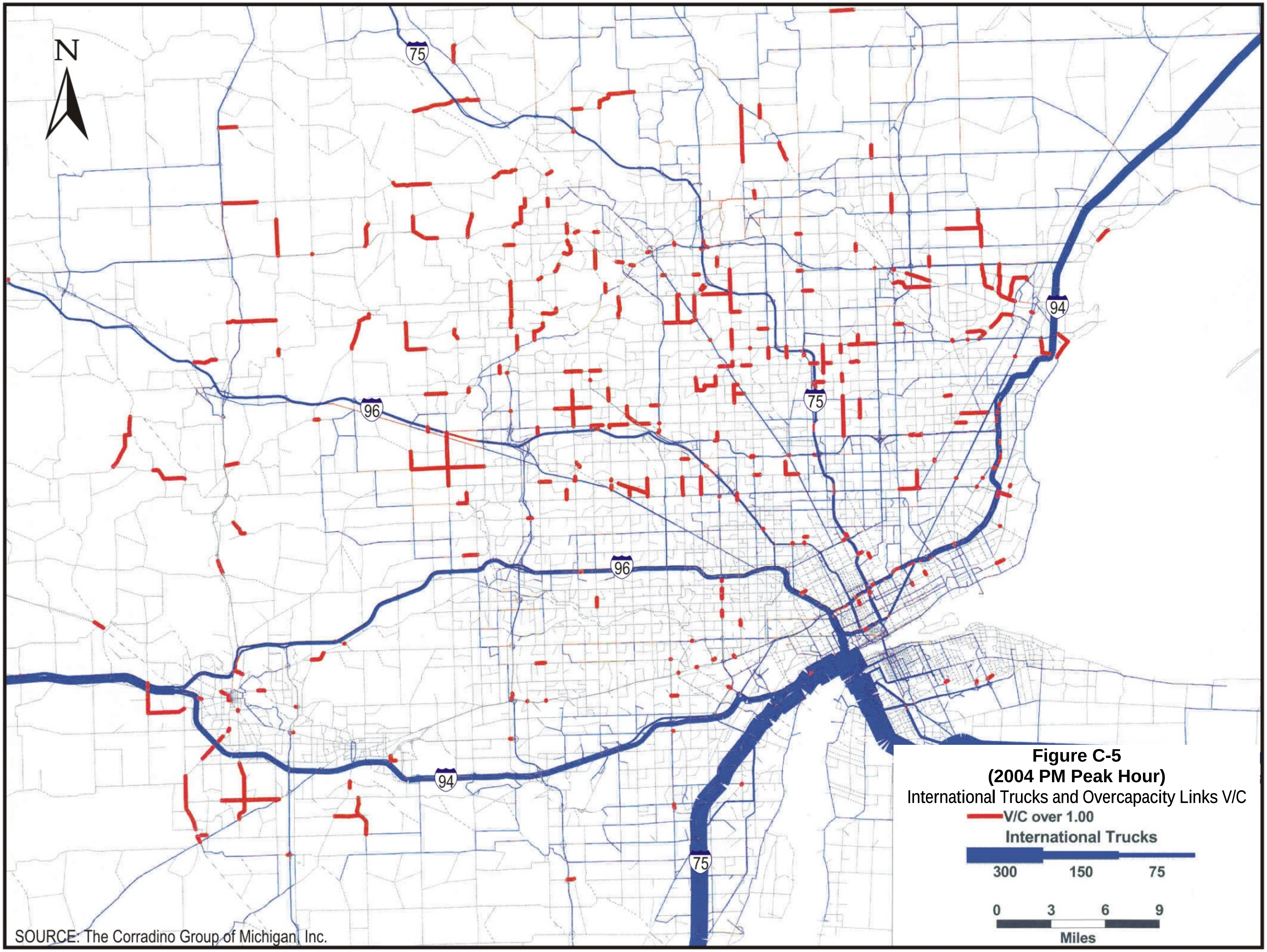


Figure C-5
(2004 PM Peak Hour)
International Trucks and Overcapacity Links V/C

I:Projects/3600/Graphics/ReportGraphics/TrafficAnalysis/FigB-3.cdr