Executive Summary

E 1.0 Introduction and Project Overview

I-75 is a transcontinental highway connecting Miami, Florida and Sault Ste. Marie, Michigan. It is a vital component of the overall transportation system in Michigan and the United States. In Michigan, I-75 is the major north-south highway, connecting with other freeways in 16 locations. See **Figure E 1-1** for an overview of the study area. This Engineering Report is an extension of the original planning and engineering efforts conducted with the development of the Final Environmental Impact Statement (FEIS), for Oakland County. The Engineering Report is divided into two sections. The southern section is from north of 8 Mile Road to south of 12 Mile Road. The northern section is from south of 12 Mile Road to south of M-59 and provides access to the cities of Madison Heights, Royal Oak, Troy, Auburn Hills, and Pontiac, as well as Bloomfield Township. The northern project is 13.64 miles and includes seven interchanges and ten local road crossings. Within the the northern project limits, I-75 connects with the following state trunklines: I-75BL/US-24 BL (Square Lake Road), and M-59.

Originally, I-75 was laid out in a stair-step manner following section and property lines to minimize impacts to the development which existed at the time (1960s). Built in the late 1960s, I-75 was a means for fast travel. Now I-75 is the most highly traveled freeway in Michigan and in the past 20 years has become a gateway for travel north and south. Its NW/SE orientation was designed to roughly parallel Woodward Avenue (M-1) and Dixie Highway (U.S. 24 in portions), serving destinations separated by long distances such as Flint and points north. The diagonal orientation of I-75 forces it to act, in some measure, as a local roadway. It is used by many Oakland County residents and workers for intra-county/local trips. Parallel local options are not available due to development and land features, such as lakes and wetlands which are prevalent in Oakland County. The north/south and east/west local roadway grid system does not serve I-75 travel needs well and does a poor job of providing alternative, direct access between development nodes that have been created along the diagonal of I-75. At the time that I-75 was built, development of businesses and homes were much less then they are today. Residents and businesses of Oakland County utilize I-75 for intra county/local trips as well as many other uses. There are several studies showing that a widening of I-75 is beneficial for existing and future economic growth to the county.

The purpose of the proposed project is to increase the capacity of the transportation infrastructure in the I-75 corridor to meet travel demand for personal mobility and goods movement. The project need for increased corridor capacity is driven by the growth that has occurred along I-75 since its original construction. The specific conditions creating the need are:

- Population
- Employment Growth
- Existing Traffic
- Future Traffic
- Existing Design Standards
- Physical Condition
- Safety
- Goods Movement

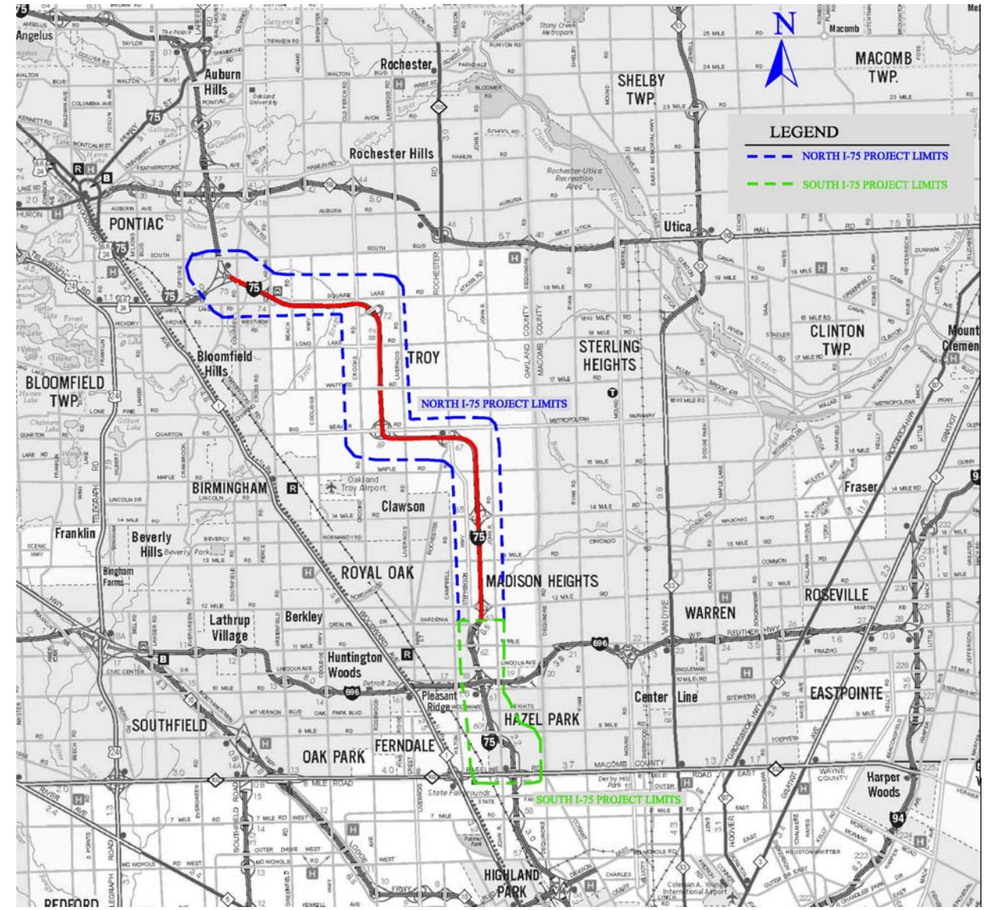


Figure E 1-1 Overview of the Study Area

This report provides the design, framework, estimates and impacts to comprehensively upgrade and provide additional capacity to the freeway.

E 1.1 Project Background

Several studies conducted by the Michigan Department of Transportation (MDOT) since 1990 have recommended adding a lane in each direction to I-75 throughout Oakland County in areas where there are fewer than four through lanes per direction in total, due to forecasted increased traffic volumes and additional development. Also recommended are improvements to interchanges, arterial streets, and ITS. A study of how the transit infrastructure could be strengthened and expanded to improve the transit's share of travel in the I-75 corridor was also completed. Those studies led to the development and approval of the I-75 Final Environmental Impact Statement (FEIS).

Development of the FEIS for I-75 began in 2003 in response to the need established in the previous studies. The Final EIS was released in 2005, and addresses the reconstruction of I-75 and the widening from three to four lanes in each direction between M-102 and just south of M-59. The preferred alternative which was recommended in the Final EIS was to construct one additional lane in each direction from M-102 and South Boulevard. The median lanes would be limited to use by High Occupancy Vehicles (HOV) during peak hours. The preferred alternative also included the reconstruction of the 12 and 14 Mile Road Interchanges.

This report details the median widening, reconstruction along I-75, upgrading of all seven interchanges and local road crossings. The report also reviewed the existing and proposed drainage, traffic analysis, HOV and Intelligent Transportation System (ITS) and work associated at each structure.

E 2.0 Design Criteria

The geometric design criteria used for the upgrade of the freeway, interchanges, ramps and local roads is detailed in the Engineering Report. The goal of the new design for the project is to meet the design criteria for all design elements within the project limits.

E 3.0 Preliminary Design Analysis

E 3.1 Traffic Operations

Existing and design year (2025) traffic operations reveal the need for additional capacity along I-75 between 12 Mile Road and South Boulevard. The peak hour Level of Service (LOS) of numerous freeway segments, ramp/freeway junctions, and freeway weave segments along I-75 operate at LOS “E” or “F” conditions under the No-Build Alternative. With the additional lane in each direction of I-75 (for HOV use), design year (2025) peak hour traffic operations are in the acceptable range for almost all freeway segments, ramp/freeway junctions, and freeway weave segments.

An Interchange Access Justification Report (IAJR) was completed for the I-75/Square Lake Road (I-75BL) Interchange. The FEIS-Approved Alternative retained the existing left-exiting and left-entering ramps along northbound I-75. A new alternative that included standard right-exiting and right-entering ramps was designed. The results of the IAJR indicate that the proposed interchange with right-entering and right-exiting ramps operated at acceptable peak hour Levels of Service, while meeting the various FHWA policy guidelines for modifications to the Interstate system.

E 3.2 Recommendations for HOV Implementation and Operation

A survey was done of the current practice of High Occupancy Vehicle (HOV) lane design used for select facilities in the United States. Specifically, HOV lane management agencies were contacted in Minnesota, Georgia, Virginia, California and Washington, related to general facility design. The following is a list of recommendations for consideration with respect to the implementation and operation of HOV facilities on I-75 based on best practices and engineering judgment.

HOV Justification – It is recommended that the HOV lane provide at least a one minute time savings per mile to HOV users over users of general purpose lanes in order to justify the need for the HOV lane.

Beginning and ending the HOV lanes – It is recommended to use fixed signage and striping in lieu of ITS elements, as few, if any, additional benefits would result from the use of the ITS elements for HOV purposes only.

Delineating HOV lanes – Skip-dash pavement marking striping is recommended for transfer facilities (locations designated for ingress/egress from the HOV facility) with solid double pavement marking stripes between transfer facilities. This configuration should reduce the opportunities for violation.

What constitutes an HOV vehicle - 2+occupancy is recommended as this is typically standard practice. The minimum occupancy requirement will need to be monitored to determine if 3+ is warranted. If the HOV lanes are getting too congested with the 2+ occupancy, to provide at least a one minute time savings per mile, MDOT may need to implement a 3+ occupancy requirement. Additionally, if MDOT wishes to encourage the use of fuel efficient vehicles, consideration should be given to allowing these types of vehicles in the HOV lanes with less than the required number of passengers. MDOT may also wish to allow public transit vehicles (and possibly privately operated buses and coaches carrying passengers), motorcycles, vanpools, and/or all law enforcement and emergency vehicles to use the HOV lanes at all times.

Hours of operation – It is recommended HOV lanes be in effect a minimum of two hours each in the morning and afternoon peak hours each weekday.

Design Criteria – A minimum of 12 foot HOV lanes are recommended and a full width shoulder (minimum 10 foot) is recommended on the left side of the HOV lane to allow for an area for enforcement, vehicle breakdowns, etc.

Recommendations for HOV Enforcement. The following are the recommendations for consideration with respect to the enforcement of the rules and regulations (hours of operation, occupancy requirements, etc.) of the HOV facilities on I-75 based on best practices and engineering judgment:

Responsibility – It is recommended that HOV enforcement be the responsibility of the enforcement agency responsible for that section of roadway.

Shoulder Width – At times of inclement weather when sufficient shoulder width does not exist violators should be directed to the far right shoulder.

Fine Collection – It is proposed that fines collected be directed towards the agency doing the enforcement to encourage their efforts. Fines should be sufficient to be a deterrent and escalate as a motorist incurs multiple violations.

Enforcement – Violators should be identified by roving patrols unless excessive violations (i.e. greater than 15%) are occurring.

E 3.3 Carpool Lots

Carpool lots support HOV lane use by providing areas where drivers can form carpools and then be eligible to use the HOV lane. Implementation of expanded Intelligent Transportation Systems (ITS) also hold potential to encourage carpool formation and HOV lane use by informing motorists of the availability of carpool parking. The existing MDOT carpool parking lots along I-75 in the Metro Region from Adams Road to Grange Hall Road were reviewed. Recommendations regarding these lots and potential new lots, were based on the findings of the *Strategic Need Plan for Metro Region Carpool Lots*.

Recommendations are made to develop, three sites along I-75 between 8 Mile Road and south of M-59: I-696, 12 Mile Road, and Square Lake Road. Each of these carpool lots would serve new areas. Development of these lots support the HOV lane. Two additional lots at University Drive and M-15/Ortonville Road are beyond the project's limits but would further reinforce HOV lane use by providing additional opportunities to carpool.

E 3.4 Freeway Alignment

The NB I-75 and SB I-75 horizontal curves have been upgraded to meet a 70 mph design speed with corresponding minimum radii of 1,922.00 feet. The NB and SB I-75 curves at the Big Beaver Interchange are below the horizontal curve radii required for a 75 mph design speed, however, since the design speed meets posted speed, design exceptions for documentation by MDOT are all that is required for these curves.

Although the majority of the curves meet or exceed the minimum curve radii for a 75 mph design speed, there are five NB I-75 and four SB I-75 locations where design exceptions will be necessary for horizontal stopping sight distance. In each of these locations, the median barrier and/or glare screen obstructs the line of sight necessary to achieve the 75 mph stopping sight distance.

- NB PI 920+36.39
- NB PI 1125+51.56
- NB PI 1226+13.48
- NB PI 603+44.78
- NB PI 647+40.79
- SB PI 904+98.75
- SB PI 1226+85.65
- SB PI 730+99.23
- SB PI 829+29.56

All curves along NB and SB I-75 will be superelevated according to MDOT standard plan R-107-G using a 1/3-2/3 distribution, with the exception of the set of reverse curves just south of the 12 Mile Interchange. In this location, the tangent between the curves is too short to apply the standard superelevation distribution and ROW constraints prevent the necessary realignment to meet this standard. Per MDOT Geometrics, 50% of the supertransition distribution will be within the curves which will require a design exception for superelevation distribution.

The vertical alignment of I-75 is generally rolling with no grades in excess of 3% or less than 0.30%. The elevation at the north end of the project is approximately 300 feet above the elevation just south of the 12-Mile Interchange. The NB and SB I-75 crest vertical curves at the 12 Mile Road Interchange have a design speed of 70 mph. Since the design speed meets posted speed, design exceptions for documentation by MDOT are all that is required for these crest vertical curves. A minimum of 16.25 feet of underclearance is maintained for I-75 under the local roads. A minimum of 14.75 feet of underclearance is maintained for I-75 over the local roads.

Detailed plans including typical sections, horizontal and vertical alignments as well as drainage improvements are contained in *VOLUME 2: FREEWAY / INTERCHANGE ROADWAY PLANS* and *VOLUME 3: GEOMETRIC STUDY*.

E 3.5 Interchange Alignment

Consistent with the FEIS, the 12 and 14 Mile Road interchanges include significant local road reconstruction and the Square Lake Road Interchange (I-75 BL) also includes major revisions.

The proposed configuration at the 12 Mile Road Interchange, Figure E 3-1, is a combination par-clo with tight diamond. In the NE and SW quadrants are single lane and two lane entrance ramps, respectively. In the SE quadrant is a single lane entrance loop ramp with single lane diamond exit ramp. In the NW quadrant, the existing single lane entrance loop ramp was eliminated and the SB I-75 exit ramp was realigned closer to I-75 to provide more separation and storage between the ramp terminal and Stephenson Highway to the west.

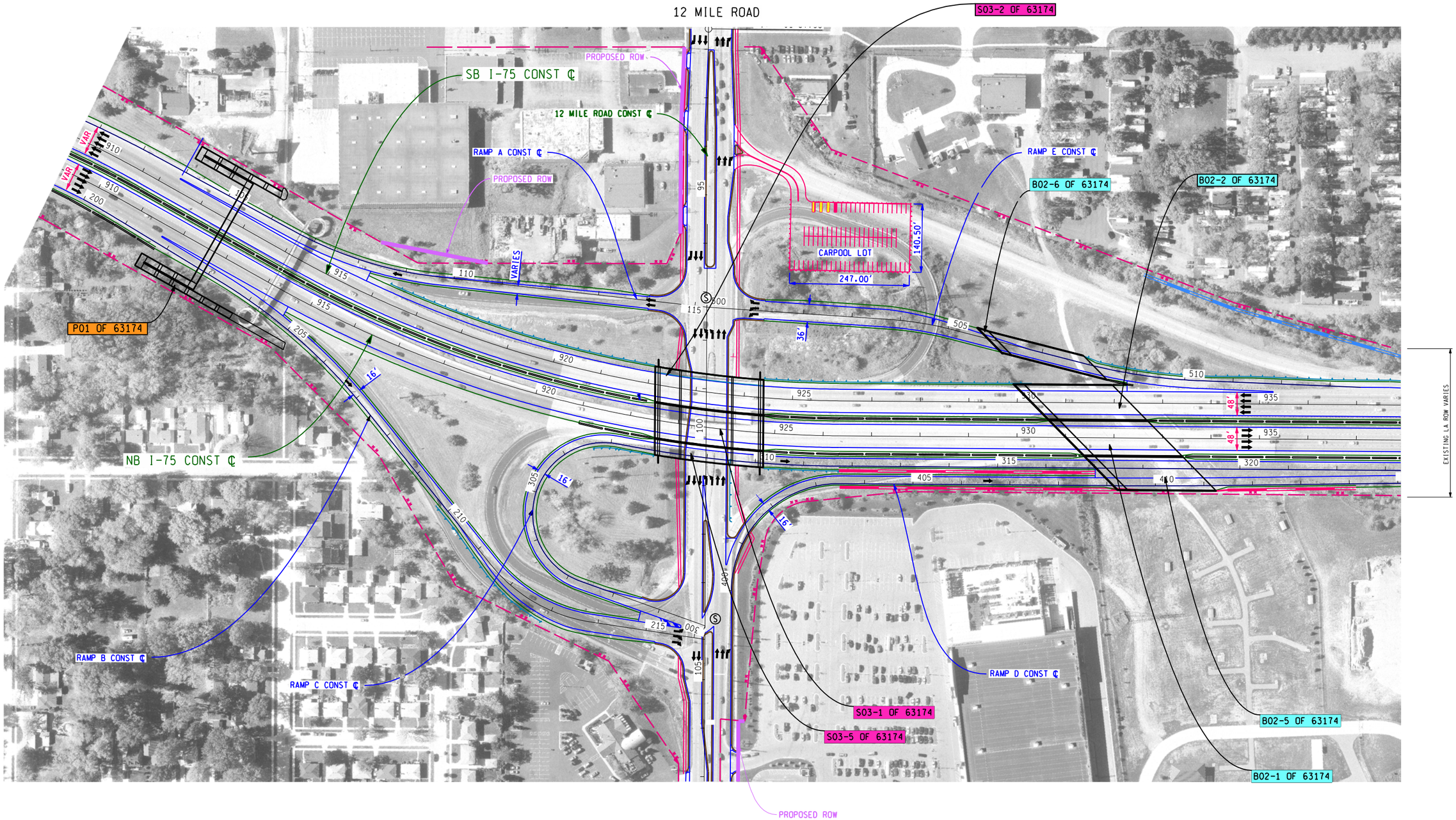
The proposed 12 Mile Road cross section adds more width to facilitate dual left turns for the WB to SB entrance ramp movement (as a result of the elimination of the loop ramp in the NW quadrant). The proposed widening occurs symmetrically over 160 feet to the east and to the west of the 12 Mile Road Interchange. The remainder of 12 Mile Road matches the existing normal crown cross section, consisting of two lanes of traffic in each direction divided by a raised median. In addition to the through lanes, dedicated right turn lanes are provided for each entrance ramp. Twelve Mile Road is completely within a tangent at the interchange, and therefore is in normal crown.

The proposed configuration at the 14 Mile Road Interchange maintains the existing combination par-clo with tight diamond ramps. The SE and NW quadrants consist of single lane exit ramps while the NE and SW quadrants contain single lane loop exit ramps with single lane diamond entrance ramps. The NB I-75 entrance ramp terminal at 14 Mile Road has a split island allowing free-flow left turn movements from EB 14 Mile to merge with the right turn movements from WB 14 Mile Road.

The proposed 14 Mile Road cross section adds more width to facilitate dual left turns for the WB to SB entrance ramp movement and an additional lane in each direction from the free-flow loop ramps directly under I-75, Figure E 3-2. The remainder of 14 Mile Road matches the existing normal crown cross section, consisting of three lanes of traffic in each direction divided by a center turn lane or raised median. In addition to the through lanes, dedicated right turn lanes are provided for the SB I-75 entrance ramp, Stephenson Highway, and Concord Drive. 14 Mile Road is completely within a tangent at the interchange, and therefore is in normal crown.

The proposed configuration at the Square Lake Road Interchange, Figure E 3-3, eliminates the free-flow left entrance and exit ramps along NB I-75. NB I-75 has been realigned horizontally to parallel SB I-75 within the limits of the interchange, which results in sufficient real estate to achieve the desired right entrance and exit ramps along NB I-75. To reduce the number of proposed structures within the interchange, both NB and SB I-75 make up the lowest level of the tri-level interchange and have a median separation of approximately 20 feet which allows sufficient space for the placement of the proposed piers supporting the two fly-over structures. The NB I-75 to WB I-75 BL ramp is the mid-level, while the EB I-75 BL to NB I-75 is the highest level of the tri-level interchange. Weave merge lanes have been continued to the Adams Road Interchange to the south. The only work anticipated along the I-75 BL (Square Lake Road) at this location is the work required to reconstruct and upgrade the ramps to current standards.

FIGURE 3-1
12 MILE ROAD INTERCHANGE



SCALE

100' 50' 0' 100'

LEGEND

GAS LINE
ELECTRIC LINE
FIBER OPTICS
SANITARY LINE
WATERMAIN
UG CONDUIT

EXISTING WETLAND
EXISTING DRAINAGE FLOW
PROP PAVEMENT EDGE
PROP SHOULDER EDGE
PROP BARRIER
PROP RETAINING WALL
PROPOSED CUL-DE-SAC

PROP WETLAND
EXISTING LA R-O-W
EXISTING R-O-W
PROP R-O-W
PROP LA R-O-W
NOISE WALL
PROP BRIDGE

PROP SIDEWALK
PROP CONSTRUCTION ℄
PROP BRIDGE REPAIR
PROP PARK & RIDE
SIGNALIZED INTERSECTION

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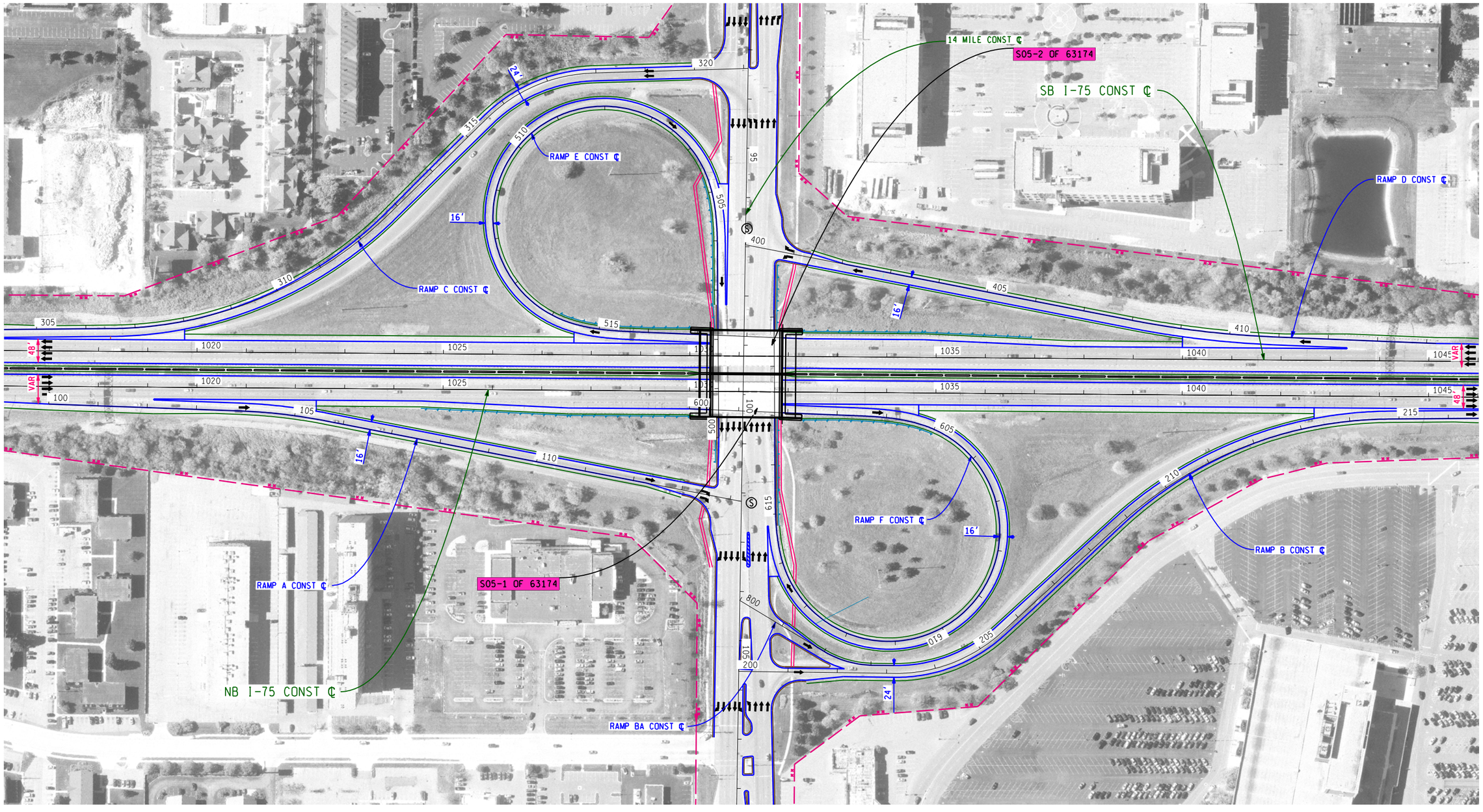
63174

MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
ENGINEERING REPORT

12 MILE ROAD INTERCHANGE

FIGURE 3-2
14 MILE ROAD INTERCHANGE



SCALE

100' 50' 0' 100'

LEGEND

GAS LINE
ELECTRIC LINE
FIBER OPTICS
SANITARY LINE
WATERMAIN
UG CONDUIT

EXISTING WETLAND
EXISTING DRAINAGE FLOW
PROP PAVEMENT EDGE
PROP SHOULDER EDGE
PROP BARRIER
PROP RETAINING WALL
PROPOSED CUL-DE-SAC

PROP WETLAND
EXISTING LA R-O-W
EXISTING R-O-W
PROP R-O-W
PROP LA R-O-W
NOISE WALL
PROP BRIDGE

PROP SIDEWALK
PROP CONSTRUCTION ℄
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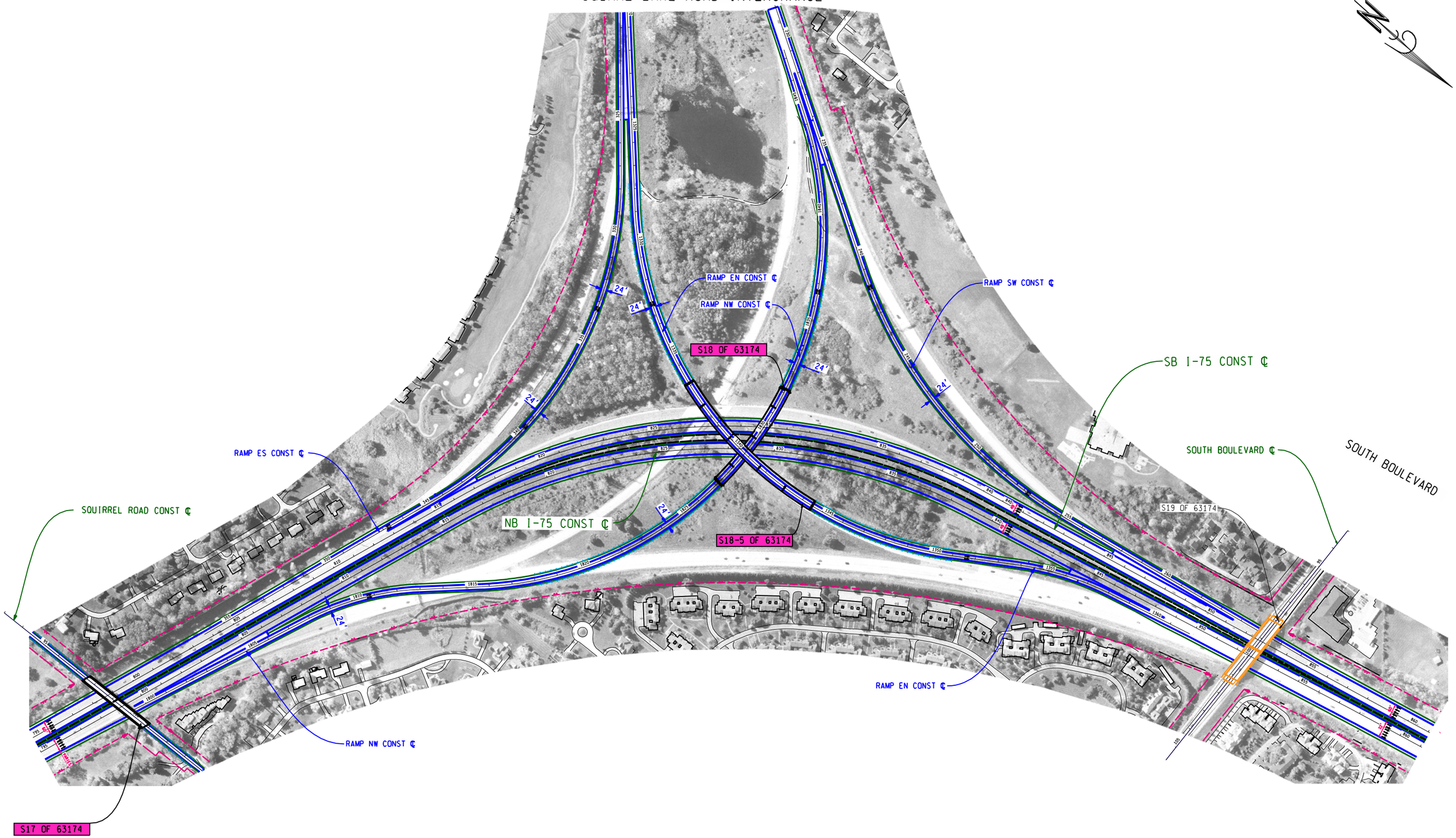
MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
ENGINEERING REPORT

14 MILE ROAD INTERCHANGE

FIGURE 3-3
SQUARE LAKE ROAD INTERCHANGE



SCALE

200' 100' 0' 200'

LEGEND

GAS LINE
ELECTRIC UTILITY LINE
POWER TRANS LINE
FIBER OPTICS
EXISTING R-O-W
SANITARY LINE
WATERMAIN
CABLE

EXISTING WETLAND
EXISTING DRAINAGE FLOW
PROP PAVEMENT EDGE
PROP SHOULDER EDGE
PROP BARRIER
PROP RETAINING WALL
PROPOSED CUL-DE-SAC

PROP WETLAND
EXISTING LA R-O-W
EXISTING R-O-W
PROP R-O-W
PROP LA R-O-W
NOISE WALL
PROP BRIDGE

PROP SIDEWALK
PROP CONSTRUCTION ℄
PROP BRIDGE REPAIR
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63174

MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY

SQUARE LAKE ROAD INTERCHANGE

A minimum underclearance of 16.25 feet has been maintained for all roadways within this interchange. Due to the horizontal alignment changes and reordering of the levels within the tri-level interchange, significant vertical changes were necessary. NB I-75 will require approximately 20 feet of excavation through the existing NW Ramp embankment to construct, while SB I-75 will require approximately 15 feet of excavation through the existing NW Ramp embankment. The NB I-75 to EB I-75 BL profile has been raised approximately 14 feet, while the EB I-75 BL to NB I-75 ramp profile has been raised approximately 11 feet.

No additional ROW is anticipated to construct this interchange.

E 3.6 Design Exceptions

Design criteria were created and set forth to meet both the current Michigan Department of Transportation standards and the Federal Highway Administration standards. This design criteria is detailed in Table 3-1 of the Engineering Report. In some locations throughout the project, some of the criteria was unattainable due to physical and socioeconomic constraints, and ROW limitations.

Locations of design elements that have not met the required standard have been documented and attached in Table 3-2 of the Engineering Report as design exceptions. Each design exception has a list of the design elements that are not to standard, the location of the design exception, the existing element design value, the proposed element design value, and the standard design value required. Each location also has a brief explanation of the cause of the design exception.

E 3.7 Drainage

A significant component of the proposed freeway reconstruction will be the replacement and improvement of the drainage system. The existing freeway from south of 12 Mile Road to south of M-59 is comprised of open roadway sections with median and roadside ditches. These ditches convey the storm water to one of the 34 crossings along the I-75 corridor. Due to the addition of the HOV lane, the median ditch is being eliminated and replaced with barrier and valley gutter. The runoff in the median will now be collected and conveyed to the roadside ditches with proposed storm sewer. All of the culverts along the corridor will be replaced and upgraded to meet current standards. Where the proposed roadway improvements will generate additional runoff, detention is being proposed to mitigate flows to existing conditions. The detailed analysis and design can be found in *VOLUME 5: DRAINAGE REPORT.*

E 3.8 Utilities

A preliminary utility investigation was completed for the I-75 corridor area. During the study, various alternatives were considered and utility impact was a factor in determining the best options. The utility companies were contacted and sent requests for utility locations within the study limits. Preliminary plans show the underground utilities and significant aerial wires and high transmission lines. Any major utility concerns along the project limits were detailed within the Engineering Report in Section 4.9.

E 3.9 Bridges and Structures

The reconstruction work associated with this project is from south of 12 Mile Road to south of M-59 and affects the majority of the existing bridges along the corridor. The structures associated with this project require replacement due to:

- Freeway reconstruction
- Improvements to local roads and ramps
- Upgrading the design loading for the bridges to meet the new AASHTO LRFD Bridge Design Specifications
- Providing the required underclearance
- Meeting the required road geometrics

The recommended scope of work for each bridge was determined taking the required geometry and construction cost as well as the conditions of the existing bridge into consideration.

A preliminary beam design was completed for each superstructure alternative utilizing the AASHTO LRFD Bridge Design Specifications. The MDOT HL-93 Modified live loading was used for the design loading for each alternative.

There are seven interchanges and associated ramps, eight local road crossings, a crossing at the Red Run Drain and a pedestrian bridge within the project limits. Two local road crossings, Crooks Road (S13 and S32) and South Boulevard (S19), do not have any structure work associated with them. See Table E 3-1 for structure study and cost estimates. A more in depth discussion of the design can be found in the *VOLUME 4: STRUCTURE STUDY* and the Engineering Report Section 4.10.

Table E 3-1 Structure Summary Table

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	STRUCTURE NUMBER	DESCRIPTION	EXISTING STRUCTURE	RECOMMENDED STRUCTURE	GRADE RAISE (FT)	2009 ESTIMATED COST
Construction Segment 1 - 2026	P01 of 63174	Pedestrian Bridge Crossing I-75 South Of 12 Mile Rd.	Two Span steel	Two-span cont. steel beams	-	$ 2,663,000
	S03-1 of 63174	NB I-75 Over 12 Mile Road	Four span prestressed concrete beams	Three-span cont. curved steel girders	2.5	$ 3,581,000
	S03-2 of 63174	SB I-75 Over 12 Mile Road			2.0	$ 3,598,000
	S03-5 of 63174	NB I-75 On-Ramp 12 Mile Road-New Bridge	N/A		-	$ 1,310,000
	B02-1 of 63174	NB I-75 Over Red Run Drain	Three span steel girders	One span steel girders	6.0	$ 3,570,000
	B02-2 of 63174	SB I-75 Over Red Run Drain			4.5	$ 3,388,000
	B02-5 of 63174	NB I-75 On-Ramp Over Read Run Drain-New Bridge	N/A		-	$ 2,924,000
	B02-6 of 63174	SB I-75 Off-Ramp Over Read Run Drain-New Bridge	N/A		-	$ 1,728,000
		Retaining Walls	N/A			$ 1,405,000
	S04-1 of 63174	NB I-75 Over 13 Mile Road	Three span prestressed concrete beams	Three span prestressed concrete beams, LL cont.	0.5	$ 2,434,000
	S04-2 of 63174	SB I-75 Over 13 Mile Road			1.0	$ 2,317,000
					Segment Subtotal	$ 28,918,000
Construction Segment 2 - 2028	S05-1 of 63174	NB I-75 Over 14 Mile Road	Three span steel girders	One span MI 1800 girders	3.3	$ 3,211,000
	S05-2 of 63174	SB I-75 Over 14 Mile Road			3.8	$ 3,211,000
	S21-1 of 63174	NB I-75 Over 15 Mile Road	Three span prestressed concrete beams	Three-span cont. steel beams	1.0	$ 2,749,000
	S21-2 of 63174	SB I-75 Over 15 Mile Road			1.5	$ 2,295,000
	S06-1 of 63174	NB I-75 Over M-150/Rochester Road	Four span prestressed concrete beams	Four-span cont. steel beams	0.4	$ 4,826,000
	S06-2 of 63174	SB I-75 Over M-150/Rochester Road			1.0	$ 4,234,000
					Segment Subtotal	$ 20,526,000
Construction Segment 3 - 2029	S08-1 of 63174	NB I-75 Over Livernois Ave.	Three span prestressed concrete beams	Three-span cont. steel beams	0.4	$ 2,932,000
	S08-2 of 63174	SB I-75 Over Livernois Ave.			1.0	$ 2,581,000
	S09-1 of 63174	NB I-75 Over Big Beaver Road	Four simple span steel beams	Four-span cont. curved steel girders	2.2	$ 6,038,000
	S09-2 of 63174	SB I-75 Over Big Beaver Road			3.6	$ 5,289,000
	S09-5 of 63174	NB I-75 CD Over Big Beaver Road			3.1	$ 3,363,000
	S09-6 of 63174	SB I-75 CD Over Big Beaver Road			3.8	$ 3,398,000
	S10 of 63174	Wattles Road Over I-75	Four span prestressed concrete beams	Two-span cont. steel girders	0.0	$ 4,832,000
	P07 of 63174	Pedestrian Bridge Over I-75 At Wattles Road-To Be Removed	Two span prestressed concrete beams	Removed	-	
					Segment Subtotal	$ 28,433,000
Construction Segment 4 - 2030	S11-1 of 63174	NB I-75 Over East Long Lake Road	Three span prestressed concrete beams	Three-span cont. steel beams	0.6	$ 2,878,000
	S11-2 of 63174	SB I-75 Over East Long Lake Road			0.5	$ 2,562,000

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	STRUCTURE NUMBER	DESCRIPTION	EXISTING STRUCTURE	RECOMMENDED STRUCTURE	GRADE RAISE (FT)	2009 ESTIMATED COST
	S12 of 63174	Corporate Drive Over I-75	Four simple span steel beams	Two-span cont. steel girders	0.7	$ 3,120,000
	S14-1 of 63174	NB I-75 Over Coolidge Road	Three span prestressed concrete beams	Three-span cont. steel beams	0.4	$ 2,486,000
	S14-2 of 63174	SB I-75 Over Coolidge Road			0.5	$ 2,244,000
	S15-1 of 63174	NB I-75 Over Square Lake Road	Three simple span steel beams	Three span prestressed concrete beams, LL cont.	3.3	$ 2,402,000
	S15-2 of 63174	SB I-75 Over Square Lake Road			2.3	$ 2,622,000
	S16-1 of 63174	NB I-75 Over Adams Road	Three span prestressed concrete beams	Three-span cont. steel beams	1.0	$ 3,246,000
	S16-2 of 63174	SB I-75 Over Adams Road			1.0	$ 3,226,000
					Segment Subtotal	$ 24,786,000
Construction Segment 5 - 2031	S17 of 63174	Squirrel Road Over I-75	Four simple span steel beams	Two-span cont. steel girders	1.3	$ 2,856,000
	S18 of 63174	Square Lake Road (I-75 BL) Interchange	Three span steel beams	Four-span cont. steel girders	6.5 *	$ 5,645,000
	S18-5 of 63174	Square Lake Road (I-75 BL) Interchange	Three span steel girders	Five-span cont. steel girders	10.7	$ 8,424,000
					Segment Subtotal	$ 16,925,000

* Denotes grade raise from existing mid-level crossing

E 3.10 Corridor Construction Phasing

The 13.64 miles of I-75 were broken into multiple construction segments, based on a combination of design issues, construction dollars and maintenance of traffic.

The I-75 Freeway contains the following construction elements:

- Addition of a lane to I-75 in each direction and to dedicate the median lane in the morning and afternoon peak traffic periods to High Occupancy Vehicle (HOV) traffic.
- Reconstruction of the 12 Mile Road Interchange as detailed in the I-75 EIS.
- Reconstruction of the Square Lake Road Interchange that brings the NB I-75 freeway and HOV lane adjacent to the SB I-75 alignment and upgrades all existing left-hand entrance and exit ramps to right-hand entrance and exit ramps.
- Reconstruction of the 14 Mile Road Interchange, including capacity improvements along 14 Mile Road at the interchange.
- Reconstruction of the ramps and lengthening at all interchanges within the project limits (Rochester Road, Big Beaver Road, Crooks Road, and Adams Road) to accommodate current MDOT and FHWA design standards.
- Upgrade of the drainage system, including cross culverts and installation of an enclosed median drainage system.
- Improvements to the local roadway corridors at 12 Mile and 14 Mile Roads.
- Major utility modifications or relocations required for the interchange and ramp reconstruction.

The following priorities were identified prior to setting the construction staging and project sequencing.

- Minimize the disruption of traffic in the construction area along I-75.
- Two lanes will be maintained in each direction on I-75 except during the placement of the bridge beams which will require I-75 traffic to shift to the other direction of travel.
- Maintain local access across I-75 during construction.
- Provide multiple local access points to and from I-75 along the corridor during construction.

The closure of local crossroads at I-75 while under construction will require traffic to find alternate routes across I-75. Detour routes will be established to direct the traffic to an alternate route.

Construction phasing of the northern section was broken into five segments as described below and as shown in Figure E 3-4.

Segment 1:
Roadway Project limits: From south of 12 Mile Road to north of 13 Mile Road
Total length: 1.74 miles (Sta 907+00 to Sta 999+00)
Interchange Construction: Includes 12 Mile Road Interchange
Bridge Project limits: Includes replacement of ten bridges

Segment 2:
Roadway Project limits: From north of 13 Mile Road to north of Rochester Road
Total length: 3.33 miles (Sta 999+00 to Sta 1175+00)
Interchange Construction: Includes 14 Mile Road and Rochester Road Interchanges
Bridge Project limits: Includes replacement of six bridges

Segment 3:
Roadway Project limits: From north of Rochester Road to north of Wattles Road
Total length is 2.62 miles (Sta 1175+00 to Sta 1313+50)
Interchange Construction: Includes Big Beaver Road Interchange
Bridge Project limits: Includes replacement of seven bridges

Segment 4:
Roadway Project limits: From north of Wattles Road to north of Adams Road
Total length is 4.14 miles (Sta 1313+50 to Sta 787+50)
Interchange Construction: Includes Crooks Road and Adams Road Interchanges
Bridge Project limits: Includes replacement of ten bridges (including Squirrel Road)

Segment 5:
Roadway Project limits: From north of Adams Road to south of M-59
Total length is 1.81 miles (Sta 787+50 to Sta 882+82.61)
Interchange Construction: Includes Square Lake Road Interchange (not including Squirrel Road)
Bridge Project limits: Includes replacement/new construction of two bridges

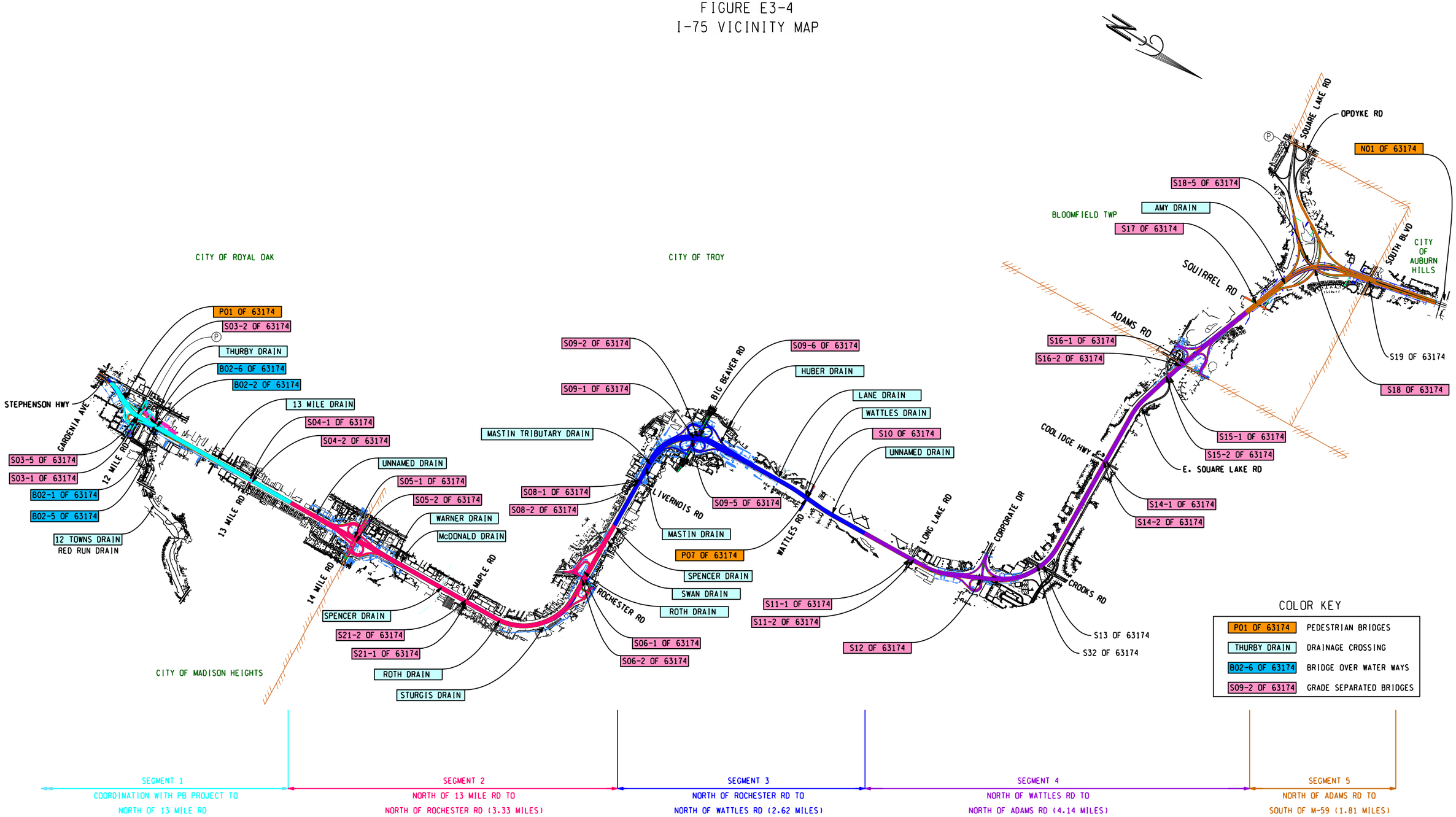
E 3.11 Construction Duration for Project Segment

The construction duration for each project segment was developed for MOT Alternatives 1 to 3. The MDOT Critical Path Construction Time Estimates were used for the individual operation rates based individually on quantities calculated by project segment. Use of these estimates provides a conservative approximation for the potential duration of a construction activity. Accelerated schedules may ultimately be used when constructing certain portions of this project. More detailed construction schedules will be developed for each project segment and the selected MOT alternative during the final design phase. The following general assumptions were used in developing these construction schedules:

- The work will proceed from south to north
- November Letting Date
- Award takes one month
- A single crew for a specific work element
- Average six work days per week
- Average 25 work days per month
- Tasks overlap whenever feasible
- No construction work will occur during the Seasonal Suspension, November 14 to April 16 as defined by the Standard Specifications for Construction

The projected construction duration for Segment 1 is two years while the remaining segments are fourteen months using the recommended part width MOT alternative.

FIGURE E3-4
I-75 VICINITY MAP



SCALE

2000' 1000' 0' 2000'

LEGEND

GAS LINE
ELECTRIC UTILITY LINE
POWER TRANS LINE
FIBER OPTICS
EXISTING R-O-W
SANITARY LINE
WATERMAIN
CABLE
EXISTING WETLAND
EXISTING DRAINAGE FLOW
PROP PAVEMENT EDGE
PROP SHOULDER EDGE
PROP BARRIER
PROP RETAINING WALL
PROPOSED CUL-DE-SAC
PROP WETLAND
EXISTING LA R-O-W
EXISTING R-O-W
PROP R-O-W
PROP LA R-O-W
NOISE WALL
PROP BRIDGE
PROP SIDEWALK
PROP CONSTRUCTION ℄
PROP BRIDGE REPAIR
PROP PARK & RIDE
SIGNALIZED INTERSECTION
CITY LIMITS

URS
Surface Transportation
Grand Rapids . Southfield .
Traverse City

MDOT
Michigan Department of Transportation

MDOT JOB NO.
88168

MDOT CONTROL SECTION
63174

MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
ENGINEERING REPORT

I-75 VICINITY MAP

E 3.12 Maintenance of Traffic

The maintenance of traffic section evaluates the design and constructability issues associated with the widening and reconstruction of the I-75 corridor from 8 Mile Road to south of M-59.

The existing southern section of I-75 from 8 Mile Road to south of 12 Mile Road is a total length of 4.02 miles and consists of a six lane urban depressed freeway, with auxiliary lanes in each direction from north of 8 Mile Road to south of I-696, and from north of I-696 to 11 Mile Road. There are 20 bridges within this section, all of which serve local roads that carry vehicular or pedestrian traffic over I-75. Service drives exist along the NB and SB I-75 directions, connecting I-75 to the local roads via ramps at 8 Mile Road, 9 Mile Road, and 11 Mile Road. The most critical access in this section is at the interchange of I-75 and I-696, located between 9 Mile Road and 11 Mile Road. The existing drainage is maintained using an enclosed storm sewer system that outlets to the Red Run Drain north of 12 Mile Road.

The existing northern section of I-75 from south of 12 Mile Road to south of M-59 is a total length of 13.64 miles and consists of a six lane rural raised freeway with seven interchanges. There are 36 bridges within this section, of which 26 structures carry I-75 traffic over local roads. Unlike the southern section of I-75, there are no service drives within this section and existing drainage is maintained using open ditches in the median and outside.

MOT concepts have been developed for both sections, using the criteria set forth in the 2005 FEIS for the project and recent mobility criteria. The MOT concepts incorporate the proposed I-75 improvements described in the geometric, bridge, drainage and traffic studies, while considering mobility and constructability as outlined in the Michigan Department of Transportation's (MDOT's) policy for Transportation Management Plans (TMP's). The southern section of I-75 is discussed in a separate Engineering Report.

The engineering approach taken for the development of MOT concepts is specific to the characteristics of their respective sections. The southern section is an urban depressed freeway with enclosed drainage, while the northern section is a rural raised freeway with an enclosed median and open outside freeway ditch. Coordination of the MOT concepts between the two sections was performed to identify a seamless project that will tie together the two sections.

Several factors were considered when developing the various MOT conceptual alternatives and identifying the construction phasing of the corridor. Existing and proposed geometrics, bridge clearance widths, and drainage were evaluated to determine constructability impacts and to aid in the development of the proposed staging alternatives. Freeway and local access for vehicular traffic, as well as pedestrian traffic, were evaluated to identify impacts to mobility.

Construction of the northern section of I-75 from south of 12 Mile Road to south of M-59 has been broken down into five constructible segments as described above in Section E 3.10..

Each segment can be let as separate individual contracts or can be combined into fewer contracts. Advance contracts that can be let to shorten the construction duration and cost of each segment have been identified.

The combination of Segment 1 of the northern section of I-75 (from south of 12 Mile Road to north of 13 Mile Road) and the southern section of I-75 (from I-696 to south of 12 Mile Road) is identified as the first construction contract for the entire I-75 corridor.

Once the first construction contract has been completed, construction of the remainder of the northern section may commence starting with Segment 2, 3, 4 and 5.

The following MOT conceptual alternatives are discussed for each of the five segments in the northern section of the I-75 corridor:

- Alternative 1: Full Freeway Closure
- Alternative 2: Half Freeway Closure in One Stage
- Alternative 3: Two-Lane Operation Minimum in Each Direction Using Crossovers

In addition, the alternative to maintain a three lane operation in each direction (contra-flow) is discussed but has not been fully evaluated for each segment from a traffic perspective.

Traffic modeling and simulation of the corridor and nearby road network has been completed for all three alternatives, as well as for the baseline existing conditions. Advantages and disadvantages of each MOT conceptual alternative, including construction duration, temporary construction costs, and user delay costs. The overall criteria used as justification for the selection of a preferred MOT concept is discussed and summarized in a decision matrix.

E 3.13 Modeling

The I-75 Engineering Report intends to develop the framework for the preliminary design of 13.64 miles of freeway section between south of 12 Mile Road and South of M-59. This section of I-75 has high traffic volumes throughout the day. Traffic demand during the AM and PM peak periods usually exceeds capacity, causing significant delays.

Using the given roadway segments, construction staging and closure options, many CS/MOT scenarios are possible. Based on practical considerations such as constructability and mobility, a total of twelve scenarios were created for operational analysis. See Table E 3-2.

MOT Alternative 1, the Full Freeway Closure construction option, has failed to provide necessary work zone mobility especially at the I-75/M-59 Interchange area. The LOS analysis shows that one weaving segment is expected to double its density, which already has LOS D and F during the base conditions.

MOT Alternative 2, related to the Half Freeway Closure construction option, is also expected to have severe congestion in a slightly less severe, but similar manner to the Full Closure construction option.

MOT Alternative 3 is the Partial Closure construction option. (two lane operation minimum in each direction using crossovers) Many parts of the network experience persistent congestion due to closures. As traffic demand decreases towards the end of peak period, however, the network is expected to recover to normal conditions. This option is considered as the preferred alternative.

Table E 3-2 List of CS/MOT Scenarios Selected for Operational Analysis

CS/MOT SCENARIO	CONSTRUCTION OPTION	CONSTRUCTION SEGMENT	MOT ALTERNATIVE	EXPECTED WORK-ZONE MOBILITY	RECOMMENDATIONS
1	Partial Closure	Segment 2	Alternative 3	OK	Favorable
2	Partial Closure	Segment 2	Alternative 3	OK	Favorable
3	Partial Closure	Segment 3	Alternative 3	OK	Favorable
4	Partial Closure	Segment 3	Alternative 3	OK	Favorable
5	Partial Closure	Segment 4	Alternative 3	OK	Favorable
6	Partial Closure	Segment 4	Alternative 3	OK	Favorable
7	Partial Closure	Segment 5	Alternative 3	OK	Favorable
8	Partial Closure	Segment 5	Alternative 3	OK	Favorable
9	Full Closure	Segment 2	Alternative 1	Failed	Not Favorable
10	Full Closure	Segment 5	Alternative 1	Failed	Not Favorable
11	Half Closure	Segment 2	Alternative 2	Failed	Not Favorable
12	Half Closure	Segment 5	Alternative 2	Failed	Not Favorable

Note: Potential MOT concept of using different construction closure options for each segment was proposed later, but was not analytically explored due to the time constraint.

E 3.12 Proposed Intelligent Transportation System

The Intelligent Transportation System (ITS) would be deployed, operating in conjunction with the proposed I-75 High Occupancy Vehicle (HOV) lanes, to help reduce travel delay and travel time uncertainty, to enhance safety, and to reduce the costs associated with travel. An ITS will help MDOT achieve these goals through the rapid detection and response to incidents and dissemination of incident, roadway condition, and travel time information to motorists and other stakeholders including, but not limited to local communities, law enforcement and public safety agencies, commercial fleets, and broadcast media. The following ITS elements are included in this project: Dynamic Message Signs (DMS), Closed Circuit Television (CCTV) cameras, Vehicle Detector Stations (VDS) and a Communications System. The Freeway Service Patrol also operates in this area.

DMS will be used to inform motorists of slow traffic ahead/queues, incidents ahead, road closures, and to inform motorists of travel times to key locations. The CCTV cameras of the Surveillance System will be used to monitor the roadway operations with cameras positioned to provide full coverage of the roadway along the corridor. Vehicle detectors will be placed at regular intervals on the roadway to determine congestion levels and the occurrence of incidents. The communications system will connect all ITS elements within the project area and connect these elements to the Michigan Intelligent Transportation System Center (MITSC) in Detroit. The field devices will be operated and monitored by operators at MITSC.

E 3.13 Cost Estimates

The cost estimate for this project was broken down by the five construction project segments and completed using standard MDOT estimating procedures.

The unit cost items are a compilation of various MDOT pay item average unit prices. For the freeway, ramp and local road work the MDOT "Weighted Average Item Price Cost Report" for 2009. While the bridge estimating was performed utilizing the procedures outlined in the MDOT Bridge Repair Cost Estimating. In addition, bid prices from recent construction projects were consulted and used to adjust some of the higher unit price items.

The individual quantity values were calculated based on the current design level of detail. These values were then applied to the unit cost values to develop grand total project cost estimates in 2009 construction year dollars for all five construction segments.

Table E 3-3 summarizes the probable opinions of cost for each segment (2009 dollars). The Segment 1 dollars will need to be combined with the southern project, as it is recommended that this project be built together. Detailed cost estimate spreadsheets are included in *APPENDIX G: COST ESTIMATES*.

Table E 3-3 Total Construction Estimates By Segment

CONSTRUCTION SEGMENT	2009 CONSTRUCTION COST	PE	CE	ROW	TOTAL
Construction Segment 1	$76,140,297	$4,568,418	$7,614,030	$500,000	$88,822,744
Construction Segment 2	$70,885,972	$4,253,158	$7,088,597	--	$82,410,998
Construction Segment 3	$68,735,506	$4,124,130	$6,873,551	--	$79,916,672
Construction Segment 4	$72,107,052	$4,326,423	$7,210,705	--	$83,644,180
Construction Segment 5	$50,017,021	$3,001,021	$5,001,702	--	$58,019,744
				Total	$392,814,340

Federal guidelines require construction estimates to be shown for the year of incurrence. This was achieved by using an inflation factor. A 4% inflation growth factor per year was assumed to determine the cost escalation for each segment estimate.

Table E 3-4 shows the total construction segment cost and anticipated construction start date for each segment within the project limits. For more detailed analysis refer to Section 4.18 in the Engineering Report and *APPENDIX G: COST ESTIMATES*.

Table E 3-4 Construction Year Estimates by Segment

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	CONSTRUCTION COST	PE	CE	ROW	TOTAL
Construction Segment 1 - 2026	$148,313,722	$8,898,823	$14,831,372	$500,000	$172,543,918
Construction Segment 2 - 2028	$149,678,917	$8,980,735	$14,967,892	--	$173,627,544
Construction Segment 3 - 2029	$150,954,543	$9,057,273	$15,095,454	--	$175,107,270
Construction Segment 4 - 2030	$164,315,248	$9,858,915	$16,431,525	--	$190,605,687
Construction Segment 5 - 2031	$118,536,278	$7,112,177	$11,853,628	--	$137,502,082

E 3.14 Summary

The reconstruction of the I-75 freeway from south of 12 Mile Road to south of M-59 will include the geometric upgrade of the freeway alignment and cross-section within these limits, the addition of a fourth median HOV lane, the installation of a center median barrier, enclosed median drainage system outletting to upgraded freeway ditches, seven interchanges, and ten local road crossings. Of the seven interchanges being upgraded, the 12 Mile Road and 14 Mile Road interchanges will be upgraded to the recommended alternative provided in the FEIS, while the recommendation for the Square Lake Road Interchange (I-75BL) will be to upgrade the interchange to a traditional right entrance and exit ramp configuration. The reconstruction of the freeway and the interchanges will require the removal of one bridge (P07 of 63174) which will be combined with the Wattles structure (S10-63174), total reconstruction of 32 existing structures and three new structures (S03-5, B02-5, B02-6). Included with the freeway reconstruction will be the installation of two carpool lots (12 Mile Road and Square Lake Road Interchange areas), upgrade of the ITS, freeway and local road signing and pavement markings and the additional signing and pavement markings necessary for the implementation of an HOV program.

The project will impact approximately 1.2 acres of wetland which is an increase from the 0.4 acres suggested in the FEIS. Additional noise analysis will be required during the final design phase which will determine the final locations of the project sound walls. In addition, the project will require ROW, however these impacts are consistent with the areas listed in the FEIS.

For project implementation, it is recommended the project be divided into five segments, with each project segment maintaining a construction cost estimate between $137 million and $190 million.