TECHNICAL MEMORANDUM

TO: Scott Pedersen, Mn/DOT
Jennifer Read, Mn/DOT

FROM: Graham Johnson, PE
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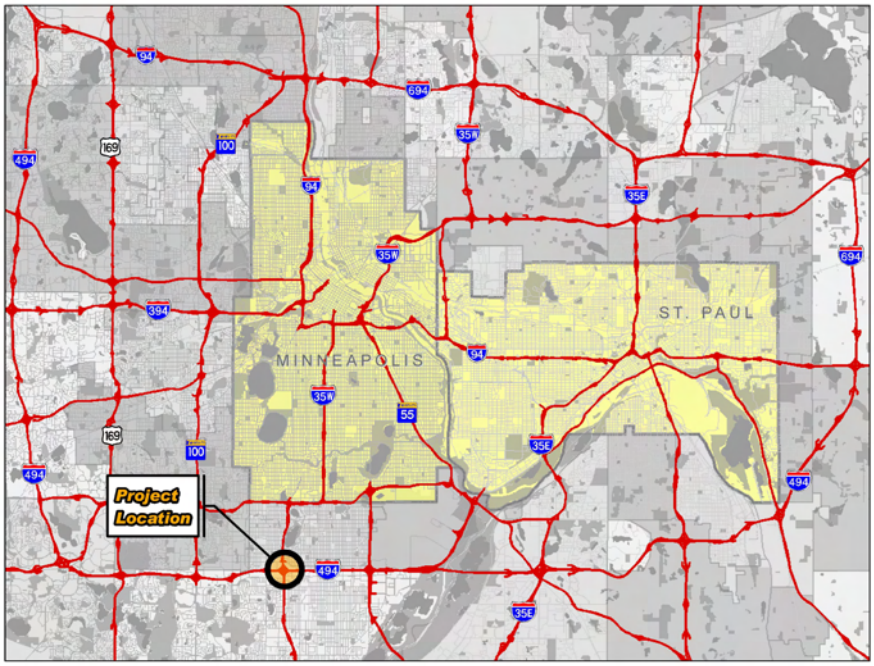
DATE: December 15, 2009

RE: I-494/I-35W Existing Conditions
SEH No. Mntco-107371

This memorandum summarizes the existing freeway conditions and the CORSIM model calibration prepared for the I-494/35W Interchange Preliminary Design Study. The interchange location relative to the Twin Cities metro area is shown below on Figure 1.

Figure 1
Project Location



OVERVIEW

The I-494/35W interchange experiences significant traffic congestion and crashes during the morning and afternoon peak periods. The heavy volume of vehicles entering and exiting causes vehicle backups in excess of several miles in each direction increasing safety problems along the corridor. The I-494/35W interchange was ranked the 7th worst cloverleaf in the metro area out of 26 interchanges in 2008 for crashes. The estimated cost of re-constructing the I-494/I-35W interchange as depicted in the 2001 Final Environmental Impact Statement (FEIS) will be difficult to implement based upon the current funding levels for transportation infrastructure. This project will develop two alternatives; a scaled-back concept

that will seek to reduce the cost of implementing improvements that address key deficiencies in operations and safety, and a second that determines the components for phases to a staged implementation of the concept developed for the 2001 FEIS.

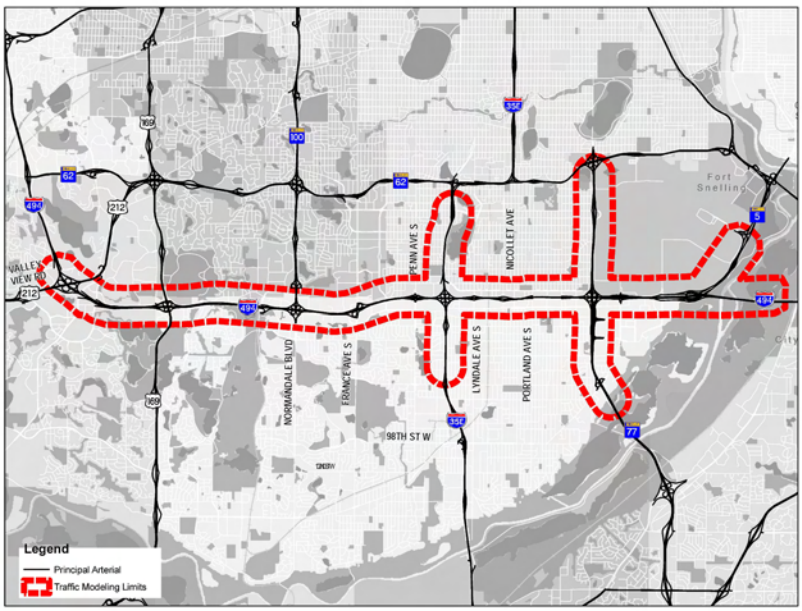
There have been several system changes that impact the study area since the 2001 FEIS study, these include:

- I-494 Stage 1 expansion project west of TH 100 (completed along I-494 in 2005).
- I-494/Penn Avenue interchange reconstructed in 2002 as a single point urban interchange (SPUI).
- The TH 62 Crosstown project: Started spring of 2007 (anticipated completion date - fall 2010).
- I-494/Lyndale Avenue interchange with I-494: Started fall of 2008 (anticipated completion date - November 2009).
- I-35W at I-494 interchange: Constructed three continuous northbound through lanes (completed in 2008).
- I-35W UPA: Northbound CD Road at I-494 (anticipated completion date - fall 2009).
- I-35W UPA: HOT lanes (anticipated completion/opening date - fall 2010).

Due to recent construction activity over multiple years, 2007 was chosen as the base year for the existing conditions CORSIM model. The existing freeway model reflects 2007 volume data and freeway geometry. The majority of the turning movement volumes were supplied from previous studies in 2007. At locations lacking 2007 data, current turning movement data was supplemented. Traffic conditions including freeway speed and volumes are based on 2007 Mn/DOT's Regional Traffic Management Center (RTMC) data. Field review of the project corridor was conducted in April 2009 and a summary of the observed traffic operations is provided in this memo. The field observations were compared to the 2007 freeway data to ensure travel characteristics similar to the 2007 conditions.

The CORSIM modeling limits for I-494 extend from Valley View Road (US 212) to the Minnesota River Bridge. I-35W model limits include 90th Street to 66th Street and TH 77 model limits extend from the Minnesota River Bridge to TH 62. The modeling limits are shown below in Figure 2.

Figure 2 – CORSIM Modeling Limits



SYSTEM PLAN

Evaluation of the "system plan" involves reviewing major design features in order to isolate issues that may contribute to the traffic congestion. These design features are described in the Mn/DOT design manual and in the American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets, 2004*. These criteria include the following:

- Basic Number of Lanes
- Lane Balance
- Route Continuity
- Interchange Spacing
- Ramp Spacing
- Interchange Type

BASIC NUMBER OF LANES

The basic number of lanes is defined as a minimum number of lanes designated and maintained over a significant length of a corridor, regardless of changes in traffic volumes and lane-balance. An assessment of basic lane needs is an indicator of minimum capacity requirements; it is not an indicator of actual capacity. The table below summarizes the basic lane volumes for LOS D and E; the density for a weaving segment was used due to the complexity of the existing freeway and the influence area of the ramps overlapping.

Table 1
Basic Lane Capacities[1]

Free-Flow Speed	Per-Lane Volume Threshold (pcphpl)/ (Vehicle Density (pc/mi/ln))	
	LOS D	LOS E
70 mph	2,150 / (35.0)	2,360 / (43.0)
65 mph	2,090 / (35.0)	2,310 / (43.0)
60 mph	2,020 / (35.0)	2,260 / (43.0)
55 mph	1,910 / (35.0)	2,200 / (43.0)

[1] Highway Capacity Manual, Exhibit 23-2 and equations from Exhibit 23-3

The following Table 2 and Table 3 show the assessment of the 2007 traffic volumes on the existing I-494 and I-35W corridors, highlighted segments are above the basic lane capacity. Because the basic lane assessment does not look at the operations of the segment, the table also highlights the volumes that operate at a LOS F during the peak hours.

I-35W meets the basic lanes needs for the current traffic conditions, the congestion on northbound I-35W is caused from spill back of the westbound I-494 exit loop.

I-494 does not meet the basic lane needs for much of the corridor. Eastbound I-494 between TH 100 and TH 77 doesn't meet the LOS D criteria but does meet LOS E for most of the stretch; however with the many short weaving areas, the actual operations are much worse. Westbound I-494 doesn't meet the basic lane needs between I-35W and TH 100; this congestion from this area spills back upstream beyond TH 77 and creates major problems that do not allow traffic to flow through.

Table 2
I-494 Basic Lane Needs for Existing 2007 Traffic

I-494 Freeway Segment		Existing Basic Lanes	Eastbound				Westbound			
			Peak Hour Traffic		Basic Lane Needs		Peak Hour Traffic		Basic Lane Needs	
			AM	PM	LOS D	LOS E	AM	PM	LOS D	LOS E
US 169	E. Bush Lake Rd	4	6160	4260	3.0	2.7	5150	6860	3.4	3.0
E. Bush Lake Rd	TH 100	3	5900	4070	2.9	2.6	5740	7330	3.6	3.2
TH 100	France Avenue	3	7140	4780	3.5	3.2	6340	7300	3.6	3.2
France Avenue	Penn Avenue	3	6510	5400	3.2	2.9	6800	6530	3.4	3.0
Penn Avenue	I-35W	3	6390	6350	3.2	2.8	6800	6230	3.4	3.0
I-35W	Lyndale Avenue	3	5910	6210	3.1	2.7	5320	5540	2.7	2.5
Lyndale Avenue	Nicollet Avenue	3	5730	6460	3.2	2.9	5780	5450	2.9	2.6
Nicollet Avenue	Portland Avenue	3	5760	6590	3.3	2.9	5340	5680	2.8	2.5
Portland Avenue	12th Avenue	3	5360	6270	3.1	2.9	5020	5200	2.6	2.3
12th Avenue	TH 77	3	5850	7330	3.6	3.2	5940	5960	3.0	2.6

Table 3
I-35W Basic Lane Needs for Existing 2007 Traffic

I-35W Freeway Segment		Existing Basic Lanes	Northbound				Southbound			
			Peak Hour Traffic		Basic Lane Needs		Peak Hour Traffic		Basic Lane Needs	
			AM	PM	LOS D	LOS E	AM	PM	LOS D	LOS E
90th Street	82nd Street	3	4910	4420	2.3	2.1	3260	3800	1.8	1.6
82nd Street	I-494	3	4510	4500	2.2	2.0	3500	3580	1.7	1.5
I-494	76th Street	3	3440	3710	1.8	1.6	3420	3340	1.6	1.5
76th Street	66th Street	3	3670	4400	2.1	1.9	3810	3530	1.8	1.6

LANE BALANCE

The concept of lane balance is intended to smooth traffic flow through and beyond an interchange. The AASHTO definition of lane balance is as follows:

1. *At entrances, the number of lanes beyond the merging of two traffic streams should not be less that the sum of all traffic lanes on the merging roadways minus one.*
2. *At exits, the number of approach lanes on the highway must be equal to the number of lanes on the highway beyond the exit, plus the number of lanes on the exit, minus one. Exceptions to this principle occur at cloverleaf loop-ramp exits that follow a loop-ramp entrance and at exits between closely spaced interchanges (i.e. interchanges where the distance between the end of the taper of the entrance terminal and the beginning of the taper of the exit terminal is less than 1,500 ft). In these cases, the auxiliary lane may be dropped in a single-lane exit with the number of lanes on the approach roadway being equal to the number of through lanes beyond the exit plus the lane on the exit.*
3. *The traveled way of the highway should be reduced by not more than one traffic lane at a time.*

Lane balance is satisfied at all the entrance ramps for I-494 and I-35W in the project area. The exit ramps along I-494 have many locations achieving lane balance by incorporating escape lanes beyond the exit location. Many exit locations can be classified as exceptions to the AASHTO criteria No. 2 due to the

closely spaced ramps including loop to loop connections which are less than 1500 feet. However there are a few locations in the project area that do not meet the lane balance criteria which include:

- Eastbound I-494: the exit ramps to East Bush Lake Road and France Avenue.
- Westbound I-494: the northbound TH 100 exit ramp.
- Northbound and Southbound I-35W: between 82nd Street and eastbound I-494. The full auxiliary lane between these ramps is an exit only lane with no escape lane.

ROUTE CONTINUITY

A route continuity evaluation is to determine if any forced lane changes are required to continue along a specific highway. A forced lane change occurs when either an established through lane is dropped at a Major Fork Diverge or when an auxiliary lane is added to the left side of the roadway to accommodate the design of a Major Fork Diverge and the through traffic must change lanes in order to continue.

Route continuity is maintained for both eastbound and westbound I-494 between US 212 to the west and the Minnesota River to the east. Each direction has three continuous lanes for the entire stretch of roadway.

Currently I-35W has three continuous lanes for both northbound and southbound directions from 66th Street past 90th Street. The southbound direction has a continuous left side HOV lane through the entire study area. The northbound direction has a continuous left side HOV lane that ends at the 86th Street Bridge.

In 2007, before capacity improvements were completed, northbound I-35W had only 2 continuous lanes through the I-494 interchange and route continuity was not maintained for the far right lane. The 2007 Existing CORSIM model will use the 2007 geometry before the 3rd continuous lane was completed.

INTERCHANGE SPACING

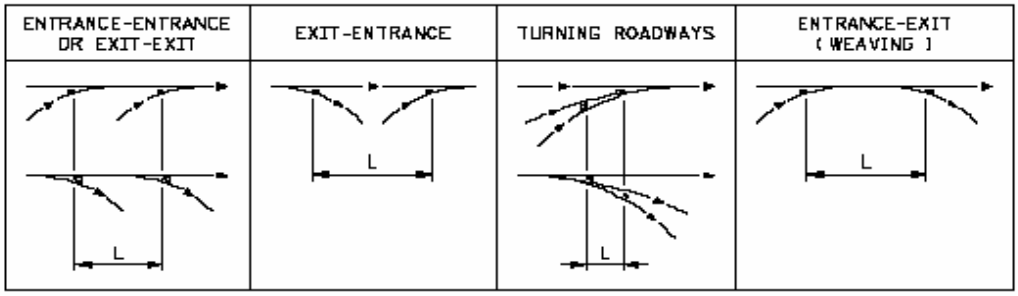
In urban areas, the minimum interchange spacing desired is 1 mile. Collector distributor roadways are recommended when that spacing criteria is not met. In the study area, the I-494 interchanges west of Penn Avenue are approximately one mile or more apart. Between Penn Avenue and TH 77 there are 5 interchanges on I-494, including: I-35W, Lyndale Avenue, Nicollet Avenue, Portland Avenue, and 12th Avenue. These 5 interchanges are spaced approximately ½ mile apart, below the desired minimum interchange spacing of 1 mile.

Along I-35W, spacing between 76th Street, I-35W and 82nd Street is substandard. The distance between 82nd and I-494 is approximately ½ mile and the distance between I-494 and 76th Street is approximately ¼ mile.

INTERCHANGE RAMP SPACING

The distance between freeway ramps can be one of the most important features to impact freeway operations. Mn/DOT has established guidelines for desired interchange ramp spacing and these guidelines are documented in the Mn/DOT Design Manual and are shown in Figure 3.

Figure 3
Mn/DOT Interchange Ramp Spacing Guidelines



DISTANCE BETWEEN SUCCESSIVE RAMP TERMINALS
Figure 6-1.04A

Table 6-1.04A
Distance Between Successive Ramp Terminals (ft)*

	Entrance – Entrance OR Exit - Exit		Exit – Entrance		Turning Roadways		Entrance - Exit (Weaving)			
							System to Service		*Service to Service*	
	Full Freeway	*C-D Road*	*Full Freeway*	*C-D Road*	*System Interchange*	*Service Interchange*	*Full Freeway*	*C-D Road*	*Full Freeway*	*C-D Road*
Desirable	1500	1200	750	600	1200	1000	3000	2000	2000	1500
Adequate	1200	1000	600	500	1000	800	2500	1800	1800	1200
Absolute Minimum	1000	800	500	400	800	700	2000	1500	1500	1000

Using this criterion against the current ramp spacing along I-494 and I-35W, there are many locations that do not meet the absolute minimum spacing requirement. Some of these locations are enhanced with a full auxiliary lane between the ramps to help with weaving traffic. Table 4 summarizes both corridors and their ramp spacing.

Table 4
Ramp Spacing

Freeway	Description: From	Description: To	Type	Desirable Spacing (feet)	Adequate Spacing (feet)	Minimum Spacing (feet)	Existing ** Spacing (feet)	Comments
Eastbount I-494	NB US 169 Entrance	E. Bush Lake Rd Exit	EN-EX	2000	1800	1500	7120	
	E. Bush Lake Rd Exit	E. Bush Lake Rd Entrance	EX-EN	750	600	500	1530	
	E. Bush Lake Rd Entrance	SB TH 100 Exit	EN-EX	2000	1800	1500	**1170**	Aux. Lane
	SB TH 100 Exit	SB TH 100 Entrance	EX-EN	750	600	500	700	
	SB TH 100 Entrance	NB TH 100 Exit	EN-EX	2000	1800	1500	**490**	Aux. Lane
	NB TH 100 Exit	NB TH 100 Entrance	EX-EN	750	600	500	**490**	
	NB TH 100 Entrance	France Ave Exit	EN^{sys}-EX	3000	2500	2000	3780	
	France Ave Exit	SB France Ave Entrance	EX-EN	750	600	500	815	
	SB France Ave Entrance	NB France Ave Entrance	EN-EN	1500	1200	1000	1100	
	NB France Ave Entrance	Penn Ave Exit	EN-EX	2000	1800	1500	3730	
	Penn Ave Exit	Penn Ave Entrance	EX-EN	750	600	500	1620	
	Penn Ave Entrance	SB I-35W Exit	EN-EX	2000	1800	1500	**1140**	Aux. Lane
	SB I-35W Exit	SB I-35W Entrance	EX-EN	750	600	500	**475**	
	SB I-35W Entrance	NB I-35W Exit	EN-EX	2000	1800	1500	**600**	Aux. Lane
	NB I-35W Exit	NB I-35W Entrance	EX-EN	750	600	500	535	
	NB I-35W Entrance	Lyndale Ave Exit	EN^{sys}-EX	3000	2500	2000	**855**	Aux. Lane
	Lyndale Ave Exit	Lyndale Ave Entrance	EX-EN	750	600	500	1960	
	Lyndale Ave Entrance	Nicollet Ave Exit	EN-EX	2000	1800	1500	**700**	Aux. Lane
	Nicollet Ave Exit	Nicollet Ave Entrance	EX-EN	750	600	500	1570	
	Nicollet Ave Entrance	Portland Ave Exit	EN-EX	2000	1800	1500	1530	
	Portland Ave Exit	12th Ave Entrance	EX-EN	750	600	500	3770	
	12th Ave Entrance	SB TH 77 Exit	EN-EX	2000	1800	1500	**1240**	Aux. Lane
Westbount I-494	TH 77 Entrance	12th Ave Exit	EN^{sys}-EX	3000	2500	2000	**1120**	Enters with full aux. lane
	12th Ave Exit	Portland Ave Entrance	EX-EN	750	600	500	3795	
	Portland Ave Entrance	Nicollet Ave Exit	EN-EX	2000	1800	1500	**1500**	
	Nicollet Ave Exit	Nicollet Ave Entrance	EX-EN	750	600	500	1505	
	Nicollet Ave Entrance	Lyndale Ave Exit	EN-EX	2000	1800	1500	**825**	Aux. Lane
	Lyndale Ave Exit	Lyndale Ave Entrance	EX-EN	750	600	500	1860	
	Lyndale Ave Entrance	NB I-35W Exit	EN-EX	2000	1800	1500	**890**	Aux. Lane
	NB I-35W Exit	NB I-35W Entrance	EX-EN	750	600	500	520	
	NB I-35W Entrance	SB I-35W Exit	EN-EX	2000	1800	1500	**635**	Aux. Lane
	SB I-35W Exit	SB I-35W Entrance	EX-EN	750	600	500	540	
	SB I-35W Entrance	Penn Ave Exit	EN^{sys}-EX	3000	2500	2000	**1095**	Aux. Lane
	Penn Ave Exit	Penn Ave Entrance	EX-EN	750	600	500	1505	
	Penn Ave Entrance	France Ave Exit	EN-EX	2000	1800	1500	3390	
	France Ave Exit	NB France Ave Entrance	EX-EN	750	600	500	865	
	NB France Ave Entrance	SB France Ave Entrance	EN-EN	1500	1200	1000	1140	
	SB France Ave Entrance	NB TH 100 Exit	EN-EX	2000	1800	1500	3775	Aux. Lane
	NB TH 100 Exit	NB TH 100 Entrance	EX-EN	750	600	500	750	
	NB TH 100 Entrance	SB TH 100 Exit	EN-EX	2000	1800	1500	**530**	Aux. Lane
	SB TH 100 Exit	SB TH 100 Entrance	EX-EN	750	600	500	620	Enters with full aux. lane
	SB TH 100 Entrance	E. Bush Lake Rd Exit	EN^{sys}-EX	3000	2500	2000	**1400**	
	E. Bush Lake Rd Exit	NB US 169 Exit	EX-EX	1500	1200	1000	8330	
Northbound I-35W	90th Street Exit	90th Street Entrance	EX-EN	750	600	500	1250	
	90th Street Entrance	82nd Street Exit	EN-EX	2000	1800	1500	4170	
	82nd Street Exit	82nd Street Entrance	EX-EN	750	600	500	1180	
	82nd Street Entrance	EB I-494 Exit	EN-EX	2000	1800	1500	**1000**	Aux. Lane
	EB I-494 Exit	EB I-494 Entrance	EX-EN	750	600	500	**410**	
	EB I-494 Entrance	WB I-494 Exit	EN-EX	2000	1800	1500	**635**	Aux. Lane
	WB I-494 Exit	WB I-494 Entrance	EX-EN	750	600	500	790	
	WB I-494 Entrance	76th Street Entrance	EN-EN	1500	1200	1000	**790**	
	76th Street Entrance	66th Street Exit	EN-EX	2000	1800	1500	5270	Exit full aux. lane
Southbound I-35W	66th Street Entrance	76th Street Exit	EN-EX	2000	1800	1500	4770	Enter with full aux. lane
	76th Street Exit	WB I-494 Exit	EX-EX	1500	1200	1000	1340	
	WB I-494 Exit	WB I-494 Entrance	EX-EN	750	600	500	**480**	
	WB I-494 Entrance	EB I-494 Exit	EN-EX	2000	1800	1500	**615**	Aux. Lane
	EB I-494 Exit	EB I-494 Entrance	EX-EN	750	600	500	**500**	
	EB I-494 Entrance	82nd Street Exit	EN-EX	2000	1800	1500	**1060**	Aux. Lane
	82nd Street Exit	82nd Street Entrance	EX-EN	750	600	500	1120	
	82nd Street Entrance	90th Street Exit	EN-EX	2000	1800	1500	3980	
	90th Street Exit	90th Street Entrance	EX-EN	750	600	500	1200	

** Physical Nose to Nose

INTERCHANGE TYPE

Uniformity of interchange types along a freeway corridor has the potential to reduce congestion and safety problems. Uniformity allows drivers to anticipate lane changing, merging, and exiting maneuvers between interchanges.

The three system interchanges in the study area, TH 100, I-35W and TH 77 are all cloverleaf designs. The only exception is that TH 77 has a flyover ramp for northbound TH 77 to westbound I-494. All of the service interchanges are diamond type interchanges, with the exception of France Avenue which is a 4-Quad Parclo-A. Penn Avenue and the new Lyndale Avenue interchange will both be single point urban interchanges (SPUI). Nicollet Avenue is a standard diamond interchange and Portland/12th Avenue is a split diamond with one-way frontage roads between the ramp terminals.

SHORT WEAVING AREA

Throughout the study area, there are many locations with short weaving sections. Table 5 shows all locations of a weaving (entrance to exit) area that is less than the minimum desired spacing of 1500 feet. Many of these locations are aided by the use of auxiliary lanes between the ramps; however between Nicollet Avenue and Portland Avenue there are no auxiliary lanes. All weaving sections with at least 1000 vehicles weaving during the peak hour are highlighted.

The heaviest weave section is along I-494 between TH 77 and 12th Avenue. Eastbound in the PM peak, there are almost 3,200 vehicles that weave between the two ramps located only 950 feet apart. Westbound has a high weave in both peak periods with over 2000 vehicles weaving within 650 feet.

Table 5
Short Weaving Areas

Weaving Area			Weave Distance (ft)	AM Peak Period			PM Peak Period			Comments
Roadway	From	To		Entering Volume	Exiting Volume	Total Weave Volume	Entering Volume	Exiting Volume	Total Weave Volume	
EB I-494	E. Bush Lake Rd Ent	SB TH 100 Exit	520	640	310	950	640	510	1150	Auxiliary lane
EB I-494	SB TH 100 Ent	NB TH 100 Exit	300	1590	410	2000	1210	230	1440	Loop to loop - Aux Lane
EB I-494	Penn Avenue Ent	SB I-35W Exit	720	500	1090	1590	1100	830	1930	Auxiliary lane
EB I-494	SB I-35W Ent	NB I-35W Exit	450	520	400	920	390	460	850	Loop to loop - Aux Lane
EB I-494	NB I-35W Ent	Lyndale Avenue Exit	725	490	430	920	770	360	1130	Auxiliary lane
EB I-494	Lydale Avenue Ent	Nicollet Avenue Exit	640	250	300	550	620	210	830	Auxiliary lane
EB I-494	Nicollet Avenue Ent	Portland Avenue Exit	1225	330	400	730	330	320	650	
EB I-494	12th Avenue Ent	SB TH 77 Exit	950	490	800	1290	1060	2130	3190	Auxiliary lane plus lane add
WB I-494	TH 77 Ent	12th Avenue Exit	650	1720	920	2640	1300	760	2060	Auxiliary lane
WB I-494	Portland Avenue Ent	Nicollet Avenue Exit	1140	320	290	610	470	510	980	
WB I-494	Nicollet Avenue Ent	Lyndale Avenue Exit	940	320	350	670	280	450	730	Auxiliary lane
WB I-494	Lyndale Avenue Ent	NB I-35W Exit	770	290	190	480	540	560	1100	Auxiliary lane
WB I-494	NB I-35W Ent	SB I-35W Exit	540	1170	320	1490	1040	360	1400	Loop to loop - Aux Lane
WB I-494	SB I-35W Ent	Penn Avenue Exit	600	820	580	1400	560	630	1190	Auxiliary lane
WB I-494	NB TH 100 Ent	SB TH 100 Exit	300	540	400	940	570	290	860	Loop to loop - Aux Lane
WB I-494	SB TH 100 Ent	E. Bush Lake Exit	750	400	590	990	1000	480	1480	Auxiliary lane
NB I-35W	82nd Street Ent	EB I-494 Exit	550	250	480	730	380	770	1150	Auxiliary lane
NB I-35W	EB I-494 Ent	WB I-494 Exit	450	400	1170	1570	460	1040	1500	Loop to loop - Aux Lane
SB I-35W	WB I-494 Ent	EB I-494 Exit	430	320	520	840	360	390	750	Loop to loop - Aux Lane
SB I-35W	EB I-494 Ent	82nd Street Exit	760	1090	390	1480	830	250	1080	Auxiliary lane

OPERATIONS – OBSERVATIONS AND ANALYSIS

Traffic operations along I-494 and I-35W have congestion problems in both the AM and PM peak periods. Some of the culprits include volumes over the capacity of the basic mainline section, heavy entering and exiting volumes, as well as closely spaced ramps which have weaving problems. While I-35W has a directional traffic split between the morning and afternoon peaks, I-494 has congestion in both directions during both peak periods. I-494 has a speed limit of 60 mph, while I-35W is 55 mph north of 82nd Street and 65 mph south of 82nd Street.

I-494 AM PEAK PERIOD

Eastbound I-494 in the AM peak period has congestion problems between US 169 and Penn Avenue. The volume between the two France Avenue entrance ramps and the Penn Avenue exit ramp, 6500 vehicles per hour (vph), are at the capacity of the 3-lane section. The slow down from this bottleneck spills back through the France Avenue interchange and upstream of the TH 100 cloverleaf. The slow moving traffic make it difficult for traffic to merge at the TH 100 interchange and for vehicles to weave into the exit only lane at France Avenue. The southbound TH 100 entrance loop ramp carries over 1500 vph into an auxiliary lane that drops at France Avenue, forcing most of those vehicles to make a lane change.

Westbound I-494 in the AM peak period experiences congestion stemming from the Penn Avenue entrance ramp all the way upstream of 24th Avenue. The volume demand between the Penn Avenue entrance ramp and the France Avenue exit ramp is approximately 6800 vph which exceeds the capacity of the 3-lane section. The slow down from this bottleneck spills back through the I-35W cloverleaf interchange where the heavy I-35W entrance ramp volumes enter into a high weaving area. This compounds the congestion and extends it further upstream though the heavy weaving areas of the closely spaced interchanges of Lyndale, Nicollet and Portland/12th Avenues. Issues are compounded even more due to the short weaving distance of 650 feet between the TH 77 entrance ramp and 12th Avenue exit ramp. TH 77 has over 1700 vph entering and 12th Avenue has about 900 vph exiting, this volume must weave over the short distance and this contributes to traffic queues upstream to the 24th Avenue interchange. Figure 4 shows the morning congestion spill back upstream of 12th Avenue.

Figure 4
Westbound I-494 AM Peak

I-494 PM PEAK PERIOD

Eastbound I-494 in the PM peak period experiences congestion that extends from East Bush Lake Road to TH 77. Figure 5 shows the start of congestion for the eastbound direction. Though much of the mainline is approaching capacity, none of the sections are above the basic lane needs for a LOS E. Instead the majority of the congestion problems occur due to heavy weaving traffic and vehicle stacking prior to an exit ramp. At both the system interchanges of TH 100 and I-35W, the cloverleaf design creates high weaving volumes over very short distances between the loop ramps. The Penn Avenue entrance volume of over 1100 vph and the 830 vph exiting to southbound I-35W all weave between 700 feet. The most extreme weaving condition occurs between 12th Avenue and the southbound TH 77 exit ramp. 12th Avenue has 1050 vph entering and southbound TH 77 has over 2100 vph exiting, this volume must weave over the short distance of 950 feet.

Westbound I-494 in the PM peak period experiences congestion that extends from the Penn Avenue entrance upstream to 24th Avenue. Between France Avenue and the I-35W interchange, I-494 is above the basic lane needs. Congestion problems are increased due to heavy weaving traffic and vehicle stacking prior to an exit ramp. The Penn Avenue entrance volume brings the mainline demand close to capacity of the 3-lane section and weaving issues occur with the exiting volumes to France Avenue. The heavy northbound I-35W entrance volume into a short weaving section also creates turbulence that propagates the congestion further upstream. The short weaving sections between I-35W, Lyndale, Nicollet and Portland Avenue slow the right most lanes down extending the congestion.

Figure 5
EB I-494 PM Peak

I-35W AM and PM PEAK PERIOD

Northbound I-35W experiences congestion during the AM peak period. The cause of the slow down is the westbound I-494 exit loop ramp. The weaving that occurs both on I-35W and along I-494 between the I-35W loop ramps creates slow moving traffic, reducing the capacity of both mainlines. On northbound I-35W this congestion can spill back to the 90th Street interchange. Southbound I-35W in the AM peak period operates at free flow conditions.

Northbound I-35W in the PM peak hour operates at free flow conditions. Southbound I-35W operates under free flow conditions through the study area; however there is some congestion created downstream outside of the project area.

CONGESTION BOTTLENECKS BEYOND STUDY AREA

During the field observations conducted in April 2009, there were two locations outside of the study area that had very poor operations as well as creating safety concerns. Both locations created congestion in the right lane prior to the exit ramps, while the other lanes operated near or above posted speeds.

EASTBOUND I-494 TO US 169

The ramp terminal intersection for the eastbound I-494 off ramp has a queue that extends back onto I-494 during the PM peak hour. The three closely spaced signals around the I-494/US 169 interchange are the

main reason for this congestion. The southern most signal at Highwood Drive has long queues that spill back into the ramp terminal intersection. This blocks the eastbound right turning traffic from the ramp which then spills back onto the freeway for almost a half mile at times.

WESTBOUND I-494 TO WESTBOUND US 212/TH 5

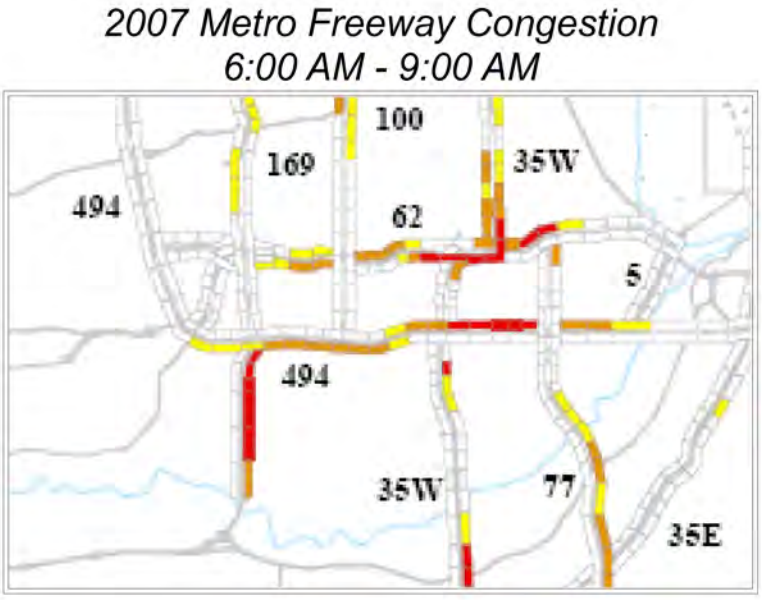
The heavy westbound I-494 loop ramp volume to westbound US 212 create a major bottleneck on US 212. This bottleneck spills traffic through the loop ramp and back onto westbound I-494. During the PM peak hour, the congestion in the right lane can spill almost one and a half miles near the US 169 interchange.

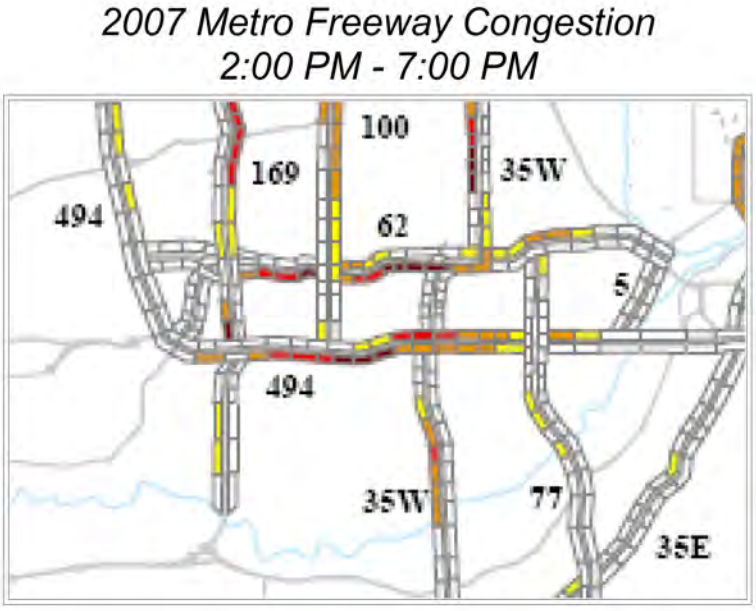
CRASH SUMMARY

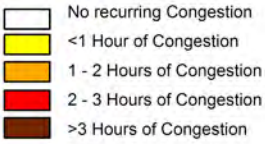
A crash analysis was completed for the approaching roadways to the I-494/I-35W interchange. Freeway crashes are attributed to shock wave activity, merging traffic, and weaving traffic on congested roadways (Mn/DOT Freeway and Major Arterial Crash Summary, 2009). The congestion stemming from the I-494/I-35W interchange area extends upstream creating potential for congestion related crashes (rear-end, sideswipe, etc). Therefore, the congested freeway segments approaching the interchange were included in the analysis.

Figure 6, shows the 2007 congestion around the interchange and study areas; this graphic was created from Mn/DOT's Metropolitan Freeway System 2007 Congestion Report. This was used to help determine the approaching segments to the interchange. The AM data shows congestion from 1-2 hours along eastbound I-494 and 2-3 hours along westbound I-494. The PM data shows congestion along eastbound I-494 to be over 3 hours and 2-3 hours for westbound I-494.

Figure 6
2007 Peak Period Congestion







CONGESTION
ESTIMATED SPEEDS LESS THAN 45 MPH

The three year crash history period between 2006 and 2008 was analyzed. The Mn/DOT Metro District averages for Crash and Severity Rates for a basic freeway segment are 0.9 and 1.3. For a cloverleaf interchange, average Crash and Severity Rates are 0.9 and 1.2.

Table 6, below, is a summary of the I-494/I-35W interchange crashes. For this interchange, all of the actual police crash reports were pulled and looked at individually in order to determine the exact location of each crash. There were a total of 308 crashes at the interchange between 2006 and 2008, with a crash and severity rate of 1.1 and 1.5; which is higher than the metro average for cloverleaf interchanges.

Table 6
2006 - 2008
I-494 at I-35W Interchange Crashes

Road	From	To	Fatal	A	B	C	Property	Total
EB I-494	Begin	SB I-35W Exit	0	0	0	4	5	9
	SB I-35W Exit	SB I-35W Ent.	0	0	1	2	4	7
	SB I-35W Ent.	NB I-35W Exit	0	0	0	3	7	10
	NB I-35W Exit	NB I-35W Ent.	0	0	0	1	0	1
	NB I-35W Ent.	End	0	0	0	1	2	3
WB I-494	Begin	NB I-35W Exit	0	0	1	7	23	31
	NB I-35W Exit	NB I-35W Ent.	0	0	1	12	16	29
	NB I-35W Ent.	SB I-35W Exit	0	1	1	18	35	55
	SB I-35W Exit	SB I-35W Ent.	0	0	0	1	3	4
	SB I-35W Ent.	End	0	0	0	2	7	9
NB I-35W	Begin	EB I-494 Exit	0	0	1	0	11	12
	EB I-494 Exit	EB I-494 Ent.	0	0	0	5	13	18
	EB I-494 Ent.	WB I-494 Exit	0	1	3	3	37	44
	WB I-494 Exit	WB I-494 Ent.	0	0	0	1	6	7
	WB I-494 Ent.	End	0	0	0	3	4	7
SB I-35W	Begin	WB I-494 Exit	0	0	0	1	1	2
	WB I-494 Exit	WB I-494 Ent.	0	0	0	1	1	2
	WB I-494 Ent.	EB I-494 Exit	0	1	0	1	9	11
	EB I-494 Exit	EB I-494 Ent.	0	0	0	0	2	2
	EB I-494 Ent.	End	1	0	1	1	10	13
	Ramp Crashes		0	1	0	13	18	32
		TOTAL	**1**	**4**	**9**	**80**	**214**	**308**

Westbound I-494 has the highest number of crashes by direction with 128 total crashes (42% of the total). The weaving area between the I-35W loop ramps has the highest number and is one of the main causes of congestion. The congestion spills back along I-494 and creates more safety problems as shown by the high number of crashes upstream of the loop ramps. Northbound I-35W has the next highest number of crashes by direction with 88 (29% of the total). The weaving area between the I-494 loop ramps has a

very high portion of crashes which is directly related to the congestion problems. Eastbound I-494 has a bottleneck upstream of the interchange which regulates the amount of traffic at the cloverleaf. Therefore the crashes directly at the interchange are very low compared to westbound I-494. Southbound I-35W operates at free flow speeds for most of the day and therefore doesn't have any major congestion-safety related problems. There is also construction on TH 62/I-35W to the north that likely reduced traffic using southbound I-35W.

Table 7 shows the summary of the overall interchange crashes for both directions that occurred along I-494 and I-35W. Along I-494, all interchanges between TH 100 and TH 77 are at or above the metro averages for the specific interchange type. This section of high crash rates correlates with the congested areas during both peak periods. Along I-35W, only 82nd Street and the I-494 interchanges are above the metro averages. This also correlates to the congested area during the peak periods.

Table 7
2006 - 2008
Interchange Crashes along I-494 and I-35W

						Mn/DOT Metro Average Interchange Crash Rates	
Road	**Interchange**	**Interchange Type**	**Total Crashes**	**Crash Rate**	**Severity Rate**	**Crash Rate**	**Severity Rate**
I-494	12th Avenue	Half Diamond	135	0.8	1.1	0.6	0.8
	Portland Avenue	Half Diamond	178	1.0	1.4	0.6	0.8
	Nicollet Avenue	Diamond	154	0.9	1.2	0.9	1.2
	Lyndale Avenue	Diamond	UNDER CONSTRUCTION 2007-PRESENT				
	I-35W	Cloverleaf	308	1.1	1.5	0.9	1.2
	Penn Avenue	Diamond	206	1.0	1.3	0.9	1.2
	France Avenue	Partial Cloverleaf	214	1.0	1.4	0.9	1.2
I-35W	90th Street	Diamond	89	0.6	0.9	0.9	1.2
	82nd Street	Diamond	129	0.9	1.4	0.9	1.2
	I-494	Cloverleaf	308	1.1	1.5	0.9	1.2
	76th Street	Half Diamond	40	0.3	0.4	0.6	0.8

The directional approaching legs to the I-494/I-35W interchange were analyzed based on the extents of congestion in the peak periods. Table 8 shows the directional approaching legs to the interchange. All approaches to the interchange are above the metro average for an urban freeway segment which the Mn/DOT average is 1.1 and 1.5. Westbound I-494 and northbound I-35W have severity rates well above the metro average.

Table 8
2006 - 2008
Approaching Leg Crash & Severity Rates

Road	From	To	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate
EB I-494	West of France	I-35W	0	0	3	39	172	214	1.5	1.8
WB I-494	East of 12th Ave	I-35W	0	0	6	71	254	331	2.0	2.5
NB I-35W	South of 82nd St	I-494	1	2	8	46	91	148	1.6	2.3
SB I-35W	North of 76th St	I-494	0	0	0	5	8	13	1.3	1.8
		TOTAL	**1**	**2**	**17**	**161**	**525**	**706**		

Table 9 shows the high percentages of congestion related crashes that occur on the approaching legs to the interchange. Over 90% of all the crashes that occurred can be in some way attributed to congestion along I-494 and I-35W.

Table 9
2006 - 2008
Approaching Leg Congestion Related Crashes

Road	From	To	Congestion Related Crashes	Total Crashes	Percentage
EB I-494	West of France	I-35W	195	214	91%
WB I-494	East of 12th Ave	I-35W	328	331	99%
NB I-35W	South of 82nd St	I-494	126	148	85%
SB I-35W	North of 76th St	I-494	8	13	62%
		TOTAL	657	706	93%

CALIBRATION

Calibration of the I-494 corridor was done with changes to the default CORSIM model parameters. With the new release of TSIS 6.1, this model tested the limits of the software and found many software bug/issues.

Due to the heavy congestion in both directions and during both peak hours, different modeling parameters were used for the AM and PM models. Typically we use one set of parameters for both peak periods, however with overly congested conditions, CORSIM has a hard time replicating traffic patterns. Therefore, separate AM and PM parameters were used.

Warning sign distances were modified throughout the model, some were increased to create stacking in the right lanes and some were decreased to replicate traffic weaving. Headway factors, a calibration parameter in CORSIM, were modified on sections of the mainline corridors. An increased headway factor creates more space between vehicles and can typically cause more congestion, a decreased headway factor allows traffic to follow vehicles closer and allows for more traffic throughput.

Anticipatory speed and warning signs were also modified. This parameter is used at entrance ramps to allow control of some vehicles in the lane closest to the entrance ramp. If a vehicle on the ramp is moving slower than the speed trigger set, at the warning sign distance on the mainline any through vehicle in the right most lane (for a right hand entrance) will try to maneuver out of the right most lane.

Further discussion of the parameters that were modified can be found in the Existing Calibration Model Submittal.

OPERATIONS ANALYSIS RESULTS

The primary measure of effectiveness that CORSIM provides for freeway segments is speed, density, and free flow. According to the Highway Capacity Manual (HCM), density is used to estimate the Level of Service (LOS) for basic freeway segments, weaving segments and merge/diverge areas. In order to simplify the modeling process, Mn/DOT adopted the freeway weaving segment LOS criteria for all freeway segments. LOS thresholds for a weaving freeway segment are summarized in Table 10.

Table 10
LOS Thresholds for Freeway Segment

LOS	Density Range (pc/mi/ln)
A	0-10
B	>10-20
C	>20-28
D	>28-35
E	>35-43
F	>43

Based on these criteria, the LOS during the peak hours for all freeway segments in the model was calculated. The resulting MOE's for both I-494 and I-35W for the AM and PM peak hours is show in Figures 7 through 10 attached at the end of the document. The resulting MOE's match closely to what was observed in the field and based on the detector speeds from the RTMC.

EASTBOUND I-494 AM CONDITIONS

The LOS was "F" from East Bush Lake Road to Northbound TH 100 entrance ramp and a LOS "E" or "F" from France Avenue exit ramp to Penn Avenue exit. The lower LOS is caused by a combination of issues that slow the mainline causing traffic to spillback upstream of the bottleneck. These issues include but are not limited to the following:

- Between France Avenue and Penn Avenue the AM volumes are reaching the capacity of the 3-lane freeway section (which slows traffic and spills it upstream of TH 100 interchange).
- SB TH 100 auxiliary lane drops at France Avenue and this force a majority of vehicles to make a lane change.
- Between Penn Avenue entrance to NB I-35W exit has a high weaving volume over a short weave distance of 720 feet (which slows traffic upstream of I-35W).

Westbound I-494 AM CONDITIONS

The LOS was "E" or "F" from NB/SB TH 77 Entrance Ramp to France Avenue exit. The lower LOS is caused by a combination of issues that slow the mainline causing traffic to spillback upstream of the bottleneck. These issues include but are not limited to the following:

- Between I-35W and East Bush Lake Road the AM volumes are reaching the capacity of the 3-lane freeway section.
- The northbound I-35W entrance and southbound I-35W exit has a high weaving volume over short weaving distance of 540 feet.
- The southbound I-35W entrance and Penn Avenue exit has a high weaving volume over short weaving distance of 600 feet.
- TH 77 entrance and 12th Avenue exit has a high weaving volume over a short weave distance of 650 feet.

Figures 7a to 7c provides the study area MOE's for eastbound and westbound I-494 for the AM peak hour.

EASTBOUND I-494 PM CONDITIONS

The LOS was "F" from France Avenue exit ramp to 12th Avenue entrance ramp. The lower LOS is caused by a mixture of issues that slow the mainline causing traffic to spillback upstream of the bottleneck. These issues include but are not limited to the following:

- I-494 system interchanges with TH 100 and I-35W cloverleaf has a high weaving volume but a short weaving distance between the loop ramps.
- 12th Avenue and TH 77 has a high weaving volume but a short weaving distance of 950 feet.
- Penn Avenue entrance and southbound I-35W has a high weaving volume but a short weaving distance of 700 feet.

WESTBOUND I-494 PM CONDITIONS

The LOS was "E" or "F" from 24th Avenue to France Avenue. The lower LOS is caused by a mixture of issues that slow the mainline causing traffic to spillback upstream of the bottleneck. These issues include but are not limited to the following:

- Between France Avenue and I-35W the PM volumes are reaching the capacity of the 3-lane freeway section.
- High northbound I-35W entrance volume.
- There are short weaving sections between I-35W, Lyndale Avenue, Nicollet Avenue, and Portland Avenue.

Figure 8a to 8c provides the study area MOE's for eastbound and westbound I-494 for the PM peak hour.

I-35W AM and PM CONDITIONS

The LOS was "E" or "F" for northbound I-35W during both AM and PM peak hour between 82nd Street and the westbound I-494 exit loop. The cause of the slow down is the westbound I-494 exit loop ramp. The LOS for southbound was a "D" or better for both the AM and PM traffic conditions.

Figure 9 and Figure 10 provide the study area MOE's for I-35W.

WESTBOUND I-494

Node	Distance (ft)	Speed (mph)	Level of Service	Density (veh/ln/mi)
6172				
	1781	66	B	18
6170				
	1105	66	B	18
6168				
	1646	66	B	18
6166				
	1281	66	B	18
6164				
	1499	63	B	17
6162				
	827	66	B	15
6160				
	1159	66	B	13
6158				
	1246	65	B	15
6156				
	807	59	B	15
6154				
	809	65	B	17
6152				
	1585	65	B	17
6150				
	1660	65	B	18
6148				
	907	65	B	18
6146				
	1217	64	B	17
6144				
	1305	64	B	16
6142				
	1363	63	B	14
6138				
	278	59	B	13
6136				
	1173	67	B	13
6132				
	1506	64	B	18
6130				
	1167	65	B	19
6128				

Node	Simulated Ramp Volumes	Demand Ramp Volumes
6162	Entry From Valley View	543 vph / 549 vph
6158	Entry From WB US 212	13 vph / 14 vph
6156	Exit To WB US 212	942 vph / 977 vph
6154	Entry From EB US 212	673 vph / 679 vph
6152	Exit To EB US 212	161 vph / 146 vph
6146	Exit To Prairie Center	979 vph / 983 vph
6142	Entry From SB US 169	535 vph / 536 vph
6138	Exit To SB US 169	468 vph / 535 vph
6136	Entry From NB US 169	734 vph / 736 vph
6132	Exit To NB US 169	1165 vph / 1233 vph

Node	Simulated Volumes	Demand Volumes
6172	3713	3782
6170	3721	3782
6168	3726	3782
6166	3728	3782
6164	3734	3782
6162	3191	3233
6160	3194	3233
6158	3181	3219
6156	4122	4196
6154	3450	3517
6152	3611	3663
6150	3616	3663
6148	3618	3663
6146	4597	4646
6144	4604	4646
6142	4069	4110
6138	4537	4645
6136	3803	3909
6132	4968	5142
6130	4971	5142
6128		

Node	Demand Volumes	Simulated Volumes
5110	4096	4086
5112	4096	4077
5114	4096	4066
5116	4096	4057
5118	4096	4049
5120	3458	3400
5122	2740	2682
5124	2775	2715
5126	2624	2576
5128	4498	4451
5130	5009	4960
5132	5009	4952
5134	5009	4941
5136	5511	5440
5138	5511	5431
5140	4768	4707
5144	5385	5318
5148	6157	6086
5150	6157	6075
5152	6157	6060
5154		

Node	Demand Ramp Volumes	Simulated Ramp Volumes
5120	Exit To Valley View Rd	638 vph / 649 vph
5122	Exit To WB US 212	718 vph / 718 vph
5124	Entry From WB US 212	35 vph / 34 vph
5126	Exit To EB US 212	151 vph / 139 vph
5128	Entry From EB US 212	1874 vph / 1875 vph
5130	Entry From Flying Cloud	511 vph / 509 vph
5136	Entry From Prairie Center	502 vph / 498 vph
5140	Exit To US 169	743 vph / 724 vph
5144	Entry From SB US 169	617 vph / 612 vph
5148	Entry From NB US 169	772 vph / 767 vph

Node	Distance (ft)	Speed (mph)	Level of Service	Density (veh/ln/mi)
5110				
	1802	66	B	19
5112				
	1190	66	B	19
5114				
	1530	66	B	19
5116				
	1685	64	B	20
5118				
	1495	63	B	19
5120				
	1584	65	B	16
5122				
	1110	67	B	13
5124				
	710	67	A	9
5126				
	1046	67	B	11
5128				
	1503	63	B	17
5130				
	775	64	B	15
5132				
	1295	65	B	18
5134				
	1469	65	B	18
5136				
	943	61	B	18
5138				
	958	62	C	20
5140				
	1338	65	C	23
5144				
	1014	63	B	20
5148				
	1347	62	C	21
5150				
	1285	63	C	23
5152				
	1485	58	C	25
5154				

EASTBOUND I-494

LEGEND

511 — Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	75
Density above	55
Density above	43

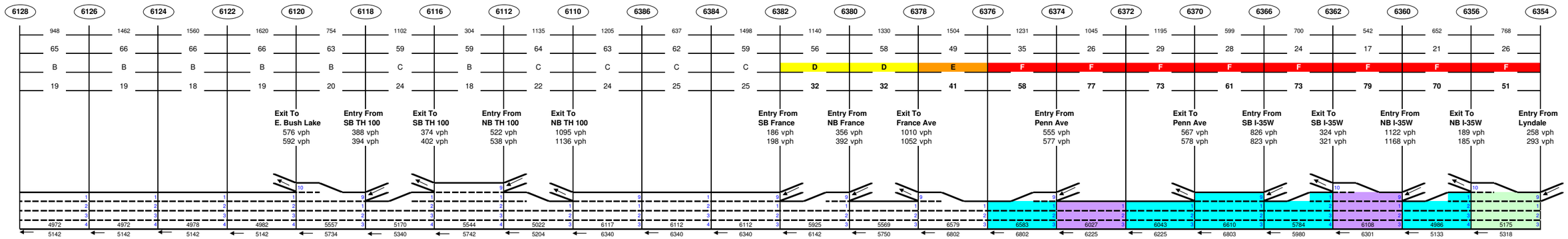
SEH

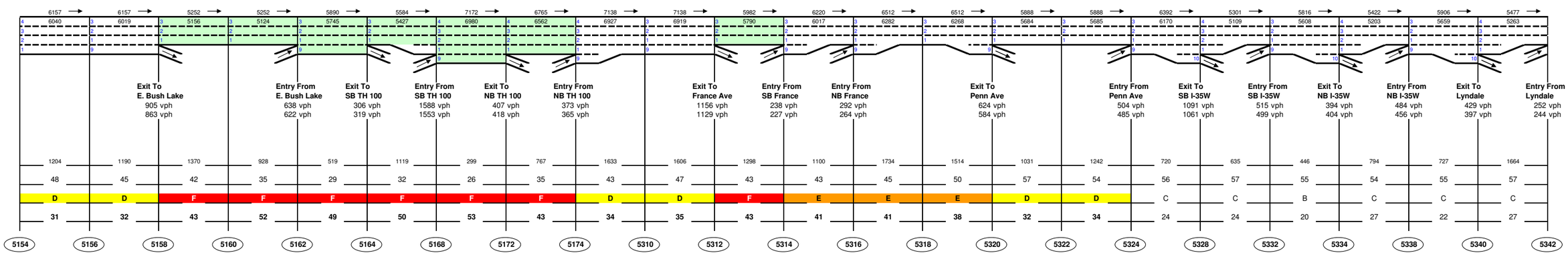
I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 7a
AM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 7:00 - 8:00

WESTBOUND I-494





EASTBOUND I-494

LEGEND

(511) Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	0
Density above	4982
Density above	4

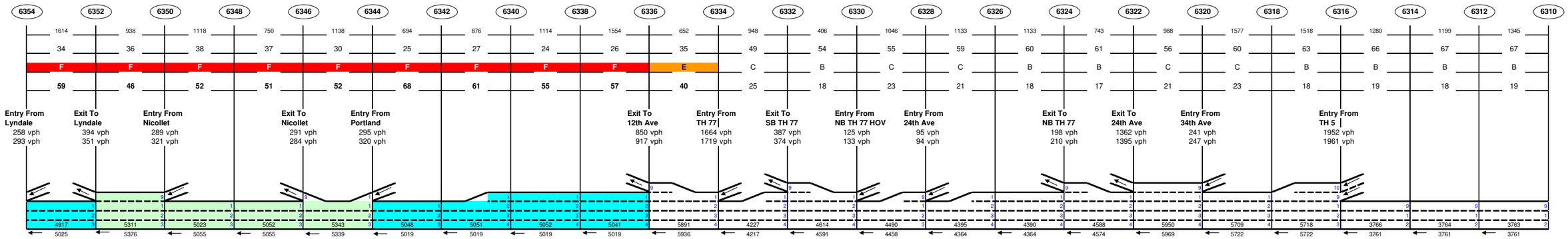
SEH

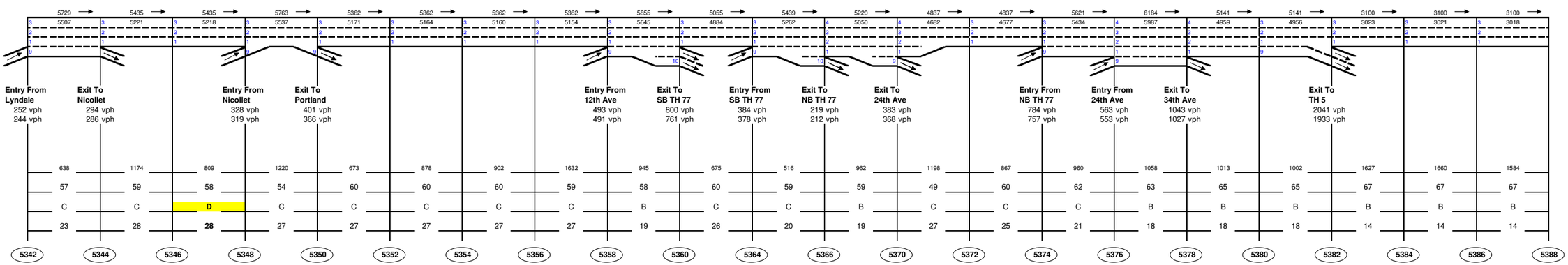
I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 7b
AM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 7:00 - 8:00

WESTBOUND I-494





EASTBOUND I-494

LEGEND

(511) Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	0
Density above	0
Density above	2

SEH

I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 7c
AM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 7:00 - 8:00

WESTBOUND I-494

Node	6172	6170	6168	6166	6164	6162	6160	6158	6156	6154	6152	6150	6148	6146	6144	6142	6138	6136	6132	6130	6128
Distance (ft)	1781	1105	1646	1281	1499	827	1159	1246	807	809	1585	1660	907	1217	1305	1363	278	1173	1506	1167	
Speed (mph)	66	65	65	65	61	66	66	65	55	63	63	64	65	64	65	62	60	65	62	63	
Level of Service	C	C	C	C	C	B	B	B	B	C	C	C	C	C	B	B	B	B	C	C	
Density (veh/ln/mi)	21	21	21	21	20	17	14	15	19	22	21	21	21	21	19	19	17	19	25	26	

Node	Simulated Ramp Volumes	Demand Ramp Volumes
6162	Entry From Valley View	847 vph / 856 vph
6158	Entry From WB US 212	98 vph / 98 vph
6156	Exit To WB US 212	1516 vph / 1615 vph
6154	Entry From EB US 212	661 vph / 665 vph
6152	Exit To EB US 212	21 vph / 32 vph
6146	Exit To Prairie Center	1376 vph / 1385 vph
6142	Entry From SB US 169	78 vph / 81 vph
6138	Exit To SB US 169	762 vph / 861 vph
6136	Entry From NB US 169	522 vph / 525 vph
6132	Exit To NB US 169	815 vph / 836 vph

Node	Simulated Volumes	Demand Volumes
6172	4183	4355
6170	4189	4355
6168	4190	4355
6166	4193	4355
6164	4192	4355
6162	3346	3499
6160	3348	3499
6158	3250	3401
6156	4766	5016
6154	4105	4351
6152	4126	4383
6150	4131	4383
6148	4127	4383
6146	5503	5768
6144	5506	5768
6142	5428	5687
6138	6189	6548
6136	5667	6023
6132	6482	6859
6130	6487	6859

Node	Demand Volumes	Simulated Volumes
5110	3404	3402
5112	3404	3393
5114	3404	3393
5116	3404	3391
5118	3404	3386
5120	2898	2886
5122	2206	2193
5124	2366	2354
5126	2250	2237
5128	3188	3178
5130	3618	3607
5132	3618	3600
5134	3618	3593
5136	4293	4264
5138	4293	4262
5140	3386	3353
5144	3684	3652
5148	4258	4228
5150	4258	4229
5152	4258	4235

Node	Demand Ramp Volumes	Simulated Ramp Volumes
5120	Exit To Valley View Rd	506 vph / 500 vph
5122	Exit To WB US 212	692 vph / 692 vph
5124	Entry From WB US 212	160 vph / 161 vph
5126	Exit To EB US 212	116 vph / 117 vph
5128	Entry From EB US 212	938 vph / 941 vph
5130	Entry From Flying Cloud	430 vph / 428 vph
5136	Entry From Prairie Center	675 vph / 671 vph
5140	Exit To US 169	907 vph / 909 vph
5144	Entry From SB US 169	298 vph / 299 vph
5148	Entry From NB US 169	574 vph / 576 vph

Node	5110	5112	5114	5116	5118	5120	5122	5124	5126	5128	5130	5132	5134	5136	5138	5140	5144	5148	5150	5152	5154
Distance (ft)	1802	1190	1530	1685	1495	1584	1110	710	1046	1503	775	1295	1469	943	958	1338	1014	1347	1285	1485	
Speed (mph)	67	67	67	66	65	65	67	67	67	66	66	66	66	64	64	66	65	61	62	61	
Level of Service	B	B	B	B	B	B	B	A	B	B	B	B	B	B	B	B	B	B	B	B	
Density (veh/ln/mi)	17	17	17	17	16	14	11	8	10	12	11	13	13	14	17	17	14	16	17	17	

EASTBOUND I-494

LEGEND

511 Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	75
Density above	55
Density above	43

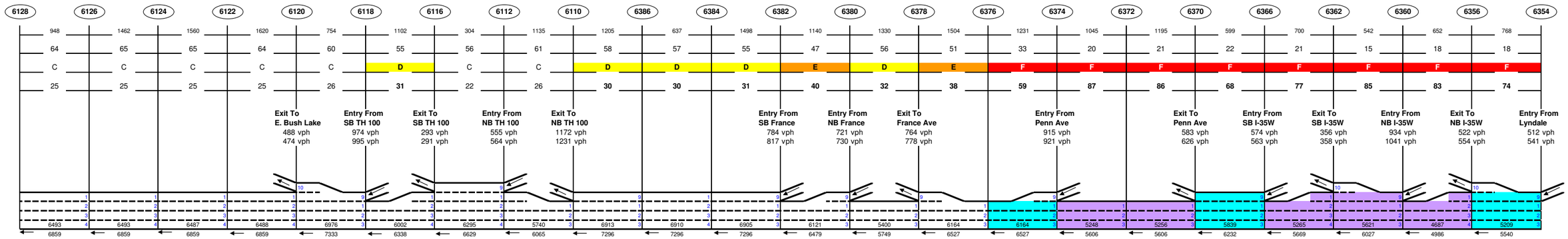
SEH

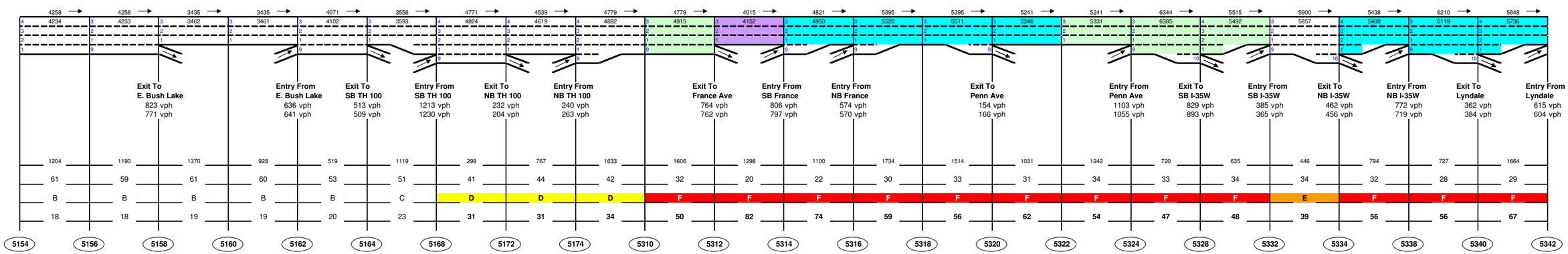
I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 8a
PM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 4:30 - 5:30

WESTBOUND I-494





EASTBOUND I-494

LEGEND

(511) Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	0
Density above	6488
Density above	4

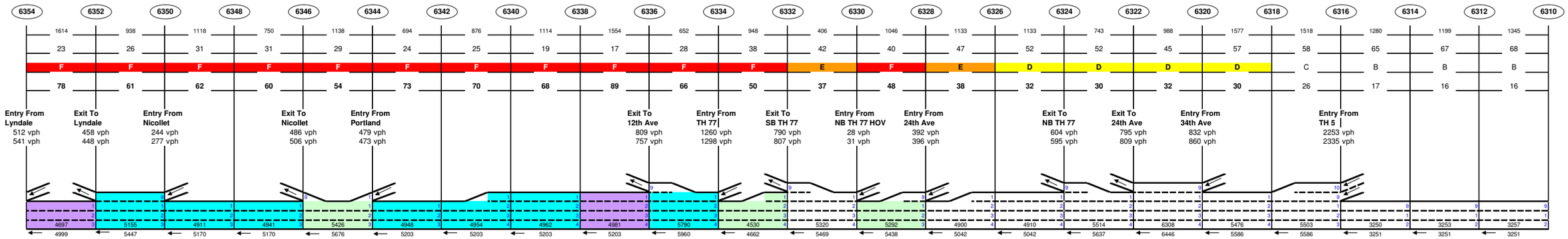
SEH

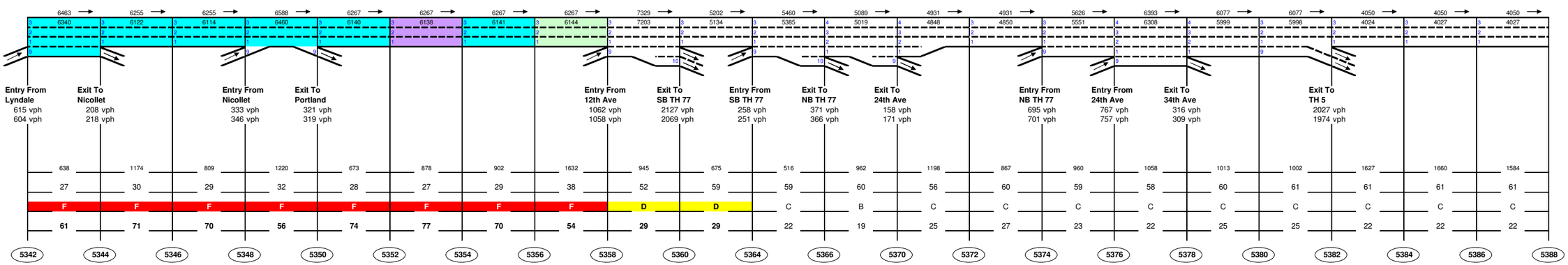
I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 8b
PM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 4:30 - 5:30

WESTBOUND I-494





EASTBOUND I-494

LEGEND

(511) Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	0
Density above	0
Density above	2

SEH

I-35W/I-494 CORSIM Model Project
I-494 between US 212 and Minnesota River
Existing Conditions

Figure 8c
PM Peak Hour MOE's
I-494 Lane Schematic
Existing Conditions

Peak Hour 4:30 - 5:30

SOUTHBOUND I-35W

Node	3564	3562	3560	3558	3556	3554	3552	3550	3548	3544	3542	3540	3536	3534	3532	3530	3528	3526	3524	3522
Distance (ft)	974	793	1147	1199	939	1283	746	756	760	712	427	727	1476	1245	1264	713	1300	1176	918	
Speed (mph)	66	66	65	64	63	62	64	63	58	56	54	57	55	53	54	55	52	57	57	
Level of Service	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	B	B	
Density (veh/ln/mi)	14	14	14	15	16	15	15	16	14	14	13	14	18	21	21	21	20	18	19	
Simulated Ramp Volumes				Exit To 90th St 382 vph			Entry From 82nd St 145 vph		Exit To 82nd St 388 vph	Entry From EB I-494 1062 vph	Exit To EB I-494 501 vph	Entry From WB I-494 307 vph	Exit To WB I-494 823 vph	Exit To 76th St 372 vph				Entry From 66th St 373 vph		
Demand Ramp Volumes				397 vph			151 vph		384 vph	1091 vph	515 vph	321 vph	823 vph	391 vph				386 vph		
Simulated Volumes	2813	2815	2816	3198	3197	3195	3050	3053	3440	2379	2880	2573	3396	3769	3773	3778	3783	3411	3418	
Demand Volumes	2866	2866	2866	3263	3263	3263	3112	3112	3496	2405	2920	2599	3422	3813	3813	3813	3813	3427	3427	

HOV LANE (6-9 AM, 3-6 PM)

Node	1520	1522	1524	1526	1528	1530	1534	1536	1538	1542	1544	1546	1550	1552	1554	1556	1558	1560	1562	1564
Demand Volumes	4660	4660	4660	4911	4911	4911	4257	4257	4508	4024	4418	3250	3435	3669	3669	3669	3669	3326	3326	
Simulated Volumes	4661	4666	4669	4916	4908	4888	4227	4216	4452	3971	4352	3216	3395	3623	3630	3634	3634	3301	3303	
Demand Ramp Volumes				Entry From 90th St 251 vph			Exit To 82nd St 654 vph		Entry From 82nd St 251 vph	Exit To EB I-494 484 vph	Entry From EB I-494 394 vph	Exit To WB I-494 1168 vph	Entry From WB I-494 185 vph	Entry From 76th St 234 vph				Exit To 66th St 343 vph		
Simulated Ramp Volumes				248 vph			661 vph		236 vph	481 vph	381 vph	1136 vph	179 vph	228 vph				333 vph		
Distance (ft)	740	1111	914	1431	910	1430	599	892	547	814	449	1032	889	1378	1406	704	1301	1220	860	
Speed (mph)	58	64	62	56	56	55	52	45	37	33	24	47	61	64	65	64	63	64	64	
Level of Service	C	C	C	C	D	D	E	E	E	F	F	D	B	B	B	B	B	C	C	
Density (veh/ln/mi)	27	24	25	27	31	32	36	41	42	55	56	31	19	18	19	19	19	26	26	

NORTHBOUND I-35W

LEGEND

511 Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

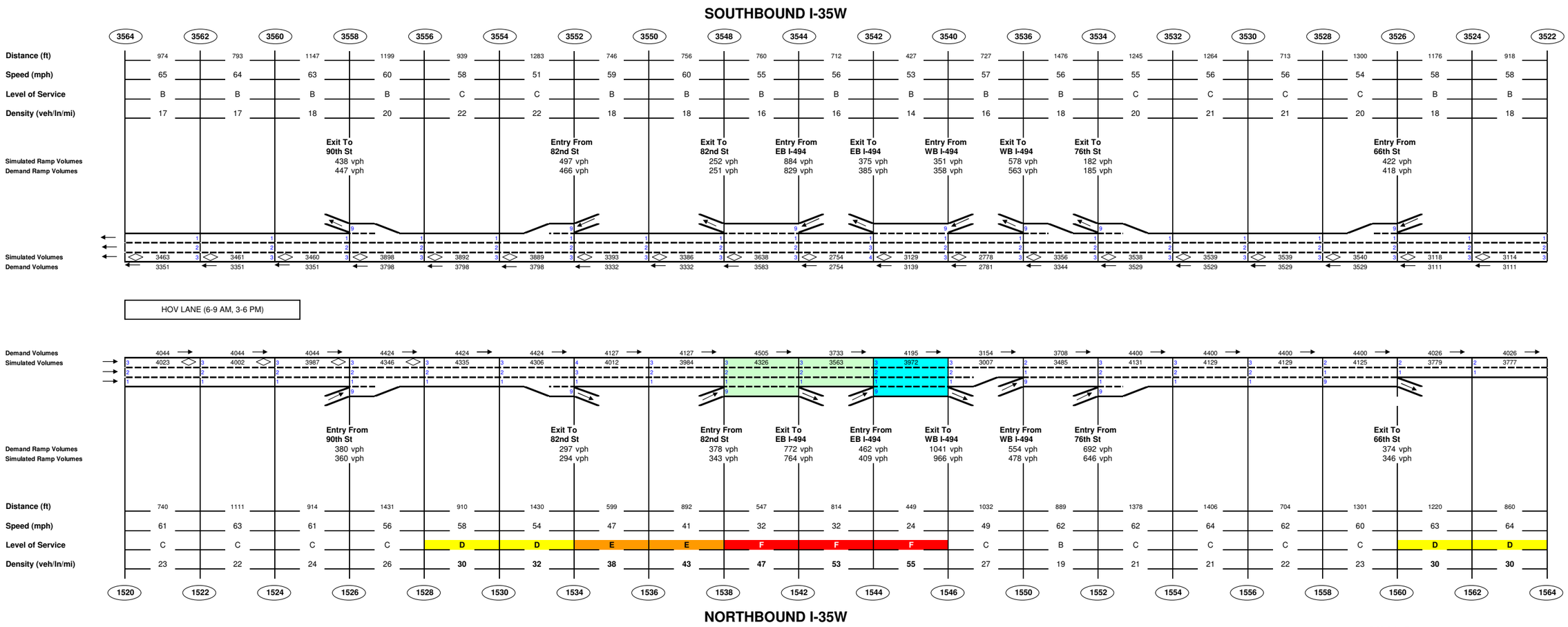
Density above	75
Density above	55
Density above	43

SEH

I-35W/I-494 CORSIM Model Project
I-35W between 90th and 66th Street
Existing Conditions

Figure 9
AM Peak Hour MOE's
I-35W Lane Schematic
Existing Conditions

Peak Hour 7:00 - 8:00



LEGEND

511 Node Number

All Ramp Volumes are Demand Volumes

Level of Service		Density
LOS	F	43 and above
LOS	E	35 to 43
LOS	D	28 to 35
LOS	C	20 to 28
LOS	B	10 to 20
LOS	A	0 to 10

Freeway Geometric Coloring

Degrees of LOS F

Density above	75
Density above	55
Density above	43

SEH

I-35W/I-494 CORSIM Model Project
I-35W between 90th and 66th Street
Existing Conditions

Figure 10
PM Peak Hour MOE's
I-35W Lane Schematic
Existing Conditions

Peak Hour 4:30 - 5:30

SEH **MEMORANDUM**

TO: Scott Pedersen, Mn/DOT,
Jennifer Read, Mn/DOT

FROM: Graham Johnson, PE
Jeff Rhoda, PE

DATE: February 11, 2010

RE: I-494 I-35W Interchange Deficiencies
SEH No. 107371

This memorandum summarizes the deficiencies around the I-494/I-35W system to system interchange. CORSIM freeway models have been developed for the I-494/35W Interchange Preliminary Design Study including the existing calibrated CORSIM model (approved) and the 2020 No Build CORSIM model (approved). Both of these models along with the 2007 Existing Conditions Memorandum were used to help determine the interchange area deficiencies. In general traffic levels increased throughout the study area in 2020 and exacerbated the existing corridor issues.

Overview

The 2007 Existing Conditions Memorandum focused on safety problem areas and geometric deficiencies along the two corridors. The freeway analysis focused on the 2007 and 2020 No Build operations for the entire corridor. Information from both sources are summarized in the attached Figures 1 though 6. A more detailed description of the information can be found after the overview.

Figure 1 shows the 2006 and forecast 2020 ADT volumes for the I-494 corridor. Figure 2 includes the peak hour volumes for both the 2007 and 2020 forecasts demands in the interchange area used in the CORSIM analysis.

A crash summary from 2005 to 2007 was conducted for the Existing Conditions Memo for this project and was used to aid in prioritizing the deficiencies. Figure 3 shows the existing crash summary for the approaching legs to the interchange; it highlights areas that are above the metro average crash rates for an urban freeway section.

Existing operations are highlighted in Figure 4. Congestion is abundant through most of the study area in both the AM and PM peak periods. Capacity constraints and high weaving demands create most of the problems. In 2020 the problems area intensified by the increase in vehicle demands.

Figure 5 includes the 2020 forecast volumes for the short weaving segments along I-494 and I-35W. There are seven weaving segments in the study area that are well below the minimum ramp spacing for entrance and exit ramps and one at the minimum spacing.

2020 freeway operations are highlighted in Figure 6. Congestion is abundant through most of the study area in both the AM and PM peak periods. Many problems from the existing conditions analysis are intensified and bottlenecks become worse extending congestion upstream away from the study area.

The deficiencies were looked at from an operations and safety perspective using all of the information described above. The existing conditions as well as the 2020 No Build conditions were used to determine the deficiencies. A summary of the deficiencies determined from the analysis are listed below and highlighted in Figure 7:

Main Priority Projects:

1. Northbound I-35W loop ramp to westbound I-494. The demand volume is high and there are sub-standard weaving area for both the exit from I-35W and the entrance to I-494. Improving this deficiency would improve both westbound I-494 and northbound I-35W traffic operations.
2. Eastbound I-494 weave segment between the Penn entrance ramp and southbound I-35W exit ramp. High weaving volumes over short weave distance.

Secondary Priority Projects:

3. Westbound I-494 weave segment between the TH 77 entrance ramp and 12th Avenue exit ramp. Very high weaving volumes over short weave distance. (Planned fix to create Full interchange at Portland and remove Nicollet and 12th Avenue ramps)
4. Eastbound I-494 weave segment between the 12th Avenue entrance ramp and southbound TH 77 exit ramp. Very high weaving volumes over short weave distance. (Planned fix to create Full interchange at Portland and remove Nicollet and 12th Avenue ramps)
5. Eastbound I-494 between southbound France Avenue loop entrance to the southbound I-35W exit ramp. The I-494 Congestion Management Plan includes a full auxiliary lane between TH 100 and the southbound I-35W exit ramp. This improvement would relieve congestion for future traffic demands in this area.
6. Westbound I-494 between northbound I-35W entrance loop and France Avenue exit ramp. The westbound I-494 Congestion Management Plan includes a full auxiliary lane between the northbound I-35W entrance loop and the northbound TH 100 exit ramp. This improvement could be combined with #3 to improve safety and operations further.

Other Deficiencies:

7. Non-priority short weave sections:
    a. EB I-494 between SB I-35W and NB I-35W loop ramps
    b. EB I-494 between NB I-35W and Lyndale exit ramp
    c. WB I-494 between Lyndale entrance ramp and NB I-35W
    d. WB I-494 between SB I-35W and Penn exit ramp (could be addressed in #1)
    e. NB I-35W between 82nd entrance ramp and EB I-494 (could be addressed in #1)
    f. SB I-35W between WB I-494 and EB I-494 loop ramps
    g. SB I-35W between EB I-494 and 82nd exit ramp (could be addressed in #2)

Eastbound I-494

Eastbound I-494 Existing and 2020 No Build

Congestion for eastbound I-494 occurs during both existing AM and PM peak periods. The cause for the congestion is different during each peak period. During the AM peak period much of the congestion is caused from the capacity constraint section between France Avenue and Penn Avenue interchanges. The congestion spills back through the TH 100 interchange and is worsened by the heavy weaving demands at that interchange. During the PM peak period, the volumes through the France/Penn Avenue areas are much lower than the AM peak and the congestion is caused from the multiple short weaving areas between the I-35W and TH 77.

Under 2020 forecast demands, the PM peak period traffic has a bottleneck near France Avenue that is similar to the existing AM peak period. This bottleneck does not allow the full traffic demand through the area and into the study interchange of I-494/I-35W, notably the PM peak hour is short over 1100 vehicles per hour (vph) through the study interchange.

Eastbound I-494 Congestion Management Plan

The 2007 Congestion Management Plan had an improvement for eastbound I-494 between France Avenue and I-35W that included a full auxiliary lane between the southbound France Avenue entrance loop and the southbound I-35W exit ramp. This improvement is not planned but it was tested to determine the benefit of the improvement to I-494.

During the AM peak period, the congestion management plan improvement enhances system operations. The bottleneck at the France Avenue interchange is relieved and traffic is able to pass through the area at speeds above 40 mph. Even with the improvement, spot congestion is present around the TH 100 cloverleaf interchange and speeds are about 25 mph. Travel speeds between Penn Avenue and Lyndale Avenue are less than posted which can be attributed to the short weave areas and volume demand nearing capacity.

During the PM peak period, the congestion management plan improves corridor traffic flow but congestion is still present between US 169 and TH 77. The congestion management plan allows for more traffic demands to be served through the France Avenue bottleneck but congestion is still present during the PM peak period. The mainline volumes during the PM peak period between Lyndale Avenue and TH 77 are near the capacity of a three-lane freeway. Another bottleneck occurs at the short weave area between the 12th Avenue entrance ramp and the southbound TH 77 exit ramp. Over the 950 foot weaving section, the 1290 vehicles that enter from 12th Avenue have to weave with the 2400 vehicles trying to exit to southbound TH 77. Due to the high number of exiting cars at this ramp, many vehicles stack in the right most lanes far upstream of the exit ramp which reduces the mainline capacity.

Speeds around the I-35W interchange are above 20 mph during for the PM peak period. There is a reduction in speeds between the Penn Avenue exit ramp and the southbound I-35W exit ramp. This is related to vehicles stacking in the right most lanes and creating a difficult weave between the Penn Avenue entrance ramp and the southbound I-35W exit ramp. It is important to note that the Penn Avenue entrance 2020 forecast volume is less than the existing demands (1100 vph existing, 450 vph 2020 forecasts). If the volume does not decrease as planned, the weaving volumes between the two ramps will increase dramatically resulting in worse system operations near the I-35W/I-494 interchange.

Eastbound I-494 Mitigation
Even with the 2007 Congestion Management Plan substantial congestion problems occur along I-494. A 4th freeway lane was added from I-35W to TH 77 to test the full traffic demand impacts to the I-494/35W interchange. This additional lane allows most of the traffic demand to flow through the system which reveals a major deficiency at the I-494/35W interchange.

In the AM peak hour the 4th lane does not noticeably change the traffic operations due to the bottleneck at TH 100. However in the PM peak hour the additional lane improves most of the capacity constraints downstream and allows the majority of the traffic through the interchange. The increased throughput shows a significant congestion between the Penn Avenue entrance ramp and the southbound I-35W exit ramp. If the volume does not decrease as planned, the weaving volumes between the two ramps will increase dramatically resulting in worse system operations near the I-494/35W interchange.

Eastbound I-494 Crashes
The crashes data suggests the area around the Penn Avenue Bridge has the highest crash rate. This can be attributed to the congestion caused by the high weaving volumes in this area and the tendency for traffic to stack in the right lanes prior to their exit ramps. Removing some of the short weave areas will help relieve congestion and possibly reduce the number of congestion related crashes that occur in this area.

Eastbound I-494 Deficiencies:
- Capacity constraint at the France Avenue interchange. The congestion management plan improves vehicle throughput and improves system operations.
- Short weaving area between Penn Avenue entrance and southbound I-35W exit (720'), I-35W loop ramps (450'), northbound I-35W entrance and Lyndale Avenue exit (730').
- High weaving volumes between 12th Avenue entrance ramp (1290 vph) and the southbound TH 77 exit ramp (2400 vph) over a short distance (950') with improper lane balance.
- No auxiliary lane between Nicollet Avenue entrance ramp and Portland Avenue exit ramp.

Westbound I-494

Westbound I-494 Existing and 2020 No Build
Congestion for westbound I-494 occurs during both existing AM and PM peak periods. The main bottleneck and cause for the congestion is similar during both the AM and PM peak period. The freeway section between the Penn Avenue entrance ramp and the France Avenue exit ramp is over capacity causing congestion upstream. This congestion creates a difficult weaving situation between nearby interchanges. At I-35W between the loop ramps, the heavy entering demand from northbound I-35W must enter an already congested freeway system and merge out of the short auxiliary lane. The congestion spills back from Penn Avenue upstream of TH 77 even through the volumes between Lyndale Avenue and TH 77 are well below the capacity of the basic freeway section.

Under 2020 demands, the volumes east of I-35W increase at a much greater rate than the volumes west of I-35W (see Figures 1 and 2). This shifts the current bottleneck from the Penn Avenue interchange east to near the Portland/12th Avenue interchanges. The 3-lane section between the Portland Avenue entrance ramp and the Nicollet Avenue exit ramp has 6850 vph in the AM peak and 7200 vph in the PM peak. This volume demand is above the 3-lane capacity and congestion is magnified due to the short distance (1140') between these two ramps with no auxiliary lane. In both peak periods this bottleneck does not allow the full demand to the I-494/35W interchange. The AM peak is short over 900 vph and the PM peak is short over 1100 vph.

In the 2020 forecast AM peak hour, congestion occurs near the I-35W interchange even when not all of the traffic demand is being served. The northbound I-35W entrance ramp creates spot congestion at the I-35W interchange with speeds below 30 mph. The entrance demand of 1340 vph has to weave against the southbound I-35W exit of 630 vph and then merge into the through lanes on I-494. In the PM peak hour without the full throughput there is very little operational problems at the I-494/35W interchange. Some spot congestion does occur between Penn Avenue and France Avenue.

Westbound I-494 Congestion Management Plan

The 2007 Congestion Management Plan has an improvement for westbound I-494 between I-35W and France Avenue that includes a full auxiliary lane between the northbound I-35W entrance loop and the France Avenue exit ramp. This improvement is not planned but it was tested to determine the benefit of the improvement to I-494.

During the PM peak period, the congestion management plan improves corridor traffic flow. The bottleneck is relieved at the I-35W interchange and traffic travels through the area at speeds above 55 mph. With the congestion management plan the heavy northbound I-35W loop entrance does not have to merge into traffic but instead vehicles now have a separate auxiliary lane. This new auxiliary lane increases the number of lanes an exiting vehicle now must cross to exit (SB I-35W or Penn Avenue) but the improvement does help the system operationally and it might even help to increase system safety. The congestion management plan also improves the spot congestion around between Penn Avenue and France Avenue.

Westbound I-494 Mitigation

Even with the 2007 Congestion Management Plan substantial congestion problems occur along westbound I-494 upstream of the I-494/35W interchange. A 4th freeway lane was added from I-35W to TH 77 to test the full traffic demand impacts to the I-494/35W interchange. This additional lane allows most of the traffic demand to flow through the system which reveals a major deficiency at the I-494/35W interchange.

In the AM peak hour the 4th lane allows the majority of the traffic demand to reach the study area. With the increased demand, the weaving between the I-35W loop ramps creates congestion that spills upstream. The short weave between the Lyndale Avenue entrance ramp and the northbound I-35W exit ramp increases the problem and extend the congestion beyond Nicollet Avenue.

In the PM peak hour the 4th lane allows a majority of the demand volume to reach the study area. At the I-35W interchange no significant congestion or operational bottlenecks are present. Capacity constraints with speeds around 30 mph are present downstream of the I-35W interchange between France Avenue and Penn Avenue interchange.

Westbound I-494 Crashes

The crash data suggests the area between the I-35W loop ramps at the I-35W interchange has the highest crash rate. The congestion related crashes can be attributed to the heavy northbound I-35W loop ramp entrance volume merging into an already congested freeway section over a short merge distance. The entire section of westbound I-494 between the I-35W interchange and the 4th lane drop between 12th Avenue and Portland Avenue also has a high crash rate. This can be attributed to the congestion spill back from the high weaving volumes around the I-35W interchange and the merging from the 4th lane drop. Removing some of the short weave areas between Lyndale Avenue, I-35W and Penn Avenue will help relieve congestion and possibly reduce the number of congestion related crashes that occur in this area.

Westbound I-494 Deficiencies:

- Heavy entering loop ramp from northbound I-35W into a short weaving section.
- Capacity constraints upstream of study interchange between Nicollet Avenue and TH 77.
- No auxiliary lane between Portland Avenue entrance ramp and Nicollet Avenue exit ramp
- Short weaving area between Lyndale Avenue entrance ramp and northbound I-35W exit ramp (770'), I-35W loop ramps (540'), southbound I-35W entrance ramp and Penn Avenue exit ramp (600')
- Capacity constraints at the Penn Avenue interchange; the congestion management plan would likely improve operations through this area.

Northbound I-35W

Northbound I-35W Existing and No Build

Under existing traffic levels, this section of I-35W operates under capacity but at the exit loop ramp to westbound I-35W can spill back onto the mainline causing congestion and safety problems. In 2009, a short collector-distributor (CD) road was being constructed to allow the weaving between the two loop ramps to occur off of the mainline and help to minimize the impacts to mainline I-35W. This project was not constructed completely in 2009 but it was included in the 2020 No Build analysis.

Northbound I-35W operates very well under the 2020 forecast conditions with the inclusion of the CD roadway between the loop ramps. The right most lanes do have minor congestion problems from the continued spillback from westbound I-494. Due to the relatively low volumes on this portion of I-35W, the short weaving area between 82nd Street and the I-494 ramps does not have a substantial impact on traffic operations but it does contribute to safety issues.

Northbound I-35W Congestion Management Plan

The 2007 Congestion Management Plan had an improvement for westbound I-494 between I-35W and France Avenue that includes a full auxiliary lane between the northbound I-35W entrance loop and the France Avenue exit ramp. This improvement is not planned but it was tested to determine the benefit of the improvement to I-35W.

This improvement allows the northbound I-35W to westbound I-494 movement to enter I-494 with a full auxiliary lane. This allows for better traffic flow through the loop ramp and eliminates the congestion problems caused from traffic spillback from the CD road.

Northbound I-35W Crashes

The crashes data suggests the section of roadway between the cloverleaf ramps at the I-494 interchange has a severely high crash rate. This can be attributed to weaving traffic between the loop ramps and vehicle stacking in the right most lanes for the westbound I-494 exit loop ramp. Removing some of the short weave areas will help relieve congestion and possibly reduce the number of congestion related crashes that occur in this area. Also with congestion management plan improvement along westbound I-494, the northbound I-35W exit loop ramp to westbound I-494 should not spill back onto I-35W.

Northbound I-35W Deficiencies:

- Short weaving area between 82nd Street entrance ramp and I-494 CD road exit (550')
- Westbound I-494 exit loop spills back through CD road and onto mainline I-35W

Southbound I-35W

Southbound I-35W Existing and No Build

This section of southbound I-35W within the study area operates under capacity during the existing AM and PM peak hour demands. Also I-35W operates under capacity using 2020 forecast AM peak hour demands. In the 2020 forecast PM peak hour congestion extends upstream from 66th Street past 90th Street. The demand volumes are close to the capacity of portions of the mainline, especially with only two general purpose lanes and one HOV/HOT lane. There is a weaving issue between the loop ramps at I-494, but the main weaving area is between the eastbound I-494 entrance ramp and the 82nd Street exit ramp. The eastbound entrance ramp has a demand that is above a typical half lane of traffic that must merge into the two general purpose lanes. The entrance volume from 82nd Street also carries about a half lane of traffic that must merge into an already near capacity freeway section.

Southbound I-35W Crashes

The crash data suggests there isn't a high crash area for this direction of I-35W. However, removing some of the short weave areas will help relieve spot congestion and possibly reduce the number of congestion related crashes that occur in this area.

Southbound I-35W Deficiencies:

- Short weaving areas between westbound I-494 entrance loop and eastbound I-494 exit loop (430'), eastbound I-494 entrance ramp and 82nd Street exit ramp (750')
- In the PM Peak hour heavy congestion between 90th Street and TH 62. Heavy weaving volumes between ramps and in/out of HOV lanes.
- Capacity between 82nd Street entrance and 90th Street exit ramps, a full auxiliary lane would be beneficial.

gtj
Figure 1 2006 and 2020 Forecast ADT Traffic Volumes
Figure 2 2007 and 2020 Forecast Traffic Volumes
Figure 3 2005-2007 Crash Summary
Figure 4 2020 Weaving Volumes and Ramp Spacing
Figure 5 Existing 2007 Congestion/Issues
Figure 6 2020 Congestion/Issues
Figure 7 Prioritized Deficiencies
Table 1 Eastbound I-494 Operations
Table 2 Westbound I-494 Operations
Table 3 I-35W Operations
Table 4 TH 77 Operations

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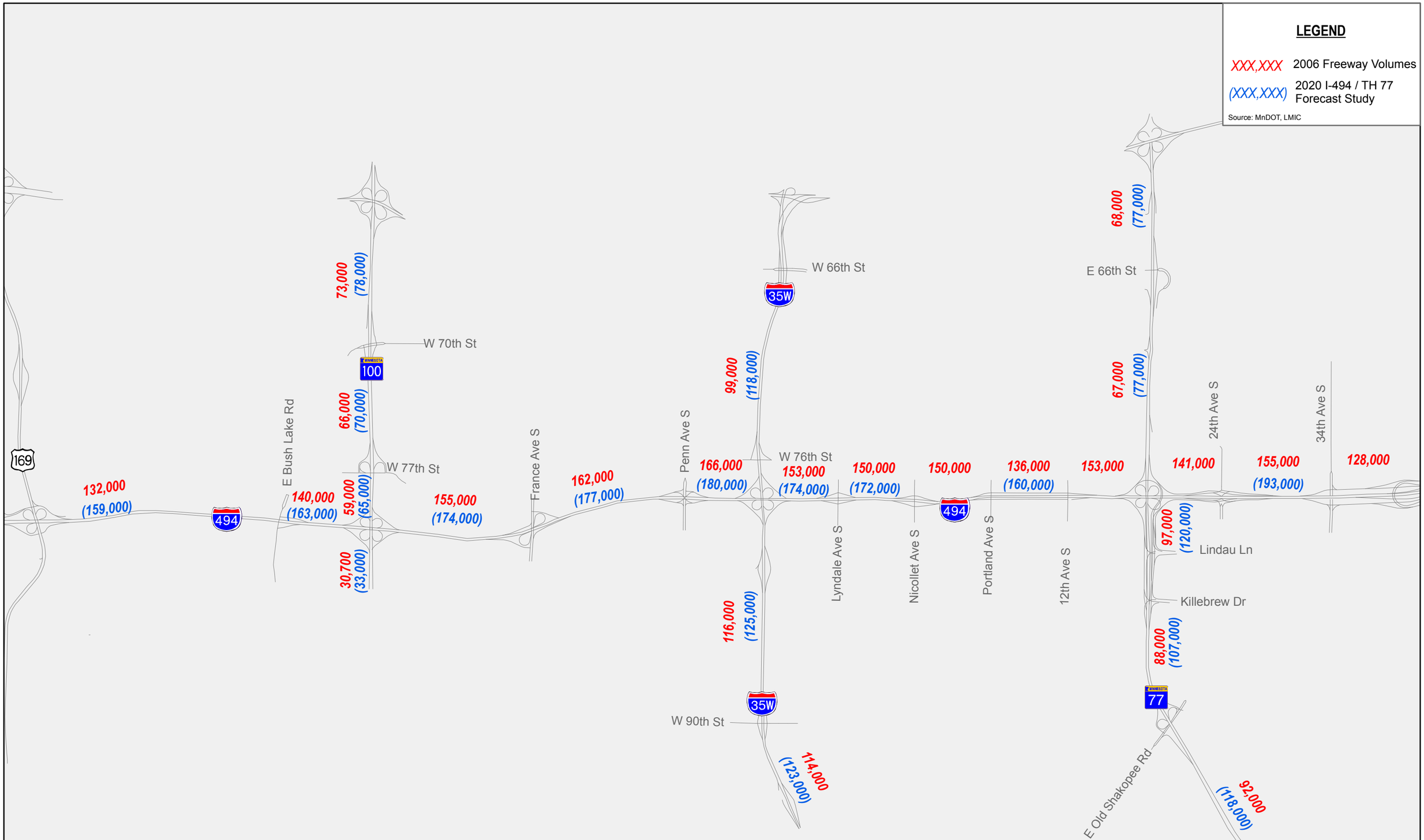

I-494 / 35W Preliminary Interchange Design

Figure 1: Average Daily Traffice Volumes

August 19, 2009

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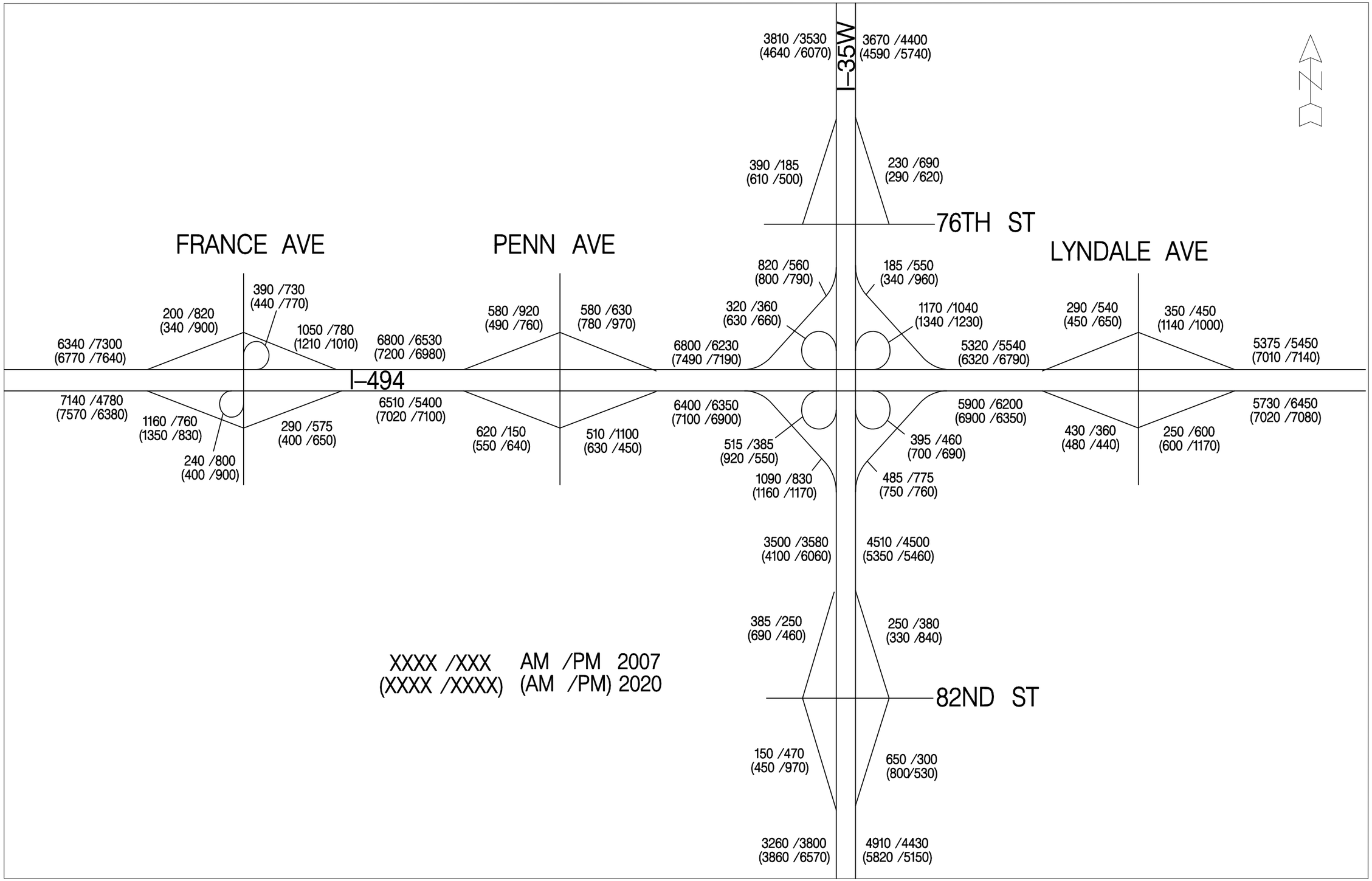

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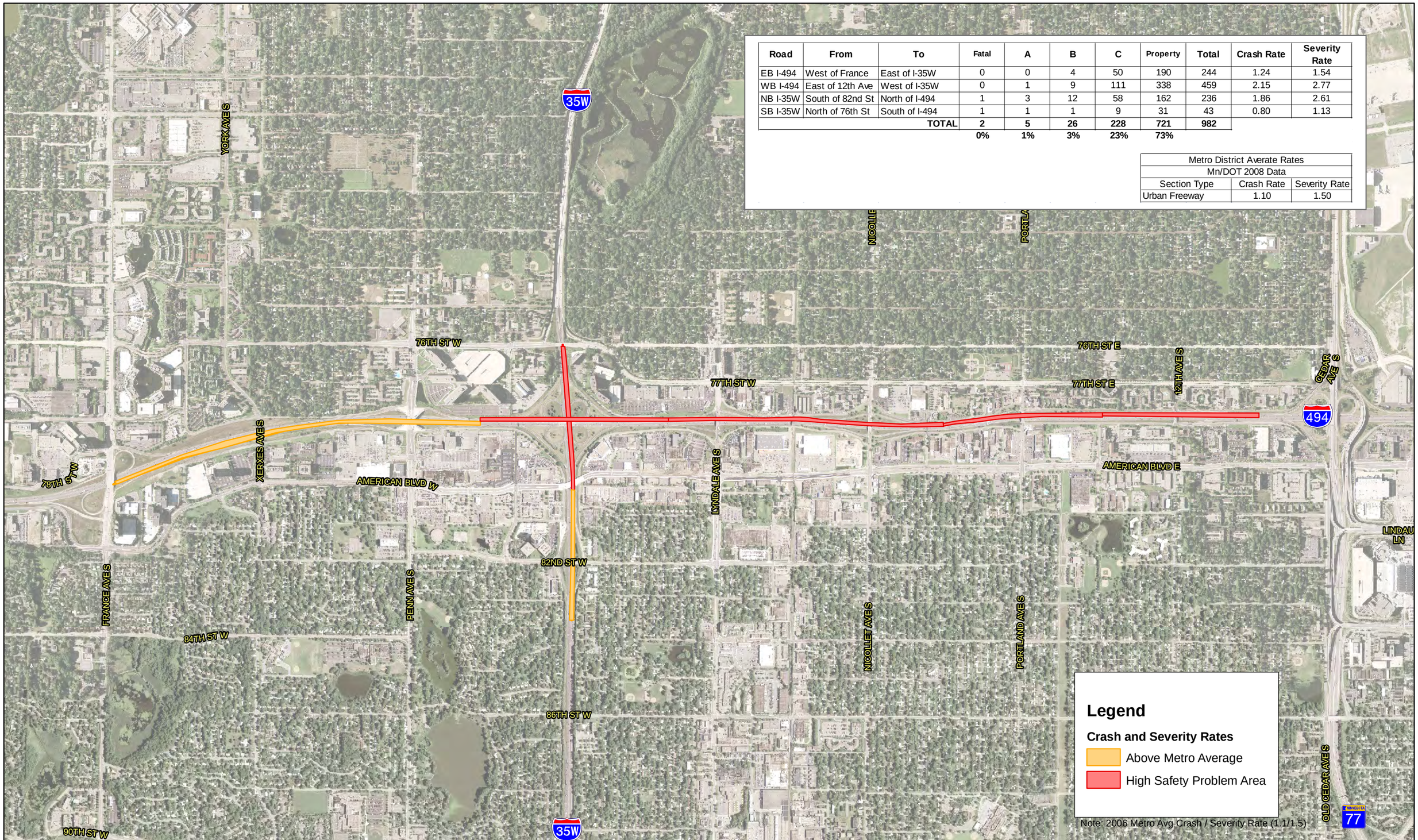
FIGURE 2
2007 AND 2020 FORECAST
TRAFFIC VOLUMES



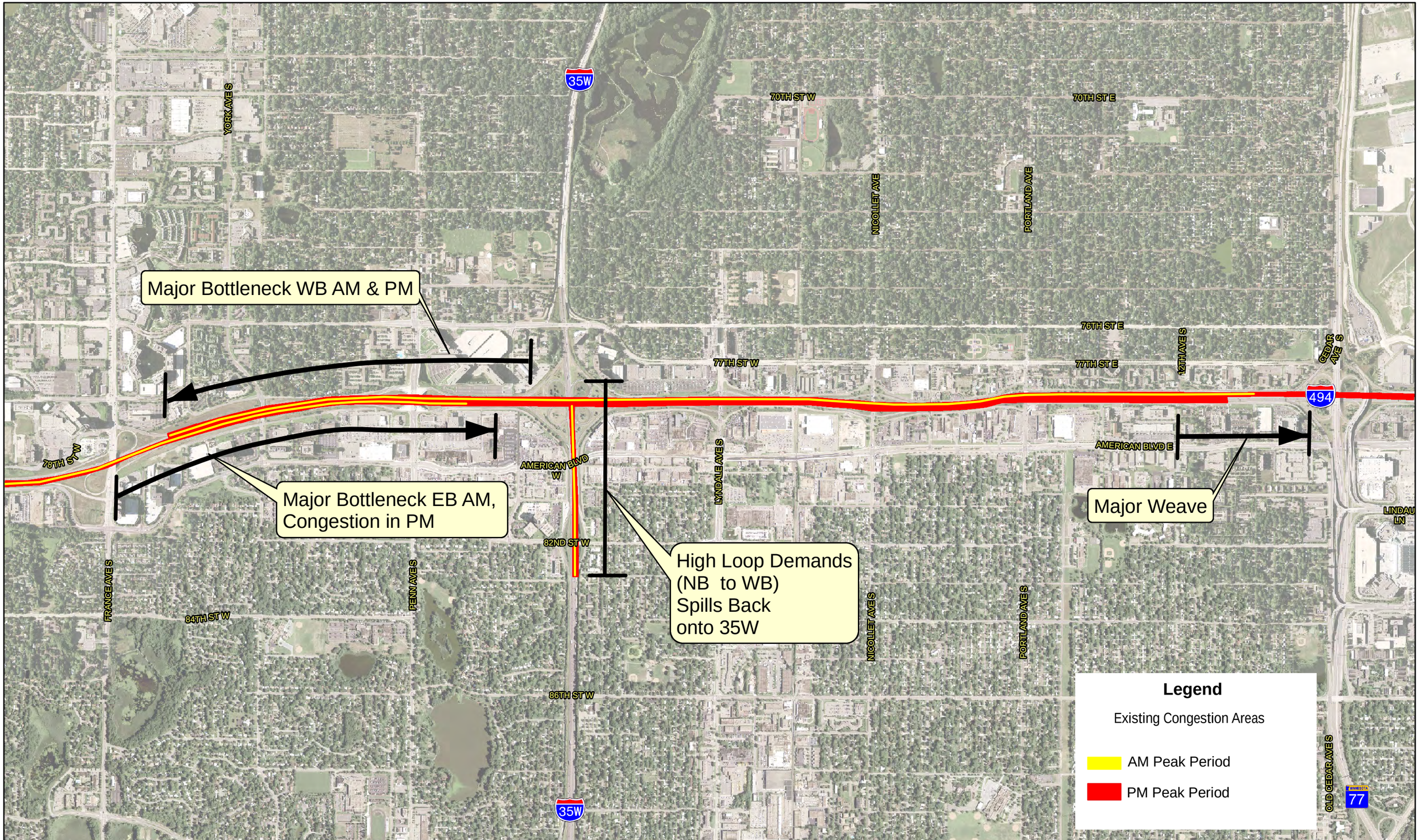
Road	From	To	Fatal	A	B	C	Property	Total	Crash Rate	Severity Rate
EB I-494	West of France	East of I-35W	0	0	4	50	190	244	1.24	1.54
WB I-494	East of 12th Ave	West of I-35W	0	1	9	111	338	459	2.15	2.77
NB I-35W	South of 82nd St	North of I-494	1	3	12	58	162	236	1.86	2.61
SB I-35W	North of 76th St	South of I-494	1	1	1	9	31	43	0.80	1.13
		TOTAL	**2**	**5**	**26**	**228**	**721**	**982**		
			0%	**1%**	**3%**	**23%**	**73%**			

Metro District Averate Rates		
Mn/DOT 2008 Data		
Section Type	Crash Rate	Severity Rate
Urban Freeway	1.10	1.50

I-494 / 35W Preliminary Interchange Design

Figure 3 : 2006 - 2008 Crash Summary - Approaching Legs

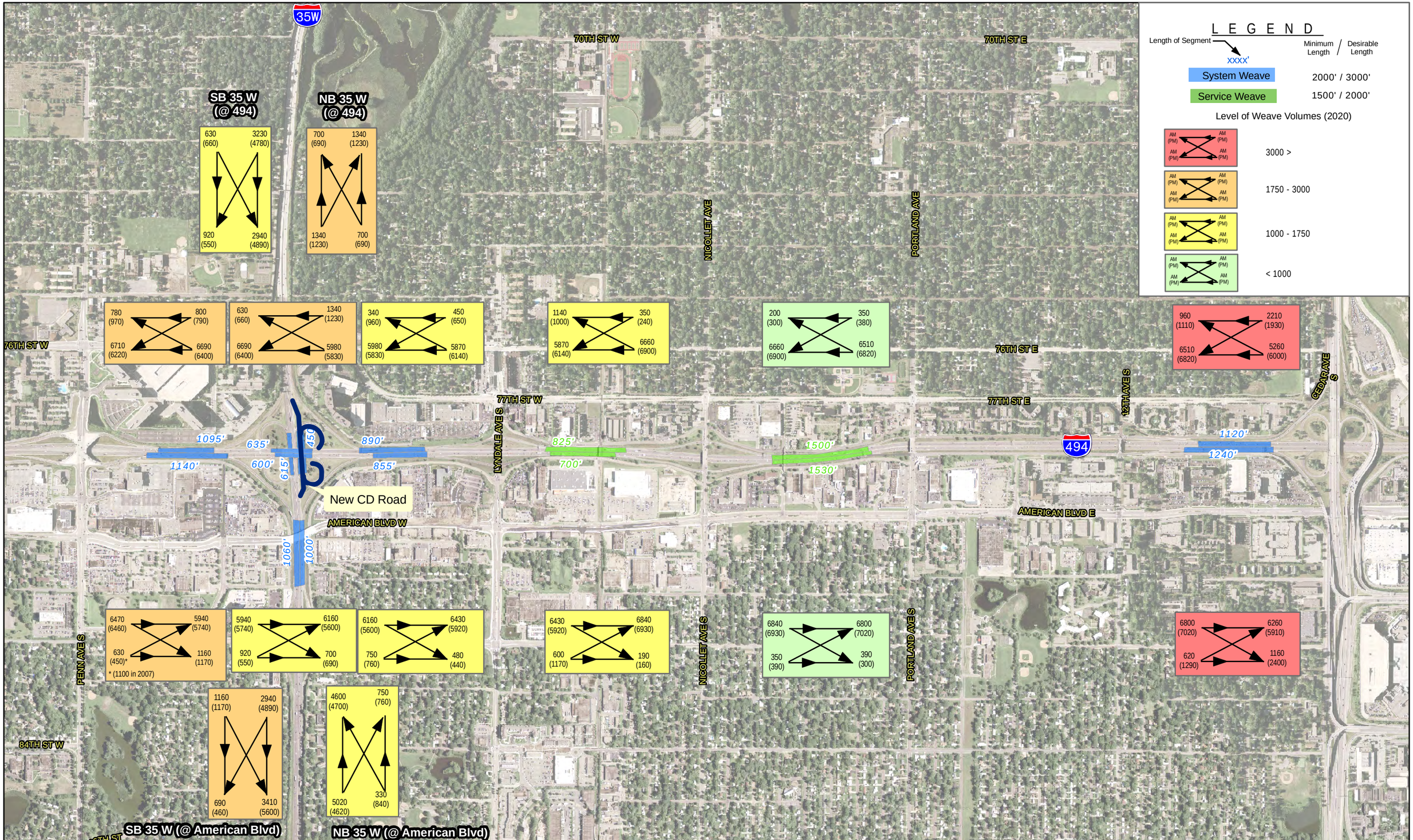
August 17, 2009



I-494 / 35W Preliminary Interchange Design

Figure 4: 2007 Existing Congestion / Issues

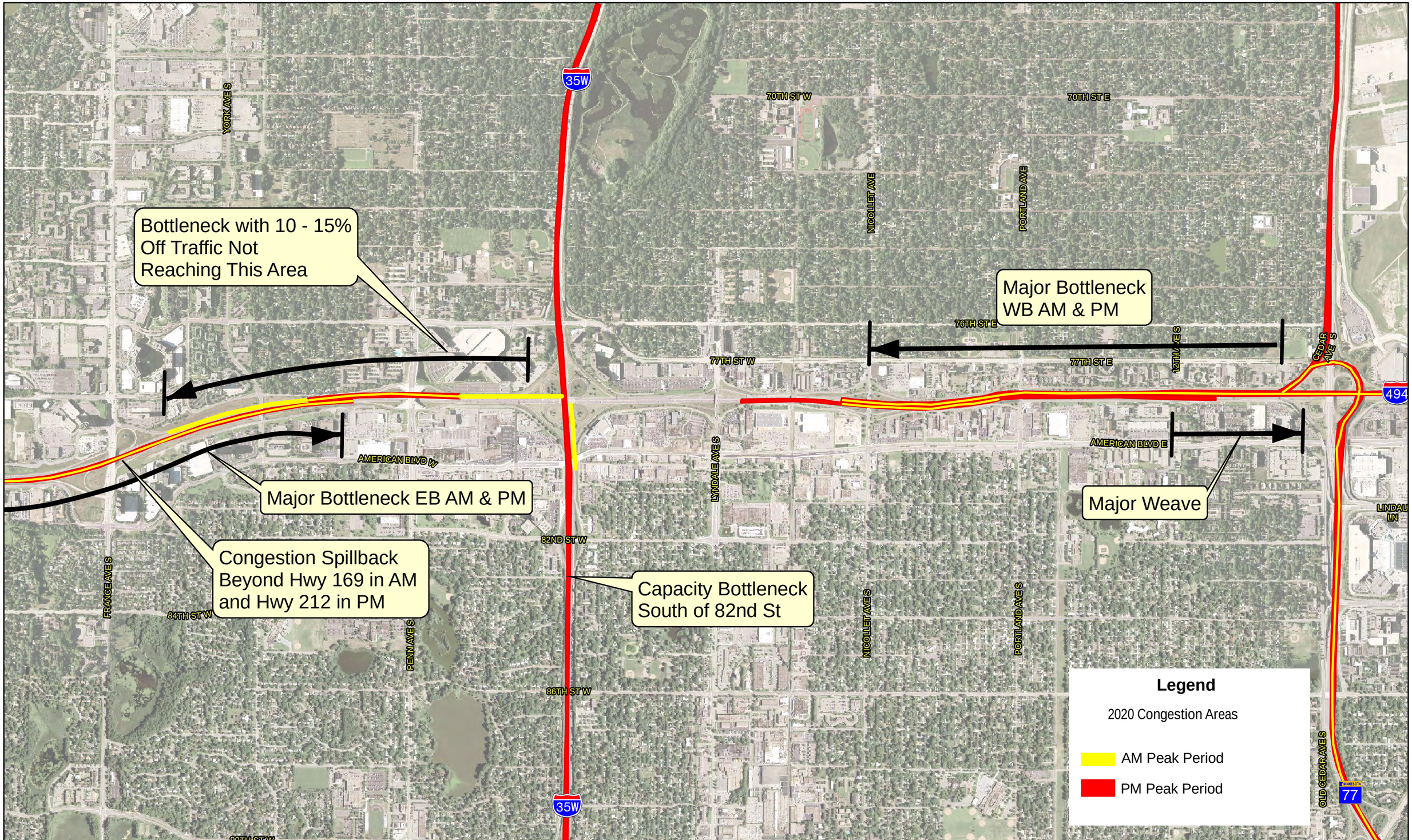
August 17, 2009



I-494 / 35W Preliminary Interchange Design

Figure 5: 2020 Weave Volumes and Ramp Spacing

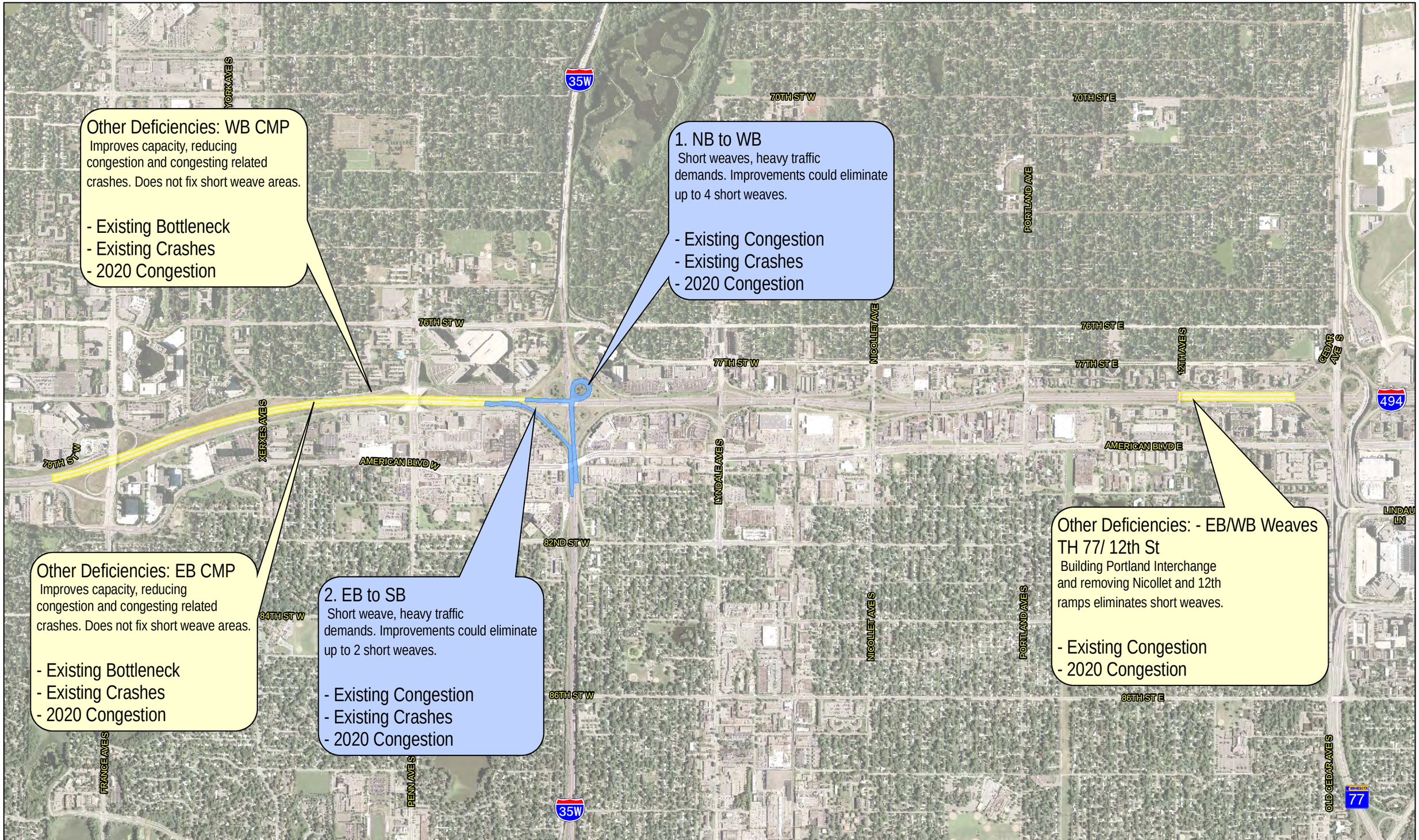
August 17, 2009



I-494 / 35W Preliminary Interchange Design

Figure 6: 2020 Congestion / Issues

August 17, 2009



I-494 / 35W Preliminary Interchange Design

Figure 7: Prioritized Deficiencies

August 17, 2009

TABLE 1
Eastbout I-494 Operations

		FROM:	Valley View Rd Exit	WB TH 212 Exit	WB TH 212 Entrance	EB TH 212 Exit	EB TH 212 Entrance	Flying Cloud Entrance	Prairie Center Entrance	TH 169 Exit	SB TH 169 Entrance	NB TH 169 Entrance	E. Bush Lake Exit	E. Bush Lake Entrance	SB TH 100 Exit	SB TH 100 Entrance	NB TH 100 Exit	NB TH 100 Entrance	France Exit	SB France Entrance	NB France Entrance	Penn Exit	Penn Entrance	SB I-35W Exit	SB I-35W Entrance	NB I-35W Exit	NB I-35W Entrance	Lyndale Exit	Lyndale Entrance	Nicollet Exit	Nicollet Entrance	Portlane Exit	12th Entrance	SB TH 77 Exit	SB TH 77 Entrance	NB TH 77 Exit	24th Exit	NB TH 77 Entrance	24th Entrance	34th Exit	TH 5 Exit	END MODEL
		TO:	BEGIN MODEL	Valley View Rd Exit	WB TH 212 Exit	WB TH 212 Entrance	EB TH 212 Exit	EB TH 212 Entrance	Flying Cloud Entrance	Prairie Center Entrance	TH 169 Exit	SB TH 169 Entrance	NB TH 169 Entrance	E. Bush Lake Exit	E. Bush Lake Entrance	SB TH 100 Exit	SB TH 100 Entrance	NB TH 100 Exit	NB TH 100 Entrance	France Exit	SB France Entrance	NB France Entrance	Penn Exit	Penn Entrance	SB I-35W Exit	SB I-35W Entrance	NB I-35W Exit	NB I-35W Entrance	Lyndale Exit	Lyndale Entrance	Nicollet Exit	Nicollet Entrance	Portlane Exit	12th Entrance	SB TH 77 Exit	SB TH 77 Entrance	NB TH 77 Exit	24th Exit	NB TH 77 Entrance	24th Entrance	34th Exit	TH 5 Exit	END MODEL
		Distance (ft)	7,702	1,584	1,110	710	1,046	1,503	3,539	1,901	1,338	1,014	6,511	2,298	519	1,119	299	767	3,239	1,298	1,100	3,248	2,273	720	635	446	794	625	1,964	603	1,819	1,220	4,085	945	675	516	962	2,065	960	1,058	2,015	4,871
AM PEAK HOUR	2020 No Build	Demand (vph)	4,620	3,860	2,941	3,032	2,862	5,002	5,702	6,372	5,512	6,192	7,093	5,953	6,642	6,282	7,822	7,252	7,572	6,221	6,621	7,020	6,470	7,101	5,941	6,861	6,160	6,910	6,430	7,031	6,841	7,192	6,802	7,422	6,261	7,021	6,570	5,891	7,041	8,071	6,170	3,710
		Simulated (vph)	4,574	3,794	2,890	2,978	2,818	4,865	5,421	5,884	4,998	5,554	6,260	5,181	5,843	5,518	6,997	6,459	6,768	5,576	5,939	6,314	5,822	6,432	5,378	6,242	5,577	6,324	5,858	6,457	6,233	6,546	6,187	6,779	5,763	6,424	6,005	5,386	6,099	7,125	5,383	3,268
		Difference	(46)	(66)	(51)	(54)	(44)	(137)	(281)	(488)	(514)	(638)	(833)	(772)	(799)	(764)	(825)	(793)	(804)	(645)	(682)	(706)	(648)	(669)	(563)	(619)	(583)	(586)	(572)	(574)	(608)	(646)	(615)	(643)	(498)	(597)	(565)	(505)	(942)	(946)	(787)	(442)
		Speed	62	64	67	66	67	55	48	37	34	23	23	28	26	31	26	34	40	35	37	46	53	53	52	46	47	47	48	45	48	47	57	54	56	56	60	61	61	58	63	67
		Density	23	18	14	10	12	22	34	46	65	88	69	63	55	52	53	45	40	52	48	41	36	27	28	26	33	28	36	34	41	36	34	24	32	26	22	26	24	24	20	16
		LOS	C	B	B	A	B	C	D	F	F	F	F	F	F	F	F	F	E	F	F	E	E	C	D	C	D	D	E	D	E	E	D	C	D	C	C	C	C	C	C	B
	2020 No Build Congestion Mgmt Plan	Demand (vph)	4,620	3,860	2,941	3,032	2,862	5,002	5,702	6,372	5,512	6,192	7,093	5,953	6,642	6,282	7,822	7,252	7,572	6,221	6,621	7,020	6,470	7,101	5,941	6,861	6,160	6,910	6,430	7,031	6,841	7,192	6,802	7,422	6,261	7,021	6,570	5,891	7,041	8,071	6,170	3,710
		Simulated (vph)	4,578	3,783	2,891	2,976	2,805	4,932	5,591	6,145	5,258	5,864	6,619	5,521	6,188	5,840	7,324	6,779	7,070	5,836	6,223	6,612	6,068	6,633	5,519	6,386	5,710	6,438	5,945	6,519	6,293	6,610	6,224	6,815	5,784	6,428	6,024	5,429	6,115	7,133	5,388	3,253
		Difference	(42)	(77)	(50)	(56)	(57)	(70)	(111)	(227)	(254)	(328)	(474)	(432)	(454)	(442)	(498)	(473)	(502)	(385)	(398)	(408)	(402)	(468)	(422)	(475)	(450)	(472)	(485)	(512)	(548)	(582)	(578)	(607)	(477)	(593)	(546)	(462)	(926)	(938)	(782)	(457)
		Speed	63	64	67	66	67	60	57	43	37	26	26	33	31	41	40	44	49	60	58	58	50	35	43	41	43	44	46	42	45	46	56	54	56	56	60	61	61	58	63	67
		Density	22	18	14	10	12	19	24	34	52	74	62	53	48	39	36	38	33	24	24	26	31	37	36	32	38	32	40	37	44	38	34	24	32	26	22	26	24	24	20	15
		LOS	C	B	B	A	B	B	C	D	F	F	F	F	F	E	E	E	D	C	C	C	D	E	E	D	E	D	E	E	F	E	D	C	D	C	C	C	C	C	C	B
	2020 No Build Mitigated	Demand (vph)	4,620	3,860	2,941	3,032	2,862	5,002	5,702	6,372	5,512	6,192	7,093	5,953	6,642	6,282	7,822	7,252	7,572	6,221	6,621	7,020	6,470	7,101	5,941	6,861	6,160	6,910	6,430	7,031	6,841	7,192	6,802	7,422	6,261	7,021	6,570	5,891	7,041	8,071	6,170	3,710
		Simulated (vph)	4,577	3,795	2,888	2,972	2,812	4,947	5,595	6,158	5,248	5,855	6,610	5,515	6,187	5,853	7,343	6,778	7,064	5,825	6,220	6,600	6,092	6,679	5,575	6,436	5,717	6,466	6,011	6,598	6,408	6,730	6,353	6,922	5,865	6,532	6,107	5,490	6,591	7,607	5,758	3,469
		Difference	(43)	(65)	(53)	(60)	(50)	(55)	(107)	(214)	(264)	(337)	(483)	(438)	(455)	(429)	(479)	(474)	(508)	(396)	(401)	(420)	(378)	(422)	(366)	(425)	(443)	(444)	(419)	(433)	(433)	(462)	(449)	(500)	(396)	(489)	(463)	(401)	(450)	(464)	(412)	(241)
		Speed	62	64	67	66	67	60	58	44	37	26	26	33	30	41	42	47	49	60	58	58	51	35	46	45	47	55	60	58	60	57	55	43	52	55	59	61	58	55	62	67
		Density	23	18	14	10	12	19	23	33	52	73	63	54	48	39	33	35	32	24	24	26	30	36	33	28	33	25	23	21	25	24	27	30	35	27	23	27	27	26	22	16
		LOS	C	B	B	A	B	B	C	D	F	F	F	F	F	E	D	D	D	C	C	C	D	E	D	C	D	C	C	C	C	C	C	D	E	C	C	C	C	C	C	B
PM PEAK HOUR	2020 No Build	Demand (vph)	4,869	4,239	3,249	3,599	3,449	4,620	5,150	5,849	4,839	5,179	5,899	5,229	5,898	5,338	6,538	6,108	6,378	5,548	6,447	7,097	6,456	6,905	5,735	6,285	5,595	6,355	5,915	7,085	6,924	7,315	7,015	8,305	5,905	6,345	5,845	5,415	6,303	7,563	6,474	3,494
		Simulated (vph)	4,225	3,466	2,640	2,854	2,724	2,765	2,897	3,619	3,007	3,313	3,823	3,574	4,256	3,871	4,897	4,573	4,847	4,228	5,126	5,755	5,205	5,643	4,595	5,090	4,545	5,302	4,918	6,071	5,924	6,287	5,986	7,278	5,152	5,481	5,051	4,655	5,253	6,499	5,536	3,015
		Difference	(644)	(773)	(609)	(745)	(725)	(1,855)	(2,253)	(2,230)	(1,832)	(1,866)	(2,076)	(1,655)	(1,642)	(1,467)	(1,641)	(1,535)	(1,531)	(1,320)	(1,321)	(1,342)	(1,251)	(1,262)	(1,140)	(1,195)	(1,050)	(1,053)	(997)	(1,014)	(1,000)	(1,028)	(1,029)	(1,027)	(753)	(864)	(794)	(760)	(1,050)	(1,064)	(938)	(479)
		Speed	35	25	13	6	6	4	6	8	6	5	9	11	11	11	11	16	15	14	20	40	55	55	56	54	55	55	50	37	50	47	40	49	57	58	61	60	60	56	59	62
		Density	67	74	109	128	141	148	124	119	150	150	113	111	98	99	94	73	76	103	78	47	32	23	24	19	24	22	32	41	40	38	51	30	30	22	19	24	22	23	23	15
		LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	D	C	C	B	C	C	D	E	E	E	F	D	D	C	B	C	C	C	C	B
	2020 No Build Congestion Mgmt Plan	Demand (vph)	4,869	4,239	3,249	3,599	3,449	4,620	5,150	5,849	4,839	5,179	5,899	5,229	5,898	5,338	6,538	6,108	6,378	5,548	6,447	7,097	6,456	6,905	5,735	6,285	5,595	6,355	5,915	7,085	6,924	7,315	7,015	8,305	5,905	6,345	5,845	5,415	6,303	7,563	6,474	3,494
		Simulated (vph)	4,843	4,186	3,232	3,580	3,440	4,606	5,116	5,761	4,730	5,045	5,732	5,143	5,806	5,246	6,297	5,882	6,132	5,292	5,677	6,221	5,549	5,913	4,799	5,300	4,687	5,430	4,981	6,098	5,952	6,350	6,060	7,366	5,210	5,522	5,084	4,703	5,289	6,549	5,572	2,990
		Difference	(26)	(53)	(17)	(19)	(9)	(14)	(34)	(88)	(109)	(134)	(167)	(86)	(92)	(92)	(241)	(226)	(246)	(256)	(770)	(876)	(907)	(992)	(936)	(985)	(908)	(925)	(934)	(987)	(972)	(965)	(955)	(939)	(695)	(823)	(761)	(712)	(1,014)	(1,014)	(902)	(504)
		Speed	63	63	66	65	65	65	62	50	42	23	19	28	26	28	18	21	23	12	14	20	18	21	24	20	22	20	19	22	28	30	32	49	57	58	60	60	60	56	59	62
		Density	25	21	16	12	16	18	21	32	52	82	78	65	60	58	80	78	69	111	103	85	90	61	65	67	79	69	88	71	73	59	65	31	30	23	19	24	22	23	23	15
		LOS	C	C	B	B	B	B	C	D	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	D	D	C	B	C	C	C	C	B
	2020 No Build Mitigated	Demand (vph)	4,869	4,239	3,249	3,599	3,449	4,620	5,150	5,849	4,839	5,179	5,899	5,229	5,898	5,338	6,538	6,108	6,378	5,548	6,447	7,097	6,456	6,905	5,735	6,285	5,595	6,355	5,915	7,085	6,924	7,315	7,015	8,305	5,905	6,345	5,845	5,415	6,303	7,563	6,474	3,494
		Simulated (vph)	4,840	4,201	3,221	3,570	3,418	4,580	5,104	5,806	4,831	5,244	6,082	5,505	6,199	5,635	6,880	6,480	6,769	5,866	6,584	7,213	6,514	6,910	5,654	6,182	5,520	6,276	5,846	6,999	6,832	7,229	6,928	8,208	5,811	6,239	5,740	5,299	6,170	7,423	6,351	3,393
		Difference	(29)	(38)	(28)	(29)	(31)	(40)	(46)	(43)	(8)	65	183	276	301	297	342	372	391	318	137	116	58	5	(81)	(103)	(75)	(79)	(69)	(86)	(92)	(86)	(87)	(97)	(94)	(106)	(105)	(116)	(133)	(140)	(123)	(101)
		Speed	63	63	66	65	66	62	55	41	32	22	23	35	32	38	37	39	39	18	20	30	25	30	42	47	51	55	60	54	58	55	53	39	52	57	60	59	58	53	57	62
		Density	25	21	16	12	16	19	28	45	72	96	72	54	50	43	42	45	43	85	79	60	67	48	37	26	31	25	24	26	29	28	32	41	36	26	22	27	26	27	27	17
		LOS	C	C	B	B	B	B	D	F	F	F	F	F	F	F	E	F	F	F	F	F	F	F	E	C	D	C	C	C	D	D	D	E	E	C	C	C	C	C	C	B

Scenarios:
No Build : No change from existing plus current construction projects
No Build Congestion Management Plan: No Build plus auxiliary lane between France and I-35W
No Build Mitigated: No Build plus additional lane between France and TH 77

STUDY INTERCHANGE AREA

TABLE 2
Westbound I-494 Operations

		FROM:	Valley View Rd Entrance	WB TH 212 Entrance	WB TH 212 Exit	EB TH 212 Entrance	EB TH 212 Exit	Prairie Center Exit	SB TH 169 Entrance	SB TH 169 Exit	NB TH 169 Entrance	NB TH 169 Exit	E. Bush Lake Exit	SB TH 100 Entrance	SB TH 100 Exit	NB TH 100 Entrance	NB TH 100 Exit	SB France Entrance	NB France Entrance	France Exit	Penn Entrance	Penn Exit	SB I-35W Entrance	SB I-35W Exit	NB I-35W Entrance	NB I-35W Exit	Lyndale Entrance	Lyndale Exit	Nicollet Entrance	Nicollet Exit	Portlane Entrance	12th Exit	TH 77 Entrance	SB TH 77 Exit	NB TH 77 HOV Entrance	24th Entrance	NB TH 77 Exit	24th Exit	34th Entrance	TH 5 Entrance	BEGIN MODEL
		TO:	END MODEL	Valley View Rd Entrance	WB TH 212 Entrance	WB TH 212 Exit	EB TH 212 Entrance	EB TH 212 Exit	Prairie Center Exit	SB TH 169 Entrance	SB TH 169 Exit	NB TH 169 Entrance	NB TH 169 Exit	E. Bush Lake Exit	SB TH 100 Entrance	SB TH 100 Exit	NB TH 100 Entrance	NB TH 100 Exit	SB France Entrance	NB France Entrance	France Exit	Penn Entrance	Penn Exit	SB I-35W Entrance	SB I-35W Exit	NB I-35W Entrance	NB I-35W Exit	Lyndale Entrance	Lyndale Exit	Nicollet Entrance	Nicollet Exit	Portlane Entrance	12th Exit	TH 77 Entrance	SB TH 77 Exit	NB TH 77 HOV Entrance	24th Entrance	NB TH 77 Exit	24th Exit	34th Entrance	TH 5 Entrance	BEGIN MODEL
		Distance (ft)	7,312	1,986	1,246	807	809	4,152	2,522	1,363	278	1,173	8,263	754	1,102	304	1,135	3,340	1,140	1,330	2,735	2,240	599	700	542	652	671	2,051	720	1,749	1,138	4,238	652	948	406	1,046	2,266	743	988	3,095	3,824
AM PEAK HOUR	2020 No Build	Demand (vph)	4,061	3,381	3,351	4,642	3,652	3,972	5,102	4,732	5,332	4,533	5,873	6,452	5,812	6,242	5,612	6,771	6,431	5,991	7,202	6,712	7,491	6,690	7,319	5,980	6,321	5,871	7,011	6,661	6,861	6,511	7,471	5,260	5,760	5,610	5,260	5,690	7,240	6,420	3,850
		Simulated (vph)	3,847	3,180	3,155	4,342	3,359	3,659	4,754	4,390	4,917	4,122	5,317	5,856	5,214	5,582	4,966	6,049	5,736	5,346	6,430	5,988	6,711	5,904	6,448	5,011	5,305	4,875	5,794	5,445	5,599	5,234	5,915	4,612	5,022	4,949	4,554	4,875	6,077	5,197	3,856
		Difference	(214)	(201)	(196)	(300)	(293)	(313)	(348)	(342)	(415)	(411)	(556)	(596)	(598)	(660)	(646)	(722)	(695)	(645)	(772)	(724)	(780)	(786)	(871)	(969)	(1,016)	(996)	(1,217)	(1,216)	(1,262)	(1,277)	(1,556)	(648)	(738)	(661)	(706)	(815)	(1,163)	(1,223)	6
		Speed	65	66	64	56	65	64	64	63	58	66	65	62	57	58	64	61	56	59	48	46	42	31	28	52	57	59	56	50	34	18	15	18	20	20	18	16	17	13	54
		Density	18	14	15	17	17	18	17	15	14	14	20	21	25	19	22	25	31	30	43	47	40	57	50	28	21	28	26	36	47	86	95	78	55	73	68	68	70	95	27
		LOS	B	B	B	B	B	B	B	B	B	B	C	C	C	B	C	C	D	D	F	F	E	F	F	D	C	C	C	E	F	F	F	F	F	F	F	F	F	F	C
	2020 No Build Congestion Mgmt Plan	Demand (vph)	4,061	3,381	3,351	4,642	3,652	3,972	5,102	4,732	5,332	4,533	5,873	6,452	5,812	6,242	5,612	6,771	6,431	5,991	7,202	6,712	7,491	6,690	7,319	5,980	6,321	5,871	7,011	6,661	6,861	6,511	7,471	5,260	5,760	5,610	5,260	5,690	7,240	6,420	3,850
		Simulated (vph)	3,867	3,206	3,179	4,349	3,370	3,656	4,742	4,378	4,900	4,103	5,331	5,870	5,253	5,636	5,016	6,091	5,775	5,370	6,457	5,990	6,640	5,827	6,376	5,006	5,289	4,847	5,782	5,431	5,587	5,235	5,985	4,647	5,056	4,989	4,595	4,926	6,142	5,238	3,850
		Difference	(194)	(175)	(172)	(293)	(282)	(316)	(360)	(354)	(432)	(430)	(542)	(582)	(559)	(606)	(596)	(680)	(656)	(621)	(745)	(722)	(851)	(863)	(943)	(974)	(1,032)	(1,024)	(1,229)	(1,230)	(1,274)	(1,276)	(1,486)	(613)	(704)	(621)	(665)	(764)	(1,098)	(1,182)	0
		Speed	65	66	64	56	65	64	64	63	58	66	65	62	54	54	61	59	59	61	57	59	55	59	55	57	58	59	56	50	34	18	16	19	21	21	18	16	17	13	52
		Density	18	14	15	17	17	18	17	15	14	14	20	21	27	21	23	25	23	22	27	25	24	25	24	25	21	27	26	36	47	86	91	75	53	71	66	67	71	97	29
		LOS	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	E	F	F	F	F	F	F	F	F	F	F	D
	2020 No Build Mitigated	Demand (vph)	4,061	3,381	3,351	4,642	3,652	3,972	5,102	4,732	5,332	4,533	5,873	6,452	5,812	6,242	5,612	6,771	6,431	5,991	7,202	6,712	7,491	6,690	7,319	5,980	6,321	5,871	7,011	6,661	6,861	6,511	7,471	5,260	5,760	5,610	5,260	5,690	7,240	6,420	3,850
		Simulated (vph)	3,990	3,329	3,301	4,528	3,543	3,873	5,045	4,678	5,250	4,453	5,751	6,330	5,719	6,148	5,559	6,754	6,430	6,026	7,274	6,804	7,571	6,754	7,399	6,015	6,355	5,915	7,031	6,657	6,831	6,418	7,352	5,272	5,774	5,612	5,252	5,656	7,181	6,379	3,852
		Difference	(71)	(52)	(50)	(114)	(109)	(99)	(57)	(54)	(82)	(80)	(122)	(122)	(93)	(94)	(53)	(17)	(1)	35	72	92	80	64	80	35	34	44	20	(4)	(30)	(93)	(119)	12	14	2	(8)	(34)	(59)	(41)	2
		Speed	65	66	64	55	65	64	64	63	58	66	64	61	53	53	59	56	58	61	55	58	52	57	52	46	29	21	25	32	30	39	46	52	49	41	47	52	40	45	67
		Density	19	15	15	18	18	19	18	16	15	15	22	23	30	23	26	29	26	25	31	29	29	29	30	38	44	74	57	52	50	48	36	30	25	40	30	24	35	32	19
		LOS	B	B	B	B	B	B	B	B	B	B	C	C	D	C	C	D	C	C	D	D	D	D	D	E	F	F	F	F	F	F	E	D	C	E	D	C	D	D	B
PM PEAK HOUR	2020 No Build	Demand (vph)	4,591	3,601	3,471	5,370	4,460	4,581	6,141	5,821	6,831	6,221	7,081	7,581	6,301	6,632	6,032	7,643	6,743	5,973	6,984	6,223	7,192	6,403	7,063	5,832	6,792	6,142	7,143	6,903	7,203	6,823	7,932	6,000	7,170	7,120	6,261	7,301	8,871	6,410	3,370
		Simulated (vph)	4,296	3,320	3,190	4,877	3,977	4,088	5,557	5,237	6,036	5,429	6,209	6,660	5,576	5,876	5,276	6,695	5,840	5,131	6,014	5,294	6,110	5,407	5,994	4,757	5,557	4,906	5,667	5,420	5,652	5,266	6,088	4,718	5,630	5,601	4,723	5,456	6,610	5,068	3,373
		Difference	(295)	(281)	(281)	(493)	(483)	(493)	(584)	(584)	(795)	(792)	(872)	(921)	(725)	(756)	(756)	(948)	(903)	(842)	(970)	(929)	(1,082)	(996)	(1,069)	(1,075)	(1,235)	(1,236)	(1,476)	(1,483)	(1,551)	(1,557)	(1,844)	(1,282)	(1,540)	(1,519)	(1,538)	(1,845)	(2,261)	(1,342)	3
		Speed	64	66	61	46	59	62	63	62	58	65	64	60	57	57	63	58	49	57	45	39	44	41	43	53	56	58	57	52	37	20	15	16	19	20	16	15	18	13	61
		Density	22	15	16	24	23	21	20	18	17	18	24	25	27	20	23	29	37	30	43	49	36	40	31	26	22	28	25	35	44	79	96	90	66	83	82	83	74	92	19
		LOS	C	B	B	C	C	C	C	B	B	B	C	C	C	C	C	D	E	D	F	F	E	E	D	C	C	D	C	E	F	F	F	F	F	F	F	F	F	F	B
	2020 No Build Congestion Mgmt Plan	Demand (vph)	4,591	3,601	3,471	5,370	4,460	4,581	6,141	5,821	6,831	6,221	7,081	7,581	6,301	6,632	6,032	7,643	6,743	5,973	6,984	6,223	7,192	6,403	7,063	5,832	6,792	6,142	7,143	6,903	7,203	6,823	7,932	6,000	7,170	7,120	6,261	7,301	8,871	6,410	3,370
		Simulated (vph)	4,282	3,298	3,173	4,842	3,944	4,039	5,490	5,170	5,944	5,334	6,075	6,498	5,389	5,671	5,087	6,403	5,933	5,193	6,090	5,326	6,115	5,374	5,956	4,730	5,520	4,881	5,657	5,407	5,647	5,245	6,053	4,687	5,572	5,547	4,678	5,409	6,532	5,052	3,365
		Difference	(309)	(303)	(298)	(528)	(516)	(542)	(651)	(651)	(887)	(887)	(1,006)	(1,083)	(912)	(961)	(945)	(1,240)	(810)	(780)	(894)	(897)	(1,077)	(1,029)	(1,107)	(1,102)	(1,272)	(1,261)	(1,486)	(1,496)	(1,556)	(1,578)	(1,879)	(1,313)	(1,598)	(1,573)	(1,583)	(1,892)	(2,339)	(1,358)	(5)
		Speed	64	66	62	47	60	63	63	62	58	65	64	61	57	58	62	54	55	61	55	59	56	59	55	56	57	59	57	51	36	20	15	16	19	20	15	15	18	13	60
		Density	21	15	16	23	22	21	20	18	17	18	23	24	26	19	23	29	25	21	26	22	22	23	23	24	22	28	25	35	44	80	96	90	65	84	84	83	75	92	19
		LOS	C	B	B	C	C	C	C	B	B	B	C	C	C	B	C	D	C	C	C	C	C	C	C	C	C	C	C	E	F	F	F	F	F	F	F	F	F	F	B
	2020 No Build Mitigated	Demand (vph)	4,591	3,601	3,471	5,370	4,460	4,581	6,141	5,821	6,831	6,221	7,081	7,581	6,301	6,632	6,032	7,643	6,743	5,973	6,984	6,223	7,192	6,403	7,063	5,832	6,792	6,142	7,143	6,903	7,203	6,823	7,932	6,000	7,170	7,120	6,261	7,301	8,871	6,410	3,370
		Simulated (vph)	4,442	3,467	3,334	5,158	4,270	4,404	5,937	5,618	6,476	5,867	6,702	7,178	5,962	6,295	5,733	7,267	6,604	5,809	6,824	6,087	6,990	6,243	6,907	5,680	6,614	5,965	6,898	6,644	6,924	6,517	7,496	5,557	6,629	6,590	5,736	6,648	8,066	6,027	3,363
		Difference	(149)	(134)	(137)	(212)	(190)	(177)	(204)	(203)	(355)	(354)	(379)	(403)	(339)	(337)	(299)	(376)	(139)	(164)	(160)	(136)	(202)	(160)	(156)	(152)	(178)	(177)	(245)	(259)	(279)	(306)	(436)	(443)	(541)	(530)	(525)	(653)	(805)	(383)	(7)
		Speed	64	65	58	41	54	61	63	61	57	64	63	59	55	56	60	46	51	60	53	58	53	56	49	45	33	38	48	48	44	53	49	53	48	33	24	29	29	20	65
		Density	22	16	18	29	26	23	22	20	19	20	26	27	30	22	27	39	30	24	31	26	27	28	30	36	42	48	32	36	36	33	34	32	30	60	65	53	56	69	17
		LOS	C	B	B	D	C	C	C	B	B	C	C	C	D	C	C	E	D	C	D	C	C	C	D	E	E	F	D	E	E	D	D	D	D	F	F	F	F	F	B

Scenarios:
No Build : No change from existing plus current construction projects
No Build Congestion Management Plan: No Build plus auxiliary lane between France and I-35W
No Build Mitigated: No Build plus additional lane between France and TH 77

STUDY INTERCHANGE AREA

TABLE 3
I-35W Operations

			NORTHBOUND INTERSTATE 35W									
		FROM:	90th St Entrance	82nd St Exit	82nd St Entrance	EB I-494 Exit	I-494 CD Rd Exit	I-494 CD Rd Entrance	WB I-494 Entrance	76th St Entrance	66th St Exit	END MODEL
		TO:	BEGIN MODEL	90th St Entrance	82nd St Exit	82nd St Entrance	EB I-494 Exit	I-494 CD Rd Exit	I-494 CD Rd Entrance	WB I-494 Entrance	76th St Entrance	66th St Exit
		Distance (ft)	2,765	3,771	1,491	547	420	843	1,032	889	4,789	2,080
AM PEAK HOUR	2020 No Build	Demand (vph)	5,470	5,819	5,019	5,349	4,599	3,260	3,961	4,302	4,592	3,652
		Simulated (vph)	5,492	5,844	5,102	5,452	4,703	3,280	3,940	4,236	4,512	3,625
		Difference	22	25	83	103	104	20	(21)	(66)	(80)	(27)
		Speed	58	49	34	33	31	61	59	61	61	65
		Density	32	37	44	36	40	18	18	19	23	18
		LOS	D	E	F	E	E	B	B	B	C	B
	2020 No Build Congestion Mgmt Plan	Demand (vph)	5,470	5,819	5,019	5,349	4,599	3,260	3,961	4,302	4,592	3,652
		Simulated (vph)	5,489	5,850	5,062	5,386	4,639	3,285	3,951	4,233	4,532	3,635
		Difference	19	31	43	37	40	25	(10)	(69)	(60)	(17)
		Speed	60	64	64	59	58	65	60	61	62	65
		Density	30	22	20	18	20	17	18	19	23	19
		LOS	D	C	C	B	C	B	B	B	C	B
	2020 No Build Mitigated	Demand (vph)	5,470	5,819	5,019	5,349	4,599	3,260	3,961	4,302	4,592	3,652
		Simulated (vph)	5,492	5,849	5,089	5,413	4,665	3,298	4,016	4,351	4,641	3,717
		Difference	22	30	70	64	66	38	55	49	49	65
		Speed	60	64	63	58	55	65	59	60	62	65
		Density	30	22	20	19	22	17	19	20	24	19
		LOS	D	C	C	B	C	B	B	B	C	B
PM PEAK HOUR	2020 No Build	Demand (vph)	4,620	5,151	4,621	5,462	4,702	3,471	4,161	5,121	5,741	5,161
		Simulated (vph)	4,614	5,141	4,617	5,457	4,699	3,452	3,996	4,785	5,312	4,765
		Difference	(6)	(10)	(4)	(5)	(3)	(19)	(165)	(336)	(429)	(396)
		Speed	64	65	64	57	59	65	61	57	59	64
		Density	24	19	18	19	20	18	18	23	29	25
		LOS	C	B	B	B	B	B	B	C	D	C
	2020 No Build Congestion Mgmt Plan	Demand (vph)	4,620	5,151	4,621	5,462	4,702	3,471	4,161	5,121	5,741	5,161
		Simulated (vph)	4,615	5,144	4,607	5,448	4,684	3,455	4,036	4,819	5,365	4,821
		Difference	(5)	(7)	(14)	(14)	(18)	(16)	(125)	(302)	(376)	(340)
		Speed	64	65	65	58	60	65	60	56	59	64
		Density	24	19	18	19	20	18	19	23	29	25
		LOS	C	B	B	B	B	B	B	C	D	C
	2020 No Build Mitigated	Demand (vph)	4,620	5,151	4,621	5,462	4,702	3,471	4,161	5,121	5,741	5,161
		Simulated (vph)	4,611	5,130	4,596	5,433	4,680	3,454	4,118	5,056	5,579	5,020
		Difference	(9)	(21)	(25)	(29)	(22)	(17)	(43)	(65)	(162)	(141)
		Speed	64	65	65	57	60	65	59	55	59	64
		Density	24	19	18	19	20	18	19	25	30	26
		LOS	C	B	B	B	B	B	B	C	D	C

			SOUTHBOUND INTERSTATE 35W									
		FROM:	90th St Exit	82nd St Entrance	82nd St Exit	EB I-494 Entrance	EB I-494 Exit	WB I-494 Entrance	WB I-494 Exit	76th St Exit	66th St Entrance	BEGIN MODEL
		TO:	END MODEL	90th St Exit	82nd St Entrance	82nd St Exit	EB I-494 Entrance	EB I-494 Exit	WB I-494 Entrance	WB I-494 Exit	76th St Exit	66th St Entrance
		Distance (ft)	2,914	3,421	1,502	760	712	427	727	1,476	4,522	2,094
AM PEAK HOUR	2020 No Build	Demand (vph)	3,446	3,856	3,407	4,097	2,937	3,857	3,228	4,029	4,639	4,220
		Simulated (vph)	3,315	3,699	3,249	3,887	2,836	3,710	3,169	3,979	4,618	4,214
		Difference	(131)	(157)	(158)	(210)	(101)	(147)	(59)	(50)	(21)	(6)
		Speed	65	62	64	58	56	51	57	54	53	56
		Density	17	18	17	17	16	17	17	21	26	23
		LOS	B	B	B	B	B	B	B	C	C	C
	2020 No Build Congestion Mgmt Plan	Demand (vph)	3,446	3,856	3,407	4,097	2,937	3,857	3,228	4,029	4,639	4,220
		Simulated (vph)	3,347	3,738	3,295	3,946	2,849	3,747	3,193	4,005	4,620	4,225
		Difference	(99)	(118)	(112)	(151)	(88)	(110)	(35)	(24)	(19)	5
		Speed	65	64	64	58	56	50	56	54	52	56
		Density	17	14	17	17	17	18	18	21	26	23
		LOS	B	B	B	B	B	B	B	C	C	C
	2020 No Build Mitigated	Demand (vph)	3,446	3,856	3,407	4,097	2,937	3,857	3,228	4,029	4,639	4,220
		Simulated (vph)	3,392	3,801	3,358	4,027	2,928	3,801	3,157	3,970	4,617	4,211
		Difference	(54)	(55)	(49)	(70)	(9)	(56)	(71)	(59)	(22)	(9)
		Speed	65	64	64	57	56	50	56	54	52	56
		Density	17	14	17	17	17	18	17	21	26	23
		LOS	B	B	B	B	B	B	B	C	C	C
PM PEAK HOUR	2020 No Build	Demand (vph)	6,138	6,569	5,600	6,060	4,890	5,440	4,780	5,569	6,069	5,489
		Simulated (vph)	5,627	5,993	5,006	5,407	4,340	4,832	4,239	4,925	5,288	4,688
		Difference	(511)	(576)	(594)	(653)	(550)	(608)	(541)	(644)	(781)	(801)
		Speed	60	41	18	16	13	13	14	20	21	18
		Density	31	48	92	85	114	97	107	81	84	93
		LOS	D	F	F	F	F	F	F	F	F	F
	2020 No Build Congestion Mgmt Plan	Demand (vph)	6,138	6,569	5,600	6,060	4,890	5,440	4,780	5,569	6,069	5,489
		Simulated (vph)	6,127	6,493	5,451	5,880	4,732	5,227	4,618	5,320	5,717	5,031
		Difference	(11)	(76)	(149)	(180)	(158)	(213)	(162)	(249)	(352)	(458)
		Speed	48	35	25	21	18	19	19	23	22	25
		Density	43	48	75	74	99	82	95	80	89	79
		LOS	F	F	F	F	F	F	F	F	F	F
	2020 No Build Mitigated	Demand (vph)	6,138	6,569	5,600	6,060	4,890	5,440	4,780	5,569	6,069	5,489
		Simulated (vph)	6,191	6,593	5,591	6,032	4,739	5,245	4,537	5,253	5,602	4,922
		Difference	53	24	(9)	(28)	(151)	(195)	(243)	(316)	(467)	(567)
		Speed	48	33	23	19	15	15	15	20	20	21
		Density	44	51	81	81	111	96	112	89	94	89
		LOS	F	F	F	F	F	F	F	F	F	F

Scenarios:
No Build : No change from existing plus current construction projects
No Build Congestion Management Plan: No Build plus auxiliary lane between France and I-35W, Auxiliary lane between 82nd Ent and 90th Exit on SB I-35W
No Build Mitigated: No Build plus additional lane between France and TH 77

TABLE 4
TH 77 Opertations

NORTHBOUND TH 77

		FROM:	Old Shakopee Exit	Old Shakopee Entrance	Killebrew Exit	I-494 EB/WB Exit Ramp	EB I-494 Entrance	WB I-494 HOV Exit	WB I-494 Entrance	66th Exit	66th Entrance	EB TH 62 Exit	EB TH 62 Entrance	WB TH 62 Exit	END MODEL
		TO:	BEGIN MODEL	Old Shakopee Exit	Old Shakopee Entrance	Killebrew Exit	I-494 EB/WB Exit Ramp	EB I-494 Entrance	WB I-494 HOV Exit	WB I-494 Entrance	66th Exit	66th Entrance	EB TH 62 Exit	EB TH 62 Entrance	WB TH 62 Exit
		Distance (ft)	8,050	1,575	1,320	2,178	2,710	465	1,218	4,449	3,385	1,713	1,071	413	699
AM PEAK HOUR	2020 No Build	Demand (vph)	6,560	5,001	5,531	4,531	2,230	2,681	2,531	3,381	3,011	3,361	2,800	2,850	1,420
		Simulated (vph)	1,477	1,596	2,080	1,759	756	1,167	1,105	1,855	1,691	2,131	1,801	1,862	775
		Difference	(5,083)	(3,405)	(3,451)	(2,772)	(1,474)	(1,514)	(1,426)	(1,526)	(1,320)	(1,230)	(999)	(988)	(645)
		Speed	3	5	6	5	68	58	64	63	47	41	41	36	54
		Density	146	131	118	124	2	5	7	13	21	21	26	25	6
		LOS	F	F	F	F	A	A	A	B	C	C	C	C	A
	2020 No Build Congestion Mgmt Plan	Demand (vph)	6,560	5,001	5,531	4,531	2,230	2,681	2,531	3,381	3,011	3,361	2,800	2,850	1,420
		Simulated (vph)	1,476	1,578	2,031	1,747	758	1,159	1,101	1,853	1,668	2,113	1,784	1,845	790
		Difference	(5,084)	(3,423)	(3,500)	(2,784)	(1,472)	(1,522)	(1,430)	(1,528)	(1,343)	(1,248)	(1,016)	(1,005)	(630)
		Speed	3	5	6	5	68	58	64	63	49	43	42	37	54
		Density	147	133	120	123	2	5	7	13	19	19	24	23	6
		LOS	F	F	F	F	A	A	A	B	B	B	C	C	A
	2020 No Build Mitigated	Demand (vph)	6,560	5,001	5,531	4,531	2,230	2,681	2,531	3,381	3,011	3,361	2,800	2,850	1,420
		Simulated (vph)	6,329	4,804	5,345	4,409	2,137	2,554	2,393	3,193	2,911	3,366	2,824	2,882	1,282
		Difference	(231)	(197)	(186)	(122)	(93)	(127)	(138)	(188)	(100)	5	24	32	(138)
		Speed	41	40	36	23	60	48	41	29	18	23	26	17	53
		Density	54	55	48	62	21	28	46	68	97	52	54	56	8
		LOS	F	F	F	F	C	D	F	F	F	F	F	F	A
PM PEAK HOUR	2020 No Build	Demand (vph)	3,821	3,132	3,573	2,613	1,143	1,643	1,593	3,313	3,003	3,633	2,872	3,032	1,392
		Simulated (vph)	2,024	1,632	2,077	1,573	656	1,086	1,066	2,245	2,037	2,663	2,089	2,246	1,029
		Difference	(1,797)	(1,500)	(1,496)	(1,040)	(487)	(557)	(527)	(1,068)	(966)	(970)	(783)	(786)	(363)
		Speed	7	5	6	4	68	58	63	61	55	50	51	40	49
		Density	136	130	111	111	4	6	8	17	18	17	20	19	10
		LOS	F	F	F	F	A	A	A	B	B	B	C	B	B
	2020 No Build Congestion Mgmt Plan	Demand (vph)	3,821	3,132	3,573	2,613	1,143	1,643	1,593	3,313	3,003	3,633	2,872	3,032	1,392
		Simulated (vph)	1,829	1,588	2,042	1,561	658	1,098	1,078	2,246	2,041	2,658	2,090	2,249	1,038
		Difference	(1,992)	(1,544)	(1,531)	(1,052)	(485)	(545)	(515)	(1,067)	(962)	(975)	(782)	(783)	(354)
		Speed	7	5	6	4	68	58	64	61	55	50	51	41	49
		Density	137	128	112	110	4	6	8	17	18	17	20	18	10
		LOS	F	F	F	F	A	A	A	B	B	B	C	B	B
	2020 No Build Mitigated	Demand (vph)	3,821	3,132	3,573	2,613	1,143	1,643	1,593	3,313	3,003	3,633	2,872	3,032	1,392
		Simulated (vph)	3,815	3,100	3,537	2,589	1,139	1,640	1,601	3,189	2,881	3,490	2,739	2,892	1,329
		Difference	(6)	(32)	(36)	(24)	(4)	(3)	8	(124)	(122)	(143)	(133)	(140)	(63)
		Speed	66	66	64	65	68	58	60	58	54	47	42	24	49
		Density	19	16	14	11	8	9	13	26	26	25	34	41	13
		LOS	B	B	B	B	A	A	B	C	C	C	D	E	B

SOUTHBOUND TH 77

		FROM:	EB Old Shakopee Entrance	WB Old Shakopee Entrance	WB Old Shakopee Exit	Killebrew Entrance	EB I-494 CD Rd Entrance	EB I-494 CD Rd Entrance	Lindau Entrance	SB I-494 CD Rd Entrance	Killebrew Exit Ramp to CD	I-494 EB/WB CD Rd Exit	66th St Entrance	66th St Exit	EB TH 62 Entrance	EB TH 62 Exit	WB TH 62 Entrance	BEGIN MODEL
		TO:	END MODEL	EB Old Shakopee Entrance	WB Old Shakopee Entrance	Old Shakopee Exit	Killebrew Entrance	EB I-494 CD Rd Entrance	Lindau Entrance	SB I-494 CD Rd Entrance	Killebrew Exit Ramp to CD	I-494 EB/WB CD Rd Exit	66th St Entrance	66th St Exit	EB TH 62 Entrance	EB TH 62 Exit	WB TH 62 Entrance	BEGIN MODEL
		Distance (ft)	6,703	1,355	1,284	1,740	786	788	1,169	3,957	1,090	3,859	2,966	1,536	977	268	725	
AM PEAK HOUR	2020 No Build	Demand (vph)	2,401	2,142	1,951	2,321	1,941	1,391	1,150	651	1,251	2,521	2,131	2,530	1,340	1,610	1,170	
		Simulated (vph)	2,277	2,033	1,846	2,204	1,826	1,280	1,043	611	1,161	2,338	2,092	2,531	1,352	1,611	1,173	
		Difference	(124)	(109)	(105)	(117)	(115)	(111)	(107)	(40)	(90)	(183)	(39)	1	12	1	3	
		Speed	67	66	68	66	64	65	64	68	64	49	64	63	63	54	65	
		Density	10	9	8	8	9	6	6	4	6	26	15	12	9	8	8	
		LOS	B	A	A	A	A	A	A	A	A	C	B	B	A	A	A	
	2020 No Build Congestion Mgmt Plan	Demand (vph)	2,401	2,142	1,951	2,321	1,941	1,391	1,150	651	1,251	2,521	2,131	2,530	1,340	1,610	1,170	
		Simulated (vph)	2,270	2,018	1,834	2,191	1,819	1,269	1,032	603	1,127	2,300	2,065	2,528	1,349	1,606	1,168	
		Difference	(131)	(124)	(117)	(130)	(122)	(122)	(118)	(48)	(124)	(221)	(66)	(2)	9	(4)	(2)	
		Speed	67	66	68	66	64	65	64	68	64	46	60	62	63	54	66	
		Density	10	8	8	8	9	6	6	4	6	30	21	12	9	8	8	
		LOS	B	A	A	A	A	A	A	A	A	D	C	B	A	A	A	
	2020 No Build Mitigated	Demand (vph)	2,401	2,142	1,951	2,321	1,941	1,391	1,150	651	1,251	2,521	2,131	2,530	1,340	1,610	1,170	
		Simulated (vph)	2,335	2,084	1,896	2,257	1,886	1,336	1,098	617	1,172	2,400	2,101	2,528	1,343	1,605	1,166	
		Difference	(66)	(58)	(55)	(64)	(55)	(55)	(52)	(34)	(79)	(121)	(30)	(2)	3	(5)	(4)	
		Speed	68	66	68	66	64	65	64	68	63	50	65	63	63	54	66	
		Density	8	9	9	8	9	7	6	4	6	23	14	12	9	8	8	
		LOS	A	A	A	A	A	A	A	A	A	C	B	B	A	A	A	
PM PEAK HOUR	2020 No Build	Demand (vph)	7,270	6,171	5,830	6,410	5,800	4,310	3,770	2,592	3,503	4,562	4,032	4,442	2,292	2,471	1,781	
		Simulated (vph)	6,317	5,251	4,949	5,491	4,929	3,453	2,927	2,022	2,704	3,515	2,967	3,247	2,288	2,461	1,778	
		Difference	(953)	(920)	(881)	(919)	(871)	(857)	(843)	(570)	(799)	(1,047)	(1,065)	(1,195)	(4)	(10)	(3)	
		Speed	54	30	39	48	50	51	54	63	56	15	11	9	17	33	50	
		Density	39	54	52	32	34	25	22	16	19	94	137	127	85	43	24	
		LOS	E	F	F	D	D	C	C	B	B	F	F	F	F	E	C	
	2020 No Build Congestion Mgmt Plan	Demand (vph)	7,270	6,171	5,830	6,410	5,800	4,310	3,770	2,592	3,503	4,562	4,032	4,442	2,292	2,471	1,781	
		Simulated (vph)	6,311	5,245	4,948	5,487	4,918	3,429	2,898	1,998	2,680	3,481	2,936	3,223	2,254	2,457	1,771	
		Difference	(959)	(926)	(882)	(923)	(882)	(881)	(872)	(594)	(823)	(1,081)	(1,096)	(1,219)	(38)	(14)	(10)	
		Speed	53	30	41	53	52	52	55	63	55	14	10	9	19	36	55	
		Density	39	54	47	27	31	24	21	16	19	94	139	128	80	30	21	
		LOS	E	F	F	C	D	C	C	B	B	F	F	F	F	D	C	
	2020 No Build Mitigated	Demand (vph)	7,270	6,171	5,830	6,410	5,800	4,310	3,770	2,592	3,503	4,562	4,032	4,442	2,292	2,471	1,781	
		Simulated (vph)	7,167	6,103	5,778	6,357	5,751	4,259	3,729	2,622	3,541	4,611	4,076	4,510	2,312	2,477	1,782	
		Difference	(103)	(68)	(52)	(53)	(49)	(51)	(41)	30	38	49	44	68	20	6	1	
		Speed	63	51	58	56	44	32	29	61	49	52	56	56	61	51	64	
		Density	28	35	33	28	43	47	52	22	28	35	34	25	19	16	14	
		LOS	D	D	D	D	F	F	F	C	D	E	D	C	B	B	B	

Scenarios:
No Build : No change from existing plus current construction projects
No Build Congestion Management Plan: No Build plus auxiliary lane between France and I-35W
No Build Mitigated: No Build plus additional lane between France and TH 77

Preliminary Water Resources Technical Memorandum

For the I-494/35W Interchange Preliminary Design

S.P. 2785-350
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1.0 Project Summary

This technical memorandum describes the water resources impact, identifies feasible mitigation measures, and describes regulatory permitting and review required for the proposed reconstruction of the interchange at Interstate 494 (I-494) and Interstate 35W (I-35W), and ancillary roadway improvements in the cities of Bloomington and Richfield. Two roadway layouts were analyzed: 1) the Turbine Design Ultimate (Ultimate) layout, and 2) the Turbine Design Phase 1 (Phase 1) layout, which would be constructed prior to the Ultimate layout and designed so that very little of the Phase 1 layout would need to be demolished and replaced when the Ultimate layout was constructed. The Ultimate and Phase 1 layouts are shown in Figures 01A/B and 02A/B, respectively.

The western limits of the Ultimate I-494 roadway improvement are located approximately 1,400 feet west of Xerxes Avenue, and the eastern limits are located approximately 600 feet east of Portland Avenue. In total, the extents of the Ultimate I-494 roadway improvements are equal to approximately 2.9 miles in length. The northern limits of the I-35W roadway improvement are located near 66th Street, and the southern limits are located approximately 800 feet south of 90th Street. In total, the extents of the Ultimate I-35W roadway improvements are equal to about 2.9 miles in length. The proposed typical roadway section is three to five lanes in each direction with auxiliary lanes, and bus rapid transit (BRT) lanes and facilities along the center of I-35W. The existing interchange is a full cloverleaf design. The proposed interchange is a turbine design, which may be constructed in phases.

Presently stormwater runoff from the project area is mostly untreated. Stormwater runoff from I-494 west of the existing interchange, the interchange itself, and I-35W from 76th Street to 90th Street, drains to Nine Mile Creek via Upper Penn Lake and Lower Penn Lake. North of 76th Street, I-35 in the project limits drains to Wood Lake. Runoff from I-494 east of the interchange is directed east, outletting to the Minnesota River east of 34th Avenue. Figure 03 shows existing drainage patterns.

The roadways are anticipated to be designed to have an urban typical section with curb and gutter. Stormwater runoff from the proposed project will be collected in catch basins and conveyed via pipe to proposed ponds or infiltration treatment basins, shown in Figures 04A/B.

1.1. Purpose and Scope

The purpose and scope of this preliminary drainage analysis is to:

- Review existing stormwater plans and studies
- Assess permitting and agency involvement

- Determine required stormwater treatment volumes for both the Ultimate and Phase 1 roadway layouts to meet current stormwater regulations
- Recommend stormwater management approach
- Determine whether adequate right of way is available for stormwater treatment devices for both the Ultimate and Phase 1 roadway layouts
- Develop drainage overview exhibits

1.2. Existing Stormwater Plans and Studies

The following documents pertaining to water resources in the project area were reviewed:

- I-35W Environmental Impact Statement Water Resources Special Study, July 1991
- Interstate 494 From Interstate 394 to the Minnesota River Final Environmental Impact Statement and Section 4(f)/6(f) Evaluation, August 2001 (FEIS) – Section 6.3, Surface Water Drainage, and Section 6.4, Water Quality, August 2001
- Penn Lake Use Attainability Analysis, December 2003 – Prepared for the City of Bloomington, Minnesota
- Interstate 494 Improvements-Penn Avenue to the Minnesota River: Interstate 494 Stormwater Alternatives Study, May 2007
- Comprehensive Surface Water Management Plan for the City of Bloomington, Minnesota, October 2007
- Nine Mile Creek Watershed District (NMCWD) Amended Rules, March 2008
- Richfield-Bloomington Watershed Management Plan, July 2008 – Prepared for the Richfield-Bloomington Watershed Management Organization (RBWMO)
- Comprehensive Surface Water Management Plan for the City of Richfield, Minnesota, August 2008

The *I-35W Environmental Impact Statement Water Resources Special Study* analyzes water resources impacts due to reconstructing I-35W from I-35E in the city of Burnsville to Washington Avenue in the City of Minneapolis. The study divides the I-35W corridor into eleven drainage basins. The two basins that pertain to the I-494/35W interchange are the Penn Lake basin and the Wood Lake basin. To limit peak stormwater discharge to existing flow rates, the report recommends that detention ponds be constructed in the interchange, and along the west side of I-35W from 83rd Street to 85th Street. Similarly, because Wood Lake at that time did not have an outlet, the report recommends that stormwater runoff be restricted to the existing rate. Detention ponds along the west side of I-35W from 69th Street to 72nd Street, or on the east side of I-35W in the Wood Lake Nature Preserve, are recommended. Penn Lake is estimated to receive the highest pollutant loading in the study corridor.

Sedimentation ponds are recommended to mitigate pollutant burdens. Exhibit A contains the cover of this document.

The *Interstate 494 From I-394 to the Minnesota River FEIS,* in its drainage area analysis, shows that for drainage areas NM 400, NM 401, BR 100, BR 101, and BR 102 the combined increase in highway impervious area for the preferred alternative compared to existing conditions is almost 72 percent. The FEIS notes that I-35W from 66th Street to 76th Street has already been reconstructed, including directing highway runoff toward a detention pond system within the Wood Lake Nature Area. To limit stormwater discharge rates for the preferred alternative as closely as possible to existing rates, while complying with requirements of the watershed district and municipalities, the FEIS recommends that two ponds be created in the interchange, and that Irving Pond be constructed along the west side of I-35W from 83rd Street to 85th Street. The FEIS asserts that the reconstruction of the preferred alternative will provide stormwater runoff treatment by means of dry or wet detention, biofiltration, or infiltration best management practices. The treatment is expected to maintain water quality or perhaps improve water quality with respect to existing conditions, since there are few stormwater detention or treatment amenities in the I-494 project corridor. Exhibit B contains the cover of the FEIS.

The *Penn Lake Use Attainability Analysis* is an evaluation of the physical, chemical, and biological status of Lower Penn Lake which lies east of Penn Avenue and south of 86th Street. The tributary area to the lake includes I-35W from 85th Street to 92nd Street. The water quantity goal for Penn Lake is to provide adequate water storage during the regional flood. The report states that this goal has been attained. It strongly recommends that detention ponds be constructed in conjunction with I-35W improvements to provide pre-treatment of additional runoff waters from the project. Exhibit C contains the cover of the report.

The *Interstate 494 Improvements-Penn Avenue to the Minnesota River: Interstate 494 Stormwater Alternatives Study* analyzes the surface water drainage system on the segment of I-494. It provides seven alternatives for stormwater management, each of which will accommodate a 10-year design storm on continuous grades and a 50-year design event at sag points. Life cycle costs for the alternatives ranged from $79 million to $206 million. Mn/DOT selected as its first preference a storage tunnel with gravity outfall. The proposed system consists of a 144-inch diameter pipe from Penn Avenue to 12th Avenue. The depth at I-35W is about 70 feet. A 42-inch outlet pipe extends from 12th Avenue to a proposed detention pond located adjacent to the Minnesota River. The life cycle cost is $120 million. Mn/DOT's second preferred alternative is using the existing storm sewer enhanced with proposed buried ponding under the roadway. The ponds consist of buried storage cells sealed from surrounding groundwater infiltration. Ponds would be located at

Penn Avenue, Wentworth Avenue, Portland Avenue, and at TH 77. The life cycle cost of this alternative is $79 million. Although the storage tunnel, Mn/DOT's first preference, is excluded from present consideration for the I-494/35W Interchange Preliminary Design stormwater management facility, Mn/DOT desires that the current stormwater design concept be consistent with the ultimate storage tunnel alternative. Exhibit D contains a cover of the study.

The *Comprehensive Surface Water Management Plan (CSWMP) for the City of Bloomington, Minnesota* is developed to comply with local watershed management planning requirements of the Metropolitan Surface Water Management Act (Chapter 103B) and the Board of Water and Soil Resources Rules 8410. Among its attributes, the document is intended to provide the City with an inventory of water resources related information and management of those resources. The CSWMP states that, "in the design and construction of new, or modifications to existing water conveyance systems, treatment of storm water runoff to National Urban Runoff Program (NURP) guidelines must be provided prior to discharge to the Public system".

The NMCWD, within which the interchange preliminary design is located, has adopted rules requiring obtaining a permit from the Watershed District prior to beginning an activity that it regulates. Table B includes a synopsis of criteria of the NMCWD.

The *Richfield-Bloomington Watershed Management Plan* is prepared in accordance with Minnesota Rules Chapter 8410. The plan includes goals and policies of the RBWMO. Table B shows a summary of RBWMO stormwater management requirements.

The *Comprehensive Surface Water Management Plan (CSWMP) for the City of Richfield, Minnesota* is developed to conform to local watershed management planning requirements of the Metropolitan Surface Water Management Act (Chapter 103B) and the Board of Water and Soil Resources Rules 8410.

1.3. Existing Stormwater Issues in Project Vicinity

1.3.1. The I-494 Stormwater Alternatives Study dated May 2007 states that "the storm sewer system that serves the corridor has been undersized for many years, and flooding has occurred at low points near the interchanges during more recent years, occasionally forcing the closure of the highway." The study notes that the existing storm sewer system on I-494 surcharges during storms approximating the 5-year event, compared to Mn/DOT's design criteria of accommodating a 10-year storm on continuous grades and a 50-year event at sag points.

1.3.2. During a meeting on May 7, 2009 with staff of the City of Richfield Public Works Department, the City stated that I-494 at Portland Avenue has experienced flooding on a couple of occasions during the past two years. It is anticipated that the preferred alternative set forth in the I-494 Stormwater Alternatives Study discussed in Section 1.2. will ultimately accommodate the 50-year storm event at the sag point near Portland Avenue.

1.3.3. The City of Richfield pointed out that an outlet for Wood Lake was created by installing a pipe from Wood Lake to a lift station that is located near I-494. The lift station pumps flow from the lake into the storm sewer on I-494 at a point west of Lyndale Avenue. The City wishes to have the lift station removed if a deeper storm sewer is installed on I-494. When constructed, the ultimate stormwater storage tunnel pipe shown in the preferred alternative of the I-494 Stormwater Alternatives Study is of adequate depth to preclude the need for the lift station. A storm sewer and appurtenances could be designed that would provide gravity flow of stormwater from the current lift station location to the ultimate pipe on I-494.

1.3.4. The City of Richfield would be receptive to using Wood Lake for stormwater runoff rate control provided the stormwater quality is good.

1.3.5. During a meeting on May 7, 2009 with staff of the City of Bloomington Public Works Department and other City departments, the City said that there is a stormwater lift station that is located at Penn Avenue. It pumps runoff into the 72-inch storm sewer pipe that drains south to Upper Penn Lake. The City desires to have the lift station eliminated. The ultimate storage tunnel pipe presented in the I-494 Stormwater Alternatives Study, upon being installed, would be of sufficient depth to accept gravity flow from the lift station and its tributary area. Therefore, with the ultimate modifications to the existing drainage system the lift station could be removed.

1.3.6. The City of Bloomington has improved the outlet from Lower Penn Lake. Due to the cost of the outfall project, the hydraulic capacity of Penn Lake should be considered fixed. Drainage enhancements that would result from the preferred alternative of the I-494 Stormwater Alternatives Study referred to in Section 1.2., including eliminating the existing lift station at Penn Avenue and I-494 as discussed in 1.3.5., are expected to control the rate of runoff to Upper Penn Lake, thus reducing the probability of the outfall capacity being exceeded.

1.3.7. It was noted by Mn/DOT staff during a meeting on November 6, 2009 that the City of Bloomington's storm sewer on 80 ½ Street South

extended west from I-35W does not have sufficient capacity to handle current runoff events.

1.4. Stormwater Permitting

This roadway project will require approvals and permitting from several local, state, and federal agencies. Agencies and local units of government involved are:

- Minnesota Pollution Control Agency (MPCA)
- Nine Mile Creek Watershed District (NMCWD)
- Richfield-Bloomington Watershed Management Organization (RBWMO)
- City of Bloomington
- City of Richfield

The project is located in an area whose surface waters are managed by the Nine Mile Creek Watershed District (NMCWD) and Richfield-Bloomington Watershed Management Organization (RBWMO). The boundary between the NMCWD and RBWMO is shown in Figure 03. Since the NMCWD rules are stricter than the RBWMO rules, the RBWMO prefers that the project adhere to NMCWD rules. Stormwater management regulations for the Cities of Richfield and Bloomington follow the requirements set by the RBWMO; the Cities are the permitting authority for the RBWMO.

Hennepin County does not require any additional stormwater permits.

Table A shows the permitting agencies, their permits, and the contact person for each permit that may be required for this project.

Table A Stormwater Management Permits

Permitting Authority	Permit Title	Contact
MPCA	NPDES/SDS Construction Site Permit (Phase II)	Todd Smith (Engineering and Technical) (651) 757-2732 todd.smith@state.mn.us Teddi Seibring-Trofin (Hennepin County) (651) 757-2719 teddi.seibring-trofin@state.mn.us
Nine Mile Creek Watershed District	Stormwater Management Permit Erosion and Sediment Control Permit	Kevin Bigalke, District Administrator (952) 835-2078 kbigalke@ninemilecreek.org
City of Richfield	Stormwater Management Plan Erosion Control Plan	Kristin Asher (612) 861-9795 kasher@cityofrichfield.org
City of Bloomington	Storm Water Management and Maintenance Plans Erosion and Sediment Control and Grading Plans	Scott Anderson (952) 563-4867 smanderson@ci.bloomington.mn.us

1.4.1. Minnesota Pollution Control Agency (MPCA)

The MPCA requires a National Pollutant Discharge Elimination System (NPDES) Construction Storm Water Permit when disturbing one acre or more of land. An NPDES application for General Storm Water Permit for Construction Activity (MN R100001) and a Construction Storm Water Pollution Prevention Plan (SWPPP) Template is shown in Exhibit E.

Since this project will have construction limits greater than one acre, a Storm Water Pollution Prevention Plan (SWPPP) is required that meets Part III A of the NPDES Construction General Permit (CGP).

1.4.2. Nine Mile Creek Watershed District (NMCWD)

The NMCWD requires a Stormwater Management Permit and Erosion and Sediment Control Permit when disturbing 50 cubic yards or more of earth and for linear projects creating more than one acre of new or additional impervious surface. A watershed permit application is shown in Exhibit F.

In addition, the NMCWD requires a stormwater management plan accompanying the permit application. Stormwater treatment requirements are shown in Table B.

1.4.3. City of Richfield

The City of Richfield requires erosion control measures for areas of 5,000 square feet or greater that will be disturbed by excavation, grading, filling or other earth moving activities resulting in the loss of protective vegetation; or excavation or fill exceeding 50 cubic yards; or the installation of underground utilities, either public or private, resulting in more than 300 linear feet of trenching or earth disturbance. This project will require erosion control measures. Erosion control plans are reviewed and approved under the existing building permit process.

The City requires the implementation of Best Management Practices (BMPs), water quantity control, and water quality control for the maintenance, improvement, or construction of public or private road, street, highway, sidewalk, trail, other linear project or parking lot that results in net increase in impervious surface of greater than 1 acre and the project area is more than 5 acres. Stormwater management plans are reviewed and approved under the existing building permit review.

1.4.4. City of Bloomington

The City of Bloomington requires the submission and approval of erosion and sediment control and grading plans prior to the issuance of any grading or building permits. These plans are to conform to the general criteria set forth by the MPCA and City ordinances and SWPPP.

In addition, storm water management and maintenance plans must be submitted for all developments and redevelopments utilizing stormwater BMPs. It is intended that the storm water management and maintenance plan be a filed document with Hennepin County.

2.0 Stormwater Management Approach

The overall goal of the preliminary water resources design is to determine whether adequate right of way is available for treatment of stormwater runoff generated by the project. Treatment volumes were calculated to meet current stormwater treatment requirements for both the Phase 1 and Ultimate conditions.

The NPDES CGP currently requires that a wet sedimentation basin (pond) have a permanent volume of 1,800 cubic feet of storage below the outlet pipe for each acre that drains to the basin. The basin's permanent volume must reach a minimum depth of at least three feet and must have no depth greater than ten feet. Since runoff from the project area does not discharge at a point within one mile of, and flow to, an MPCA-designated Impaired or Special Water, no additional treatment is required.

NMCWD rules require permanent stormwater BMPs to retain onsite one inch of runoff from new impervious surface from the project, limit increases in peak flow for the 2-, 10-, and 100-year, 24-hour storm events for all points where stormwater discharge leaves a parcel, and to detain all runoff from the 2.5-inch storm event from new impervious surface from the project. Treated stormwater should meet at least sixty percent (60%) annual removal for phosphorous and at least ninety percent (90%) annual removal efficiency for total suspended solids.

The rules of the MPCA NPDES program and Nine Mile Creek Watershed District (in its jurisdictional area) pertain within Mn/DOT right of way. Mn/DOT has made it a practice to work with cities and watershed management organizations to meet their requirements where possible, and the RBWMO / Cities of Bloomington and Richfield have said that the project should follow NMCWD rules because those rules are more restrictive. Because stormwater treatment rules are continually evolving, the NMCWD and RBWMO rules, as well as the Cities of Bloomington and Richfield CSWMPs, should be reevaluated as the project develops.

The rules that govern the design fall into three categories: rate control, water quality treatment, and volume control. A comparison between stormwater requirements of the MPCA, NMCWD, and RBWMO is shown in Table B.

Table B Stormwater Requirements Comparison

Category	MPCA	NMCWD	RBWMO
Rate Control	Maximum pond discharge rate of 5.66 cfs per acre of surface area	Limit to existing peak runoff rate for 2-, 10-, and 100-year, 24-hour storm events	Not to exceed existing runoff rates
Water Quality	Minimum dead pool volume for treatment ponds of 1800 cubic feet per acre drained, or infiltration/filtration systems designed to remove 80% of TSS	Treat runoff from 2.5-inch storm event from net new or additional impervious areas through detention	Should treat runoff from 2.5-inch storm over entire contributing area presuming full development
Infiltration	0.5-inch runoff from new impervious surfaces for projects with discharge points within one mile of an impaired or special water	1-inch runoff from net new or additional impervious surfaces	Should limit runoff volumes and nutrient discharge to 1988 levels or lower

2.1. Best Management Practices (BMPs) Incorporated into Design

During a meeting with Mn/DOT on November 6, 2009, it was discussed that Mn/DOT preferred aboveground stormwater treatment for maintenance purposes. Therefore, the decision was made to incorporate ponds as a method of rate control and water quality treatment, and infiltration basins to meet infiltration volume requirements.

Mn/DOT has taken the approach of "over-treating" stormwater in one drainage area if another drainage area does not have sufficient right of way available for ponds and/or infiltration devices. However for this project, since the NMCWD requires rate control for all points where stormwater discharge leaves a parcel, the stormwater treatment devices required to treat stormwater from each drainage area were placed within their respective drainage areas. If there is inadequate right of way for stormwater treatment in a drainage area, it is noted in Section 3.0, Project Drainage Areas and Treatment, below. Stormwater treatment device locations should be coordinated with the NMCWD, and the RBWMO and Cities as appropriate, in future design.

As noted above, the stormwater treatment for the project was designed to follow NMCWD requirements, not RBWMO requirements, per direction from the RBWMO. Permits and/or coordination would still be required from the Cities of Richfield and Bloomington.

2.1.1. Ponds

Ponds were located near roadway low points and designed with the following assumptions:

- Size for drainage area within the estimated right of way with dead pool equal to runoff from a 2.5-inch storm event from net new or additional impervious areas (i.e. the difference in volume between the runoff due to the proposed project and the runoff from the existing condition). Right of way was estimated to be at the location of existing right of way or 15 feet outside of the proposed construction limits, whichever produced the greater area.
- Four-foot depth below the normal water level. A four-foot depth can be deepened to add volume to the dead pool, if necessary.
- Six-foot depth above the normal water level. Preliminary HydroCAD modeling shows that live pool bounce is approximately six feet for a few sample ponds. Ponds should be modeled in future design to more accurately determine live pool levels.
- Side slopes of 1:4 above the normal water level, a 10-foot wide bench with 1:10 side slopes immediately below the normal water level and side slopes of 1:4 extending to the pond bottom.

Figure 05 shows the typical section of the stormwater treatment ponds.

2.1.2. Infiltration Basins

Infiltration basins were located near roadway low points or where there was available space and designed with the following assumptions:

- Size for one-inch of runoff from net new or additional impervious areas
- Two-foot depth.
- Side slopes of 1:4.

It is recommended to install a pre-treatment system to remove sediments from the stormwater runoff before it enters the infiltration basin. Pre-treatment should reduce infiltration basin maintenance and extend the life of the infiltration basin. Pre-treatment could be accomplished by using a proprietary stormwater treatment device to mechanically remove solids from the stormwater runoff or by connecting stormwater treatment ponds to infiltration basins, allowing stormwater to enter ponds, settle out solids, and overflow into infiltration basins at a certain elevation.

2.2. Project Soils

The Natural Resources Conservation Service (NRCS) divides soils into four hydrologic soil groups based on their rates of infiltration of water. Hydrologic Soil Group A will infiltrate the most stormwater, while Group D infiltrates the least. Group A soils have high infiltration rates even when thoroughly wetted. Their minimum infiltration rate is 0.30 to 0.45 inches per hour according to the Mn/DOT Drainage Manual. The State of Minnesota Stormwater Manual notes design infiltration rates for Type A soils range from 0.8 to 1.6 inches per hour.

According to the Hennepin County Soil Survey, the Comprehensive Surface Water Management Plan for the City of Richfield, the Comprehensive Surface Water Management Plan for the City of Bloomington, and the Nine Mile Creek Watershed District Water Management Plan, the soils in the project area have no Hydrologic Soil Group classification, but rather are referred to as "urban land" or "unknown".

Soil borings conducted in conjunction with designing the American Boulevard bridge over I-35W, S.P. 2782-27R05, show soil textures within twenty feet of the surface in the area of the bridge to be primarily sands and fine sands. Such soils might be considered Group A soils with the lower infiltration rate (0.30 inches per hour/0.8 inches per hour). Conversations with City of Bloomington staff revealed that, based on the City of Bloomington's experiences on local projects adjacent to the corridor, the soils appear to be conducive to infiltration. Subsurface soil infiltration rates should be analyzed in conjunction with final design.

According to MPCA requirements, a minimum of three feet of separation must be provided between the bottom of proposed infiltration facilities and seasonally saturated soils beneath. In 2004, Mn/DOT installed a piezometer for monitoring groundwater elevations at five locations from Penn Avenue to the east. Available piezometer data, included in the I-494 Stormwater Alternatives Study, spans the period from September 2004 through February 2007. Among the three piezometers in the project area, the variation from minimum observed groundwater elevation to maximum observed elevation does not exceed 0.73 foot. A summary of piezometer measurement data within the project area is shown in Table C. Final design should verify that the requisite minimum separation is achieved.

Table C Summary of Piezometer Data

Piezometer Location	Ground Surface Elevation	Highest Groundwater Elevation / Date
Penn Avenue	826.1	811.26 / 03-11-2005
Nicollet Avenue	826.6	811.87 / 09-16-2004
Portland Avenue	825.3	810.48 / 09-18-2006

3.0 Project Drainage Areas and Treatment

The drainage area boundaries and corresponding calculations for this study were estimated using the following sources:

- City of Bloomington storm sewer network and contour GIS data provided in August and November 2009
- Mn/DOT utility files, *S2785EW_fip.dgn* & *S2782288_FIP.DGN*, received September 2009 from SEH, Inc.
- Mn/DOT contour file, *mntco107371_cn1.dgn*, received September 2009 from SEH, Inc.
- As-built files received September & October 2009 from SEH, Inc.
- Proposed geometric layout, *mntco107371_full build_gm1.dgn* & *mntco107371_phase1_gm1.dgn*, by SEH, Inc. received January 26, 2010, and shown in Figures 01A/B and 02A/B, respectively

The proposed alignment along I-494 begins approximately 1,400 feet west of Xerxes Avenue and extends east to approximately 600 feet east of Portland Avenue. The northern limits of the I-35W roadway improvement are located near 66th Street, and the southern limits are located approximately 800 feet south of 90th Street. The project area is comprised of eight drainage areas. One drainage area includes the interchange itself (Area Interchange). Along I-494, two drainage areas are located on the west side of the interchange (Areas 494-Xerxes and 494-Penn), and one drainage area is located on the east side of the bridge (Area 494-Lyndale/Nicollet). Along I-35W, there is one drainage area north of the interchange (Area 35W-North) and three areas south of the interchange (Areas 35W-82nd, 35W-86th and 35W-90th). No drainage area was analyzed at Portland Avenue since the roadway will need to tie-in further east of the current roadway extents and a new interchange at Portland Avenue will be constructed. When the roadway has been designed for the eastern portion of the project in later design, stormwater treatment should be analyzed in this area. Drainage patterns were compared between the existing and proposed conditions in these drainage areas. Figure 03 shows the existing drainage patterns. Figures 04A/B shows the proposed drainage boundaries and treatment devices.

Land use in the project area is currently urban, including street pavement, commercial and business areas, residential areas, and some open grass. Land use is not expected to change significantly, although impervious area will increase by approximately 3.8 acres (Phase 1 layout) and 36.1 acres (Ultimate layout) due to the widened roadway section and auxiliary lanes. Additional impervious area increases stormwater runoff, which has an adverse effect on roadside water quality. To comply with the stormwater treatment requirements of the NMCWD and the MPCA, it is proposed to treat stormwater from the proposed project area in stormwater ponds and infiltration basins. A comparison of existing, Phase 1, and Ultimate impervious areas for each drainage area is shown in Table D.

Table D Existing, Phase 1, and Ultimate Impervious Area

Pond/Drainage Area Name	Total R/W Drainage Area (ac.)	Existing		Phase 1 Layout			Ultimate Layout		
		Imperv. (ac.)	Percent Imperv.	Imperv. (ac.)	Percent Imperv.	Percent Imperv. Increase	Imperv. (ac.)	Percent Imperv.	Percent Imperv. Increase
494 - Xerxes	30.2	11.0	36.5%	11.8	39.2%	2.7%	17.5	58.0%	21.6%
494 - Penn	36.4	23.5	64.5%	23.1	63.3%	-1.2%	26.3	72.1%	7.6%
494 - Lyndale/Nicollet	63.0	34.5	54.7%	34.7	55.1%	0.4%	42.9	68.1%	13.3%
35W - North	45.3	23.6	52.1%	24.3	53.6%	1.5%	30.3	66.9%	14.8%
Interchange	53.6	21.8	40.7%	22.6	42.2%	1.5%	27.0	50.3%	9.6%
35W - 82nd	31.1	17.4	56.2%	19.3	62.3%	6.1%	19.9	64.1%	8.0%
35W - 86th	30.4	13.7	45.0%	13.5	44.5%	-0.6%	16.6	54.6%	9.6%
35W - 90th	19.5	10.5	53.8%	10.5	53.8%	0.0%	11.7	60.1%	6.3%
TOTAL	309.4	156.0	50.4%	159.8	51.7%	1.2%	192.1	62.1%	11.7%

Table E shows the required Phase 1 and Ultimate dead pool and infiltration volumes for each drainage area. The table also shows the actual dead pool and infiltration volumes of the ponds and infiltration basins shown in Figures 04A/B. Because impervious area is increasing by only 3.8 acres in the Phase 1 condition, a total dead pool volume of 0.6 ac-ft and a total infiltration volume of 0.3 ac-ft are required for stormwater treatment. Ponds and infiltration basins shown in Figures 04A/B are sized for the Ultimate condition, unless there is inadequate right of way. In that case, it is noted in Table E whether there is adequate right of way for the Phase 1 condition.

In areas where the ground adjacent to the roadway is presently higher than the roadway, retaining walls may be required to create space for ponds and infiltration basins.

Table E Phase 1, Ultimate, and Available Dead Pool and Infiltration Volumes

Pond/Drainage Area Name	Phase 1 Layout		Ultimate Layout		Available	
	Required Dead Pool Vol. (ac-ft)	Required Infilt. Vol. (ac-ft)	Required Dead Pool Vol. (ac-ft)	Required Infilt. Vol. (ac-ft)	Actual Dead Pool Vol. (ac-ft)	Actual Infilt. Vol. (ac-ft)
494 - Xerxes	0.1	0.1	0.9	0.5	1.0	0.6
494 - Penn	0.0	0.0	0.5	0.2	0.0 [a]	0.2
494 - Lyndale/Nicollet	0.0	0.0	1.4	0.7	1.6	0.7
35W - North	0.1	0.1	1.1	0.6	0.0 [b]	0.0 [b]
Interchange	0.1	0.1	0.7	0.4	1.0	0.4
35W - 82nd	0.3	0.2	0.4	0.2	0.0 [b]	0.2
35W - 86th	0.0	0.0	0.4	0.2	0.5	0.3
35W - 90th	0.0	0.0	0.2	0.1	0.0 [a]	0.1
TOTAL	0.6	0.3	5.6	3.0	4.5	2.6

[a] Does not meet Ultimate Layout requirements within estimated right of way
[b] Does not meet Phase 1 Layout or Ultimate Layout requirements within estimated right of way

3.1. Drainage Area 494-Xerxes

Area 494-Xerxes includes I-494 from the western project limits approximately 1,400 feet west of Xerxes Avenue to the roadway high point approximately 1,100 feet east of Xerxes Avenue. The drainage area is approximately 30.2 acres.

Stormwater runoff from the drainage area currently drains west along I-494 to TH 100 with no stormwater treatment. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. The Phase 1 condition requires a dead pool volume of 0.1 ac-ft and infiltration volume of 0.1 ac-ft. The Ultimate condition requires a dead pool volume of 0.9 ac-ft and infiltration volume of 0.5 ac-ft. The pond and infiltration basin shown in Figure 04A have adequate volume to treat the Ultimate condition. It is likely that retaining walls would be required to create space for a pond and infiltration basin.

3.2. Drainage Area 494-Penn

Area 494-Penn includes I-494 from the roadway high point approximately 1,100 feet east of Xerxes Avenue to approximately 1,700 feet east of Penn Avenue. The drainage area is approximately 36.4 acres.

Stormwater runoff from the drainage area is directed to a pump station located southeast of the Penn Avenue interchange. From there, water is pumped south to Upper Penn Lake with no stormwater treatment. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. Because there is a decrease in impervious area from the existing condition to the Phase 1 condition, no stormwater treatment is required by the NMCWD in the Phase 1 condition. The Ultimate condition requires a dead pool volume of 0.5 ac-ft and infiltration volume of 0.2 ac-ft. There is currently insufficient available right of way within Area 494-Penn to meet the dead pool requirement for the Ultimate condition, but the infiltration basins shown in Figure 04A have adequate volume to treat the required infiltration volume for the Ultimate condition. One option for meeting the dead pool requirement would be to over-treat stormwater in available space in a different drainage area. The City of Bloomington also noted that Upper Penn Lake could be used to treat stormwater from this drainage area. This should be coordinated with the NMCWD and the Cities of Richfield and of Bloomington in future design.

3.3. Drainage Area 494-Lyndale/Nicollet

Area 494-Lyndale/Nicollet includes I-494 from the approximately 400 feet east of I-35W to the roadway high point approximately 1,200 feet east of Nicollet Avenue. The drainage area is approximately 63.0 acres.

Stormwater runoff from the drainage area drains east along I-494 to the Minnesota River with some stormwater treatment in stormwater ponds within the Lyndale Avenue interchange and infiltration basins along I-494. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. Because there is a negligible increase in impervious area from the existing condition to the Phase 1 condition, no stormwater treatment is required by the NMCWD in the Phase 1 condition. The Ultimate condition requires a dead pool volume of 1.4 ac-ft and infiltration volume of 0.7 ac-ft. It is proposed to drain the entire area to the Nicollet Avenue interchange for treatment. The ponds and infiltration basin shown in Figure 04B have adequate volume to treat the Ultimate condition. It is likely that retaining walls would be required to create adequate space for a pond and infiltration basin.

3.4. Drainage Area 35W-North

Area 35W-North includes I-35W from the roadway high point just north of 76th Street to the northern project limits near 66th Street. The drainage area is approximately 45.3 acres.

Stormwater runoff from the drainage area currently drains to Wood Lake on the east side of I-35W with no stormwater treatment. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. The Phase 1 condition requires a dead pool volume of 0.1 ac-ft and infiltration volume of 0.1 ac-ft. The Ultimate condition requires a dead pool volume of 1.1 ac-ft and infiltration volume of 0.6 ac-ft. There is currently insufficient available right of way within Area 35W-North to meet the dead pool and infiltration requirement for the Phase 1 or Ultimate condition. One option for meeting the dead pool requirement would be to over-treat stormwater in available space in a different drainage area. Wood Lake could be used to treat stormwater from this drainage area. This should be coordinated with the NMCWD and the City of Richfield in future design.

3.5. Drainage Area Interchange

Area Interchange consists of the I-494/35W Interchange, including I-494 from approximately 1,000 feet west of I-35W to approximately 400 feet east of I-35W, and I-35W from the roadway high point approximately 800 feet south of I-494 to just north of 76th Street. The drainage area is approximately 53.6 acres.

The stormwater from the interchange itself undergoes some treatment in dry ponds located within the interchange. Stormwater runoff from the drainage area drains southwest to Upper Penn Lake. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. The Phase 1 condition requires a dead pool volume of 0.1 ac-ft and infiltration volume of 0.1 ac-ft. The Ultimate condition requires a dead pool volume of 0.7 ac-ft and infiltration volume of 0.4 ac-ft. It is proposed to treat the stormwater from the proposed condition in a stormwater pond and infiltration basin located within the interchange. The pond and infiltration basin shown in Figure 04A have adequate volume to treat the Ultimate condition.

3.6. Drainage Area 35W-82nd

Area 35W-82nd includes I-35W from the roadway high point approximately 800 feet south of I-494 to approximately 800 feet south of 82nd Street. The drainage area is approximately 31.1 acres.

Stormwater runoff from the drainage area drains southwest to Upper Penn Lake on the west side of I-35W with some stormwater treatment in infiltration basins within the 82nd Street interchange. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. The Phase 1 condition requires a dead pool volume of 0.3 ac-ft and infiltration volume of 0.2 ac-ft. The Ultimate condition requires a dead pool volume of 0.4 ac-ft and infiltration volume of 0.2 ac-ft. There is currently insufficient available right of way within Area 35W-82nd to meet the dead pool requirement for the Ultimate condition, but the infiltration basin shown in Figure 04B has adequate volume to treat the required infiltration volume for the Ultimate condition. One option for meeting the dead pool requirement would be to over-treat stormwater in available space in a different drainage area. The City of Bloomington also noted that Upper Penn Lake could be used to treat stormwater from this drainage area. This should be coordinated with the NMCWD and the City of Bloomington in future design.

3.7. Drainage Area 35W-86th

Area 35W-86th includes I-35W from the roadway high point approximately 800 feet north of 86th Street to approximately 1,300 feet south of 86th Street. The drainage area is approximately 30.4 acres.

Stormwater runoff from the drainage area drains west to Lower Penn Lake on the west side of I-35W with no stormwater treatment. Figure 03 shows existing drainage patterns.

Drainage patterns are not expected to change in the proposed conditions. Because there is a slight decrease in impervious area from the existing condition to the Phase 1 condition, no stormwater treatment is required by the NMCWD in the Phase 1 condition. The Ultimate condition requires a dead pool volume of 0.4 ac-ft and infiltration volume of 0.2 ac-ft. The pond and infiltration basin shown in Figure 04B have adequate volume to treat the Ultimate condition. It is likely that retaining walls would be required to create sufficient space for a pond and infiltration basin.

3.8. Drainage Area 35W-90th

Area 35W-90th includes I-35W from approximately 1,300 feet south of 86th Street to the southern project limits approximately 800 feet south of 90th Street. The drainage area is approximately 19.5 acres.

Stormwater runoff from the drainage area drains west to Lower Penn Lake on the west side of I-35W with no stormwater treatment.

Drainage patterns are not expected to change in the proposed conditions. Because there is no change in impervious area from the existing condition to the Phase 1 condition, no stormwater treatment is required by the NMCWD in the Phase 1 condition. The Ultimate condition requires a dead pool volume of 0.2 ac-ft and infiltration volume of 0.1 ac-ft. There is currently insufficient available right of way within Area 35W-90th to meet the dead pool requirement for the Ultimate condition, but the infiltration basin shown in Figure 04B has adequate volume to treat the required infiltration volume for the Ultimate condition. One option for meeting the dead pool requirement would be to over-treat stormwater in available space in a different drainage area. This should be coordinated with the NMCWD and the Cities of Richfield and Bloomington in future design.

4.0 Existing Public Utilities

Public utilities exist along and across the I-494 and the I-35W segments of the corridor. The subsequent discussion is based on the following references:

- Mn/DOT electronic utility file S2782288_FIP.DGN received from SEH on September 21, 2009
- As built plans of the American Boulevard Bridge, SP 2782-27R05, and associated construction, SP 107-010-09, received from SEH on October 14, 2009
- City of Richfield as built plans, received from SEH on October 16, 2009 as follows:
  - Best Buy Campus
  - Humboldt Avenue from 76th Street to Wood Lake, SP 157-108-19
  - Various sanitary sewer and water main plans
  - Meridian Crossings site plans
  - The Shops at Lyndale site plans
- Mn/DOT plans, received from SEH on November 24, 2009 as follows
  - 76th Street Bridge, SP 2782-27V98
  - I-35W from 350' north of 90th Street South to 490' north of I-494, SP 2782-287
  - I-35W from I-494 to 600' north of 76th Street and on 76th Street from Knox Avenue to Girard Avenue, SP 2782-288
- Geographic Information System (GIS) files of City of Bloomington utilities, received from the City on November 24, 2009.

Proposed project stationing is shown on Figures 01A/B for the Ultimate layout, while Figures 02A/B show stationing for the Phase 1 layout. From the western limits of the project to the eastern limits, and from the south limits to the north, public utilities will be affected by the proposed project. Due to its larger scope, the Ultimate design will exert a greater impact than will the Phase 1 design. Relevant utilities include sanitary sewers and water mains that are segments of the City of Richfield and the City of Bloomington wastewater collection and potable water distribution systems.

4.1. Turbine Design – Phase 1

Exhibit G shows existing utilities that are anticipated to be affected in conjunction with the Phase 1 design. Utility locations are shown divided into three segments: I-494, the interchange, and I-35W. Within each segment, utilities presumed to be impacted by the project and the nature of possible utility modifications is shown by stationing of eastbound I-494 and by stationing of northbound I-35W.

Estimated utility impacts include segments of I-494 beginning east of Xerxes Avenue at approximately Sta. 561+00, and ending west of the interchange at approximately Sta. 591+00. On I-35W, possible utility impacts begin south of 84th Street at approximately Sta. 280+00, and extend along segments of I-35W to include much of the interchange, terminating on the north at 75th Street.

4.2. Turbine Design – Ultimate

Exhibit G shows probable affects on existing utilities as a result of the Ultimate design. As discussed in Section 4.1., the westerly-most impact is estimated to begin at I-494 Sta. 561+00. Utility impacts are anticipated to extend east on segments of I-494 to approximately Sta. 682+00, which is just west of Portland Avenue. On I-35W utility considerations begin near 90th Street at approximately Sta. 244+00 and extend north along segments of I-35W to approximately Sta. 364+00 north of 72nd Street. At the interchange, water main relocation in and adjacent to the southwest quadrant is anticipated to be more extensive than for Phase 1 design due to the proposed EB I-494 to SB I-35W ramp geometrics. Otherwise utility impacts at the interchange will be similar to those of Phase 1.

5.0 Conclusions and Recommendations

The project is comprised of eight drainage areas. Presently stormwater runoff from the project area is mostly untreated. Stormwater runoff from I-494 west of the existing interchange, the interchange itself, and I-35W from 76th Street to 90th Street, drains to Nine Mile Creek via Upper Penn Lake and Lower Penn Lake. North of 76th Street, I-35 in the project limits drains to Wood Lake. Runoff from I-494 east of the interchange is directed east, outletting to the Minnesota River east of 34th Avenue. Drainage patterns are not expected to change as a result of the project.

Stormwater treatment requirements in the project area currently call for rate control, water quality, and infiltration of stormwater runoff. Mn/DOT prefers that stormwater runoff be treated aboveground for ease of maintenance. As a result, stormwater ponds and infiltration basins were sized for this project to meet current regulatory requirements. Four of the eight drainage areas currently have adequate right of way to meet pond dead pool and infiltration requirements. It may be possible to over-treat stormwater in drainage areas with extra ponding/infiltration space, but this approach should be discussed with the NMCWD and the Cities of Bloomington and Richfield in future design. Ponds should also be hydraulically modeled during future design to determine live pool bounce.

The proposed geometrics for the Turbine Design, both the Phase 1 and the Ultimate layouts, will result in conflicts with existing public utilities. Affected utilities include sanitary sewers and water mains that are portions of the City of Richfield and the City of Bloomington wastewater collection and potable water distribution systems. Portions of existing water mains and sanitary sewers that cross I-494 or I-35W, and that presently do not lie beneath the roadway or ramps, will need to be encased to preclude disturbing the roadway in the future if access to the pipe is necessary. Sections of water lines, whether at roadway crossings or along roadways, may need to be reconstructed at a greater depth to accommodate

final design horizontal and vertical alignments. Sanitary sewers and water lines that are oriented parallel or roughly parallel with proposed roadways, ramps, and retaining walls will need to be moved as necessary to provide adequate distance from roadways and ramps to allow accessibility for maintenance, fire fighting, future extension, and to preclude damage to roadways and structures in the event of pipe failure. The exact extent of conflicts and methodologies of mitigation will need to be determined during future design development.

Exhibit A

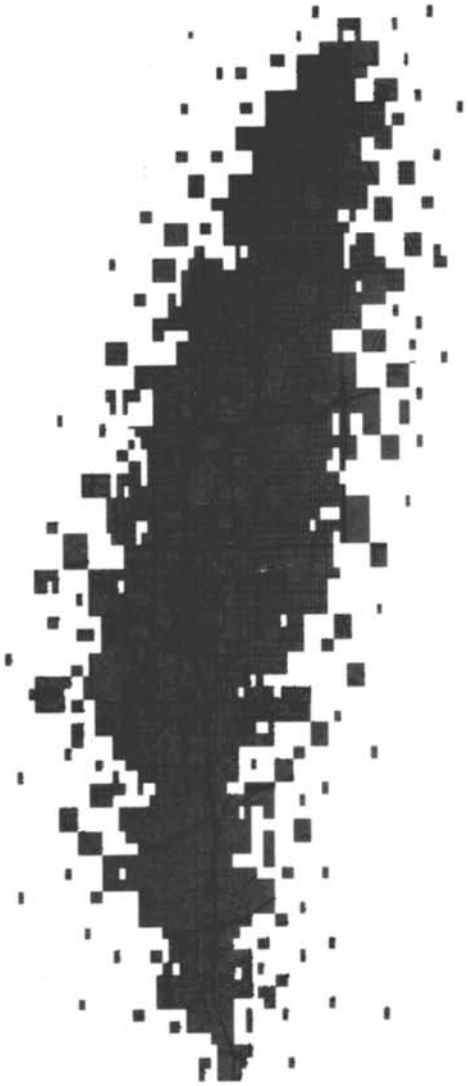
I-35W Environmental Impact Statement Water Resources
Special Study (Cover)

I-35W EIS
WATER RESOURCES SPECIAL STUDY
JULY 1991

MINNESOTA
DEPARTMENT
OF
TRANSPORTATION

METROPOLITAN
COUNCIL

FEDERAL
HIGHWAY
ADMINISTRATION



SRF Strgar-Roscoe-Fausch, Inc.
Consulting Engineers

Exhibit B

Interstate 494 From I-394 to the Minnesota River FEIS (Cover)

FHWA-MN-EIS 92-02-F
Federal Highway Administration

INTERSTATE 494
From
Interstate 394 to the Minnesota River
Hennepin County, Minnesota

Minnesota Project: IM-NH 494-4()
State Project Number: 2785-261

FINAL
ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f)/6(f) EVALUATION

Submitted Pursuant to 42 U.S.C. 4332(2)(c), 49 U.S.C. 303,
and Minn. Stat., Chapt. 116D
by
U.S. Department of Transportation,
Federal Highway Administration
and
Minnesota Department of Transportation

Cooperating Agencies

U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Federal Transit Administration

6/29/01		
Date of Approval	For Mn/DOT	Richard Stehr, Metropolitan Division Engineer
7-3-01		
Date of Approval	For Mn/DOT	Merritt H. Linzie, Chief Environmental Officer
8/15/01		
Date of Approval	For FHWA	Alan R. Steger, Division Administrator

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Roseville, Minnesota 55113-3105
(651) 582-1305

ABSTRACT: The proposed action involves improvements to I-494 from the junction with I-394 to the Minnesota River, a distance of 29.3 kilometers (18.2 miles). The Preferred Alternative analyzed in this Final Environmental Impact Statement and Section 4(f)/6(f) Evaluation includes the construction of one additional through-lane in each direction; auxiliary lanes, access changes, reconfiguration of selected interchanges, and other operational and traffic management improvements; plus preservation of right-of-way in the median (east of TH 169) for future transportation needs.

Exhibit C

Penn Lake Use Attainability Analysis (Cover)

Penn Lake

Use Attainability Analysis

December 2003

BARR

Exhibit D

Interstate 494 Improvements-Penn Avenue to the Minnesota River:
Interstate 494 Stormwater Alternatives Study (Cover)

Interstate 494 Improvements

Penn Avenue to the Minnesota River: Interstate 494 Stormwater Alternatives Study

Minnesota Department of Transportation
Metro District

Final
31 May 2007

Stanley Consultants INC.
A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

Exhibit E

NPDES Construction General Permit Application and
Construction Storm Water Pollution Prevention Plan Template

Minnesota Pollution Control Agency

Complete your application online!

Application for General Stormwater Permit for Construction Activity (MN R100001)

National Pollutant Discharge Elimination System / State Disposal System (NPDES/SDS)

Please submit to: Minnesota Pollution Control Agency
Construction Stormwater Permit Program
520 Lafayette Road North, St. Paul, MN 55155-4194

PLEASE READ: This form is for new permit applications only. Use the Notice of Termination/Permit Modification form to transfer permit coverage for a project or a portion of a project to a new owner/contractor. Forms are available at the MPCA's Construction Stormwater Web site: www.pca.state.mn.us/water/stormwater/stormwater-c.html. Complete your application online!

Please refer to the application instructions and the NPDES/SDS General Stormwater Permit for Construction Activity (MN R100001) as you complete this form. Brackets '[ ]' refer to specific parts of the permit. For assistance, call the Stormwater Program at 651-757-2119 or toll-free at 800-657-3804.

Are you ready to apply?

1. Stormwater Pollution Prevention Plan (SWPPP)

a. Has a Stormwater Pollution Prevention Plan been developed for this project and incorporated into the project's plans and specifications [Part III.A] ☐ Yes ☐ No

b. If an environmental review was required for this project or a common plan of development or sale that includes this project, has the environmental review been completed and all stormwater mitigative requirements been incorporated in the SWPPP as required in Part III.A.6 of the permit? ☐ Yes ☐ No ☐ NA

2. Discharges to Special or Impaired Waters

a. If any portion of the project has a discharge point within 1 mile of a special water or a water that is impaired for sediment or a sediment related parameter (see Appendix A.B), does the SWPPP contain the additional requirements found in Appendix A, Part A-C? If the project does not have a discharge point within 1 mile of a special water or a water that is impaired for sediment or a sediment related parameter of the permit indicate "NA" ☐ Yes ☐ No ☐ NA

b. If this project is discharging to a Calcareous fen, has an approval letter been obtained from the DNR as required in Part III.A.8 of the permit? ☐ Yes ☐ No ☐ NA

STOP if you responded 'No' to any question above. A SWPPP must be developed prior to submitting a permit application. Complete the above requirements and check 'Yes' before submitting this application. Continue if you responded 'Yes' or 'NA' to all questions above.

3. Additional Application Review:

a. Will the project include alternative treatment methods? [Part III.C.5] If yes, this application and the alternative treatment plans must be submitted a minimum of 90 days before construction starts. ☐ Yes ☐ No

b. If yes, are the plans attached? ☐ Yes ☐ No

c. Will the project disturb 50 acres? AND Is there a discharge point within one mile of an impaired or special water whose discharge may reach an impaired or special water listed in Appendix A of the permit? [Part II.B.1.b] If yes, this application and the SWPPP must be submitted a minimum of 30 days before construction starts. ☐ Yes ☐ No

d. If 'Yes,' is the SWPPP attached? ☐ Yes ☐ No

4. Application Fee:

Is the required $400 Application Fee (payable to the MPCA) enclosed? ☐ Yes

Construction Activity Information

5. Project name: _____

6. Project location:

a. Briefly describe where the construction activity occurs (For example: "Intersection of 45th St. and Irving Ave.") Include address if available: _____

b. All cities where project will occur: _____

c. All counties where project will occur: _____

d. All townships where project will occur: _____

e. Project ZIP Code: _____

f. Latitude and longitude of approximate centroid of project:

Latitude: _ _ . _ _ _ _ ○ N (decimal) *Preferred* *Longitude:* _ _ . _ _ _ _ ○ W (decimal) *Preferred*

_ _ ○ _ _ ' _ _ N (degrees, minutes, seconds) _ _ ○ _ _ ' _ _ W (degrees, minutes, seconds)

g. Method used to collect latitude and longitude:

☐ GPS

☐ USGS Topographic map — Map scale: _____

☐ Other

7. Project size:

Number of acres to be disturbed to the nearest quarter acre: _____

8. Project map:

A map must be included with the application for all projects disturbing 50 acres or more. Is a project map included? ☐ Yes ☐ No

9. Project type:

☐ Residential ☐ Residential / Road construction ☐ Other: ☐

☐ Commercial / Industrial ☐ Commercial / Road construction

☐ Road construction ☐ Commercial / Residential / Road construction

10. Cumulative impervious surface:

a. Existing area of impervious surface in acres: _____

b. Post-construction area of impervious surface in acres (If additional new impervious surface created by the project is less than one acre, skip to Question 12): _____

11. Permanent stormwater management:

- ☐ Wet sedimentation basin
- ☐ Infiltration / filtration
- ☐ Regional ponding
- ☐ Other (Use only if there is no feasible way of installing the treatment systems listed above for reasons such as lack of right-of-way or proximity to bedrock)
- ☐ Alternative methods (If using alternative methods, construction cannot commence until receiving approval from the MPCA.)

12. Receiving waters:

Identify surface waters within one mile of project boundary that will receive storm water from the site or discharge from permanent Stormwater management system. Include waters shown on USGS 7.5 minute quad or equivalent, all Special Waters and Impaired waters identified in Appendix A of the permit (To find Special or Impaired Waters, use the Special and Impaired Waters Search tool at www.pca.state.mn.us/water/stormwater/stormwater-c.html.

The Impaired Waters* list, also known as the Section 303(d) list can be found at http://www.pca.state.mn.us/water/tmdl/index.html Use additional paper if necessary.

* Impaired waters for the purpose of this permit are those identified as impaired for the following pollutant(s) or stressor(s): phosphorus, turbidity, dissolved oxygen, or biotic impairment

Name of water body	**Type of water body** (Ditch, pond, wetland, stream, river)	**Special Water?** See Stormwater Permit, Appendix A	**Impaired Water?** See Stormwater Permit, Appendix A
		☐ Yes ☐ No	☐ Yes ☐ No
		☐ Yes ☐ No	☐ Yes ☐ No
		☐ Yes ☐ No	☐ Yes ☐ No
		☐ Yes ☐ No	☐ Yes ☐ No

13. Dates of construction

a. Start date: ____/____/____

b. Estimated Completion date: ____/____/____

STOP This form will not be accepted if the Owner and Contractor contact information sections, below, are BOTH not completed and signed. If the owner is also the contractor, or a contractor hasn't yet been selected, the owner must also fill out the contractor information section and sign again.

Responsible parties

BOTH PARTIES MUST SIGN

Owner

Business or firm name

Last name | First name | Title

E-mail | Phone (include area code)

Mailing address | City | State | ZIP Code

Alternate contact name | E-mail | Phone (include area code)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or the persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I also certify under penalty of law that I have read, understood, and accepted all terms and conditions of the NPDES/SDS General Stormwater Permit Construction Activity (MN R100001) that authorizes stormwater discharges associated with the construction site identified on this form.

X Authorized signature: _____ Date: _____

This Application must be signed by:

- *Corporation: a principal executive officer of at least the level of vice-president or the duly authorized representative or agent of the executive officer if the representative or agent is responsible for the overall operation of the facility that is the subject of the permit application.*
- *Partnership or Sole Proprietorship: a general partner or the proprietor.*
- *Municipality, State, Federal or Other Public Agency: principal executive officer or ranking elected official.*

Contractor

Business or firm name

Last name | First name | Title

E-mail | Phone (include area code)

Mailing address | City | State | ZIP Code

Alternate contact name | E-mail | Phone (include area code)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or the persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I also certify under penalty of law that I have read, understood, and accepted all terms and conditions of the NPDES/SDS General Stormwater Permit Construction Activity (MN R100001) that authorizes stormwater discharges associated with the construction site identified on this form.

X Authorized signature: _____ Date: _____

This Application must be signed by:

- *Corporation: a principal executive officer of at least the level of vice-president or the duly authorized representative or agent of the executive officer if the representative or agent is responsible for the overall operation of the facility that is the subject of the permit application.*
- *Partnership or Sole Proprietorship: a general partner or the proprietor.*

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Attachment A: Construction SWPPP Template

Stormwater Pollution Prevention Plan (SWPPP) Template
To comply with the General Stormwater Permit for Construction Activity

Doc Type: Stormwater Pollution Prevention Plan

Important: Before completing this SWPPP, you must read and understand the requirements in the General Stormwater Permit for Construction Activity (MN R100001) available from Minnesota Pollution Control Agency (MPCA) Web site at http://www.pca.state.mn.us/water/stormwater/index.html. An overview of the permit is available from MPCA at http://www.pca.state.mn.us/publications/wq-strm2-05.pdf. This *Construction SWPPP Template* will help you complete information required in Parts III and IV of the permit.

Construction Activity Information

Project name: _____

Project location (Briefly describe where construction activity occurs. Include address if available.)

Address or describe area: _____

City or Township: _____ State: MN Zip code: _____

Latitude/longitude of approximate centroid of project: _____

Method of collection of latitude/longitude:

☐ GPS ☐ Online tool ☐USGS Topographic map Scale used: _____

All cities where construction will occur: _____

All counties where construction will occur: _____

All townships where construction will occur: _____

Project size (number of acres to be disturbed): _____

Project type:

☐ Residential ☐ Commercial/Industrial ☐ Road construction

☐ Residential and road construction ☐ Other (describe): _____

Cumulative impervious surface:

Existing area of impervious surface: _____ (to the nearest quarter acre)

Post construction area of impervious surface: _____ (to the nearest quarter acre)

Receiving waters

Water body ID*	Name of water body	Type (ditch, pond, wetland, lake, stream, river)	Special water? (See Stormwater Permit Appendix A)	Impaired Water?** (See Stormwater Permit Appendix A)
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No

** Water Body identification (ID) might not be available for all water bodies. Use the Special and Impaired Waters Search Tool at: www.pca.state.mn.us/water/stormwater/stormwater-c.html.*

*** Impaired water for the following pollutant(s) or stressor(s): phosphorus, turbidity, dissolved oxygen, or biotic impairment.*

Dates of construction (Briefly describe where construction activity occurs. Include address if available.)

Construction start date: _____ Estimated completion date: _____

Contact Information

Owner of the site

Business or firm name: _____

Owner name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

Contact name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

Contractor (Person who will oversee implementation of the SWPPP)

Business or firm name: _____

Owner name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

Contact name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

Party responsible for long-term operation and maintenance of the permanent Stormwater Management System

Business or firm name: _____

Owner name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

Contact name: _____ Title: _____

Mailing address: _____

City: _____ State: _____ Zip code: _____

E-mail address: _____ Telephone: _____

General Construction Project Information

Describe the construction activity (what will be built, general timeline, etc): _____

_____

_____

Describe soil types found at the project: _____

_____

_____

General Site Information (III.A)

1. Describe the location and type of all temporary and permanent erosion prevention and sediment control Best Management Practices (BMPs). Include the timing for installation and procedures used to establish additional temporary BMPs as necessary. (III.A.4.a)

2. Attach to this SWPPP a table with the anticipated quantities for the life of the project for all erosion prevention and sediment control BMPs (III. A. 4.b)

3. Attach to this SWPPP a site map that includes the following features (III.A.3.b – f):

- Existing and final grades, including dividing lines and direction of flow for all pre and post-construction stormwater runoff drainage areas located within the project limits.
- Locations of impervious surfaces and soil types.
- Locations of areas not to be disturbed.
- Location of areas of phased construction
- All surface waters and existing wetlands within one mile from the project boundaries that will receive stormwater runoff from the site (identifiable on maps such as USGS 7.5 minute quadrangle maps or equivalent). Where surface waters receiving runoff associated with construction activity will not fit on the plan sheet, they must be identified with an arrow, indicating both direction and distance to the surface water.

Methods to be used for final stabilization of all exposed soil areas.

4. Were stormwater mitigation measures required as the result of an environmental, archaeological, or other required local, state, or federal review of the project? ☐ Yes ☐ No

If yes, describe how these measures were addressed in the SWPPP. (III.A.6.)

5. Is the project located in a karst area such that additional measures would be necessary to protect drinking water supply management areas as described in Minn. R. chapters 7050 and 7060? ☐ Yes ☐ No

If yes, describe the additional measures to be used. (III.A.7.)

6. Does the site discharge to a calcareous fen listed in Minn. R. 7050.0180, subp. 6.b.? ☐ Yes ☐ No

If yes, a letter of approval from the Minnesota Department of Natural Resources must be obtained prior to application for this permit. (Part I B.6 and Part III.A.8)

7. Does the site discharge to a water that is listed as impaired for the following pollutant(s) or stressor(s): phosphorus, turbidity, dissolved oxygen or biotic impairment? Use the Special and Impaired Waters Search Tool at: www.pca.state.mn.us/water/stormwater/stormwater-c.html. ☐ Yes ☐ No

If no, skip to Training.

Does the impaired water have an approved Total Maximum Daily Loads (TMDL) with an Approved Waste Load Allocation for construction activity? ☐ Yes ☐ No

If yes:

a. List the receiving water, the areas of the site discharging to it, and the pollutant(s) identified in the TMDL.

b. List the BMPs and any other specific construction stormwater related implementation activities identified in the TMDL.

If the site has a discharge point within one mile of the impaired water and the water flows to the impaired water but no specific BMPs for construction are identified in the TMDL, the additional BMPs in Appendix A (C.1 and C.2) must be added to the SWPPP and implemented. (III.A.7). The additional BMPs only apply to those portions of the project that drain to one of the identified discharge points.

Training (III.A)

Training is required for all permitted projects after February 1, 2010. It must be provided by entities with expertise in erosion prevention, sediment control or permanent stormwater management. Training must be focused on the individual's job duties as they relate to the permit requirements (Part III.A.2). Who must be trained?

- ✓ Individual(s) preparing the SWPPP for the project
- ✓ Individual(s) overseeing the implementation of, revising and amending the SWPPP and individuals performing inspections required by the permit
- ✓ Individuals performing or supervising the installation, maintenance or repair of BMPs

Attach to this SWPPP:

Names of the personnel trained; dates of training; name of instructor(s) and entity providing training; content of training course or workshop (including number of hours of training)

Selection of a Permanent Stormwater Management System (III.C)

1. Will the project create a new cumulative impervious surface greater than or equal to one acre? ☐ Yes ☐ No

If yes, a water quality volume of one-half inch of runoff from this area must be treated before leaving the site or entering surface waters (one inch if discharging to special waters).

2. Describe which method will be used to treat runoff from the new impervious surfaces created by the project (III.C):

- Wet sedimentation basin
- Infiltration/Filtration
- Regional ponds
- Combination of practices

Include all calculations and design information for the method selected. See Part III.C of the permit for specific requirements associated with each method.

3. If it is not feasible to meet the treatment requirement for the water quality volume, describe why. This can include proximity to bedrock or road projects where the lack of right of way precludes the installation of any permanent stormwater management practices. Describe what other treatment, such as grasses swales, smaller ponds, or grit chambers, will be implemented to treat runoff prior to discharge to surface waters. (III.C)

4. If proposing an alternative method to treat runoff from the new impervious surfaces, describe how this alternative will achieve approximately 80 percent removal of total suspended solids on an annual average basis (III.C.5).

Note: If proposing an alternative method, you must submit your SWPPP to MPCA at least 90 days prior to the starting date of the construction activity.

Erosion Prevention Practices (IV.B)

1. Describe construction phasing, vegetative buffer strips, horizontal slope grading, and other construction practices to minimize erosion. Delineate areas not to be disturbed (e.g., with flags, stakes, signs, silt fence, etc.) before work begins.

2. Describe temporary erosion protection or permanent cover used for exposed soil. All exposed soil areas must be stabilized as soon as possible but in no case later than 14 days after the construction activity in that portion of the site has temporarily or permanently (part IV.B.2).

3. For drainage or diversion ditches, describe practices to stabilize the normal wetted perimeter within 200 lineal feet of the property edge or point of discharge to surface water. The remaining portions of the temporary or permanent ditch or swale must be stabilized within 14 days after connecting to surface waters and construction in that portion of the ditch has temporarily or permanently ceased.

4. Describe other erosion prevention practices (list and describe).

Sediment Control Practices (IV.C)

Describe sediment control practices used to minimize sediments from entering surface waters, including curb and gutter systems and storm drain inlets. At a minimum, these sediment control practices must include:

- Sediment controls for temporary or permanent drainage ditches and sediment basins that are designed as part of a treatment system
- Installation of check dams or other grade control practice to ensure sheet flow and prevent rills (for slope lengths greater than 75 feet with a grade of 3:1 or steeper).
- Sediment control practices on all down gradient perimeters prior to land disturbing activities.
- Storm drain inlet protection for all inlets.
- Silt fencing or other sediment control surrounding temporary soil stockpiles.
- Minimize vehicle tracking of sediments (e.g., stone pads, concrete or steel wash racks, or equivalent systems).
- Street sweeping of tracked sediment.
- Temporary sedimentation basins (see Part III.B).

Dewatering and Basin Draining (IV.D)

1. Will the project include dewatering or basin draining? ☐ Yes ☐ No
2. If yes, describe BMPs used so the discharge does not adversely affect the receiving water or downstream landowners.

Additional BMPs for Special Waters and Discharges to Wetlands (Appendix A, Parts C and D)

1. **Special Waters.** Does your project discharge to special waters? ☐ Yes ☐ No
2. If proximity to bedrock or road projects where the lack of right of way precludes the installation of any of the permanent stormwater management practices, then other treatment such as grassed swales, smaller ponds, or grit chambers is required prior to discharge to surface waters. Describe what other treatment will be provided.
3. Describe erosion and sediment controls for exposed soil areas with a continuous positive slope to a special waters, and temporary sediment basins for areas that drain five or more acres disturbed at one time.

4. Describe the undisturbed buffer zone to be used (not less than 100 linear feet from the special water).

5. Describe how the permanent stormwater management system will ensure that the pre and post project runoff rate and volume from the 1, and 2-year 24-hour precipitation events remains the same.

6. Describe how the permanent stormwater management system will minimize any increase in the temperature of trout stream receiving waters resulting in the 1, and 2-year 24-hour precipitation events.

7. **Wetlands.** Does your project discharge stormwater with the potential for significant adverse impacts to a wetland (e.g., conversion of a natural wetland to a stormwater pond)? ☐ Yes ☐ No

   If Yes, describe the wetland mitigation sequence that will be followed in accordance with Part D of Appendix A.

Inspections and Maintenance (IV.E)

Describe procedures to routinely inspect the construction site:

- Once every seven (7) days during active construction and,
- Within 24 hours after a rainfall event greater than 0.5 inches in 24 hours, and within seven (7) days after that.

Inspections must include stabilized areas, erosion prevention and sediment control BMPs, and infiltration areas.

Pollution Prevention Management Measures (IV.F)

1. Describe practices to properly manage and dispose of solid waste, including trash (IV.F.1):

2. Described practices to properly manage hazardous materials (IV.F.2):

3. Describe practices for external washing of trucks and other construction vehicles (IV.F.3):

4. Describe how are you going to provide a safe, lake proof, concrete washout on site (IV.F.4):

5. Describe your spill prevention plan:

6. Describe measures to address sanitary and septic waste:

Final Stabilization (IV.G)

Describe how you will achieve final stabilization of the site (IV.G).

Records Retention (III.D)

Describe your record retention procedures (must be kept at the site) (III.D). Records must include:

- Copy of SWPPP and any changes
- Training documentation (III.A.2.)
- Inspection and maintenance records
- Permanent operation and maintenance agreements
- Calculations for the design of temporary and permanent stormwater management systems

Exhibit F

Nine Mile Creek Watershed District Permit Application

PERMIT APPLICATION

Return application to:

Nine Mile Creek Watershed District
7710 Computer Avenue, Suite 135
Edina, MN 55435
Phone: (952) 835-2078
Fax: (952) 835-2079

TO BE COMPLETED BY DISTRICT:

PERMIT NUMBER_____

AMOUNT RECEIVED_____ DATE_____

RECEIVED FROM_____

DATE APPROVED_____

PERMIT EXPIRATION DATE_____

_____
Name of Proposed Project **Address/Intersection** **City**

_____ _____ Permit fee = $_____
Acreage to be Disturbed **Type of Development** **Total Due with Application**

Rule Applicability (check all that apply):

- ☐ Erosion/Sediment Control
- ☐ Floodplain Management
- ☐ Sediment Removal
- ☐ Stormwater Management
- ☐ Wetlands Management
- ☐ Waterbody Crossings/Structures
- ☐ Shoreline/Streambank Improvements
- ☐ Appropriation of Public Surface Waters

Name of Applicant Organization Name
(Site Owner or Project Developer)

Address

City, State, Zip

Phone Fax

Email

Applicant's Contact Organization Name
(Consulting Engineer or Project Rep)

Address

City, State, Zip

Phone Fax

Email

Submittal Requirements
Complete applications must be submitted and received 10 business days prior to the regular Board of Managers meeting, generally the third Wednesday of each month (check website for exact meeting dates). Applicants must submit 3 paper copies and an electronic copy of all required information as specified in the District's Rules (see website for complete rules or contact the Watershed District office for a copy). Projects involving a Wetland Replacement Plan have special noticing requirements and require submittal of 6 paper copies and an electronic copy of all wetland-related submittal materials. Due to the noticing requirements, applications involving a wetland replacement plan must be submitted at least 30 days prior to the Board meeting.

Applicant Signature
"I understand that, as the permittee, I am legally accountable to ensure compliance with the terms and conditions of the permit. I understand that I am not authorized to begin the project until I have received the permit. If the project is modified, I will obtain approval by the Nine Mile Creek Watershed District before I continue with the project. I authorize the District, and its agents, employees, officers, and contractors, to enter the project site to perform any inspections of work authorized by the permit or any applicable law."

"I certify that I have thoroughly read and understand the above information."

Signature of property owner or designated agent (no agents without a letter of authority) Date

Print signer's name

Signature of applicant if different from property owner Date

Print signer's name

Nine Mile Creek Watershed District Rules
Schedule A – Permit Fees

The Nine Mile Creek Watershed District (NMCWD) Board adopted Resolution 2008-02, establishing a permit fee schedule on March 19, 2008. This permit fee schedule for Nine Mile Creek Watershed District permits is established by the Board of Managers pursuant to 103D.345 and the NMCWD Rule 11.0, which directs the District to apply a permit fee to cover actual costs related to permitting, including site inspections, analysis of the proposed activities, services of consultants and compliance assurance.

In accordance with Resolution 2008-02, the following permit fees will be charged to permit applicants:

NOTE: Fees shall not be collected for public projects.

For single-family residential projects:

Rule 4.0 – Stormwater Management	**$250**
Rule 5.0 – Erosion and Sediment Control	**$50**

For subdivision of land and all other projects, Rules 2.0-6.0:

0 – 4.99 acres	**$750**
5 – 9.99 acres	**$1,000**
Larger than 10 acres	**$1,500**

For work in public waters permitting under Rules 6.0-9.0:
Permit fees will be charged in accordance with the Department of Natural Resources' Water Permit Application Schedule, except that no fee under these rules will be charged when the applicant pays a fee for a permit under rules 2.0-5.0 for the same project.

For Wetland Conservation Act permitting:
When the District serves as the Local Government Unit, actual costs associated with District regulatory activities will be billed to the applicant.

For transfer or extension of an unexpired issued permit: $40

Exhibit G

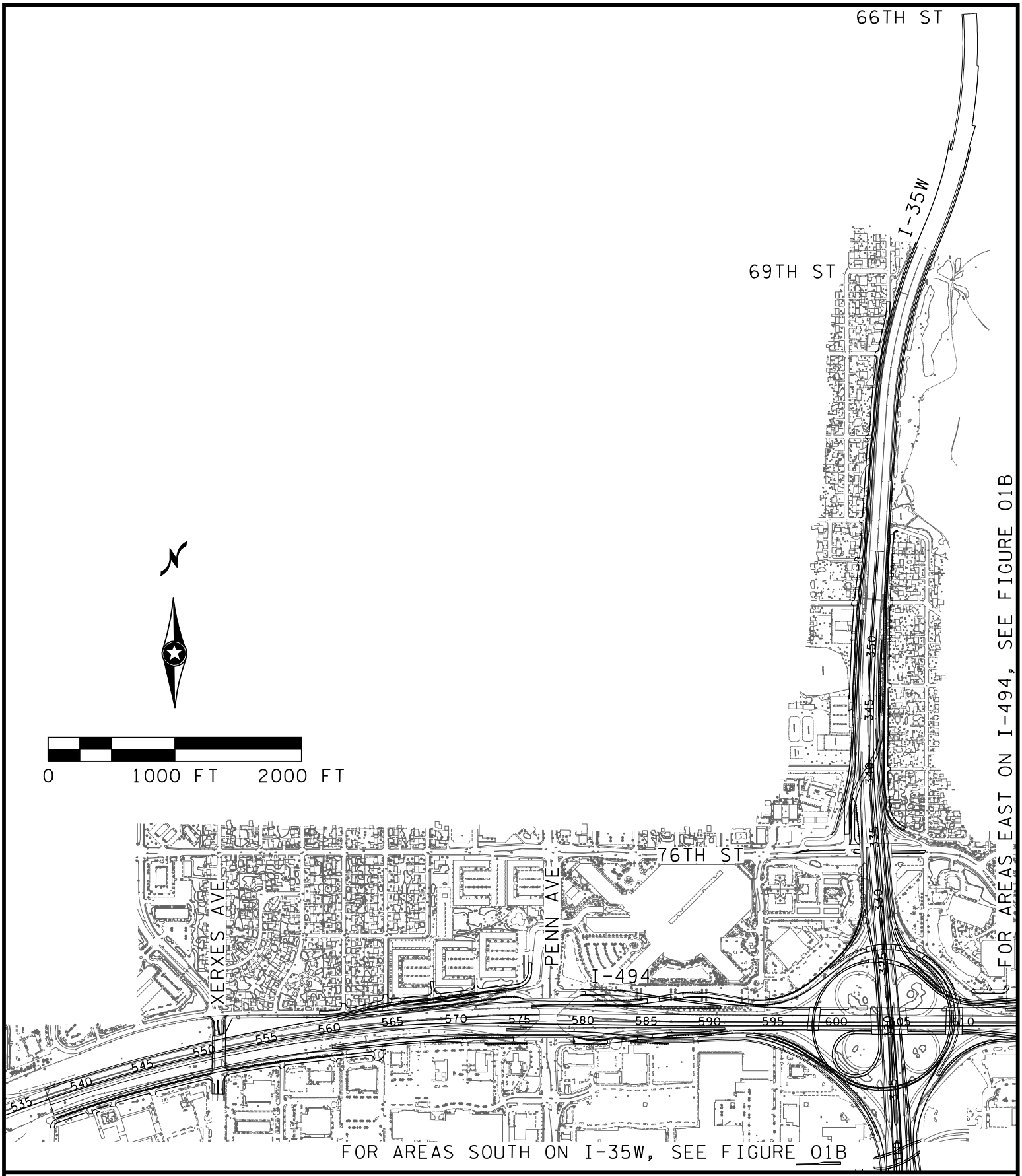
Utility Conflicts Table – Turbine Design Ultimate/Phase 1 Layouts

Interstate	Location	Approximate Stationing	Possible Existing Utility Conflicts
494	France Ave. to Xerxes Ave.	– EB 538+00 to 551+00	– No impacts anticipated
	Xerxes Ave. to Penn Ave.	– EB 551+00 to 561+00 – EB 561+00 to 573+00 left – EB 564+00 to 573+00 left	– No impacts anticipated – Relocate 12” sanitary sewer – Relocate 8” water main
	Penn Ave. to Interchange	– EB 583+00 – EB 594+00 – EB 581+00 to 590+00 left – EB 591+00	– 36” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – 42” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate existing 24” storm sewer – 36” storm sewer crossing proposed NB 35W to WB 494 Ramp, verify pipe strength
	Interchange to Lyndale Ave.	–	– No impacts anticipated
	Lyndale Ave. to Nicollet Ave.	–	– Outside of Phase 1 project limits; no impacts anticipated
	Nicollet Ave. to Portland Ave.	–	– Outside of Phase 1 project limits; no impacts anticipated
494/35W	Interchange	– NB 35W 310+00 to 315+00 left – NB 35W 311+00 to 315+00 right – NB 35W 313+00 to 315+00 right – NB 35W 326+00 – NB 35W 327+00	– Relocate 8” water main – Relocate sanitary sewer – Relocate 8” water main – 9” sanitary sewer crossing I-35W and proposed NB 35W to WB 494 Ramp, verify pipe strength, install/extend casing pipe, relocate due to proximity to proposed Ramp bridge over I-35W – 42”/54” storm sewer crossing I-35W and proposed NB 35W to WB 494 Ramp, verify pipe strength, relocate due to proximity to and potential conflict with proposed Ramp bridge over I-35W
35W	90th St. to 86th St.	–	– No impacts anticipated
	86th St. to 82nd St.	– NB 280+00 to 291+00 right – NB 274+00 to 296+00 left – NB 290+00	– Relocate 6”/24” water main – Relocate 8”/24” water main – 24” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe
	82nd St. to American Blvd.	– NB 296+00 to 309+00 left – NB 309+00 – NB 305+00 to 309+00 right – NB 296+00 to 308+00 left – NB 306+00 – NB 306+00 to 310+00 right – NB 309+00 to 310+00 right	– Relocate 8”/24” water main – 24” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate 8” water main – Relocate sanitary sewer – 18” sanitary sewer crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate 12” sanitary sewer – Relocate 24” water main
	76th St. to 66th St.	– NB 341+00	– 12” water main crossing , verify depth of cover and pipe strength, extend/install casing pipe

Interstate	Location	Approximate Stationing	Possible Existing Utility Conflicts
494	France Ave. to Xerxes Ave.	– EB 538+00 to 551+00	– No impacts anticipated
	Xerxes Ave. to Penn Ave.	– EB 551+00 to 561+00 – EB 561+00 to 573+00 left – EB 564+00 to 573+00 right – EB 564+00 to 573+00 left	– No impacts anticipated – Relocate 12” sanitary sewer – Relocate 8” water main – Relocate 8” water main
	Penn Ave. to Interchange	– EB 583+00 – EB 594+00 – EB 581+00 to 590+00 left – EB 581+00 to 596+00 right – EB 591+00	– 36” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – 42” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate existing 24” storm sewer – Relocate 8” water main – 36” storm sewer crossing proposed NB 35W to WB 494 Ramp, verify pipe strength
	Interchange to Lyndale Ave.	– EB 615+00 to 627+00 right – EB 615+00 to 627+00 right – EB 620+00 left	– Relocate 8” water main – Relocate sanitary sewer – Relocate storm sewer lift station
	Lyndale Ave. to Nicollet Ave.	– EB 634+00 to 642+00 left – EB 637+00 to 642+00 left – EB 634+00 to 652+00 right – EB 633+00 to 652+00 right	– Relocate 8” water main – Relocate 9” sanitary sewer – Relocate sanitary sewer – Relocate 8” water main
	Nicollet Ave. to Portland Ave.	– EB 662+00 to 677+00 left – EB 662+00 to 682+00 right – EB 662+00 to 682+00 right	– Relocate water main – Relocate sanitary sewer – Relocate 8” water main
494/35W	Interchange	– NB 35W 310+00 to 315+00 left – EB 494 596+00 to 601+00 right – NB 35W 311+00 to 315+00 right – NB 35W 313+00 to 315+00 right – NB 35W 326+00 – NB 35W 327+00	– Relocate 8” water main – Relocate 8” water main – Relocate sanitary sewer – Relocate 8” water main – 9” sanitary sewer crossing I-35W and proposed NB 35W to WB 494 Ramp, verify pipe strength, install/extend casing pipe, relocate due to proximity to proposed Ramp bridge over I-35W – 42”/54” storm sewer crossing I-35W and proposed NB 35W to WB 494 Ramp, verify pipe strength, relocate due to proximity to and potential conflict with proposed Ramp bridge over I-35W
35W	90th St. to 86th St.	– NB 244+00 to 252+00 left – NB 251+00	– Relocate 24” water main – 12” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe
	86th St. to 82nd St.	– NB 280+00 to 291+00 right – NB 274+00 to 296+00 left – NB 290+00	– Relocate 6”/24” water main – Relocate 8”/24” water main – 24” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe
	82nd St. to American Blvd.	– NB 296+00 to 309+00 left – NB 309+00 – NB 305+00 to 309+00 right – NB 296+00 to 308+00 left – NB 306+00 – NB 306+00 to 310+00 right – NB 309+00 to 310+00 right	– Relocate 8”/24” water main – 24” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate 8” water main – Relocate sanitary sewer – 18” sanitary sewer crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate 12” sanitary sewer – Relocate 24” water main
	76th St. to 66th St.	– NB 338+00 to 354+00 right – NB 337+00 to 346+00 right – NB 341+00 – NB 353+00 to 357+00 left – NB 354+00 – NB 344+00 to 364+00 left – NB 360+00	– Relocate 6”/8” water main – Relocate 9” sanitary sewer – 12” water main crossing , verify depth of cover and pipe strength, extend/install casing pipe – Relocate water main – 12” water main crossing, verify depth of cover and pipe strength, extend/install casing pipe – Relocate sanitary sewer. – Sanitary sewer crossing, verify depth of cover and pipe strength, extend/install casing pipe

Figure 01A and 01B

Turbine Design Ultimate Layout

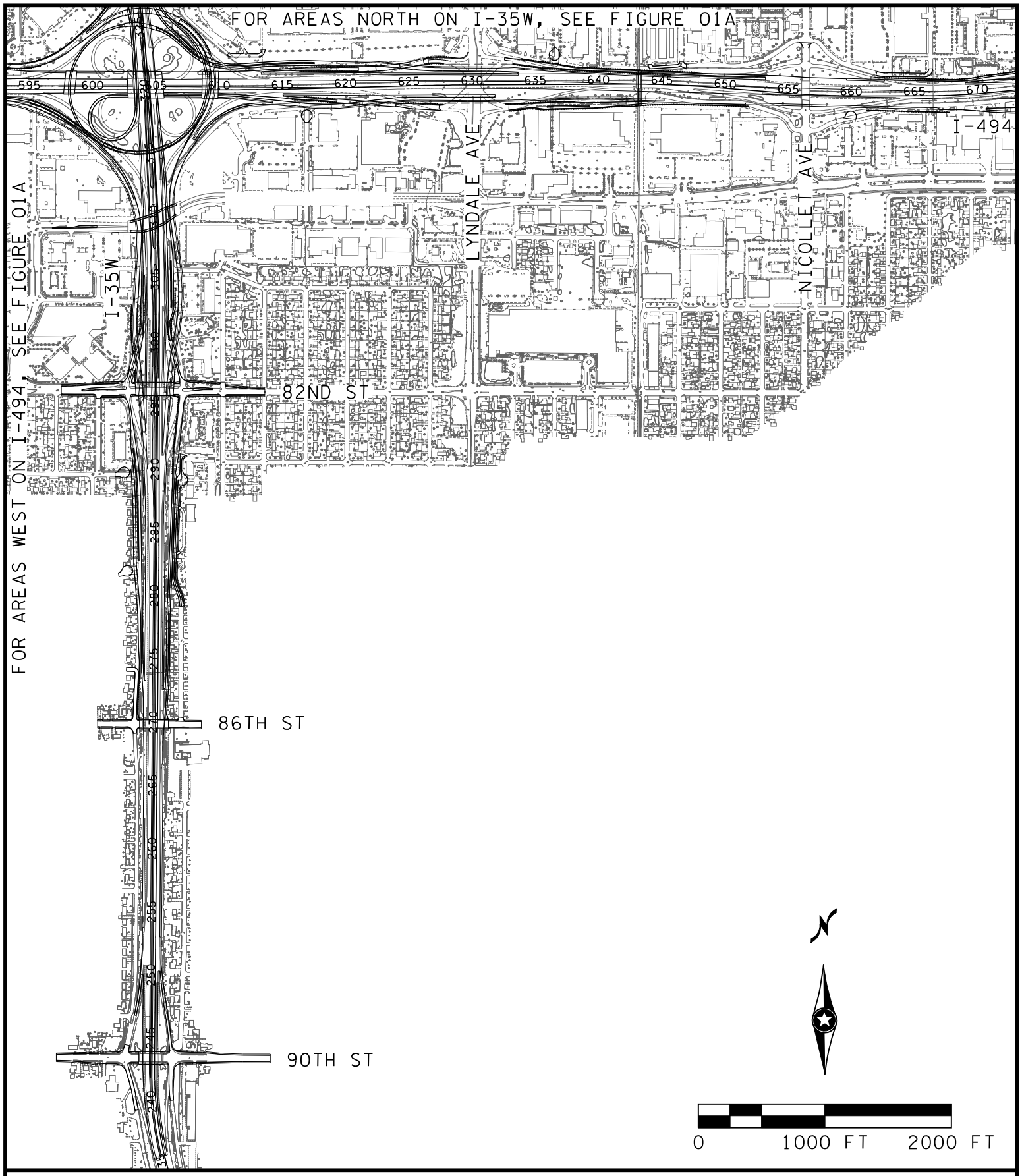


RANI engineering

I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 01A - TURBINE DESIGN ULTIMATE LAYOUT

FEBRUARY 2010



RANI engineering

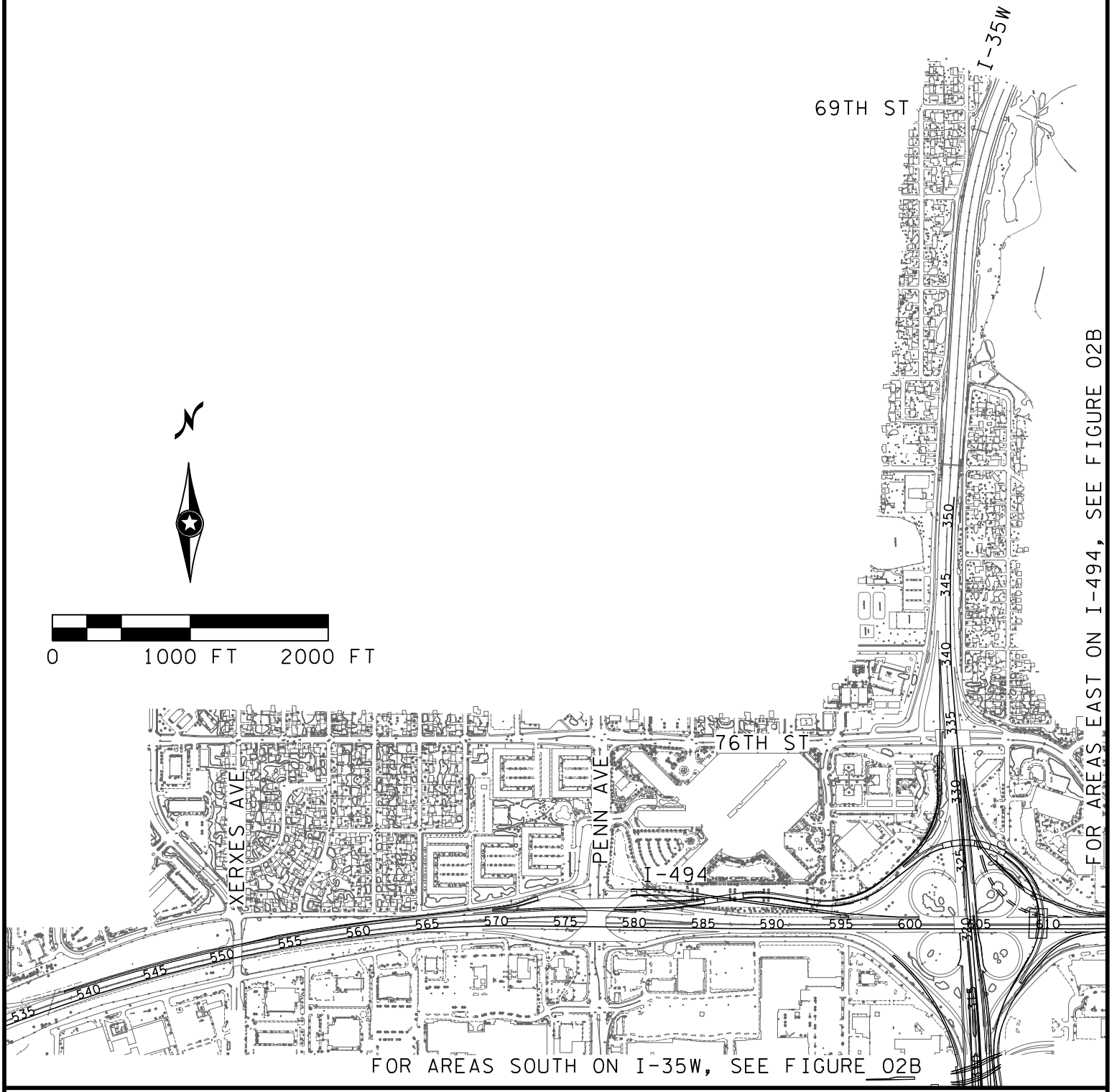
I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 01B - TURBINE DESIGN ULTIMATE LAYOUT

FEBRUARY 2010

Figure 02A and 02B

Turbine Design Phase 1 Layout



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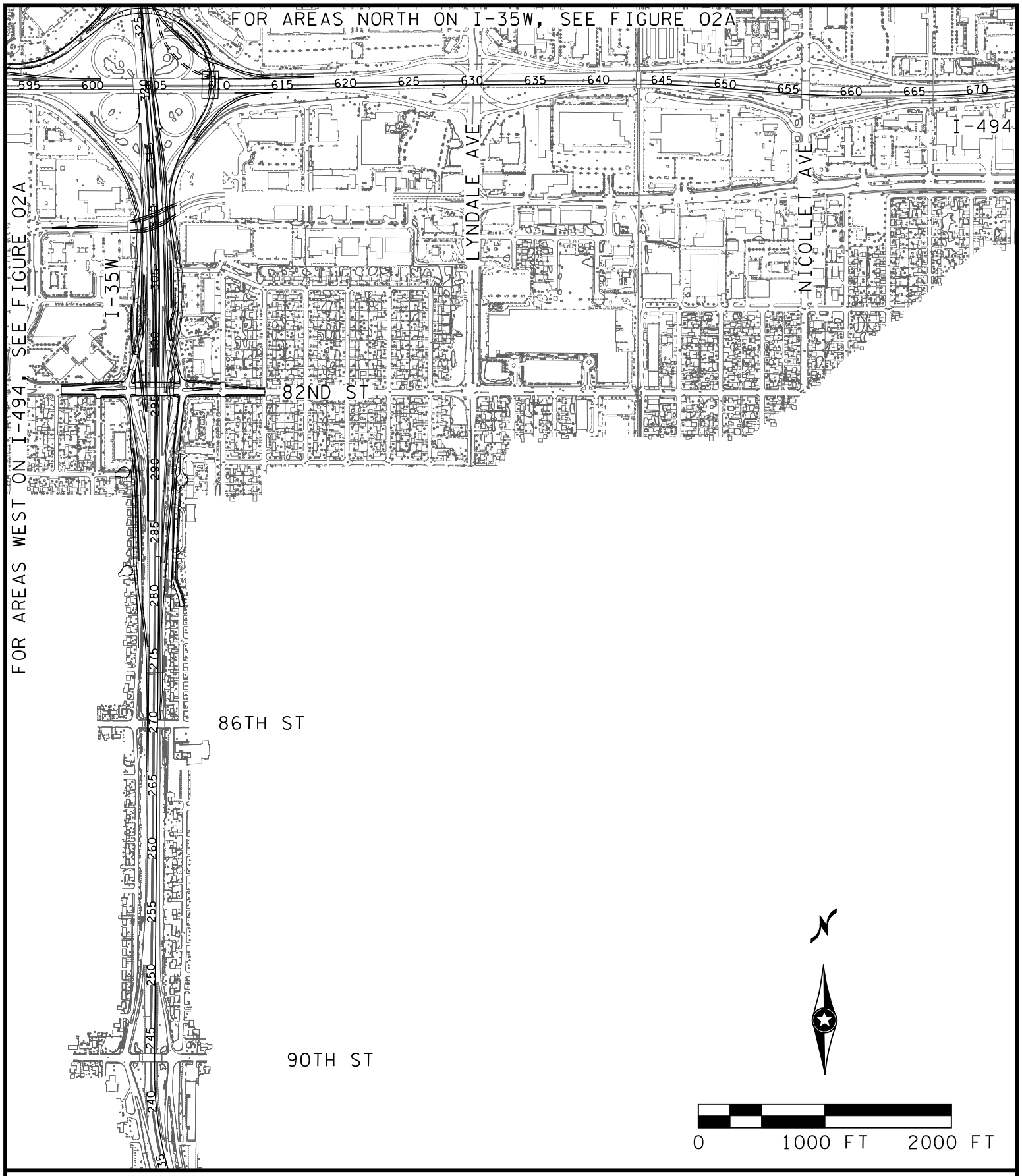
I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 02A - TURBINE DESIGN PHASE 1 LAYOUT

FEBRUARY 2010



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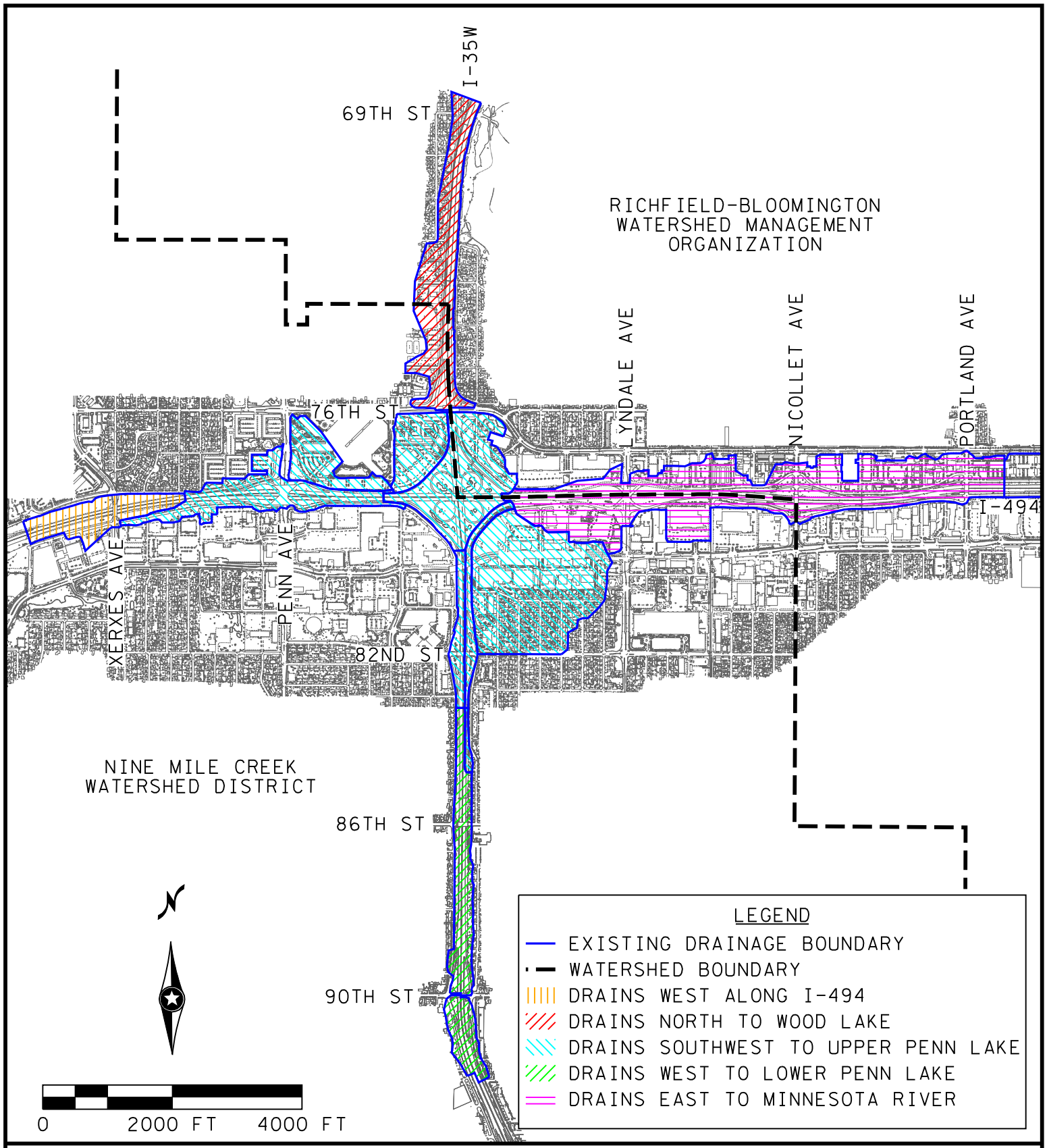
I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 02B - TURBINE DESIGN PHASE 1 LAYOUT

FEBRUARY 2010

Figure 03

Existing Drainage Patterns



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I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 03 - EXISTING DRAINAGE PATTERNS

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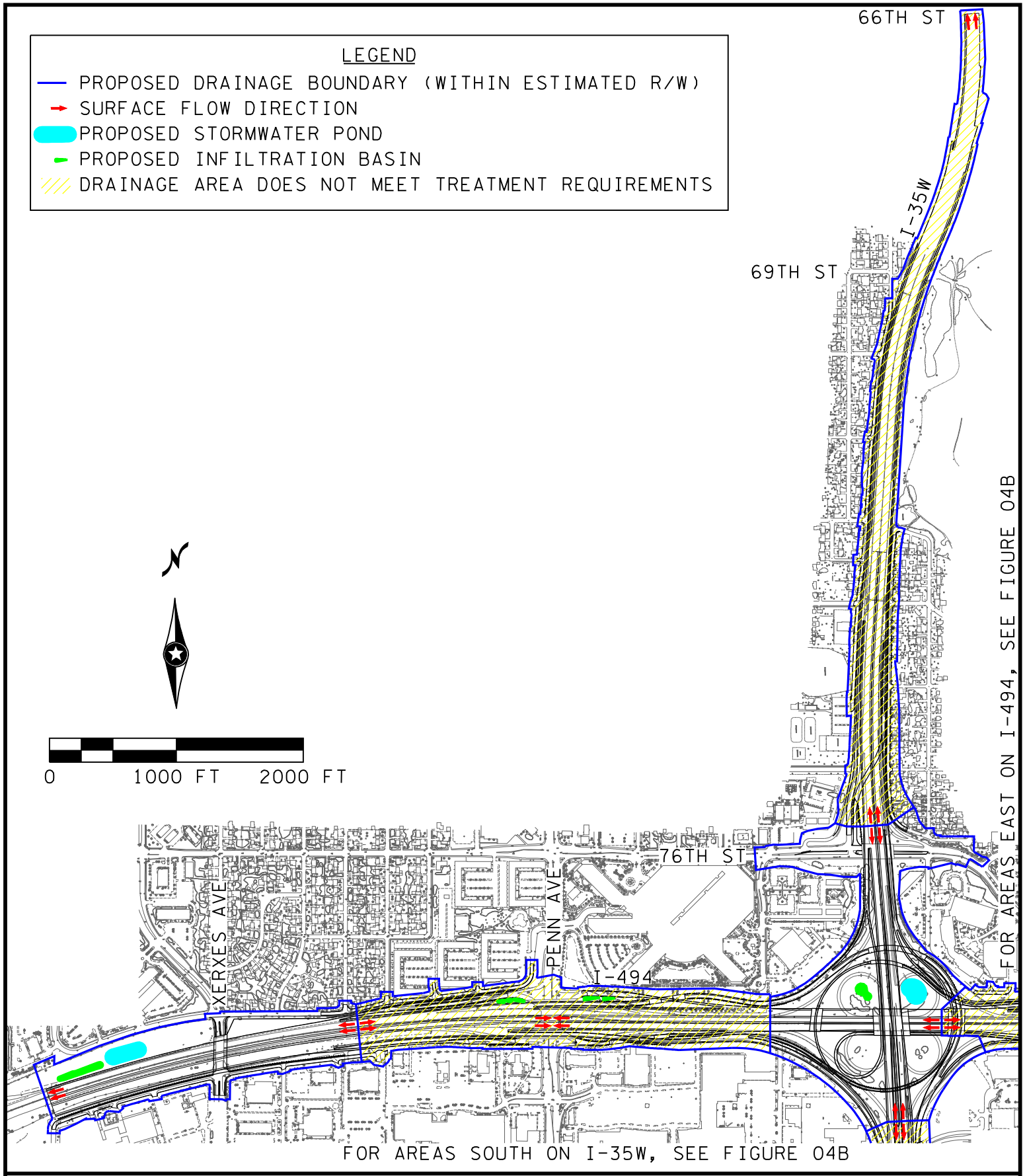
Figures 04A and 04B

Proposed Drainage Boundaries and Stormwater Treatment



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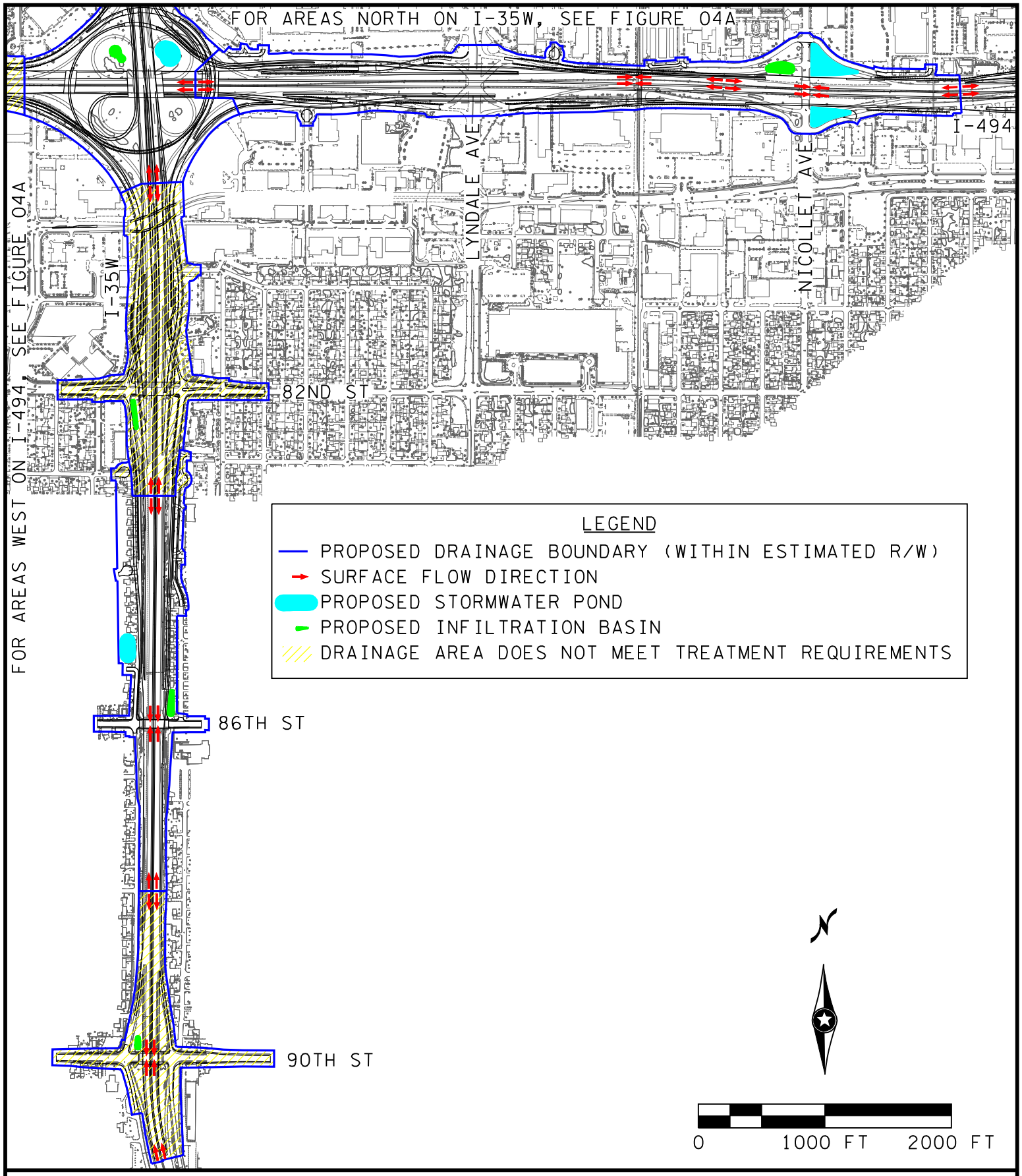
I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 04A - PROPOSED DRAINAGE BOUNDARIES AND STORMWATER TREATMENT

FEBRUARY 2010



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I-494/35W INTERCHANGE PRELIMINARY DESIGN

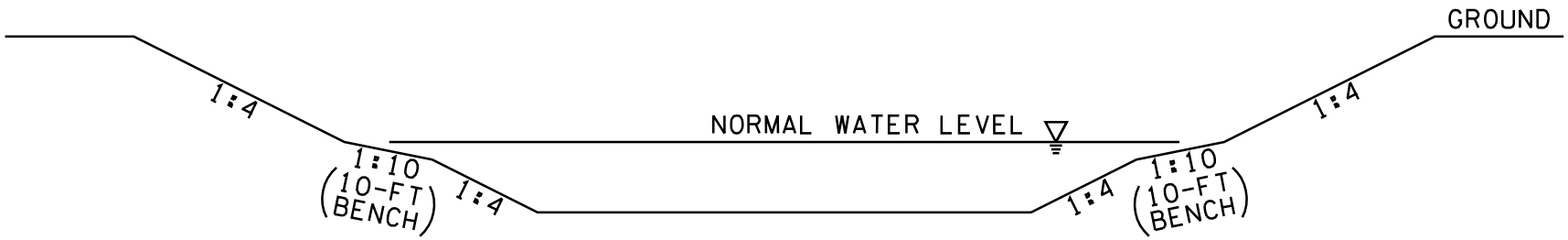
FIGURE 04B - PROPOSED DRAINAGE BOUNDARIES AND STORMWATER TREATMENT

FEBRUARY 2010

Figure 05

Stormwater Pond Typical Section

STORMWATER POND TYPICAL SECTION



NOT TO SCALE

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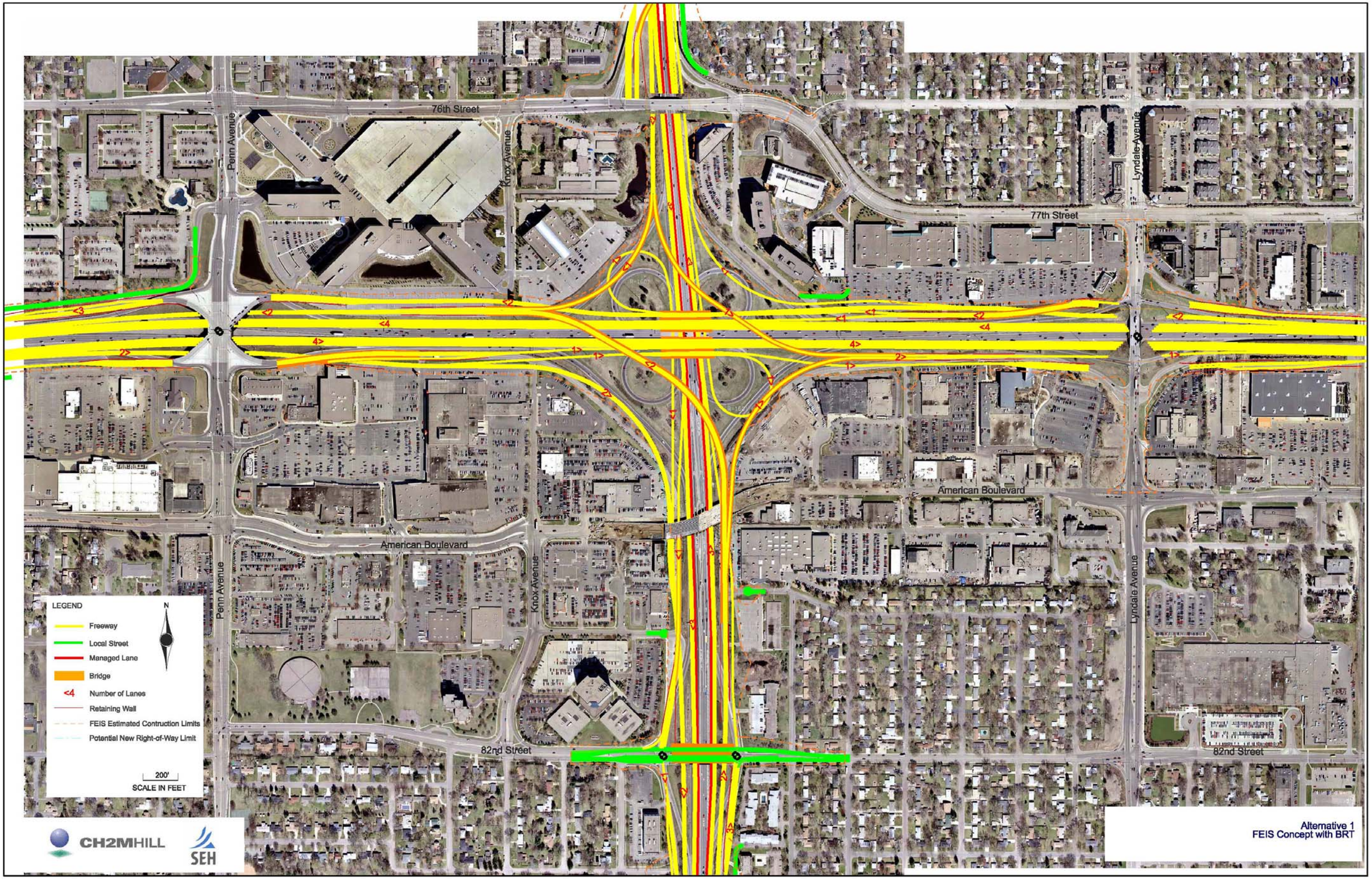
I-494/35W INTERCHANGE PRELIMINARY DESIGN

FIGURE 05 - STORMWATER POND TYPICAL SECTION

FEBRUARY 2010

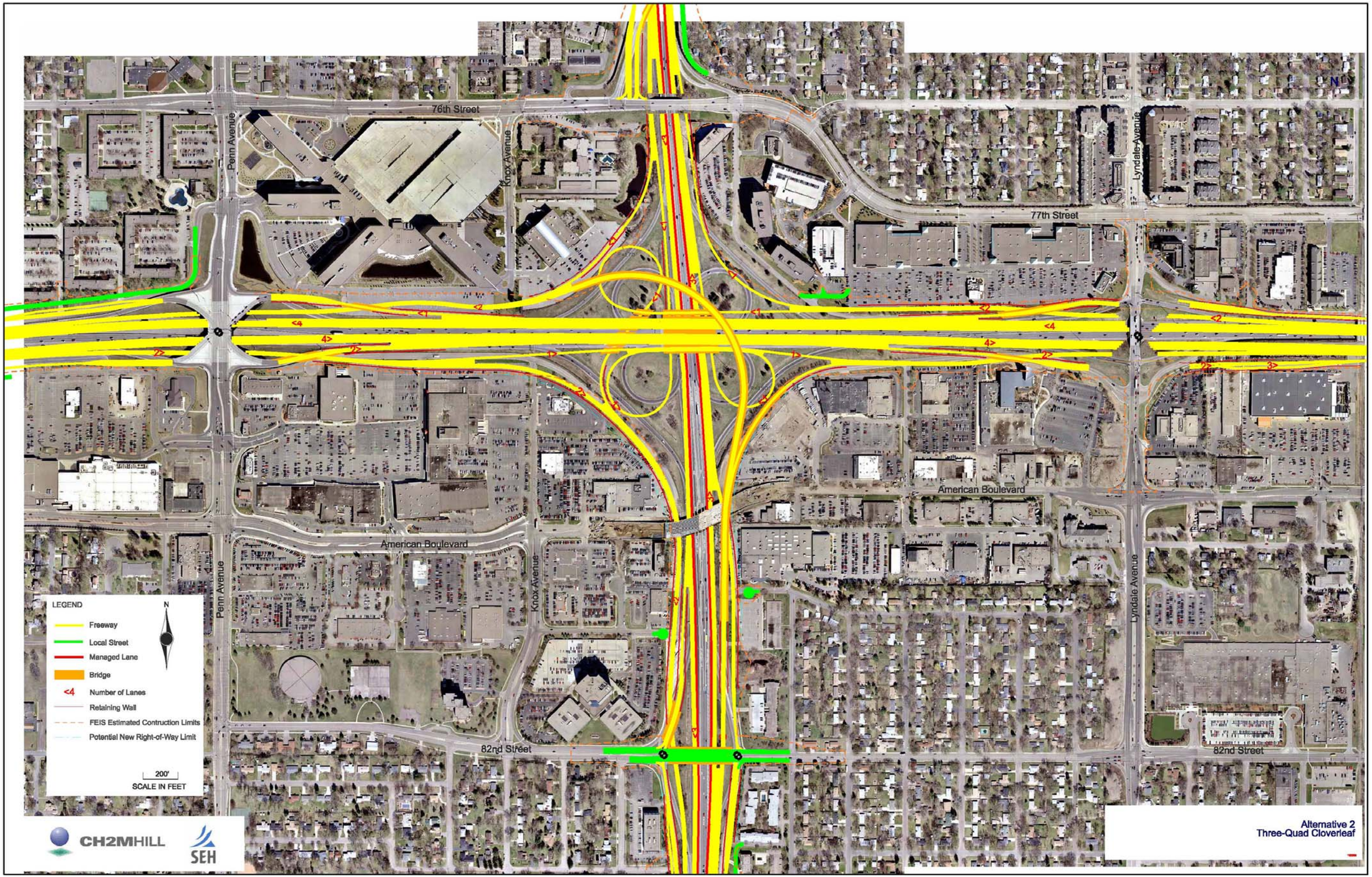


INTERCHANGE ALTERNATIVE CONCEPTS

FIGURE C1

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350

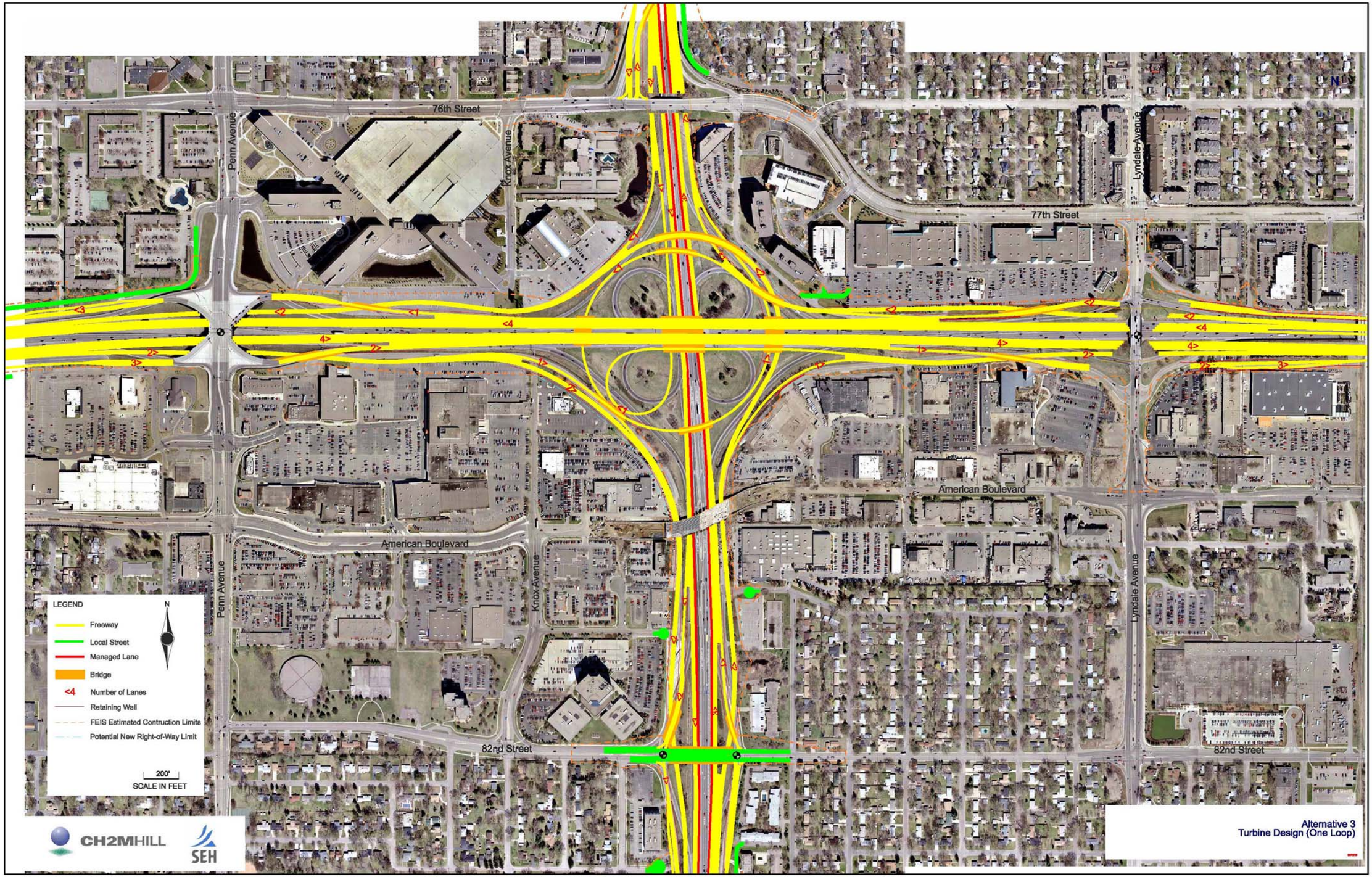


INTERCHANGE ALTERNATIVE CONCEPTS

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350

FIGURE C2

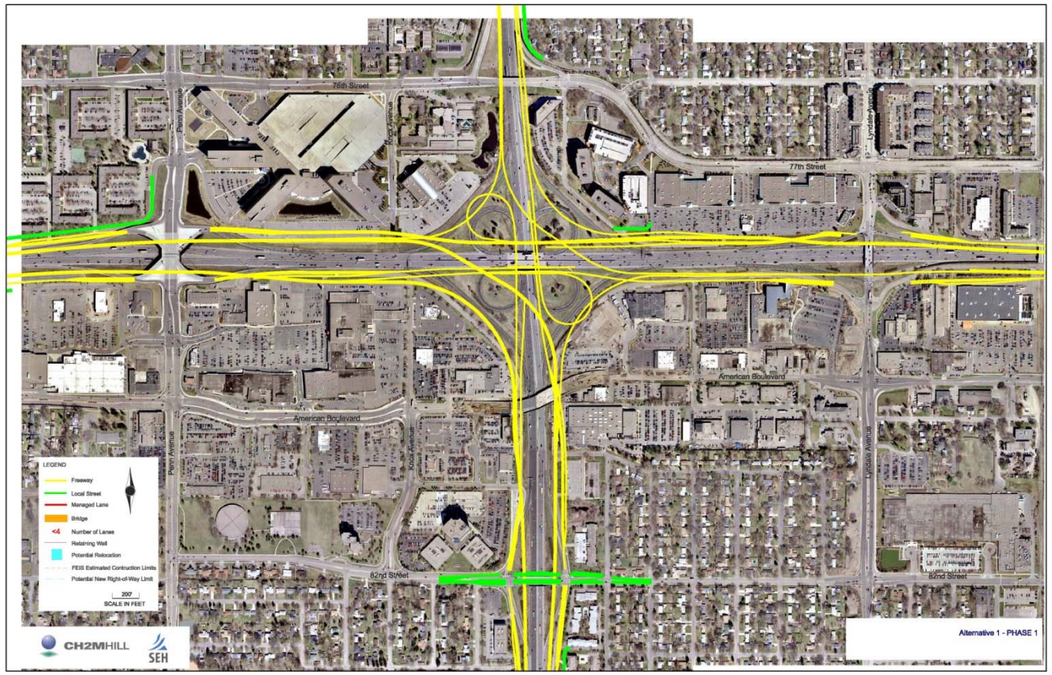


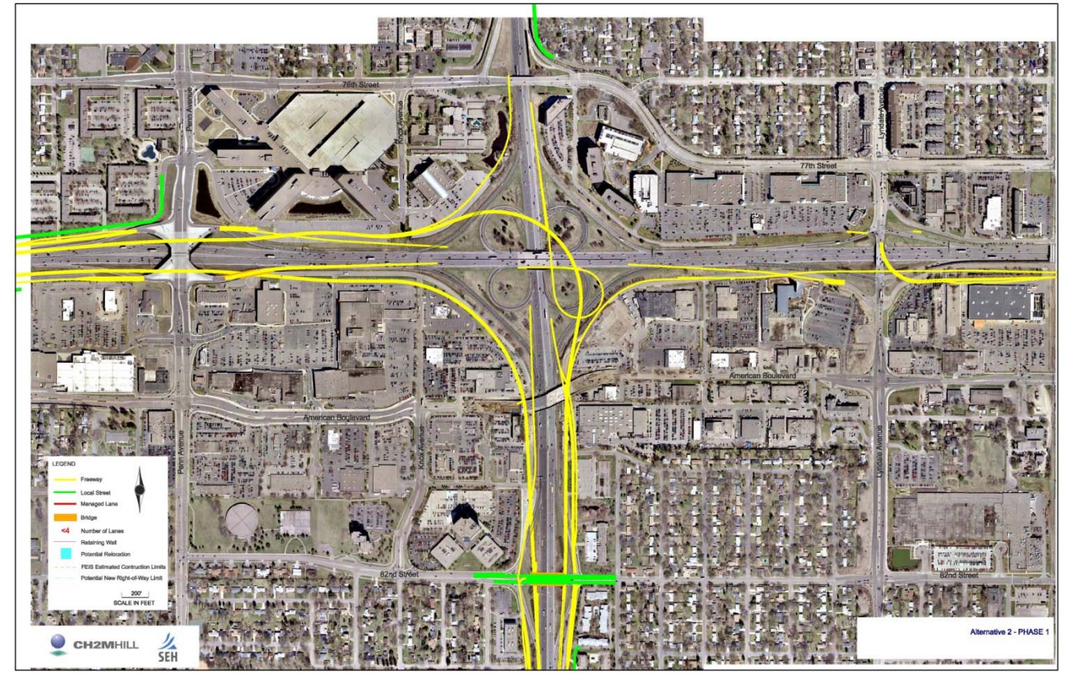
INTERCHANGE ALTERNATIVE CONCEPTS

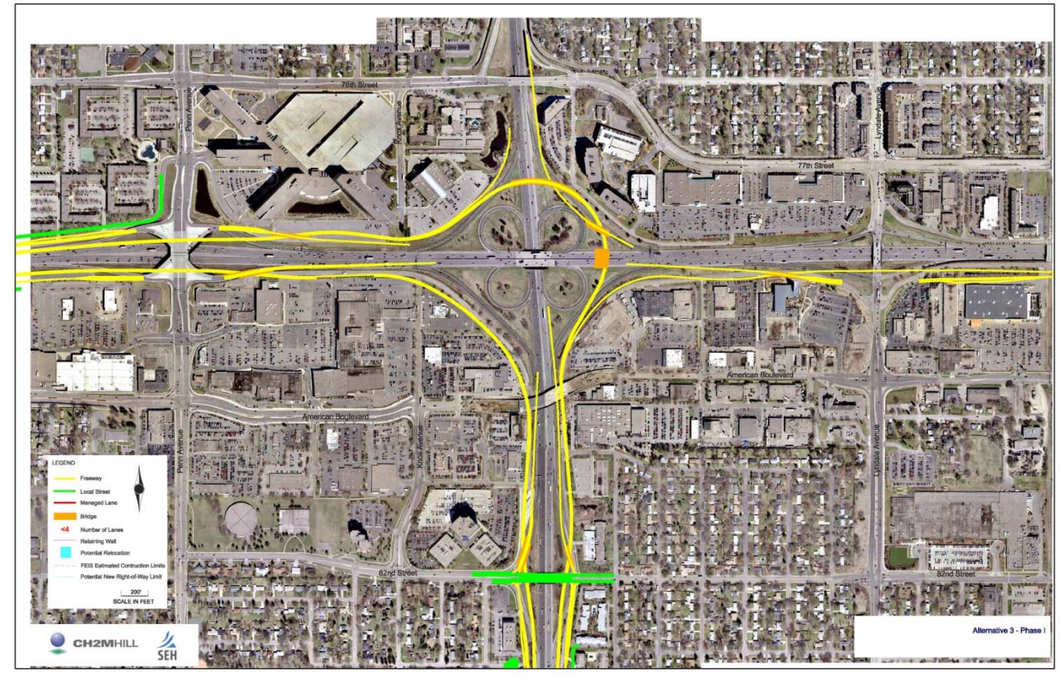
FIGURE C3

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350





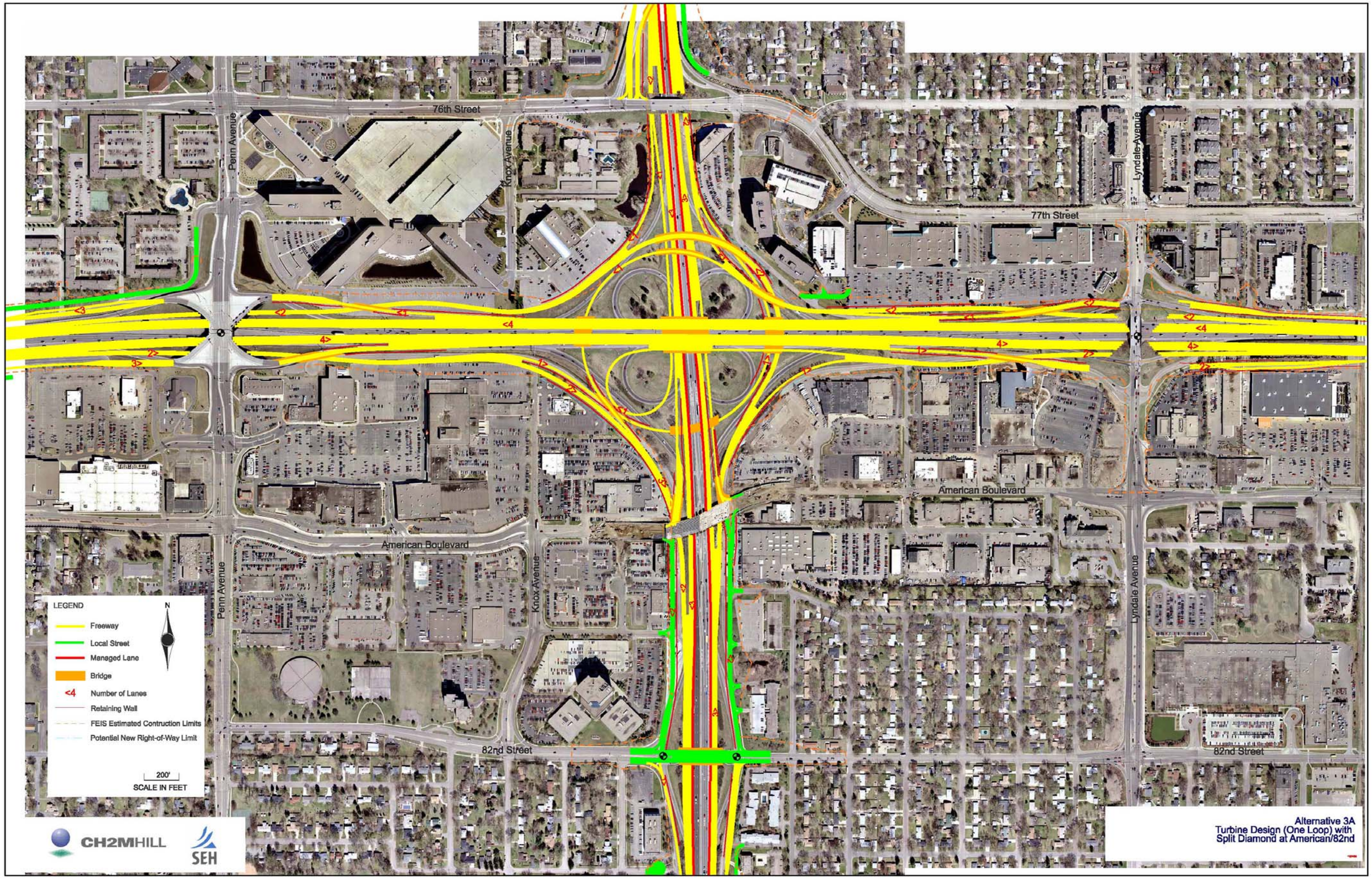


INTERCHANGE ALTERNATIVE CONCEPTS – PHASE 1 LAYOUTS

FIGURE C4

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350

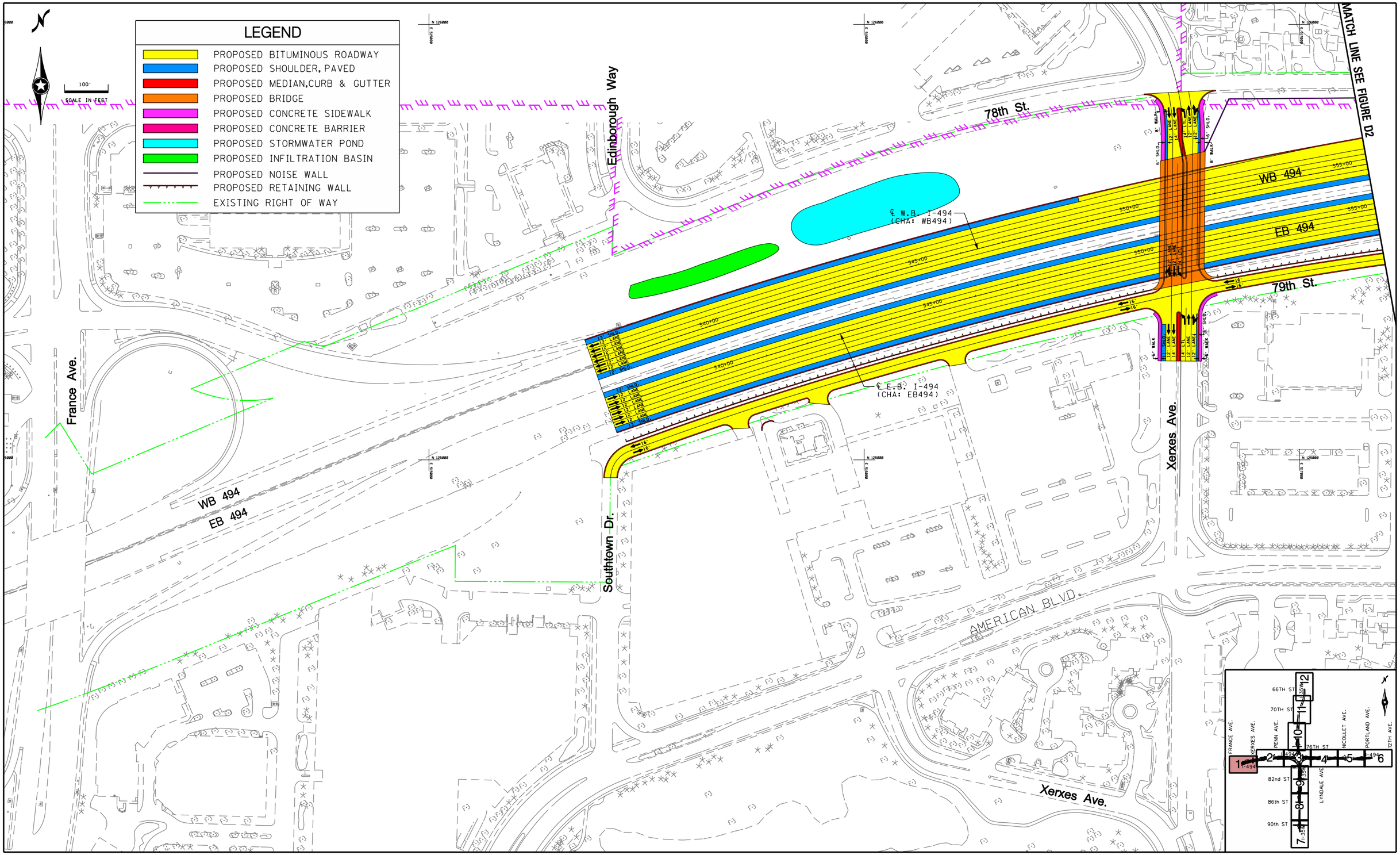


INTERCHANGE ALTERNATIVE CONCEPTS – TURBINE DESIGN WITH SPLIT DIAMOND LAYOUT

FIGURE C5

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D1

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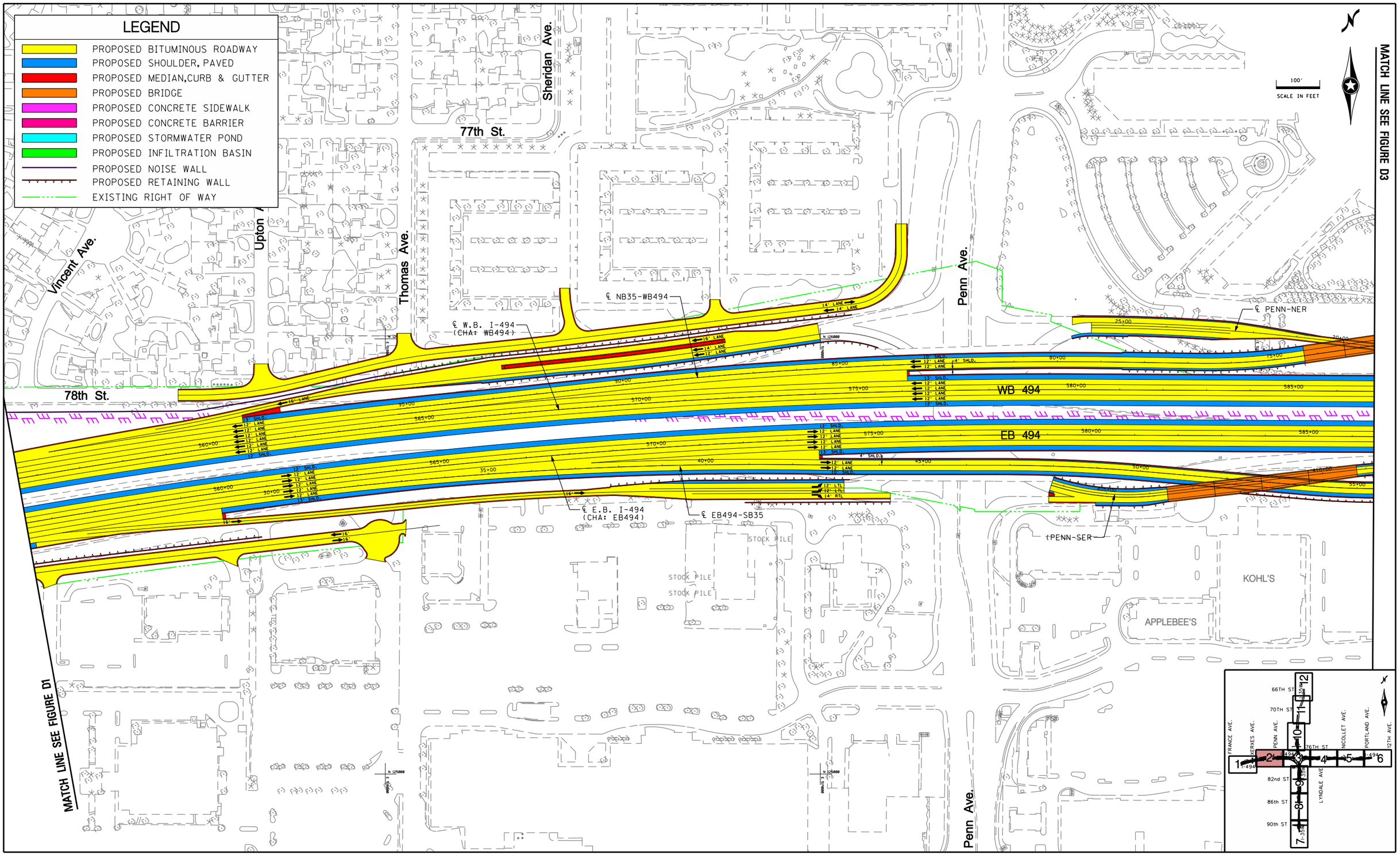
FIGURE 1



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D2

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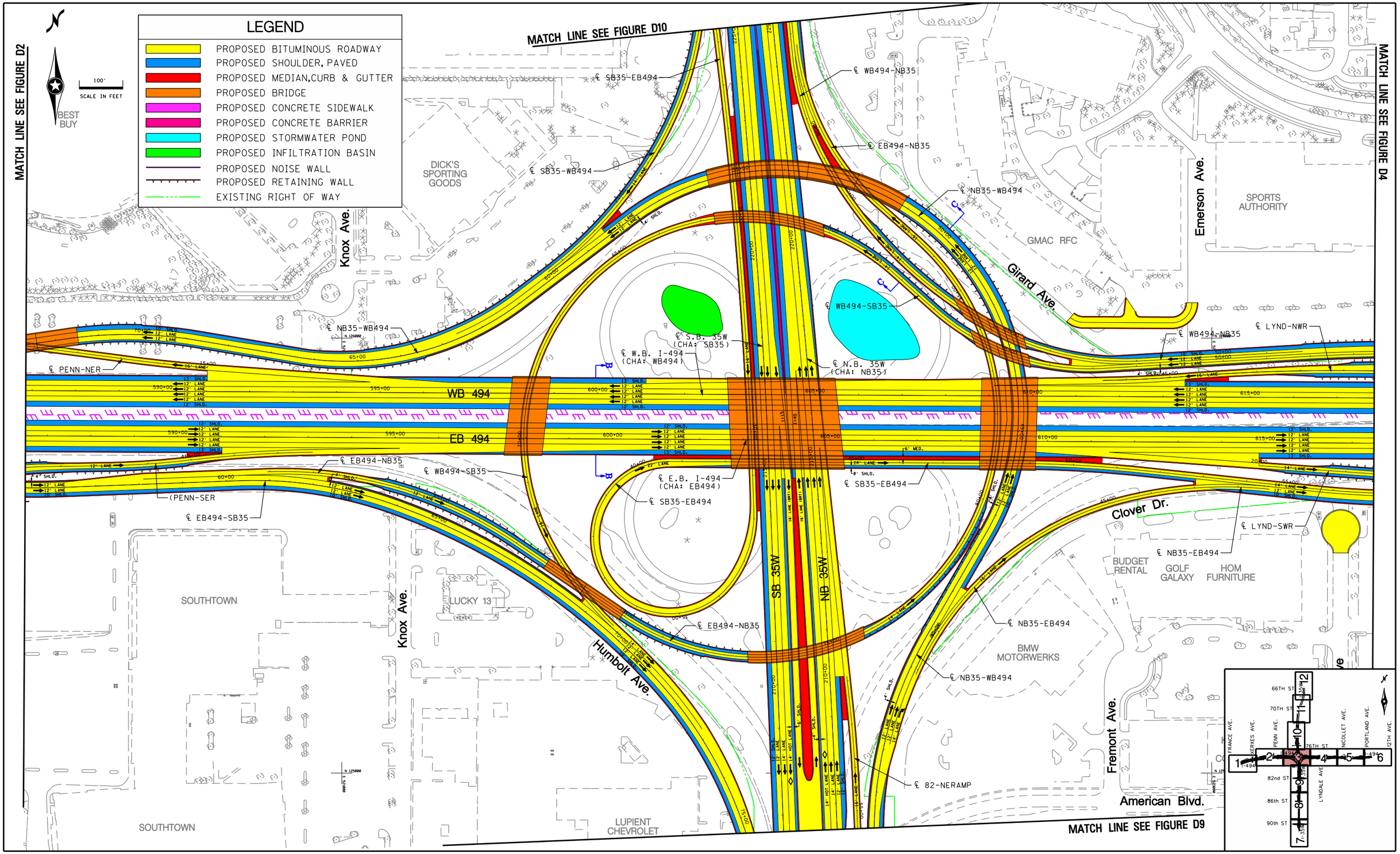
FIGURE 2



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D3

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FIGURE 3

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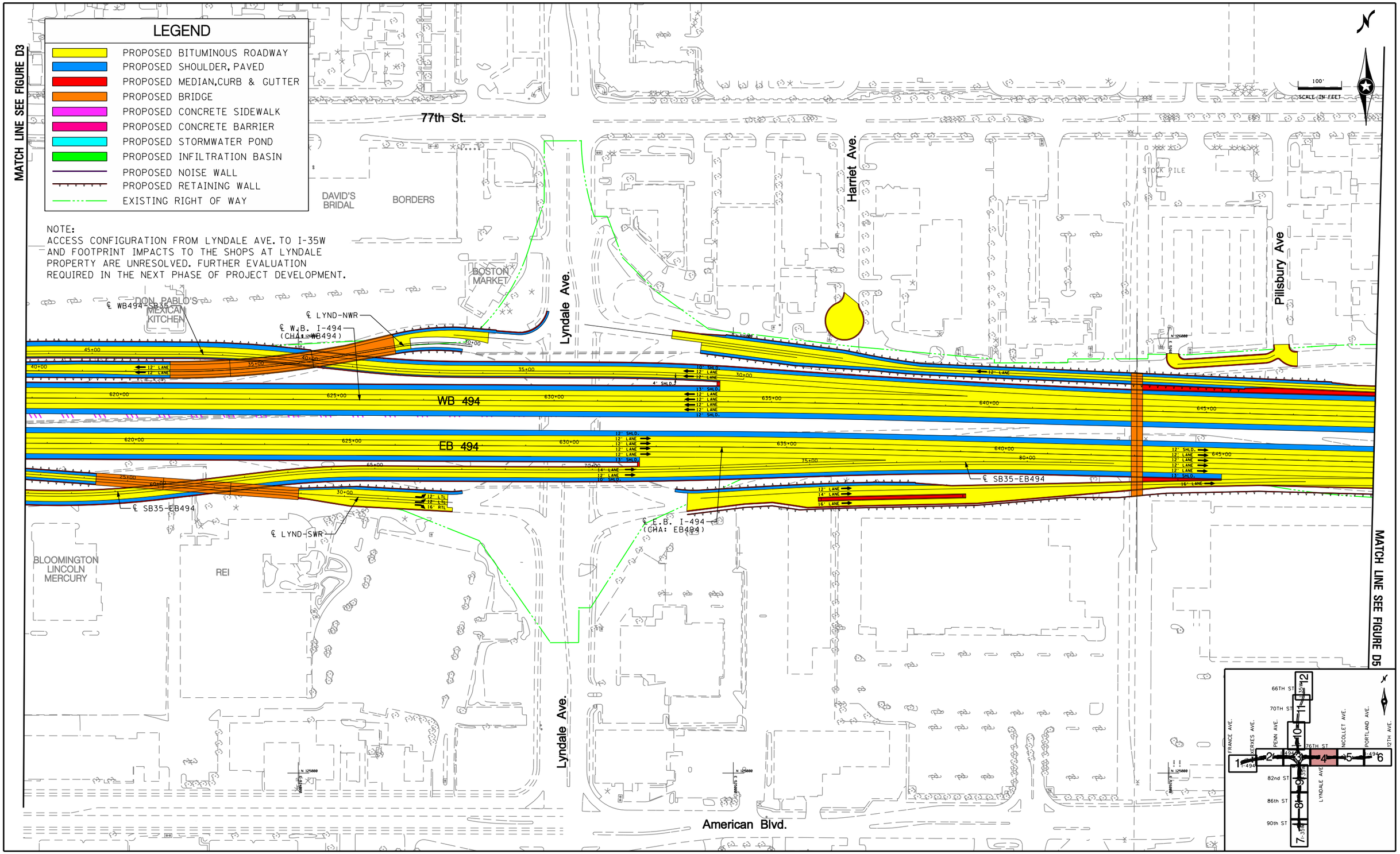

TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D4

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FIGURE 4
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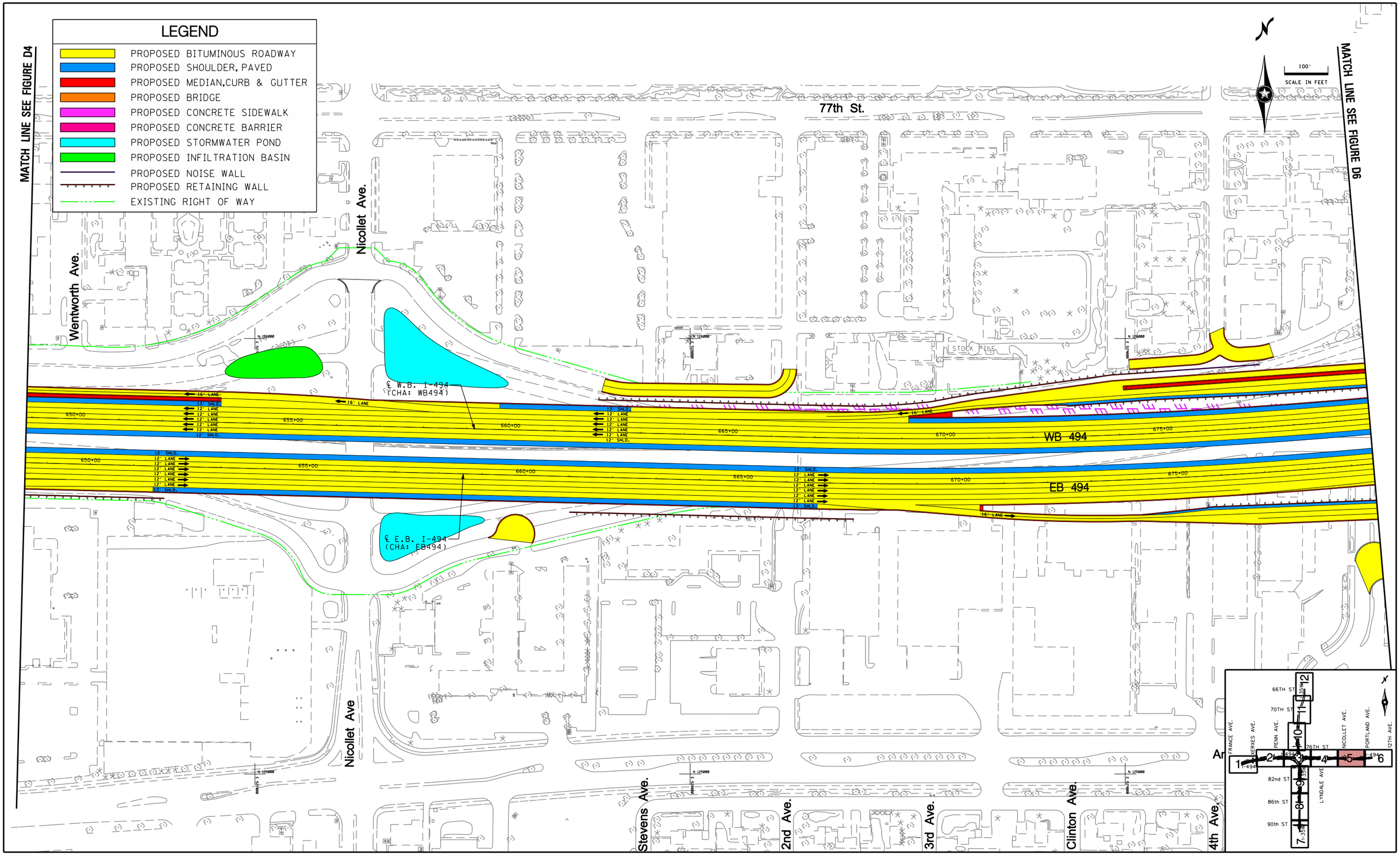

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FIGURE 5

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TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D5

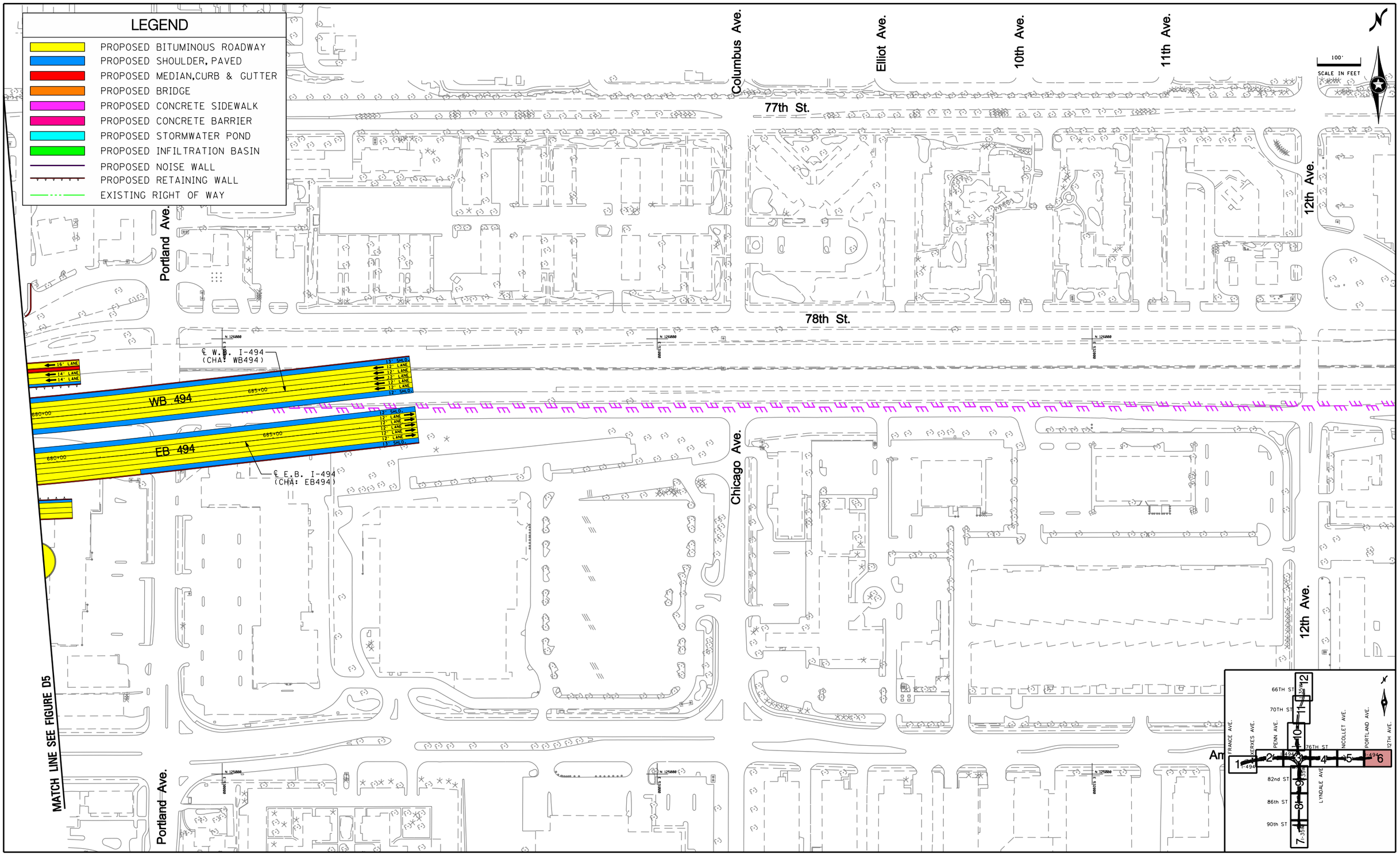

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FIGURE 6

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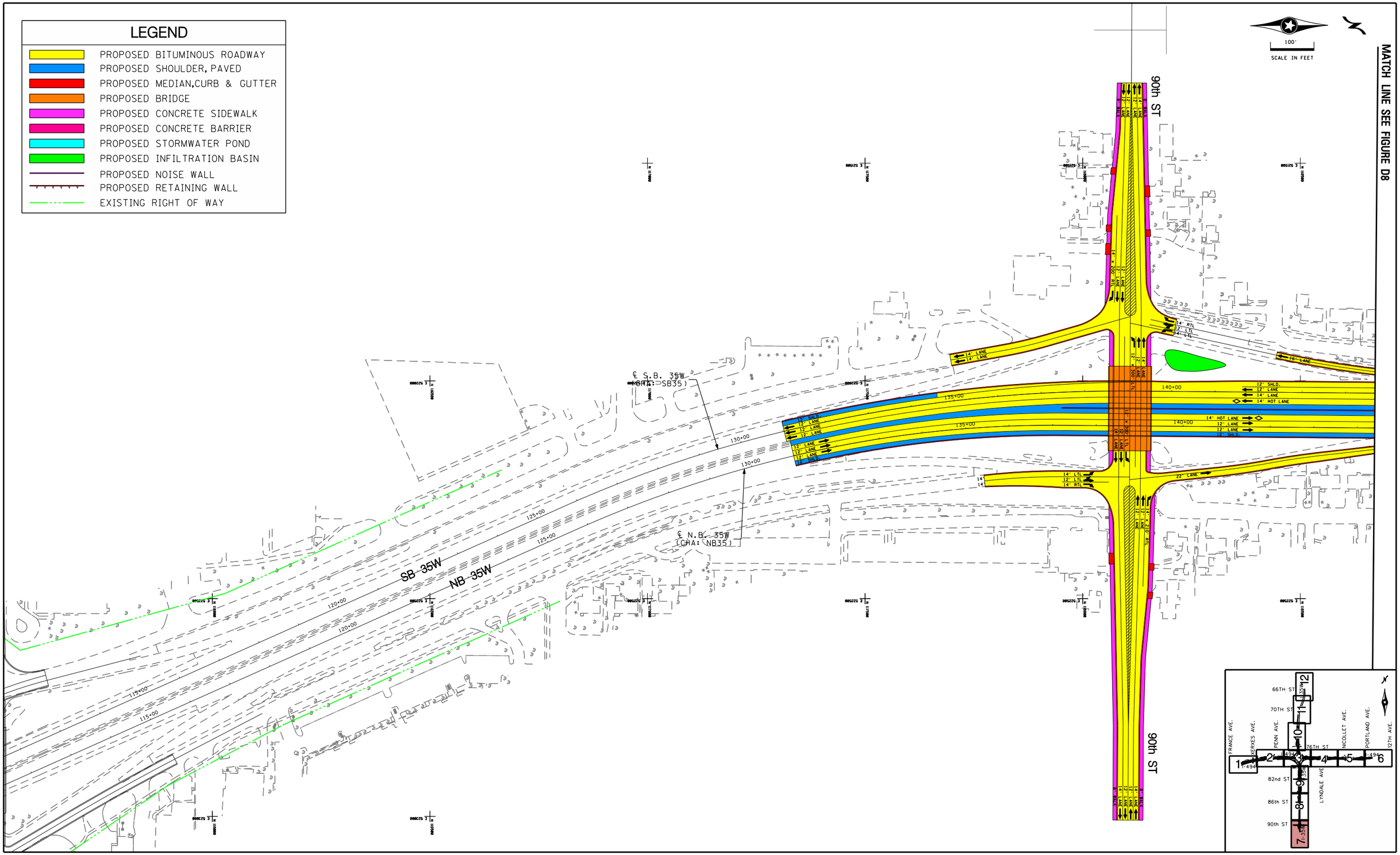
TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

FIGURE D6



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D7

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FIGURE 7
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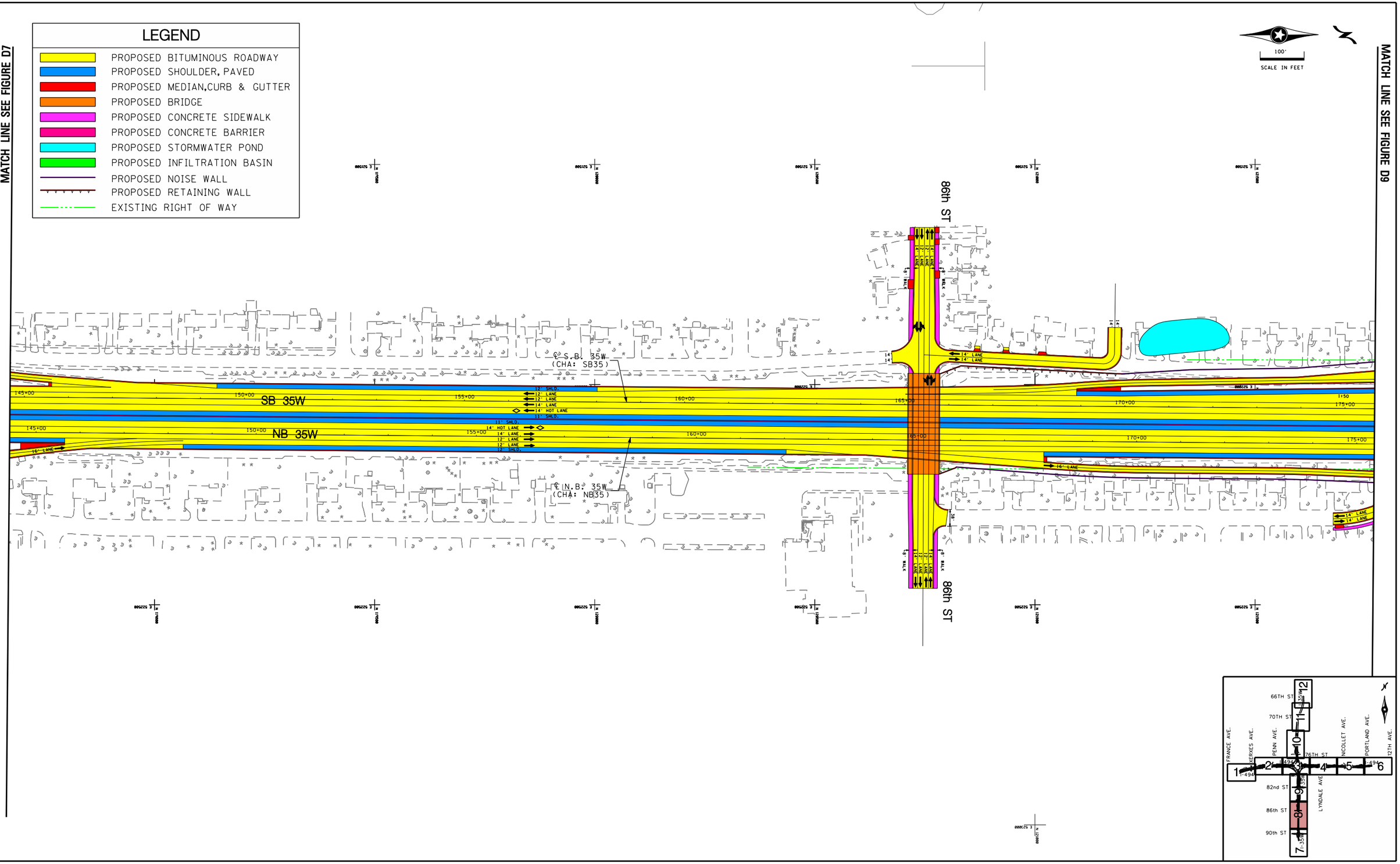
FIGURE 8

MATCH LINE SEE FIGURE D7

MATCH LINE SEE FIGURE D9

LEGEND

- PROPOSED BITUMINOUS ROADWAY
- PROPOSED SHOULDER, PAVED
- PROPOSED MEDIAN,CURB & GUTTER
- PROPOSED BRIDGE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BARRIER
- PROPOSED STORMWATER POND
- PROPOSED INFILTRATION BASIN
- PROPOSED NOISE WALL
- PROPOSED RETAINING WALL
- EXISTING RIGHT OF WAY



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D8

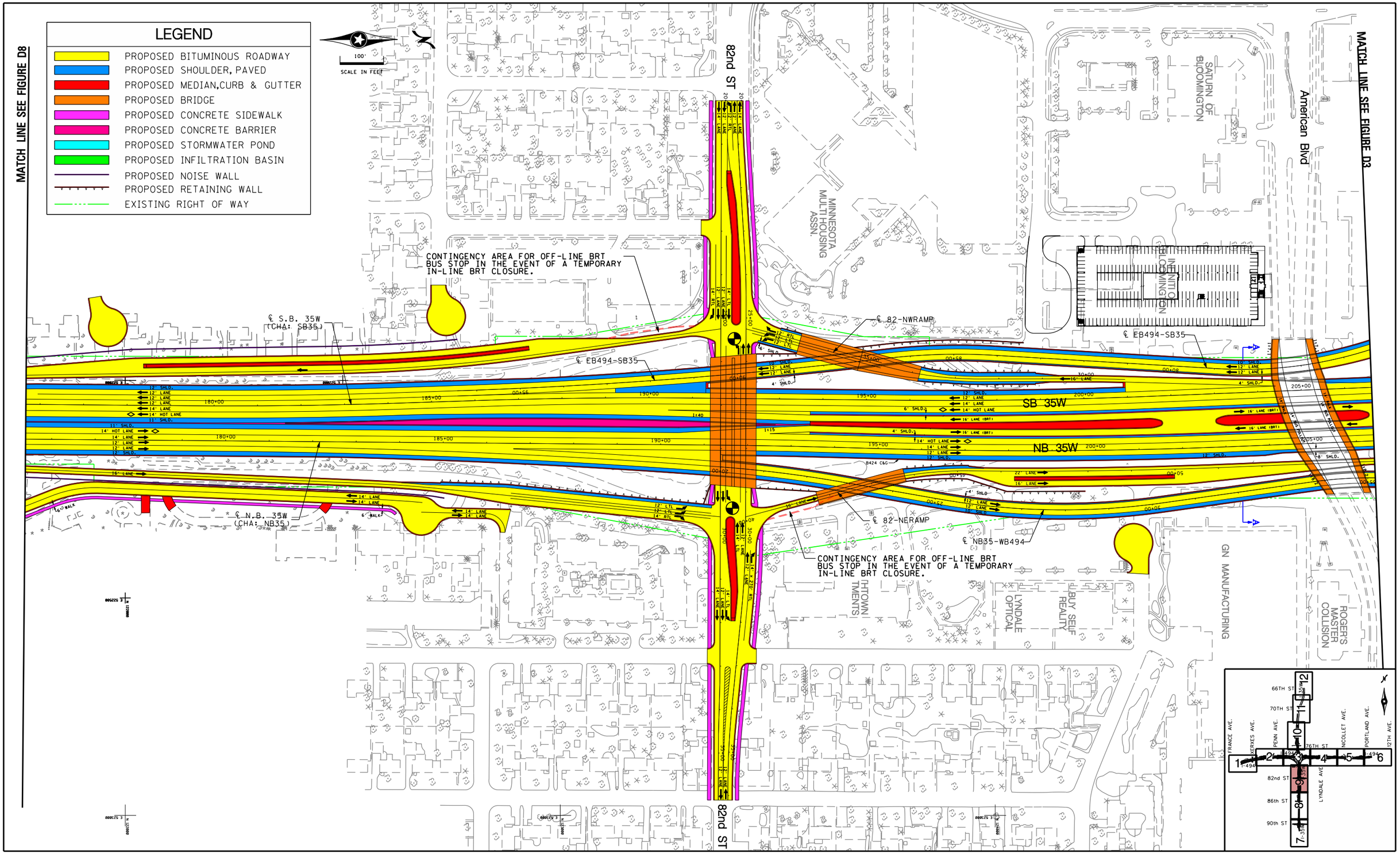

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FIGURE 9

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TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D9

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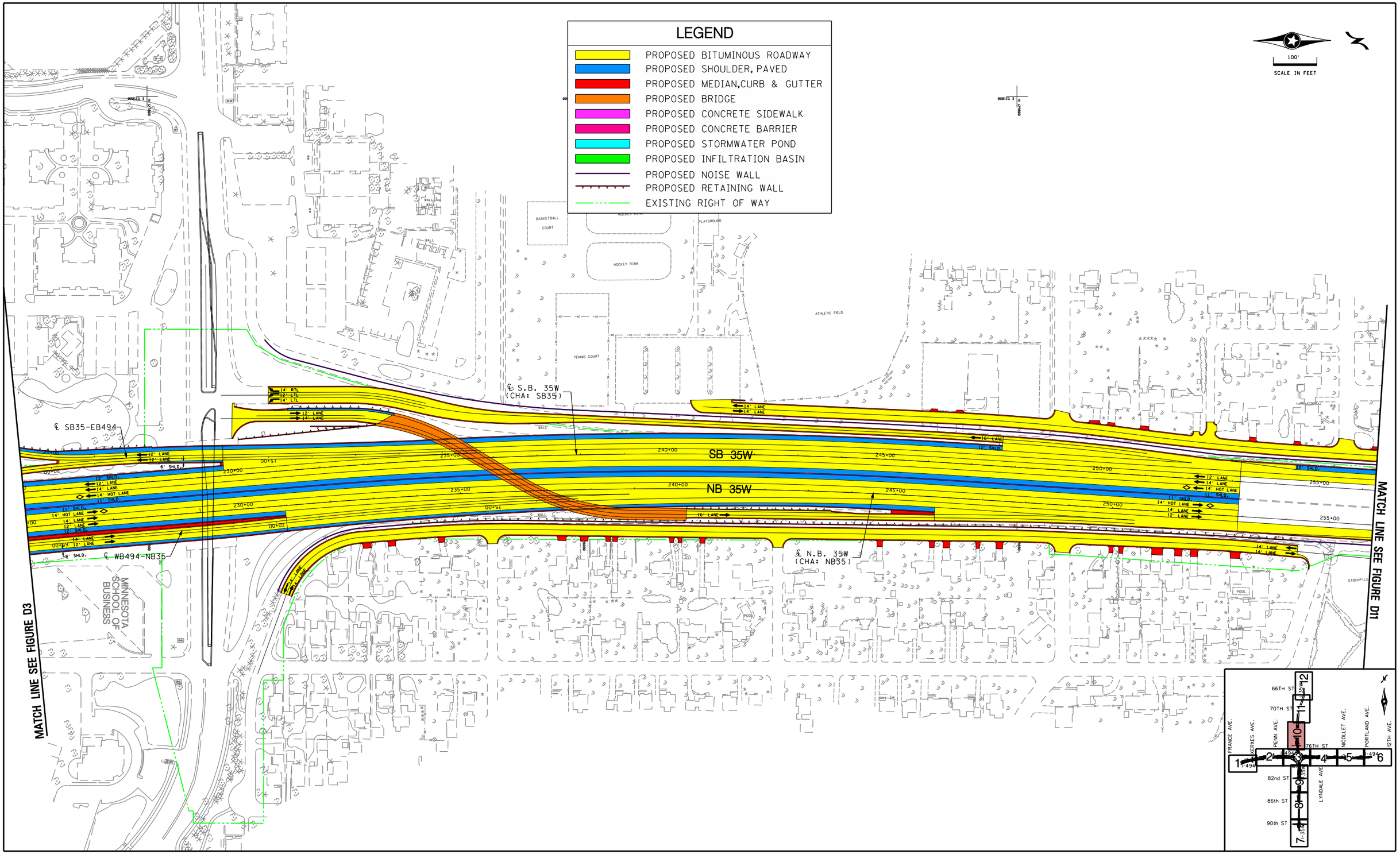

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FIGURE 10

TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D10

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FIGURE 11

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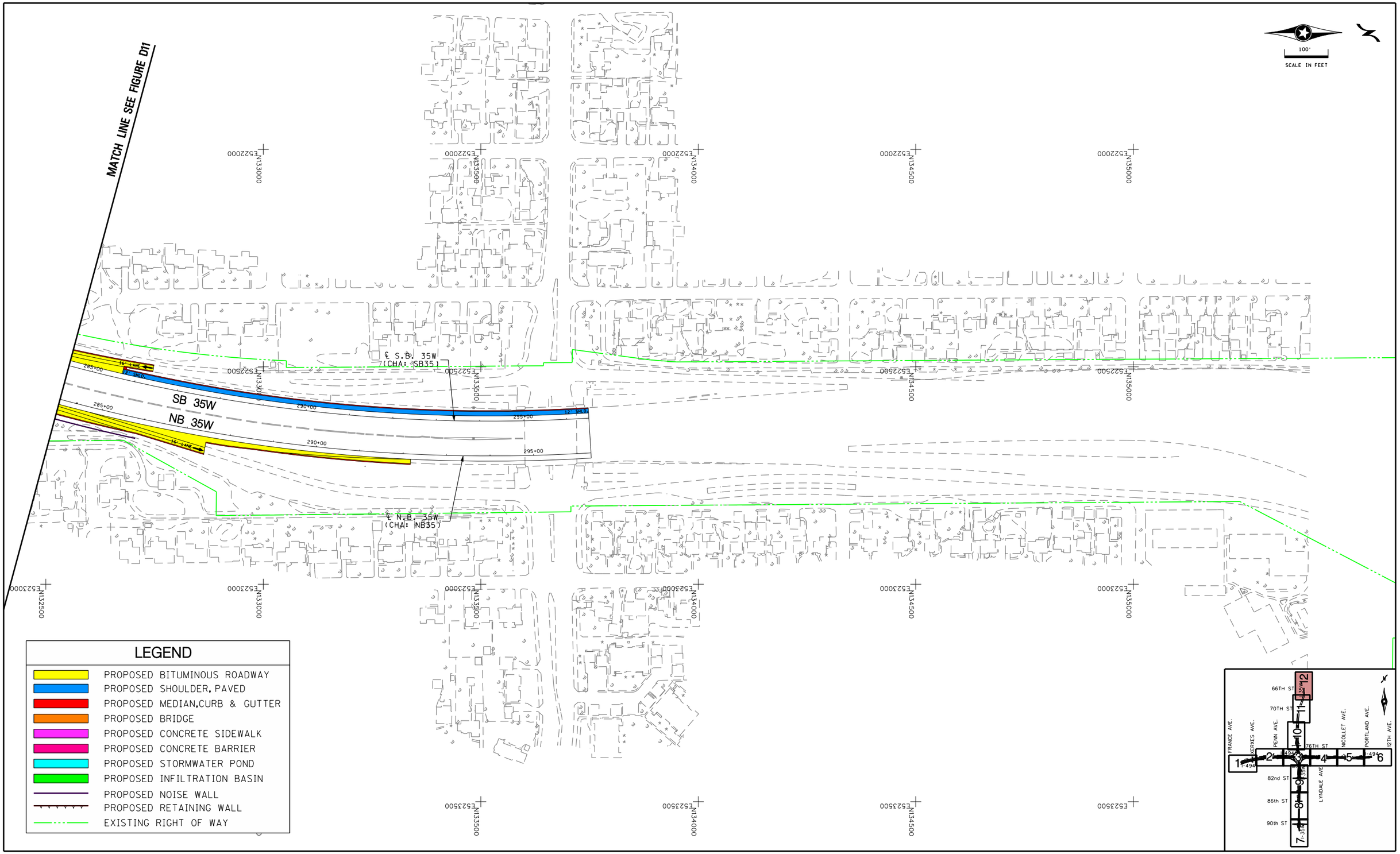
TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

FIGURE D11



TURBINE: FULL BUILD

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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FIGURE D12

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FIGURE 12

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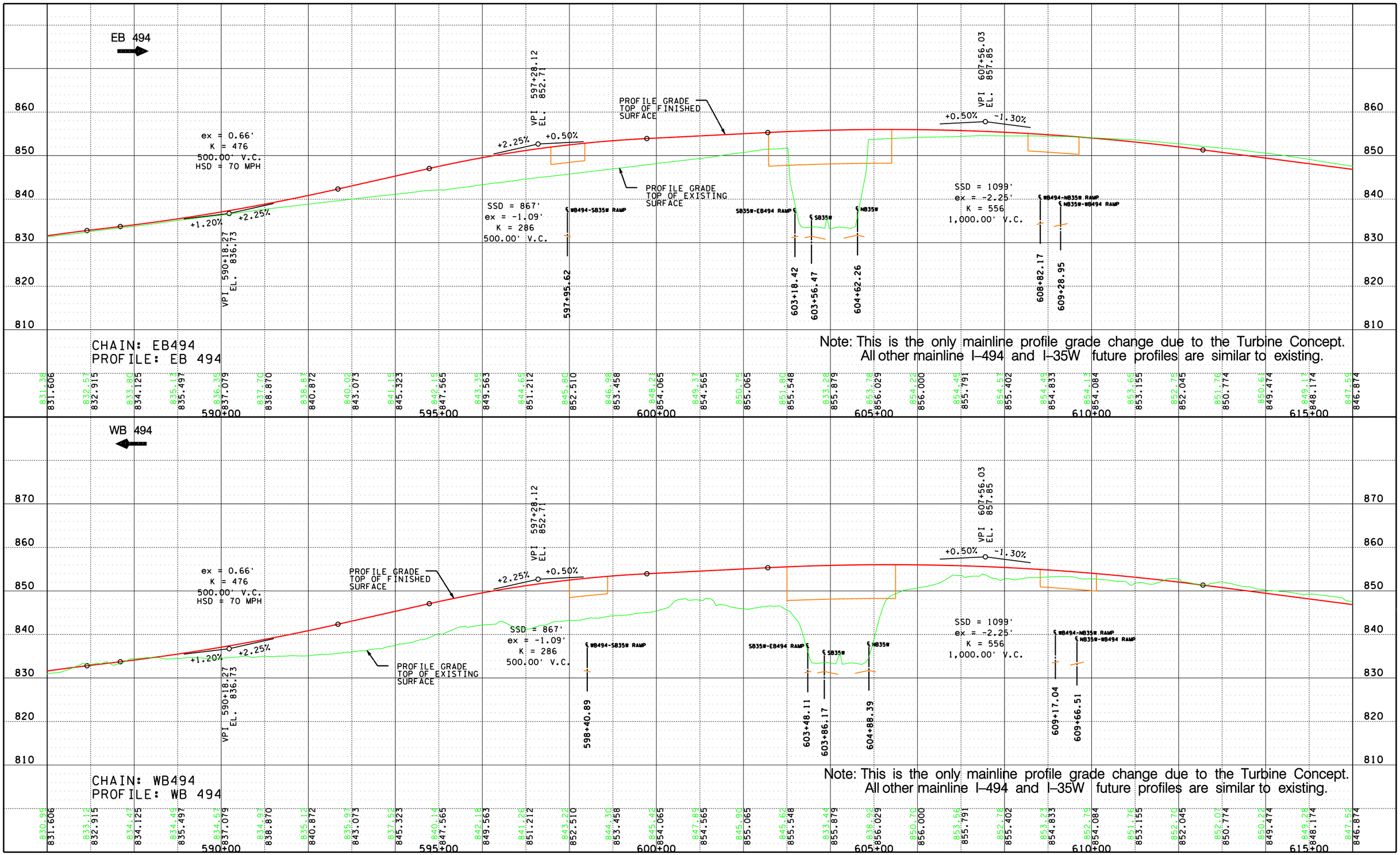

TURBINE: FULL BUILD PROFILE – EB494, WB494

FIGURE D12A

I-494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350

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SEH

MINNESOTA DEPARTMENT OF TRANSPORTATION

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D12A EB494 + WB494

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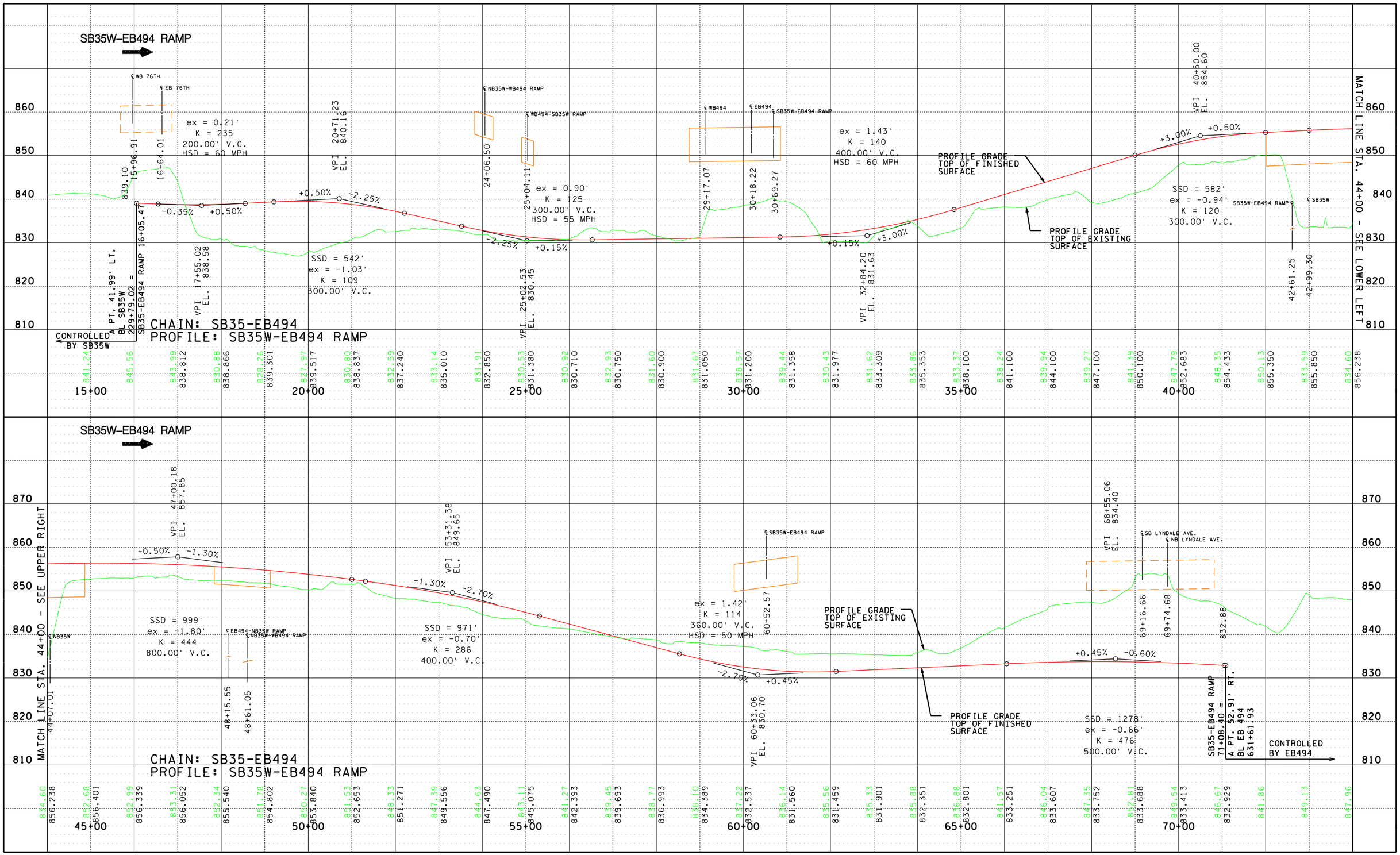

TURBINE: FULL BUILD PROFILE – SB35W–EB494 RAMP

FIGURE D12B

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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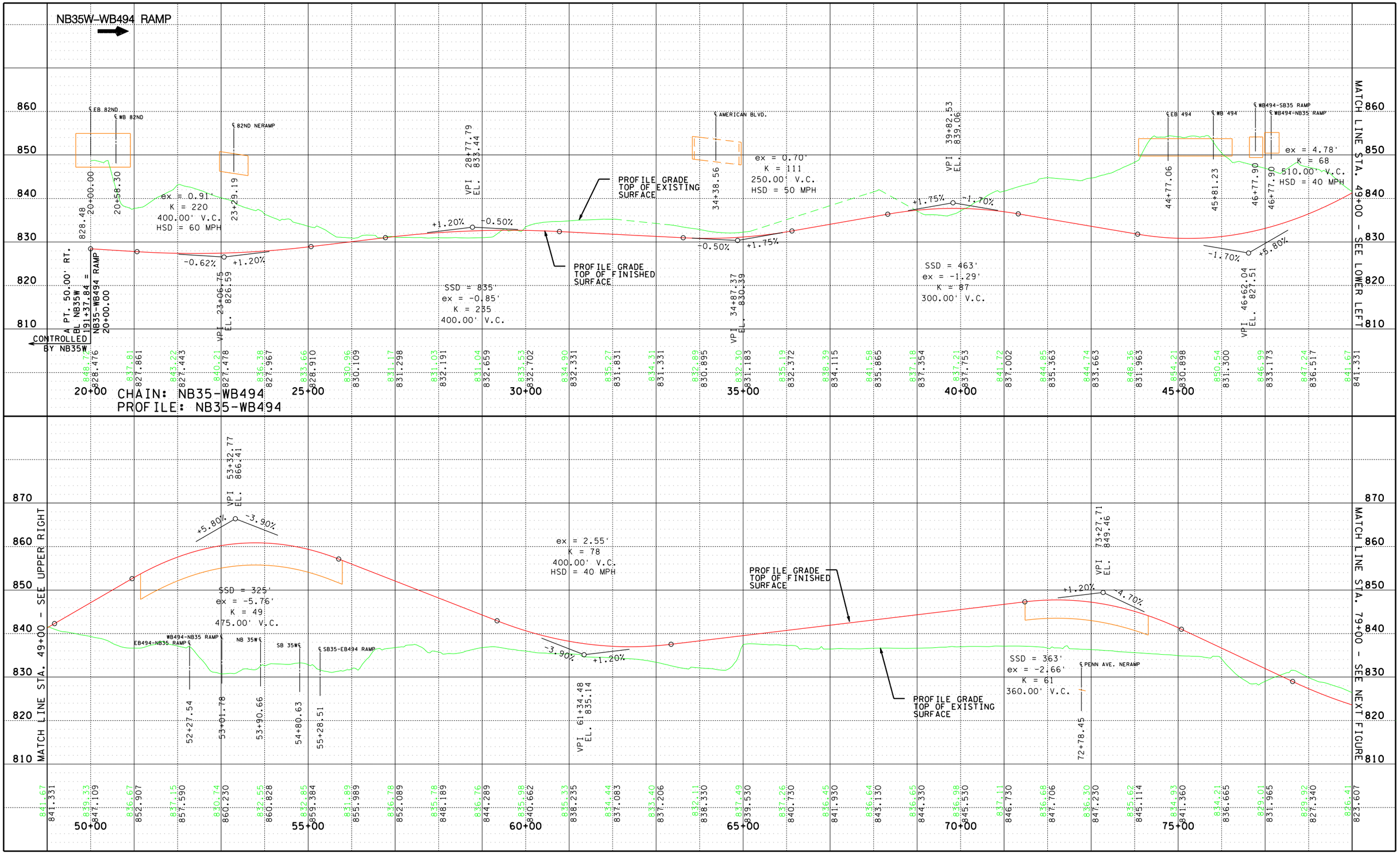
D12B SB35-EB494



TURBINE: FULL BUILD PROFILE – EB494, WB494

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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FIGURE D12C

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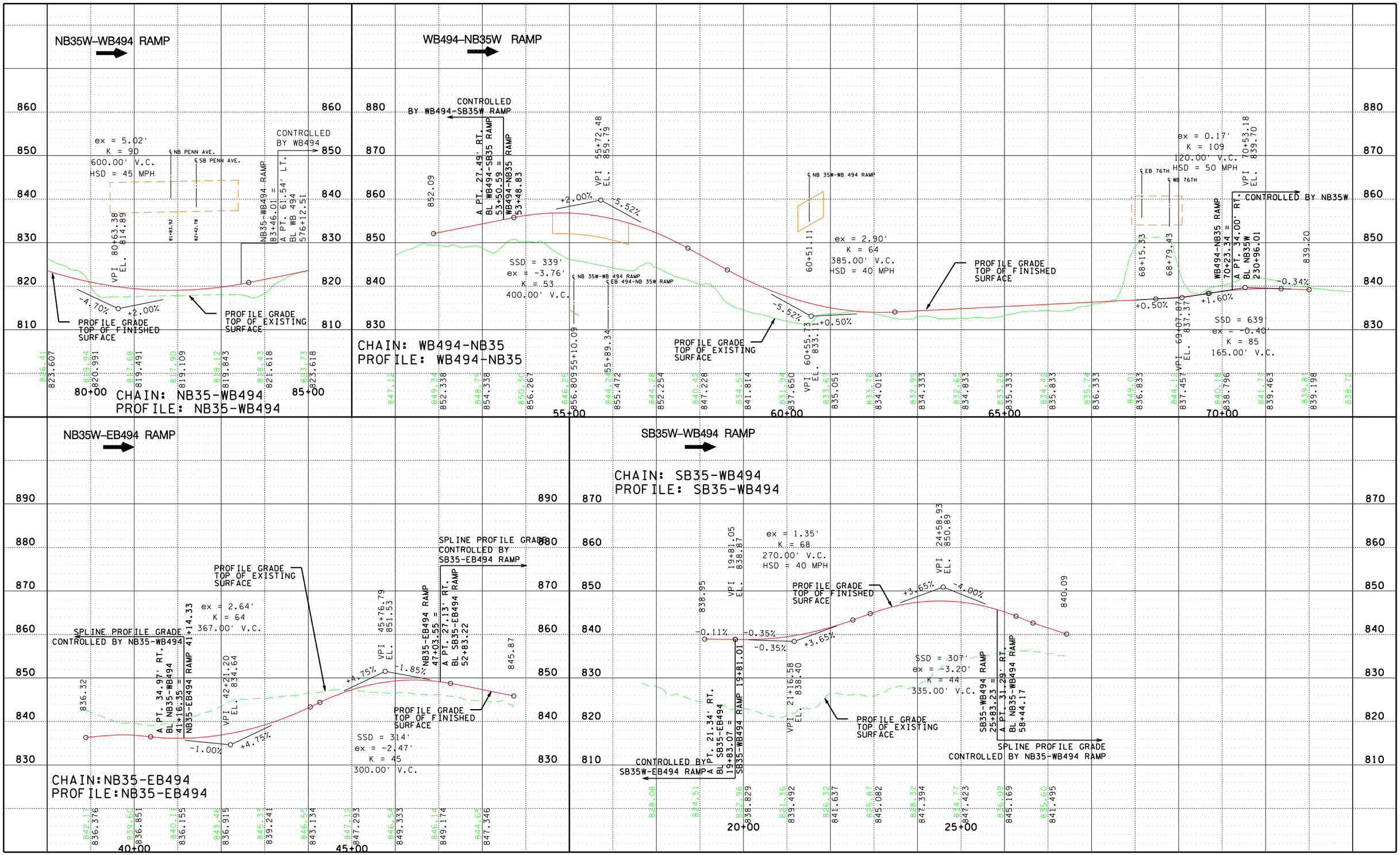
D12C NB35-WB494



TURBINE: FULL BUILD PROFILE – NB35W–WB494 RAMP, WB494–NB35W RAMP, NB35W–EB494 RAMP, SB35W–WB494 RAMP

FIGURE D12D

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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D12D
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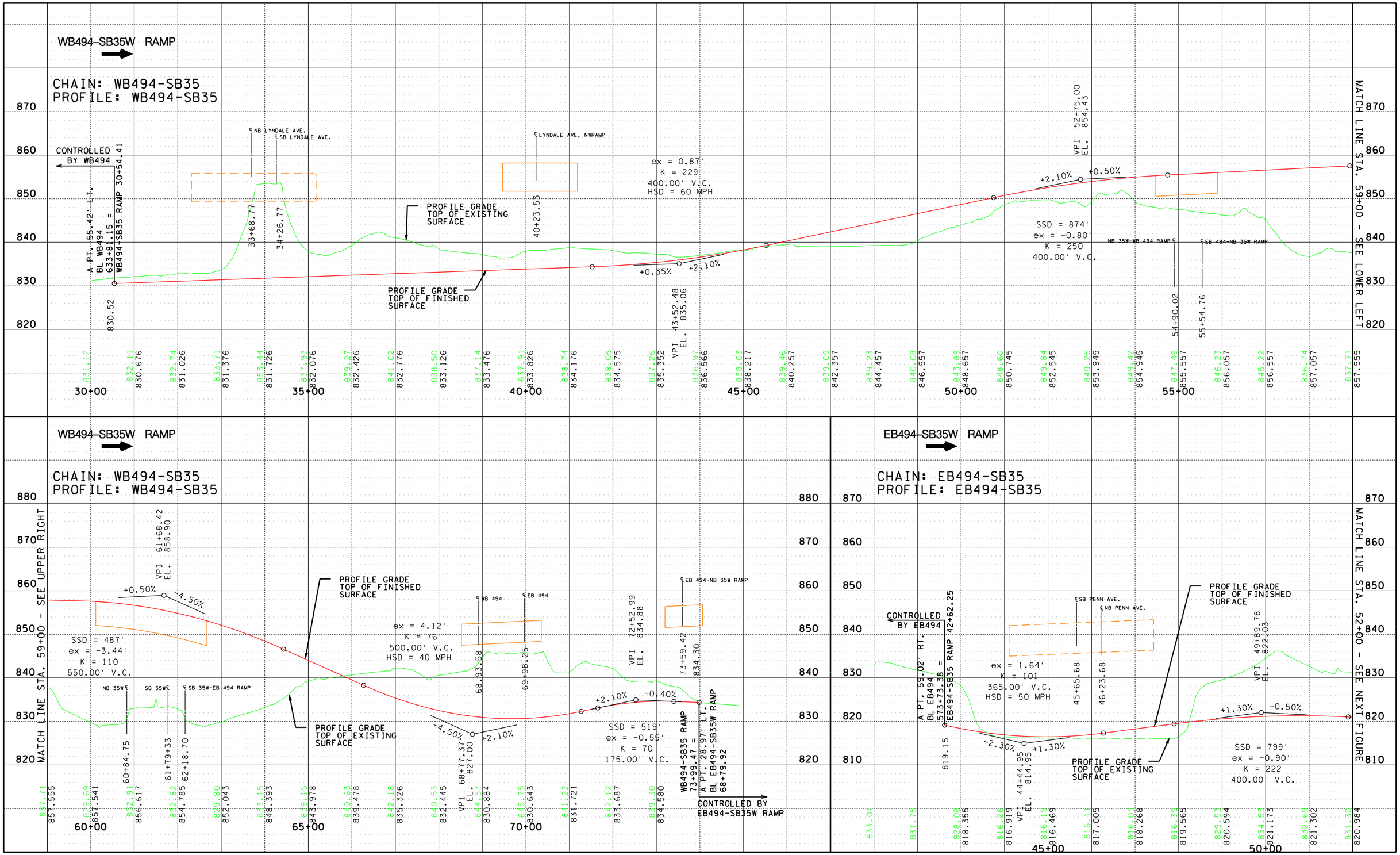

TURBINE: FULL BUILD PROFILE – WB494–SB35W RAMP, EB494–SB35W RAMP

FIGURE D12E

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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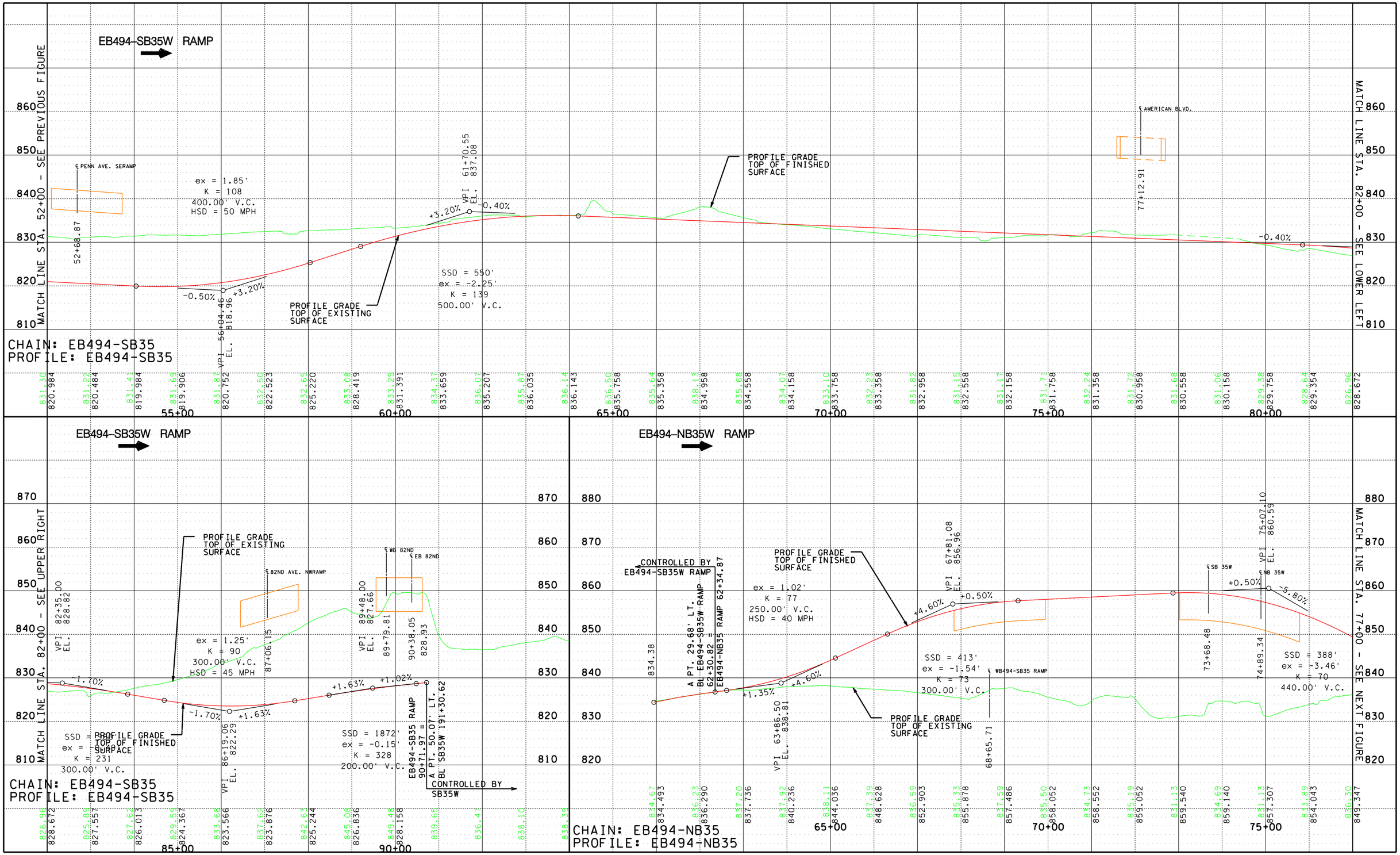

TURBINE: FULL BUILD PROFILE – EB494–SB35W RAMP, EB494–NB35W RAMP

FIGURE D12F

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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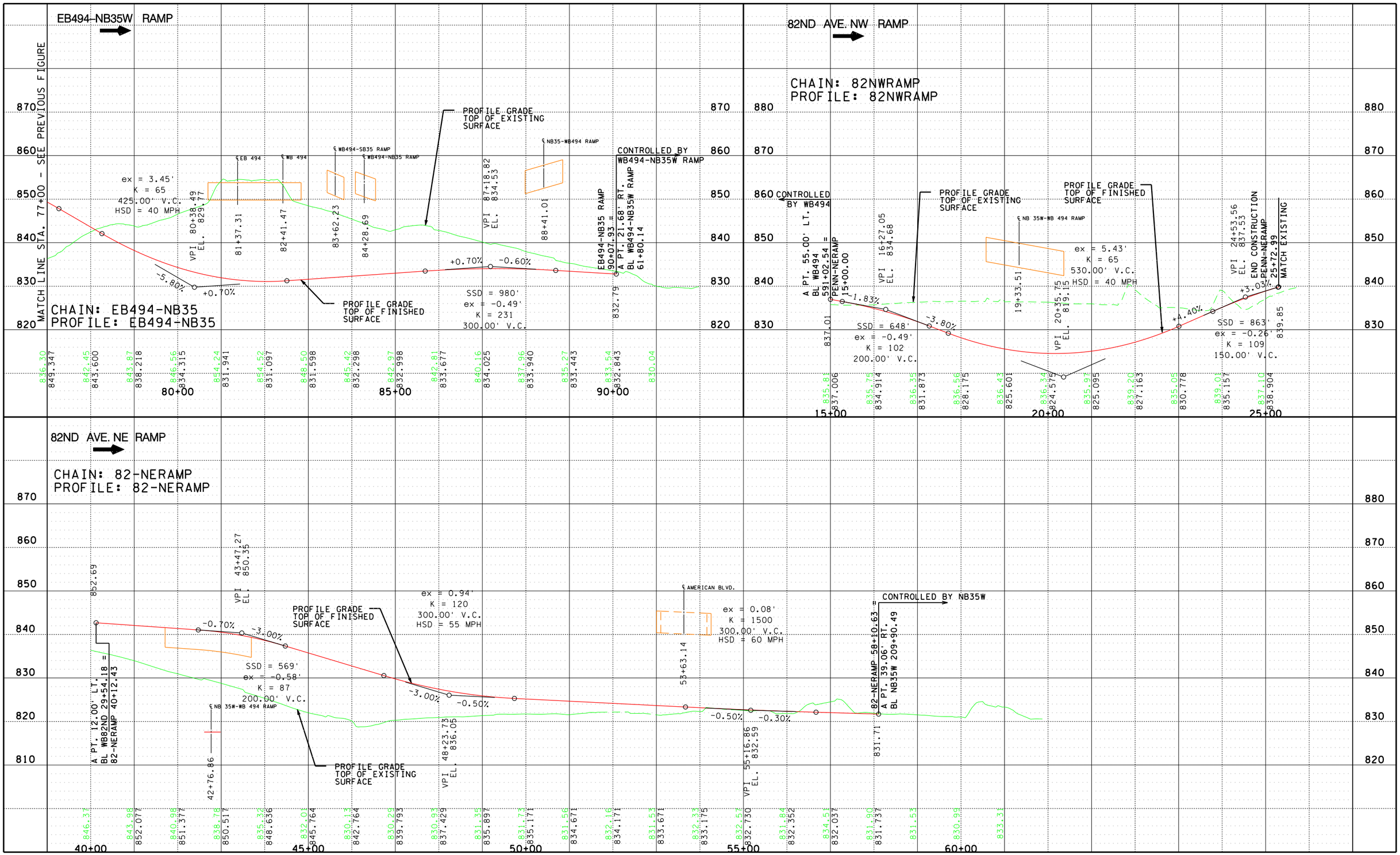
D12F



TURBINE: FULL BUILD PROFILE – EB494–NB35W RAMP, 82ND AVE. NW RAMP, 82ND AVE. NE RAMP

FIGURE D12G

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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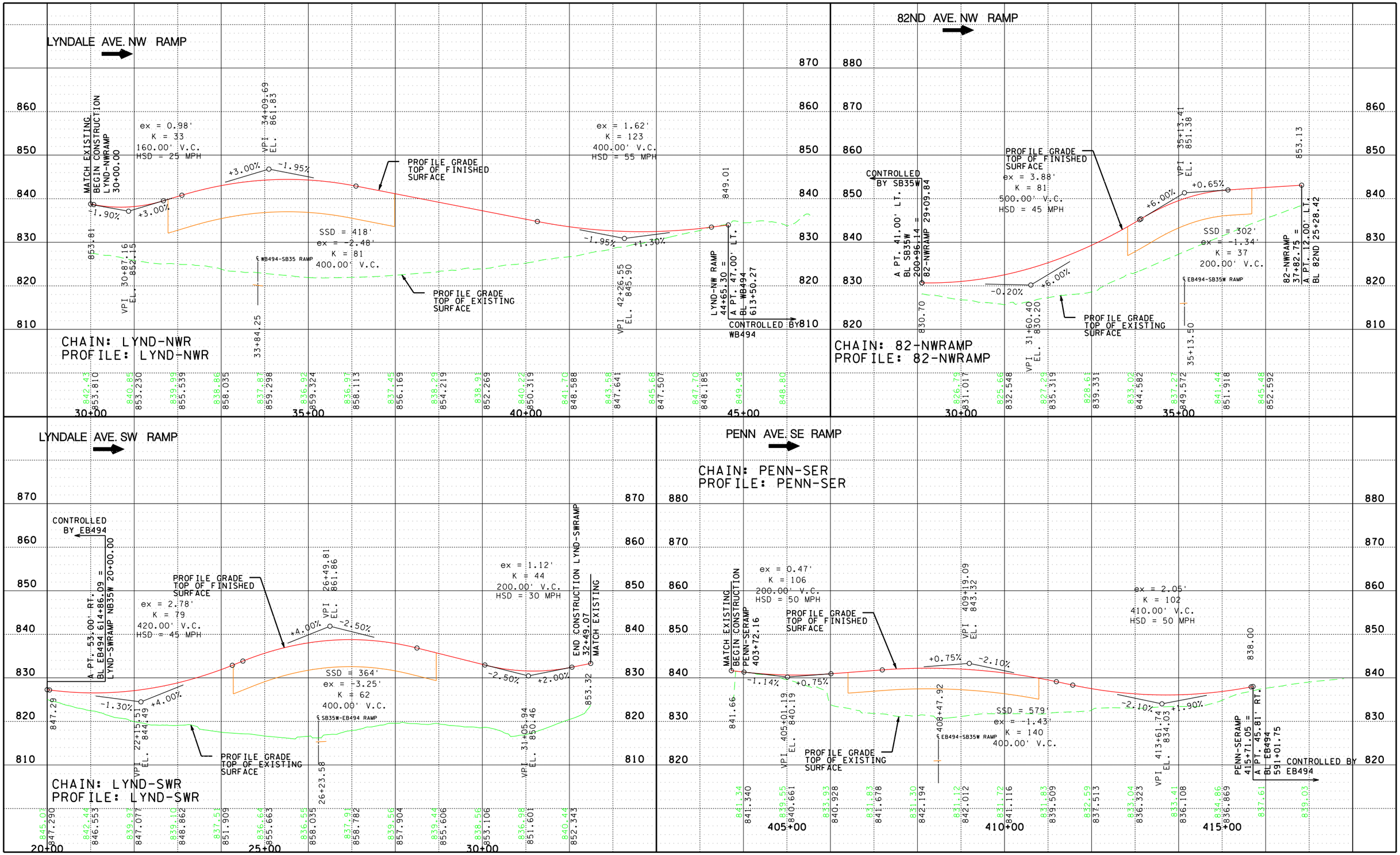
D12G



TURBINE: FULL BUILD PROFILE – LYNDALE AVE. NW RAMP, 82ND AVEW NW RAMP, LYNDALE AVE. SW RAMP, PENN AVE. SE RAMP

FIGURE D12H

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

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SEH

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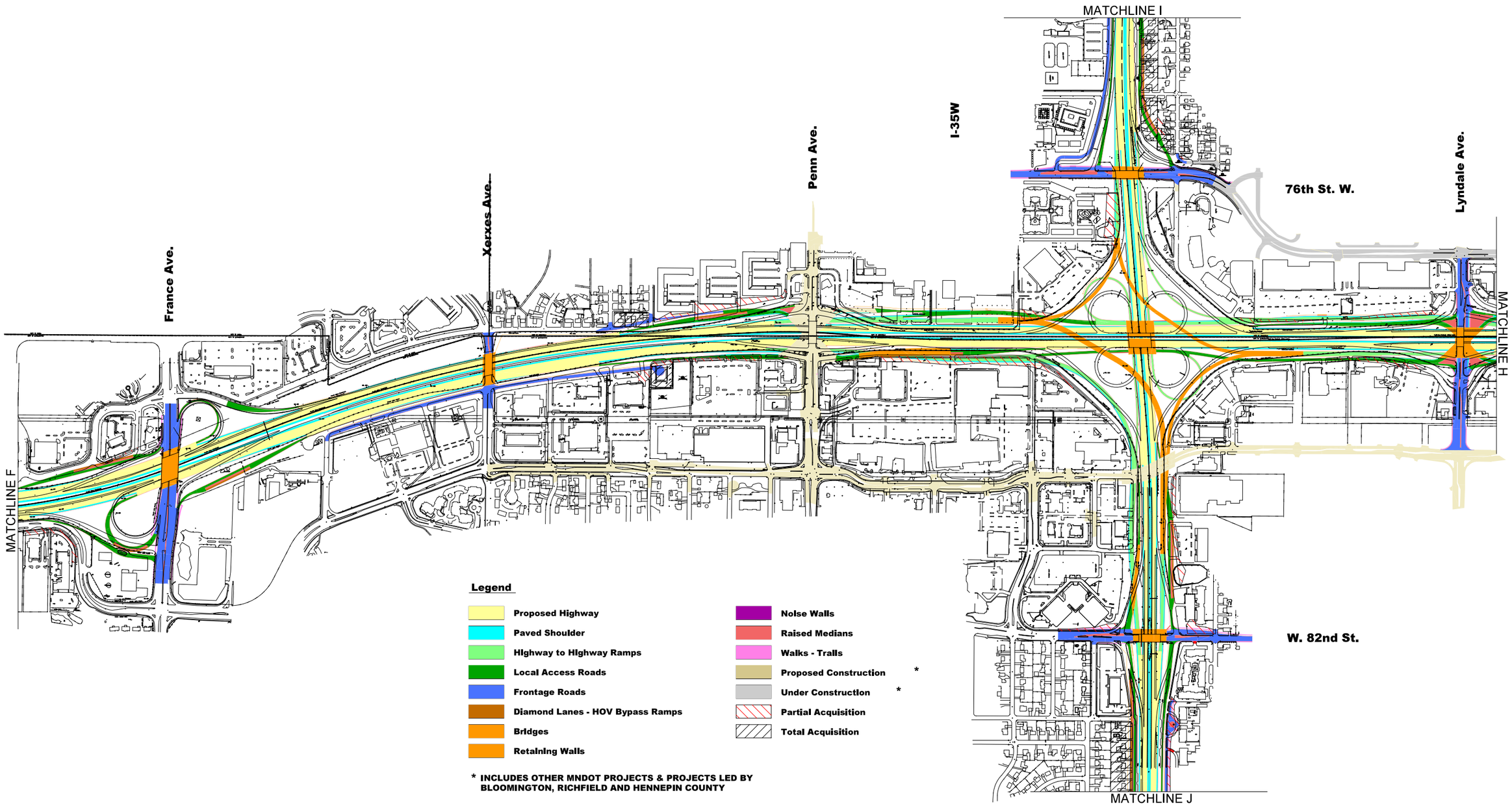
D12H



Preferred Alternative

Layout Sheet 8

0 400 800
scale feet
0 150 300 m

NORTH

Key

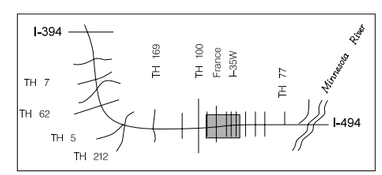


Figure 3.8

Final Environmental Impact Statement

I-494 Reconstruction

I-394 to the Minnesota River

FIGURE D13

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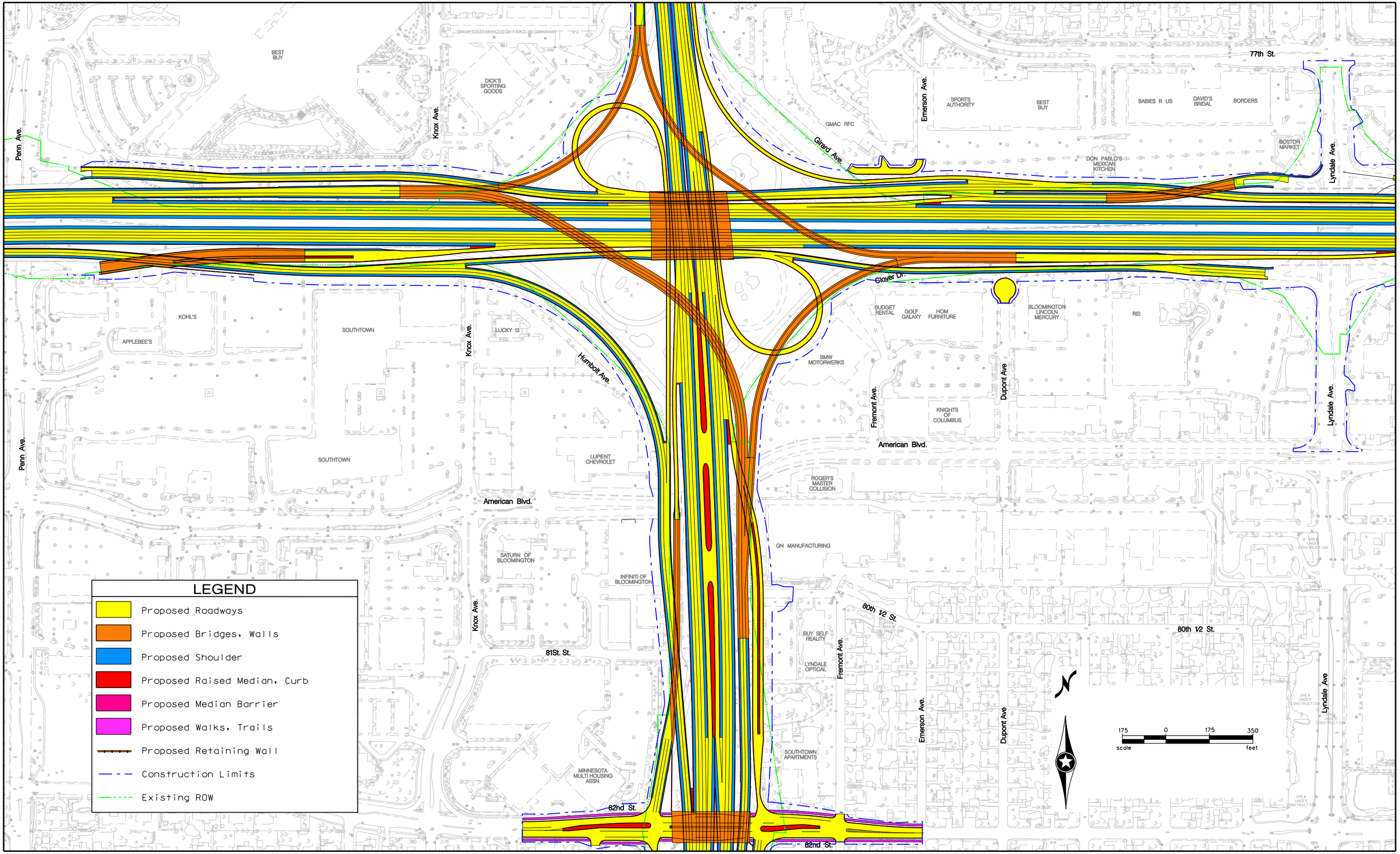
FEIS with BRT at American



FEIS CONCEPT: BRT AT AMERICAN BLVD.

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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FIGURE D13A

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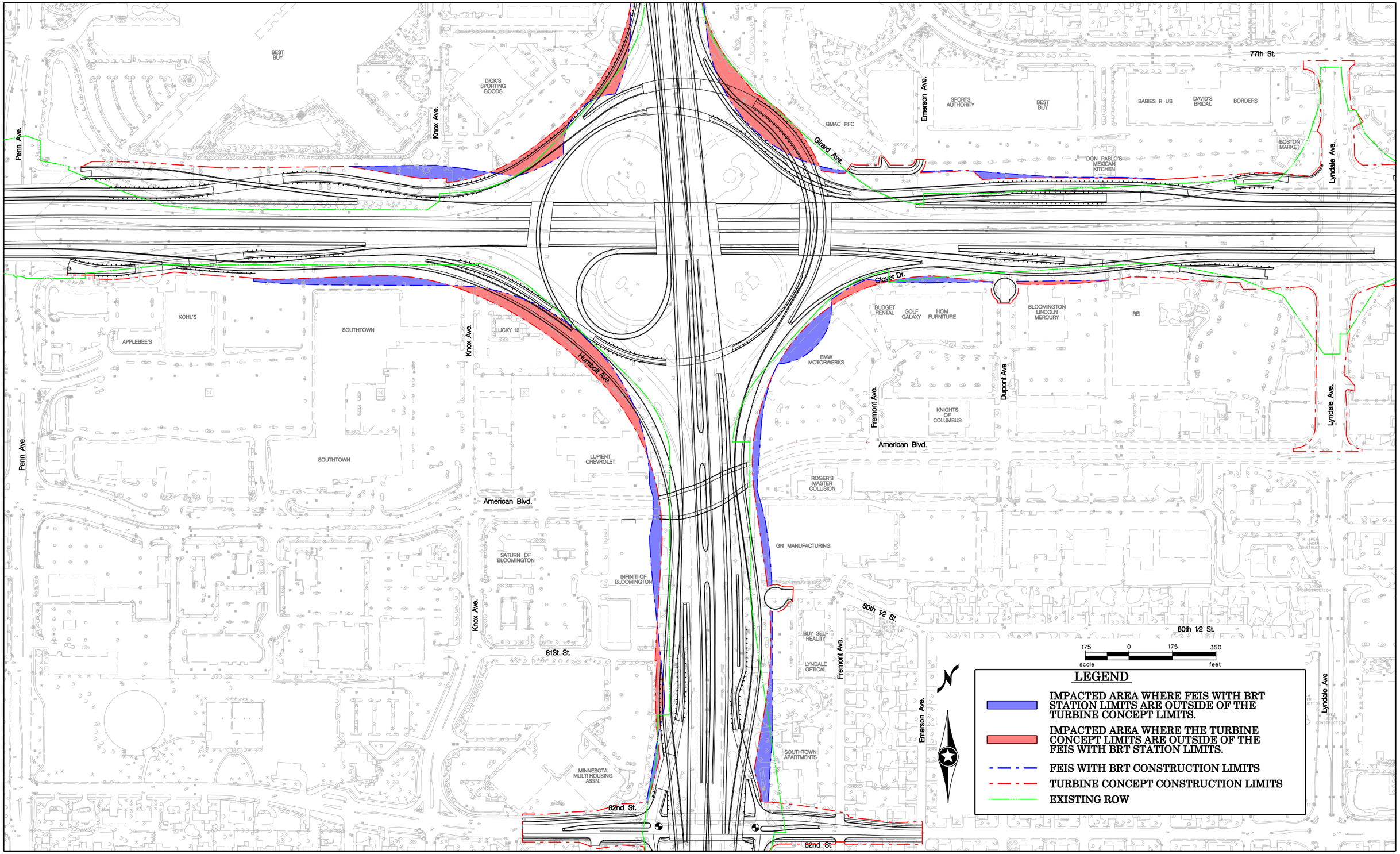
Turbine vs FEIS



TURBINE–FULL BUILD (VS) FEIS CONCEPT: BRT AT AMERICAN BLVD.

FIGURE D13B

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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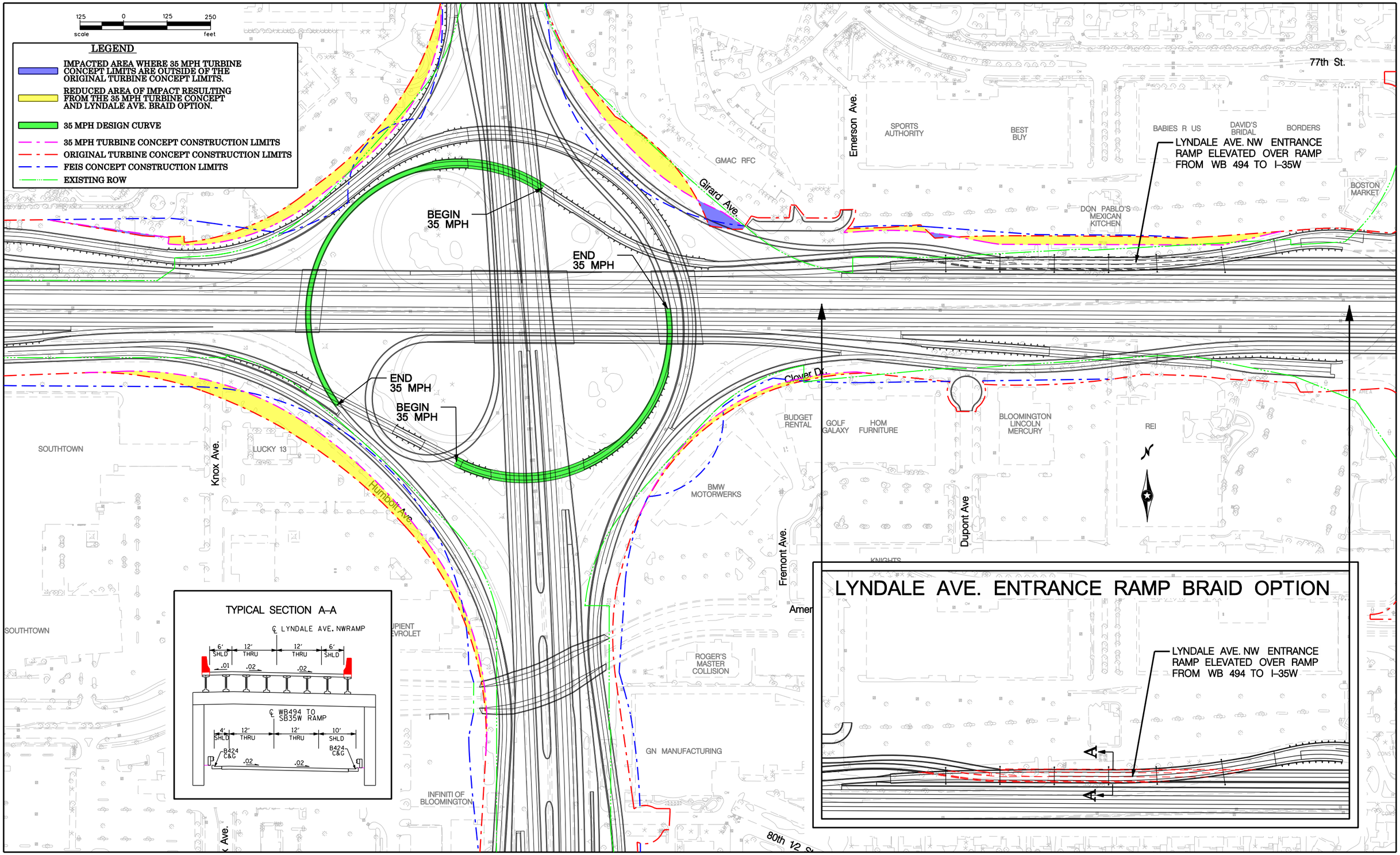

TURBINE–FULL BUILD (VS) TURBINE WITH 35 MPH DESIGN

FIGURE D14

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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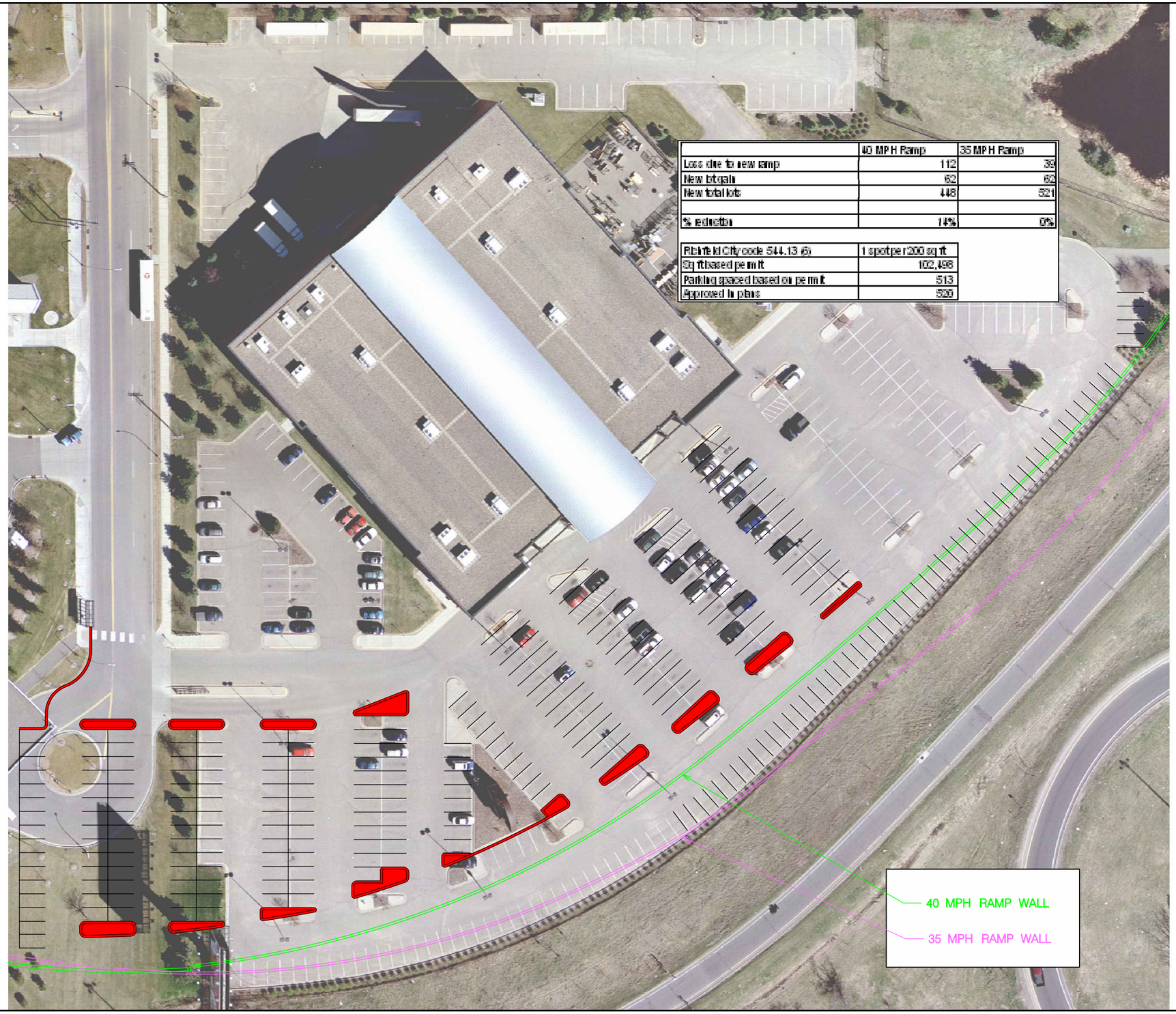
Turbine vs 35 MPH design



	40 MPH Ramp	35 MPH Ramp
Loss due to new ramp	112	39
New bt again	62	62
New total lots	448	521
% reduction	14%	0%

Plaintiff City code 544.13 (6)	1 spot per 200 sq ft
Sq ft based permit	102,498
Parking spaced based on permit	513
Approved in plans	520

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$USER$
$FILE$
$MODEL$

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DICK'S SPORTING GOODS PARKING LOT POTENTIAL MODIFICATIONS

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

FIGURE D15

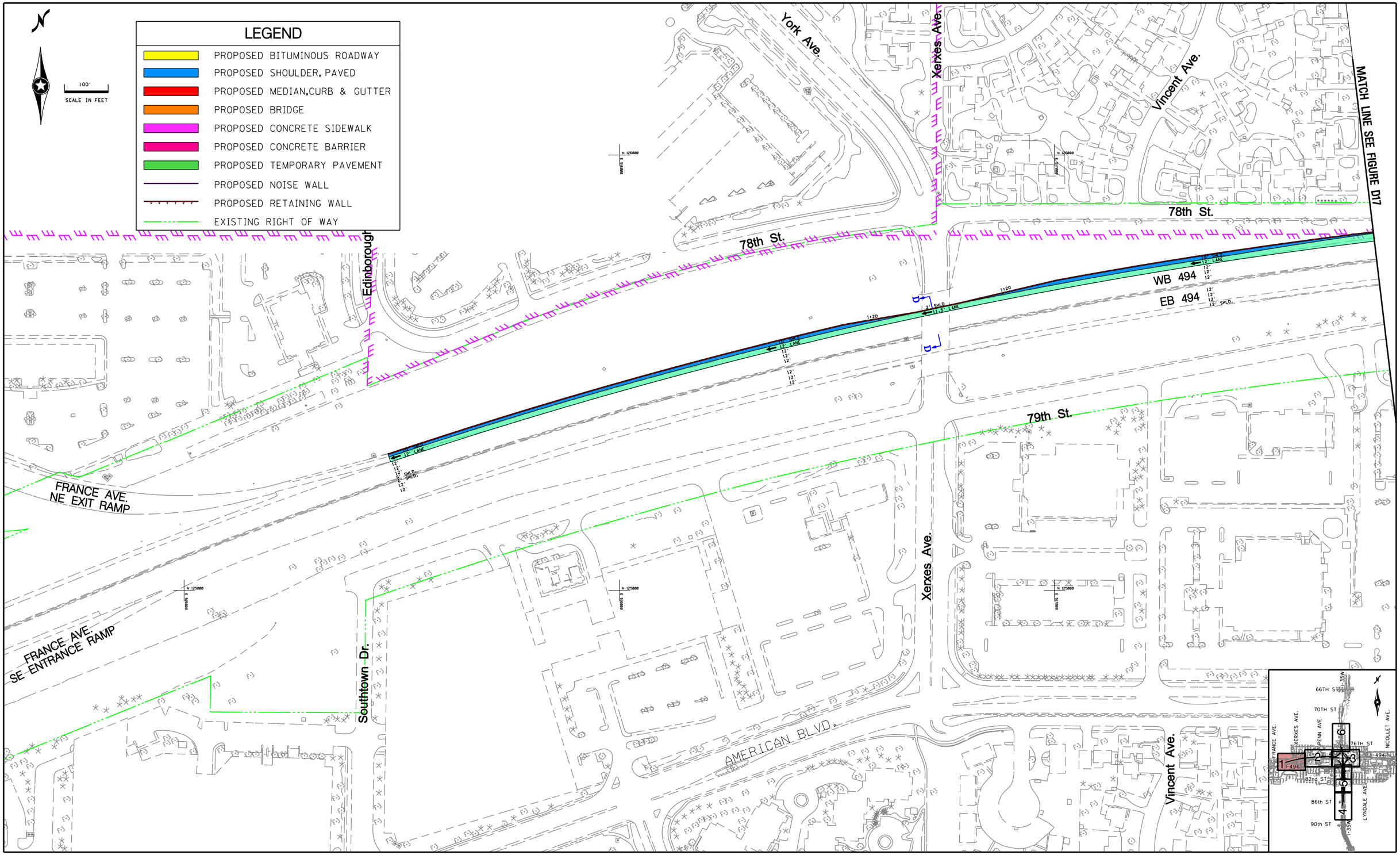

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FIGURE 1

TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D16

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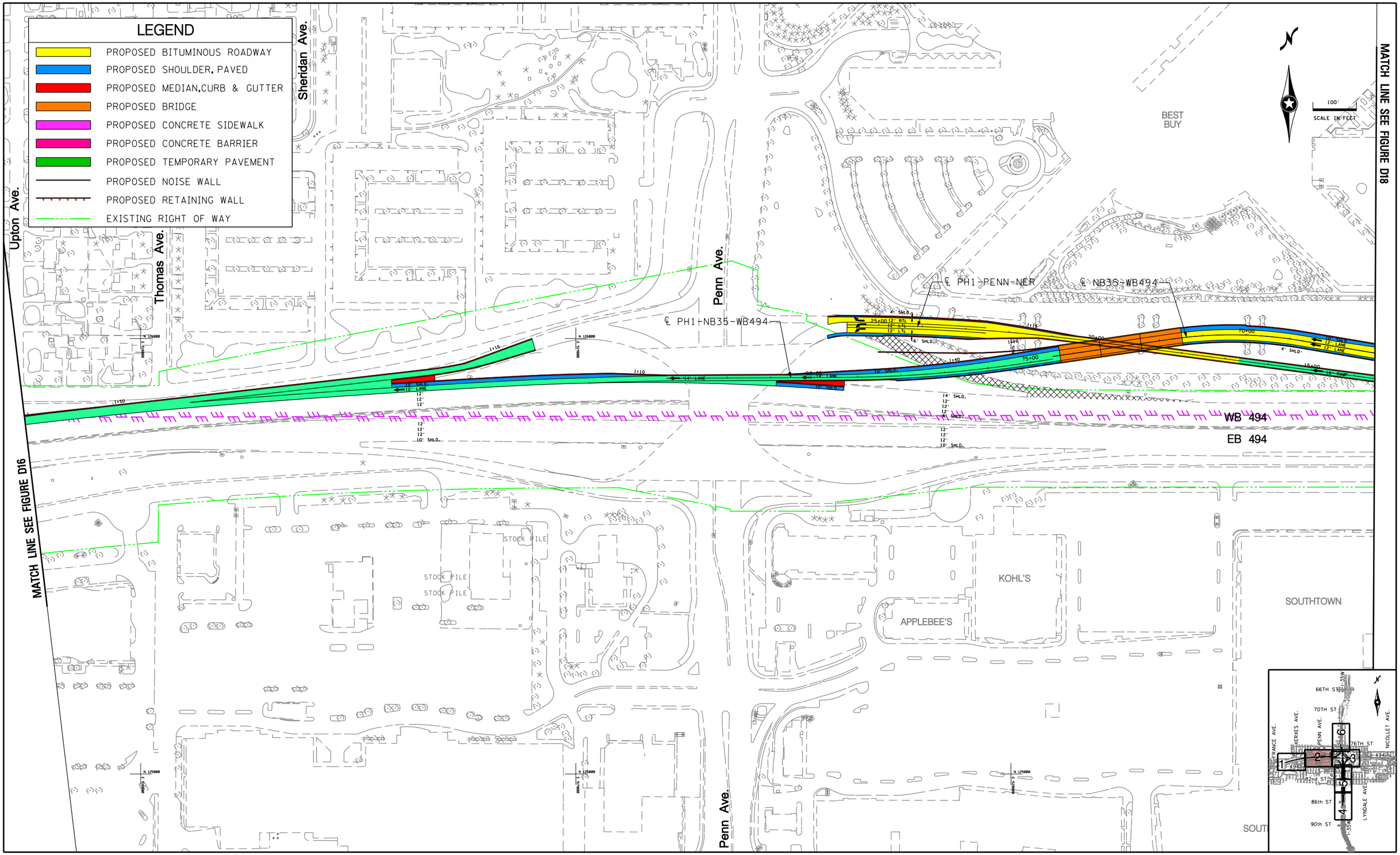
FIGURE 2



TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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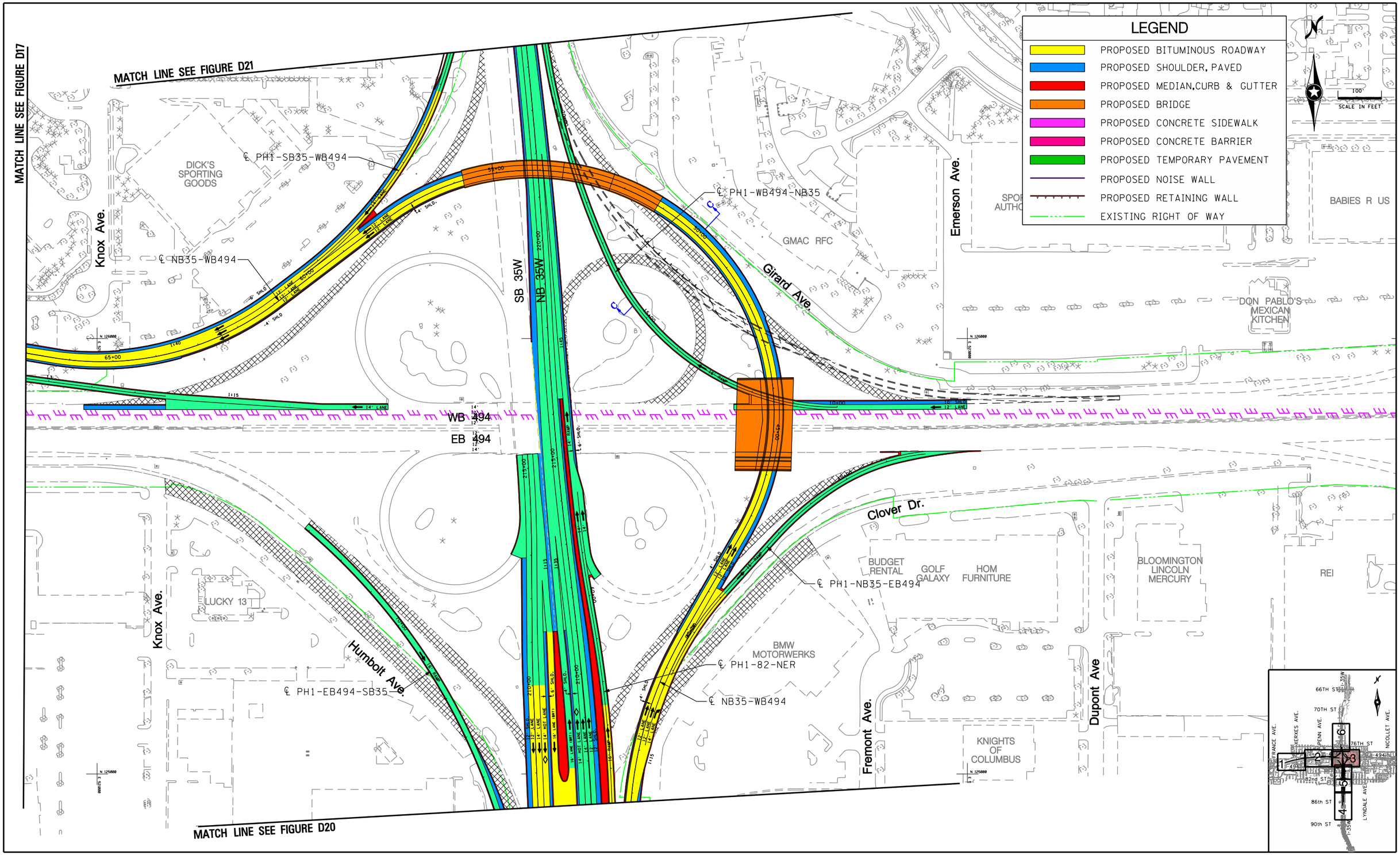
FIGURE D17



TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

AMNTCO107371

FIGURE D18

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FIGURE 3

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LEGEND

- PROPOSED BITUMINOUS ROADWAY
- PROPOSED SHOULDER, PAVED
- PROPOSED MEDIAN,CURB & GUTTER
- PROPOSED BRIDGE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE BARRIER
- PROPOSED TEMPORARY PAVEMENT
- PROPOSED NOISE WALL
- PROPOSED RETAINING WALL
- EXISTING RIGHT OF WAY

S:\KO\M\Mntco\107371\5-dsgn\51-cadd\Figures\mntco107371_phase1_1-6.dgn
FIGURE 4

TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D19

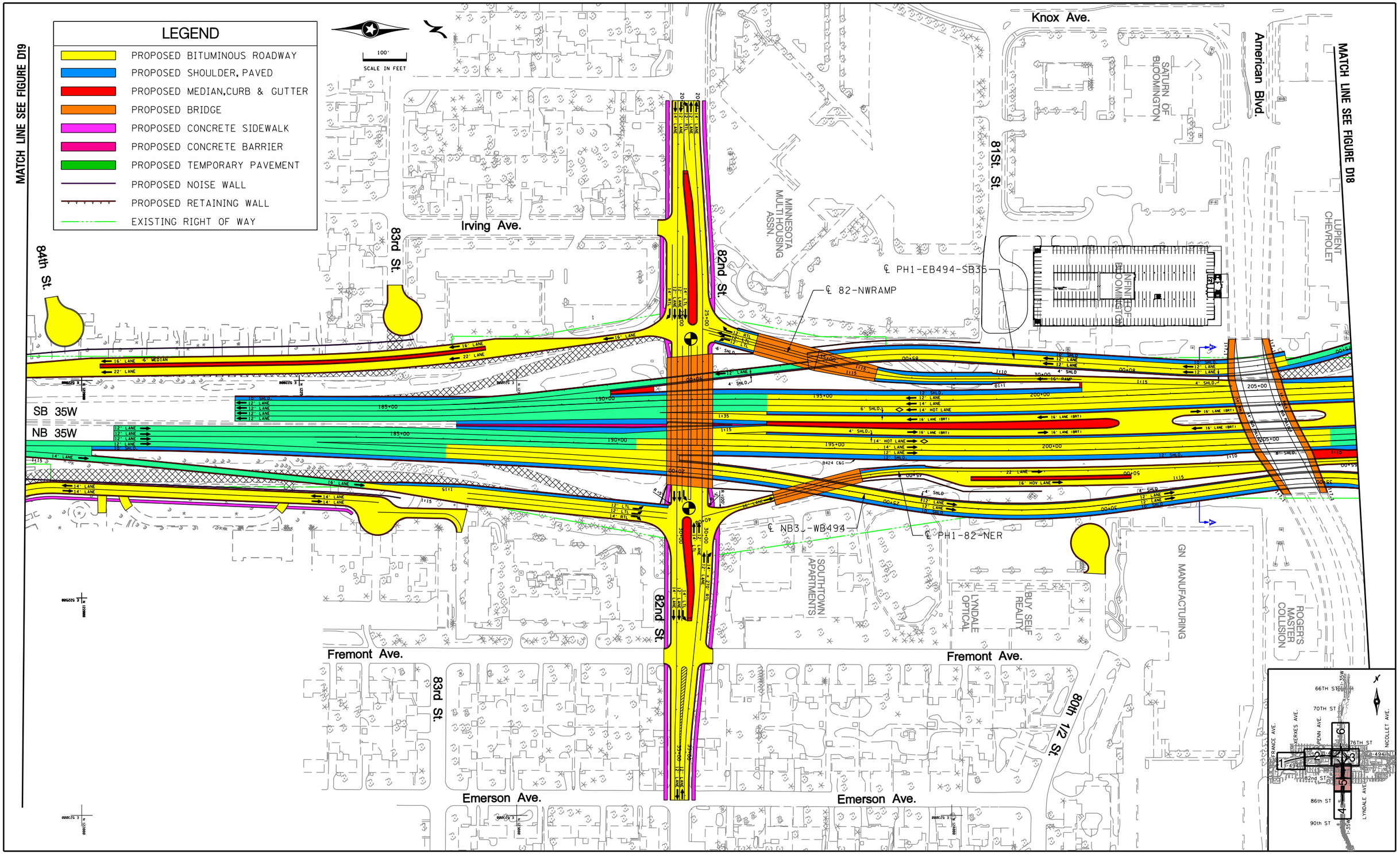

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FIGURE 5

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TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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FIGURE D20

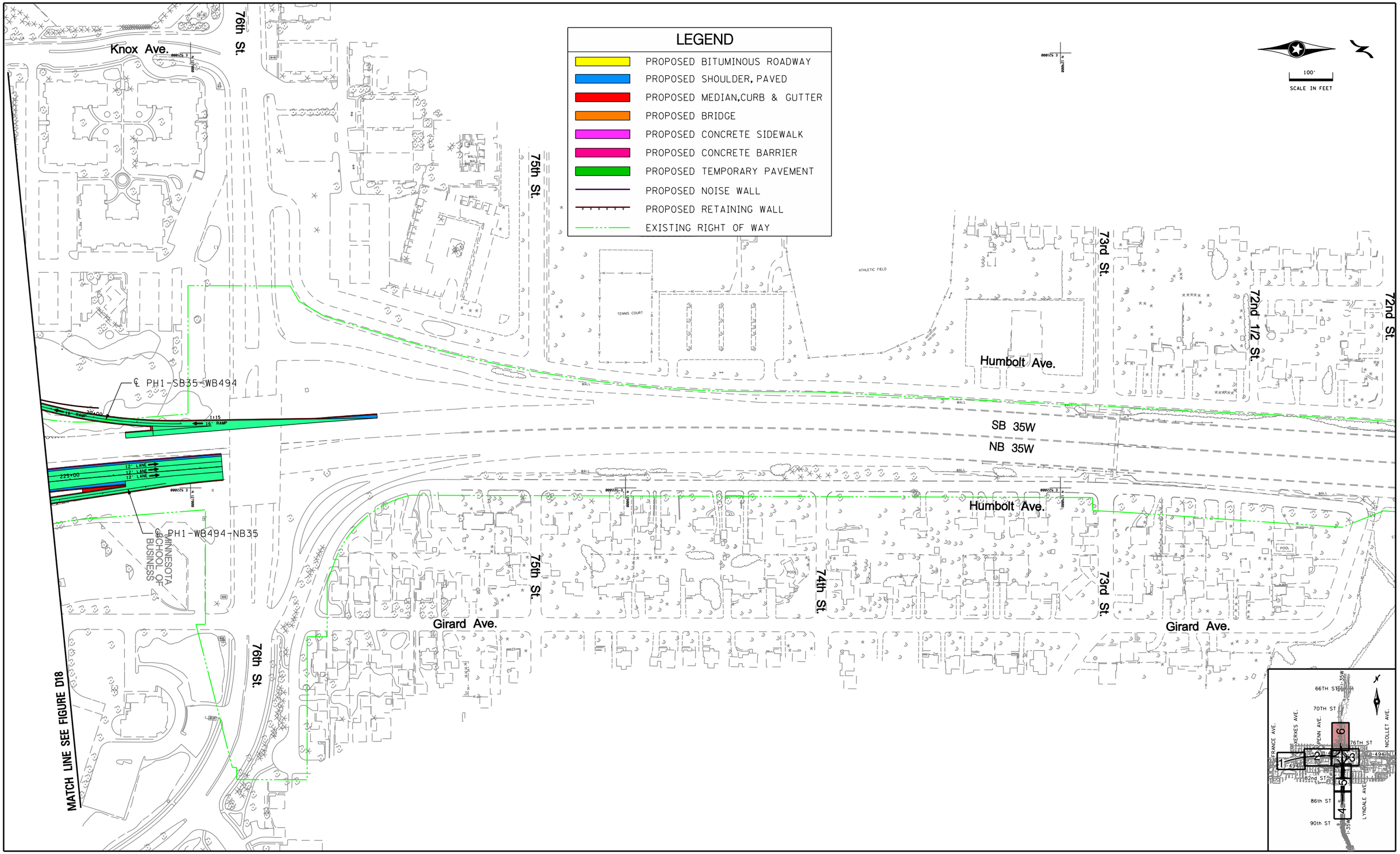

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FIGURE 6

TURBINE: PHASE 1

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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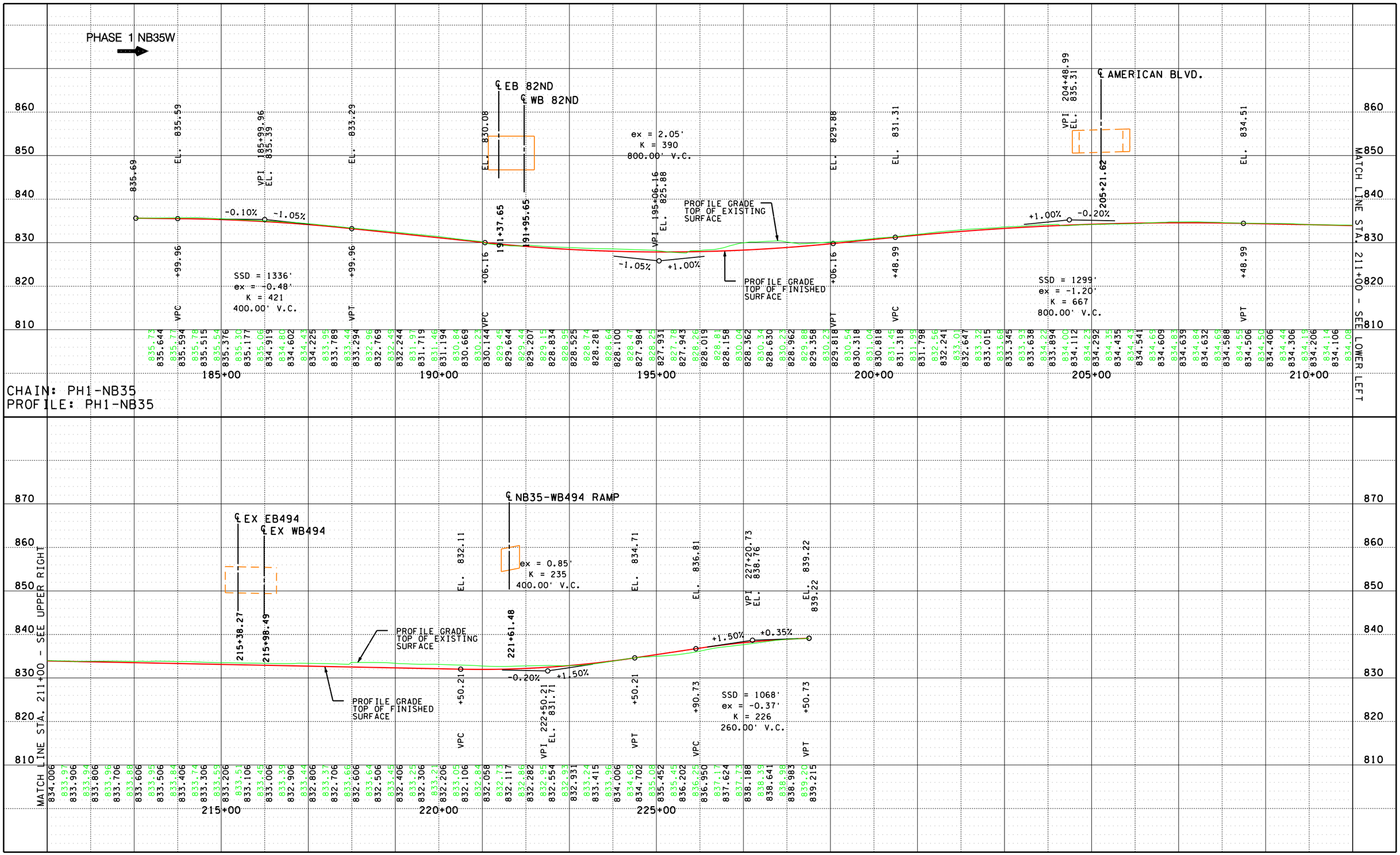
FIGURE D21



TURBINE: PHASE 1 PROFILE – NB 35W

FIGURE D22

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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I-NB 35W

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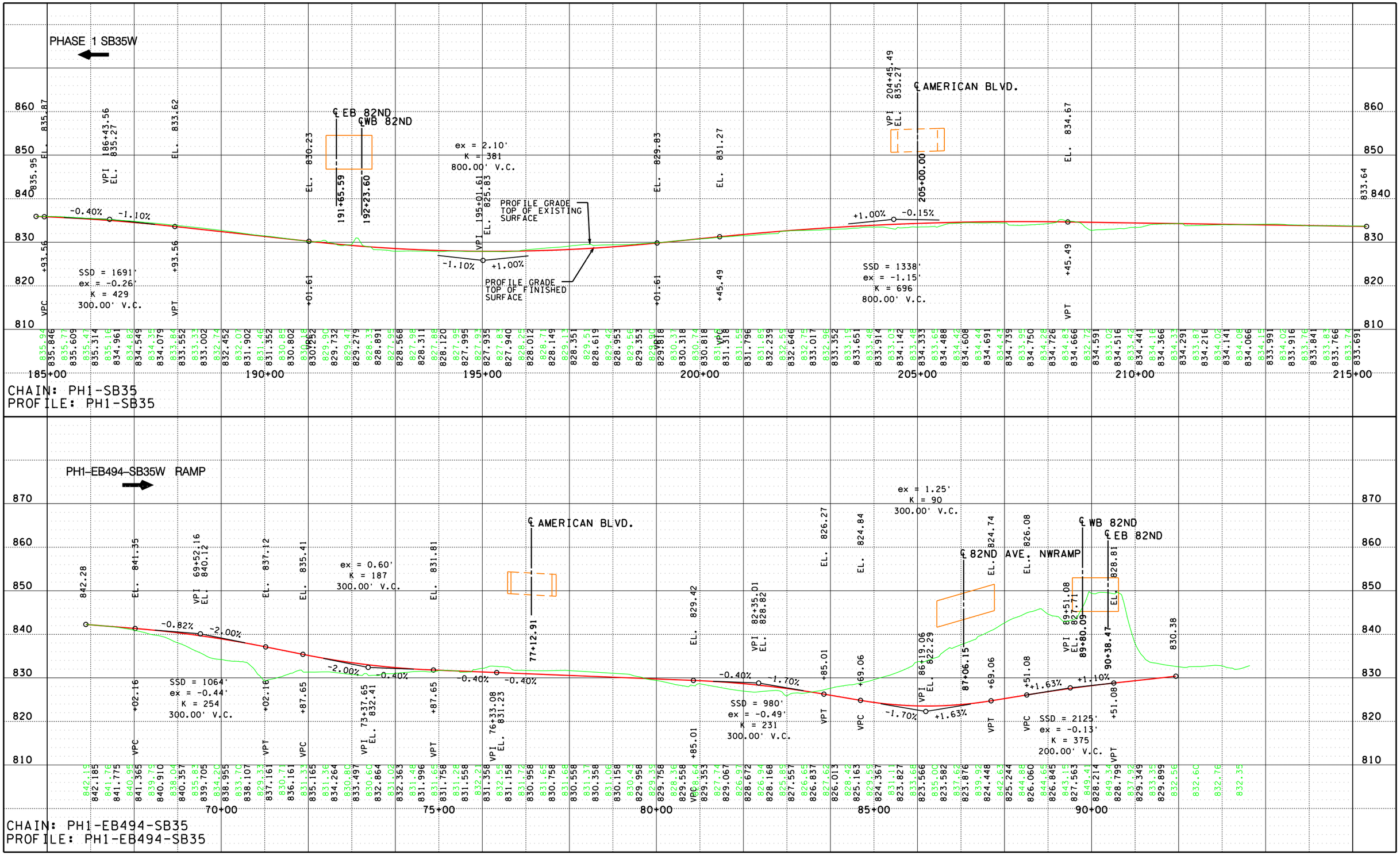

TURBINE: PHASE 1 PROFILE – SB 35W, EB494–SB35W RAMP

FIGURE D23

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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S:\KO\MN\mtco\107371\5-dsgn\51-cadd\Figures\mntco107371_phase1_profiles1-5.dgn
2-SB 35W + EB-SB

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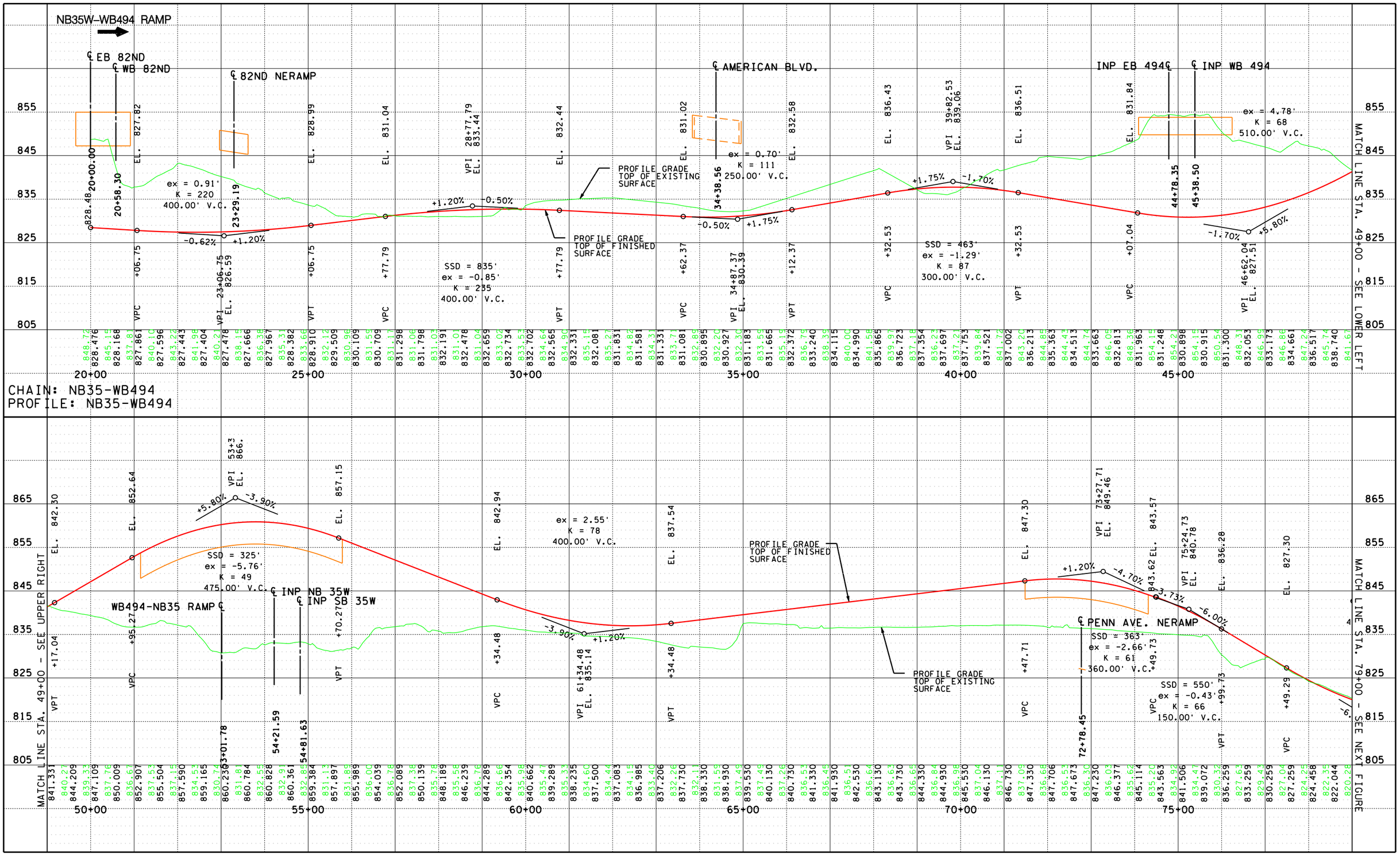

TURBINE: PHASE 1 PROFILE – NB35W–WB494 RAMP

FIGURE D24

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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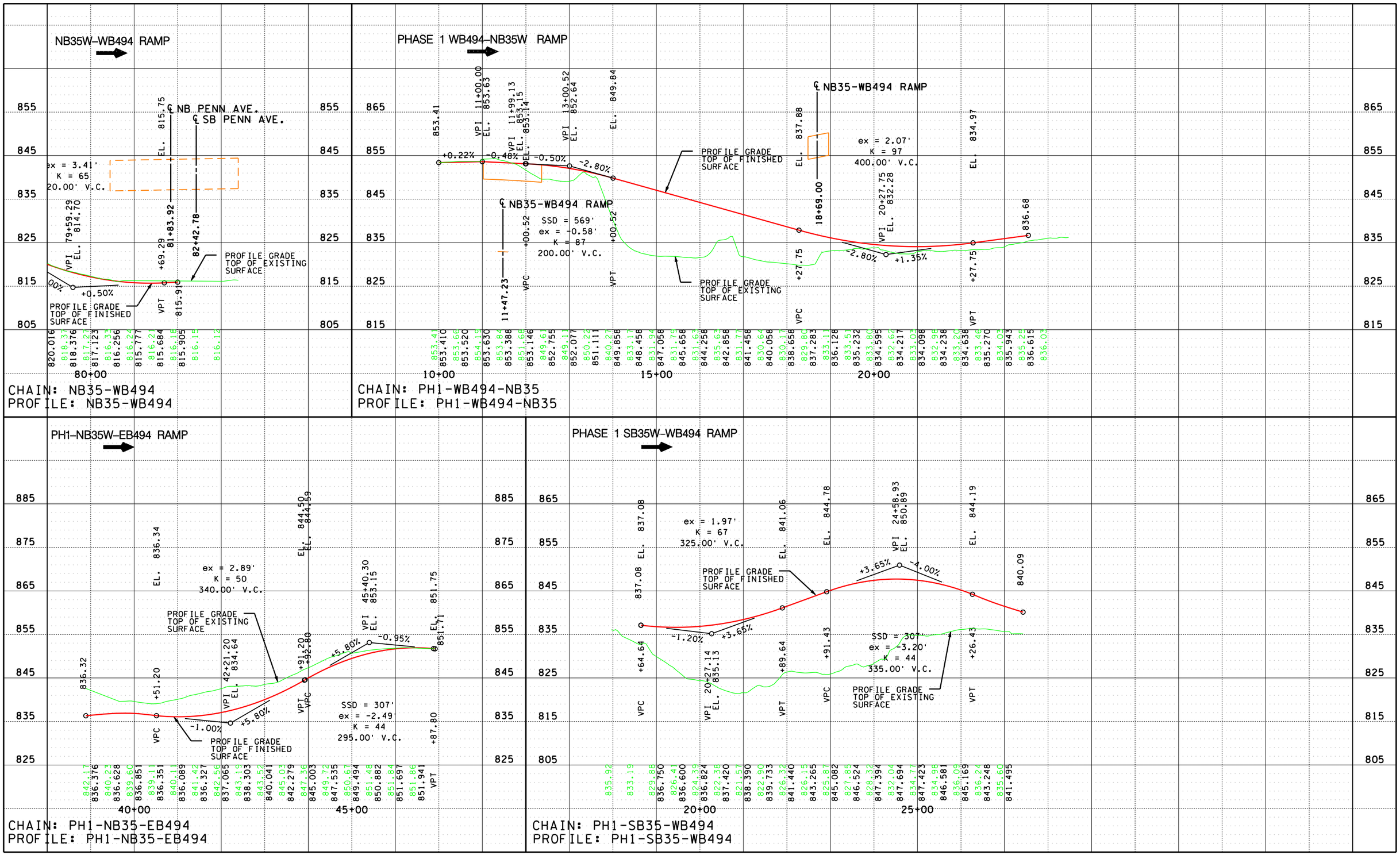
3-NB-WB



TURBINE: PHASE 1 PROFILE – NB35W–WB494 RAMP, WB494–NB35W RAMP, NB35W–EB494 RAMP, SB35W–WB494 RAMP

FIGURE D25

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

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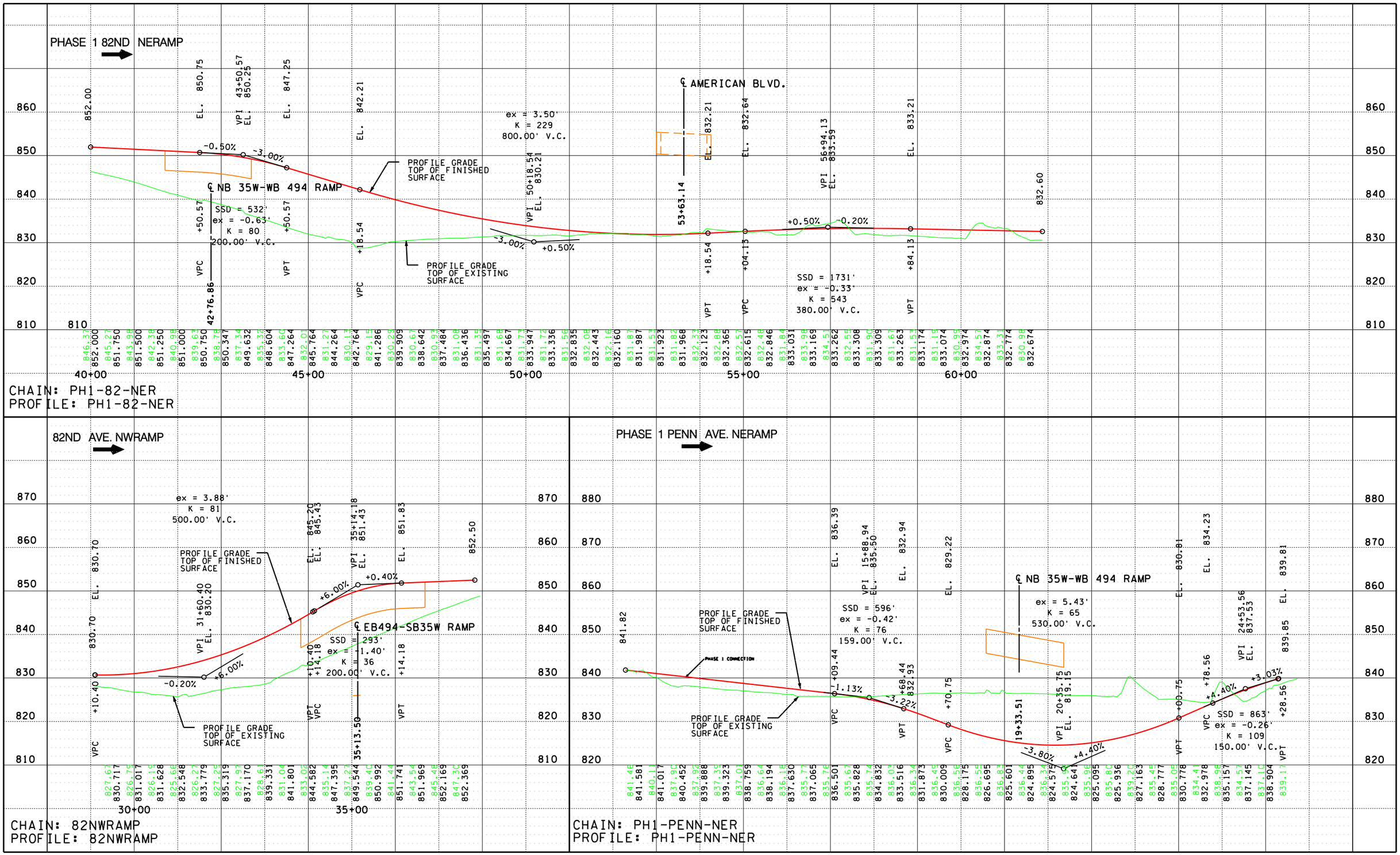
4-NB-WB + WB-NB + NB-EB



TURBINE: PHASE 1 PROFILE – NB35W–WB494 RAMP, WB494–NB35W RAMP, NB35W–EB494 RAMP, SB35W–WB494 RAMP

FIGURE D26

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

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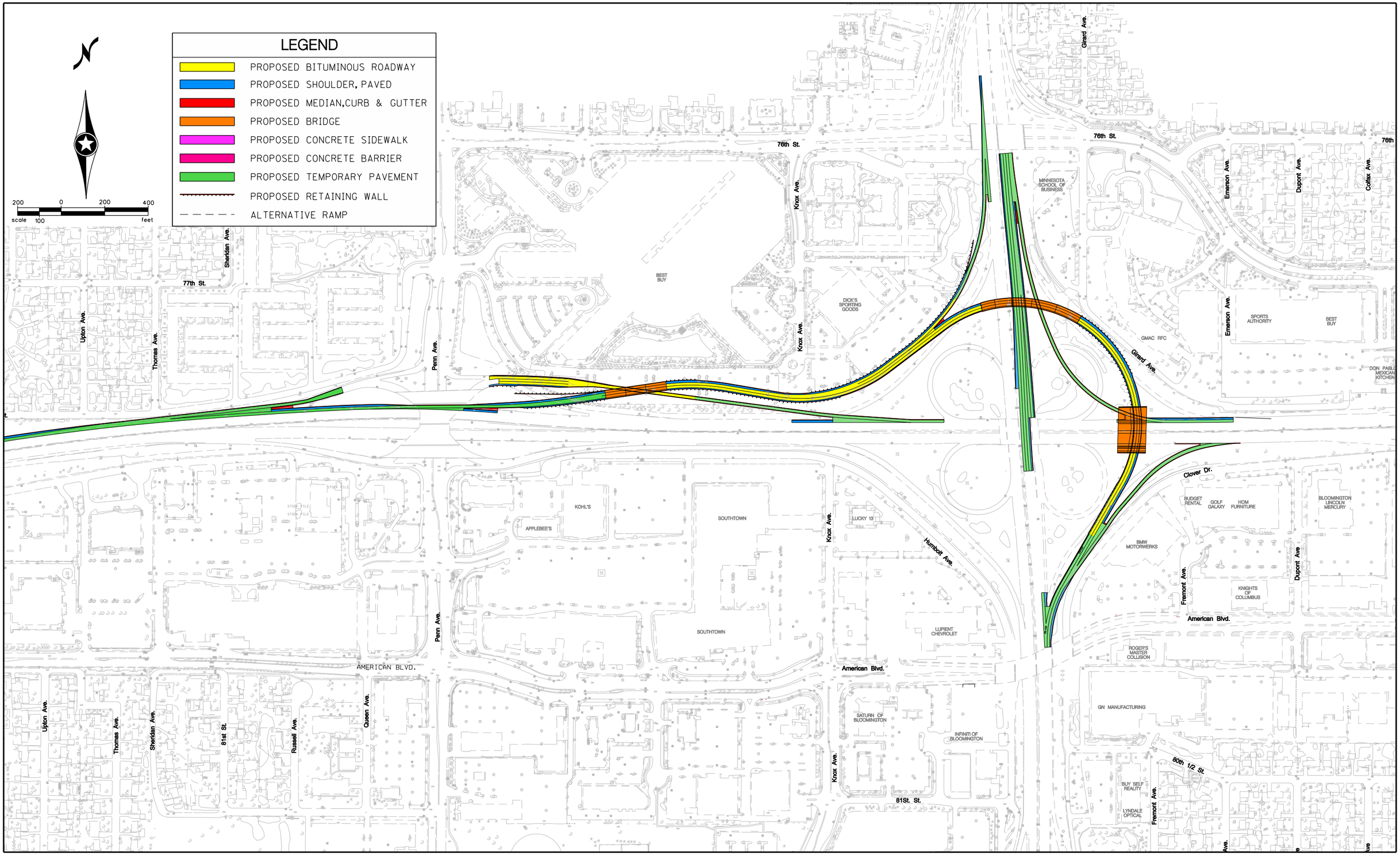
S:\KOMMntco\107371\5-dsgn\51-cadd\Figures\mntco107371_phase1_profiles1-5.dgn
5-PENN NER + 82-NER + 82-NWRAMP



TURBINE–PHASE 1A : NO BRT AT AMERICAN BLVD.

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

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FIGURE D27

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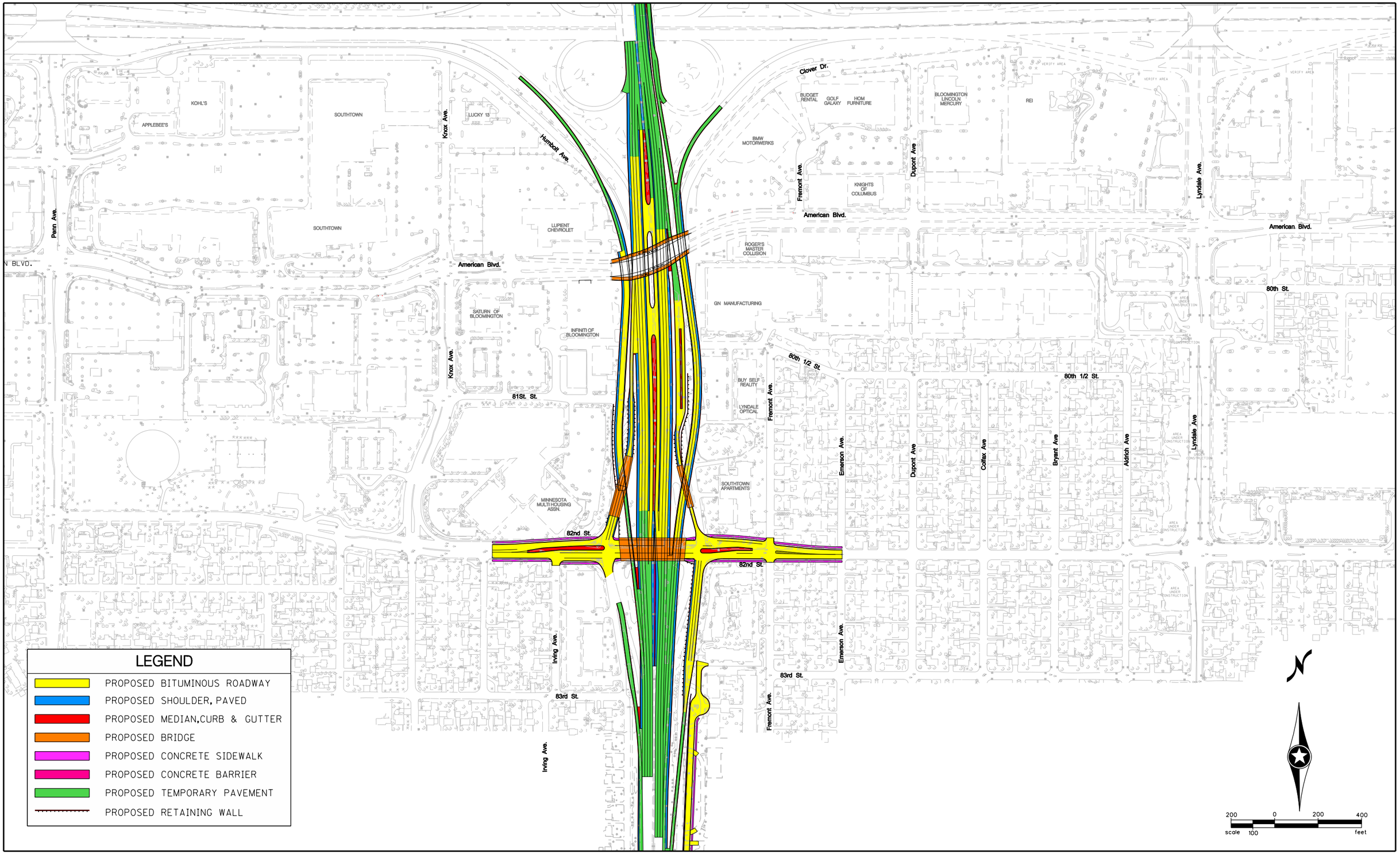
PhaseIA-no BRT



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Phase1B-BRT

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MINNESOTA DEPARTMENT OF TRANSPORTATION

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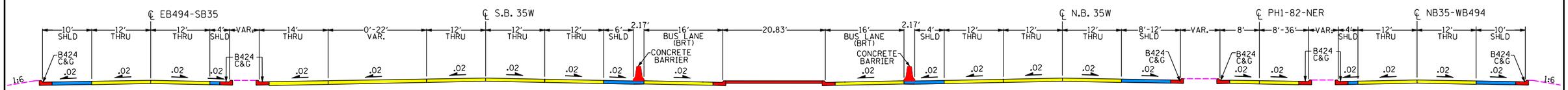
TURBINE–PHASE 1B : BRT ONLY AT AMERICAN BLVD.

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

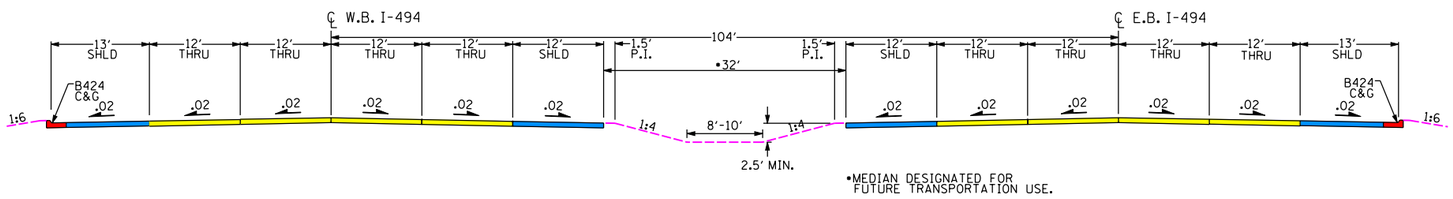
S.P. 2785–350

FIGURE D28

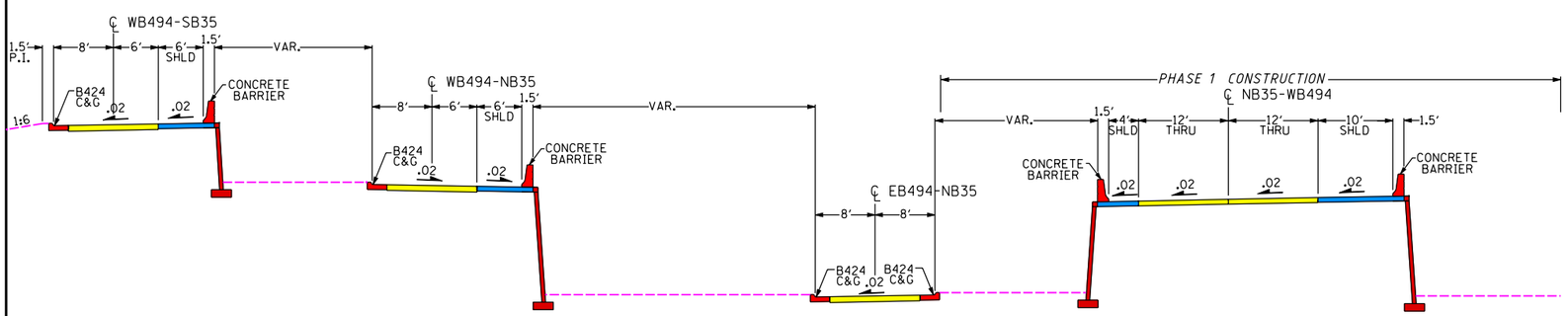
TYPICAL SECTION A–A: MAINLINE WITH BRT AT AMERICAN BLVD.



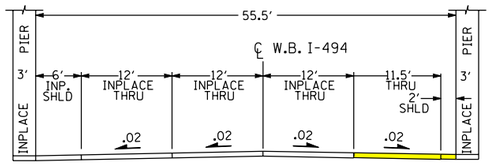
TYPICAL SECTION B–B: I–494



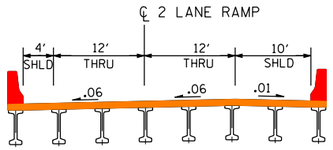
TYPICAL SECTION C–C: TURBINE NORTHEAST QUADRANT



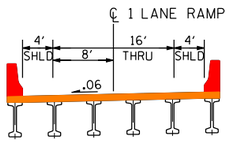
TYPICAL SECTION D–D: PHASE 1–WB I–494 AT XERXES BRIDGE



TYPICAL SECTION E–E: 2 LANE RAMP BRIDGE



TYPICAL SECTION F–F: 1 LANE RAMP BRIDGE



LOCATIONS FOR TYPICAL SECTIONS ARE SHOWN ON SHEETS: D3, D9, D16, D18, D20

TURBINE: FULL BUILD AND PHASE 1 TYPICAL SECTIONS

FIGURE D29

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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TYPICAL SECTIONS full build

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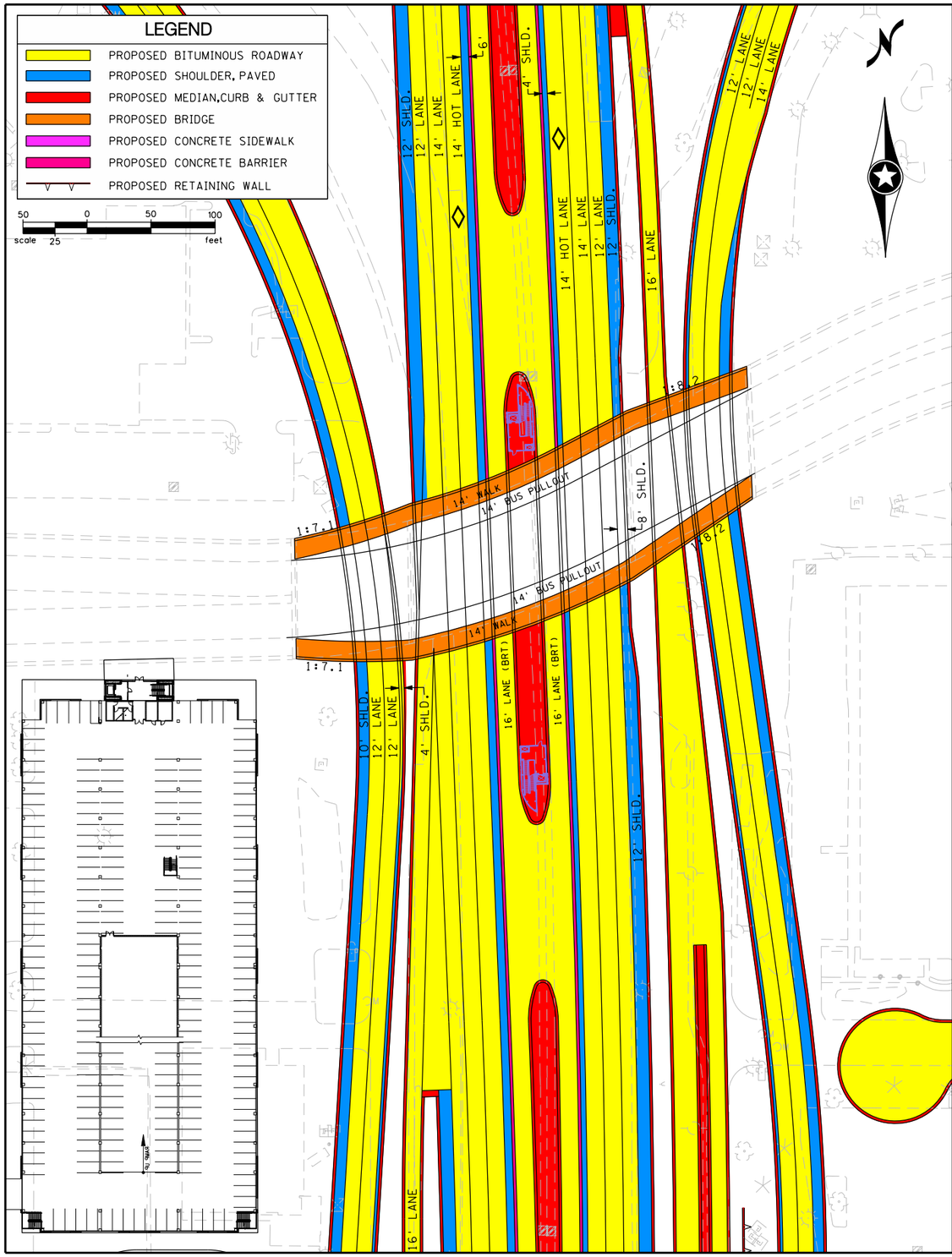
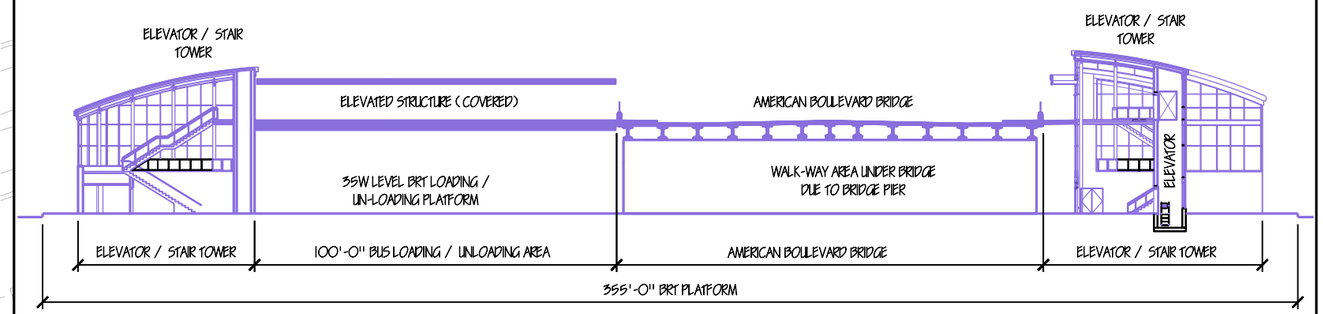
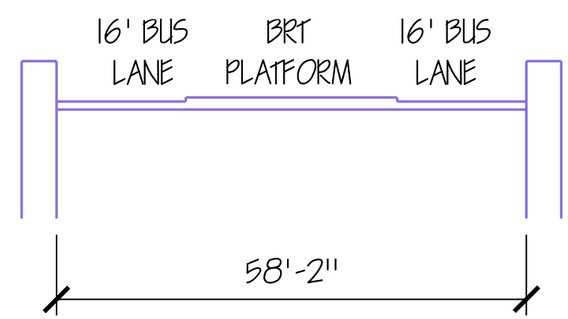
SINGLE PLATFORM





ELEVATED STRUCUTRE
OVER BRT PLATFORM

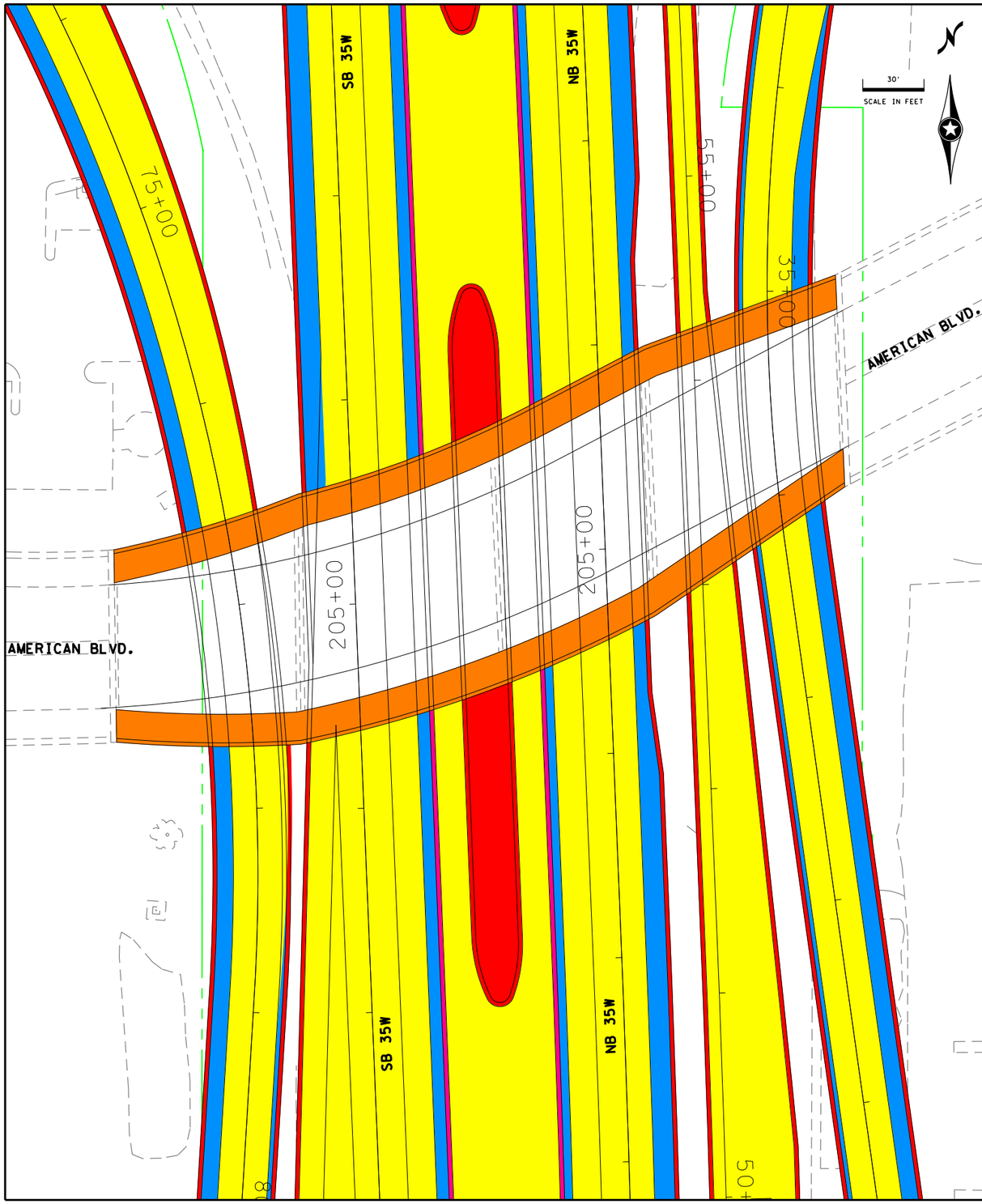


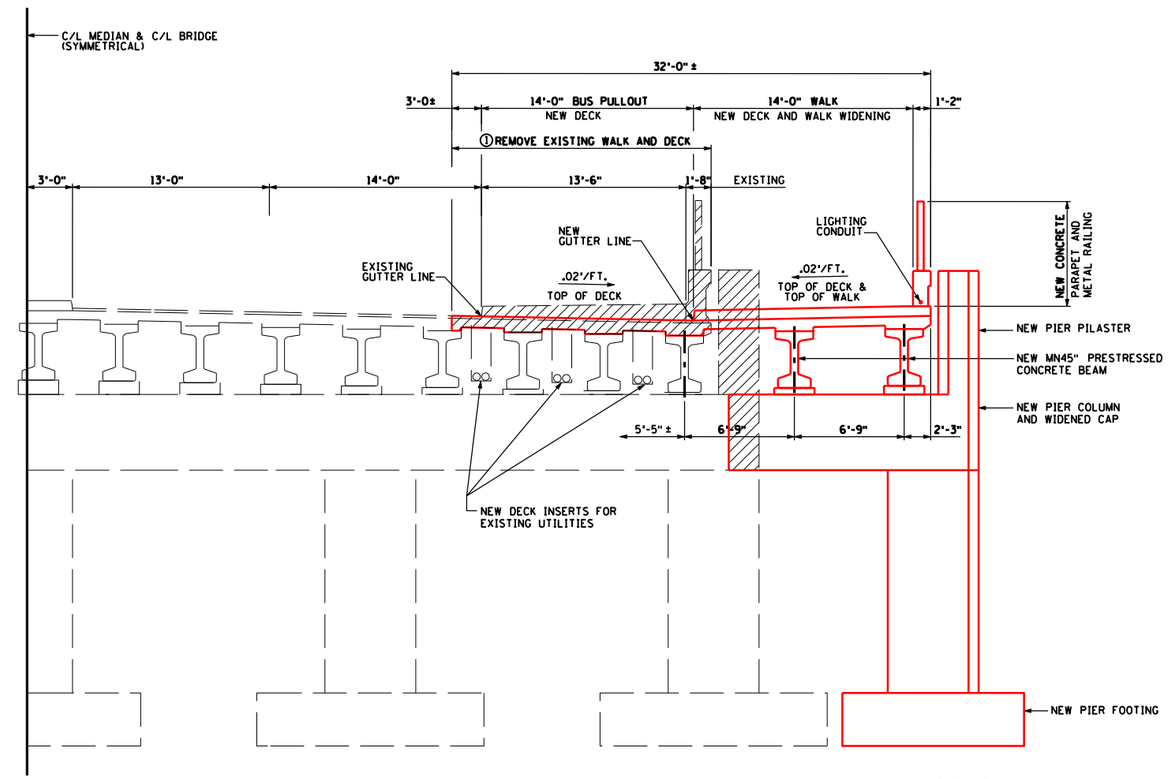
BRT : SINGLE PLATFORM WITH WEAVE

I-494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785-350

AMNTCO107371

FIGURE E1





HALF TRANSVERSE SECTION SHOWN AT PIERS

HATCHED AREA INDICATES PORTIONS TO BE REMOVED

① DECK MAY BE RE-USED IF SURFACE CAN BE OVERLAID

AMERICAN BLVD OVER I-35W

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amer_bridge plan detail

AMERICAN BLVD. BRIDGE MODIFICATION: PLAN AND DETAIL

FIGURE E2

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

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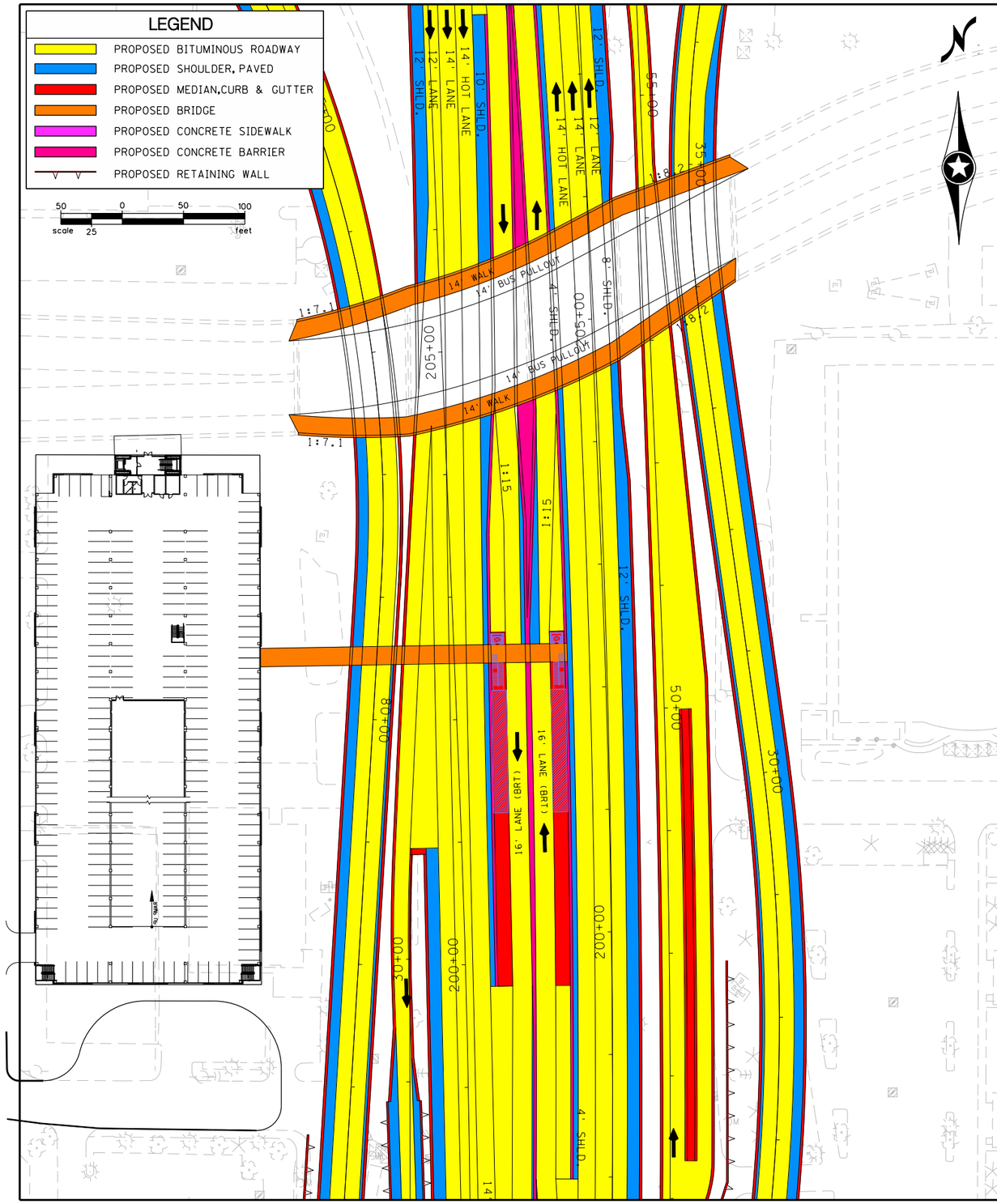

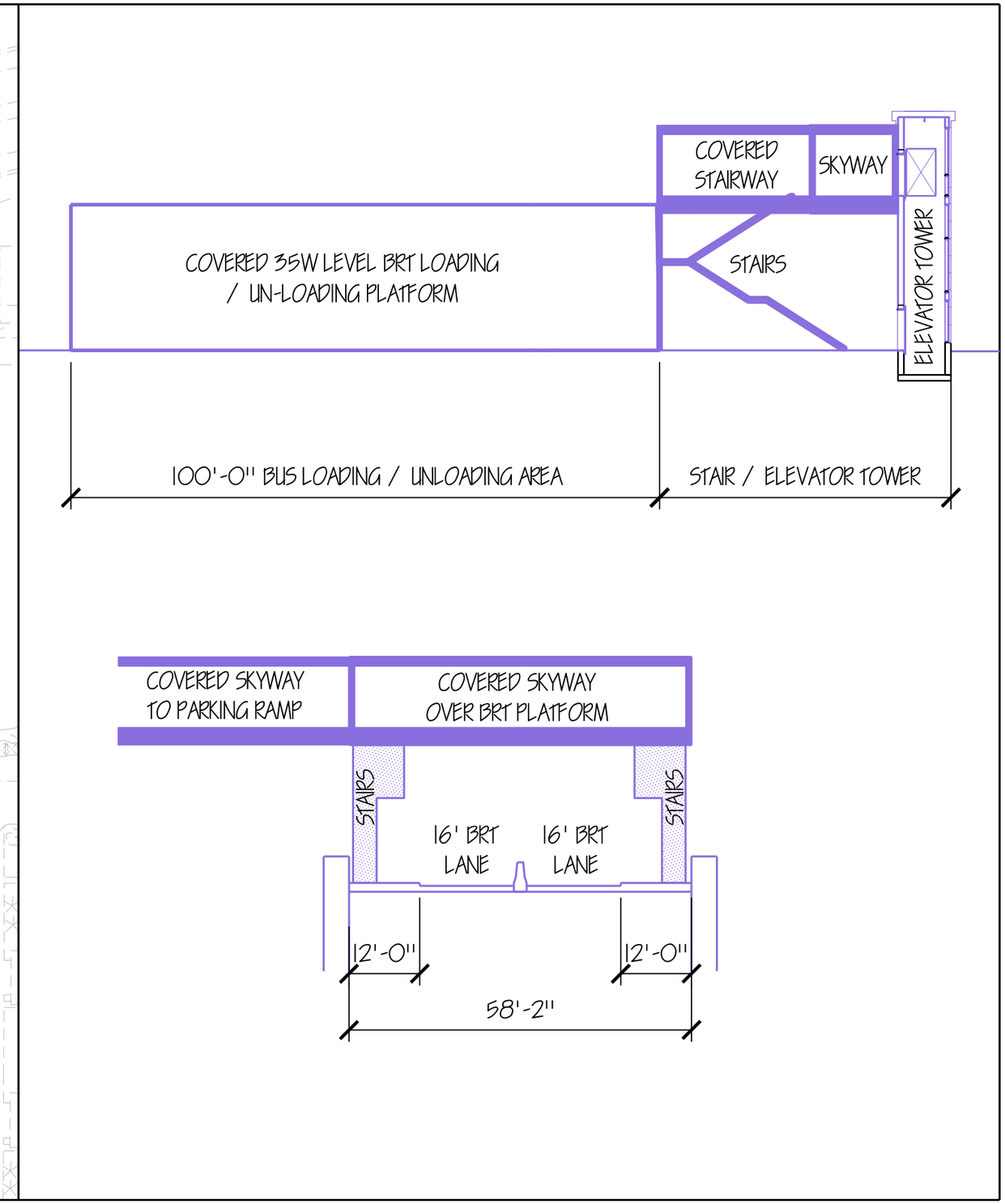

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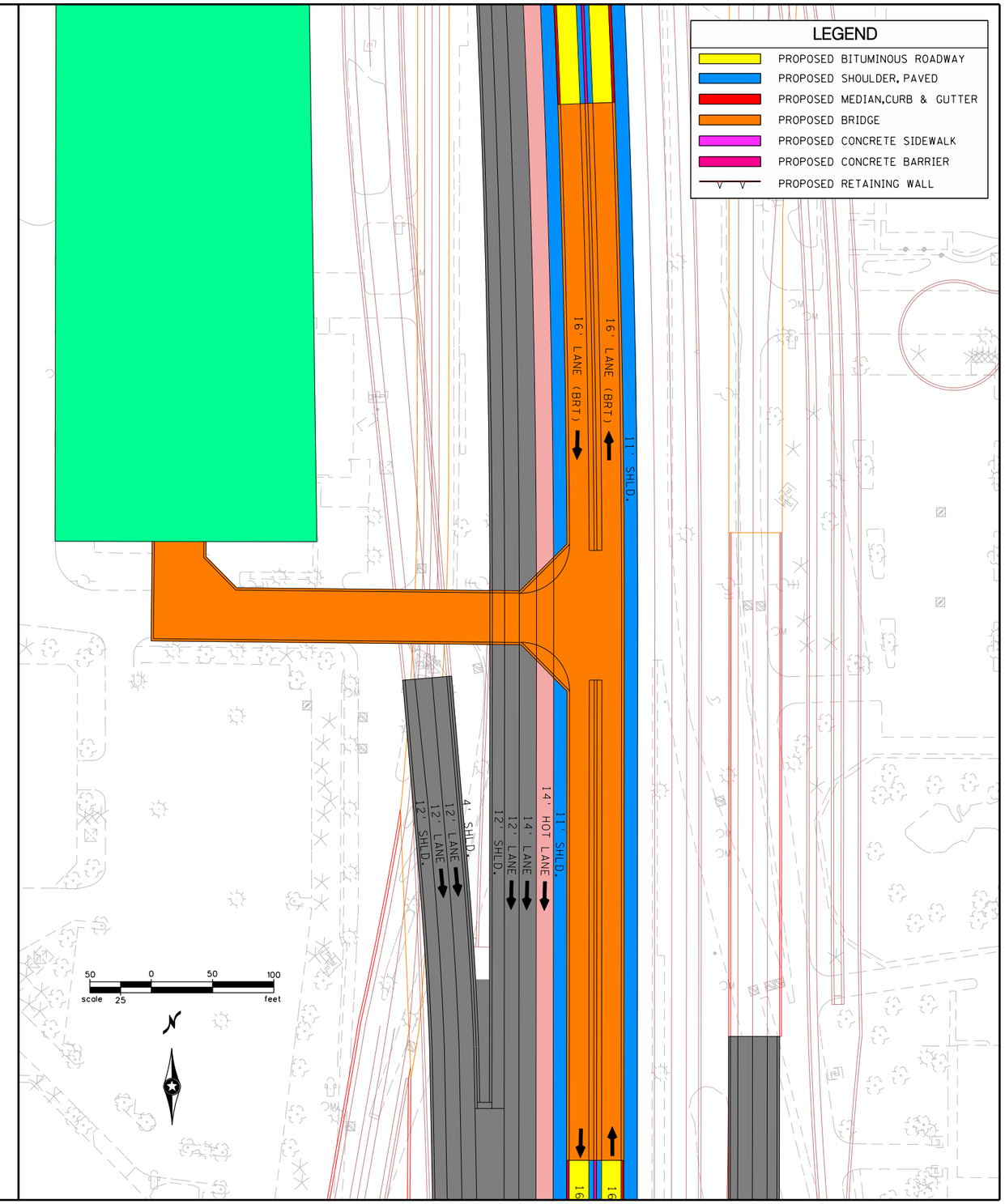
DUAL PLATFORMS

BRT : DUAL PLATFORMS WITHOUT WEAVE

FIGURE E3

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

AMNTCO107371



BRT : OFFLINE T CONCEPT

FIGURE E4

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT
S.P. 2785–350

AMNTCO107371

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T CONCEPT

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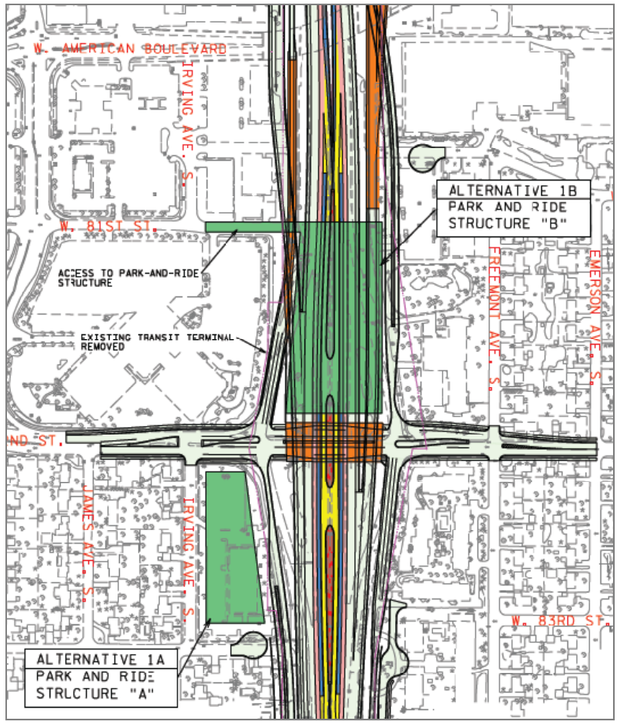
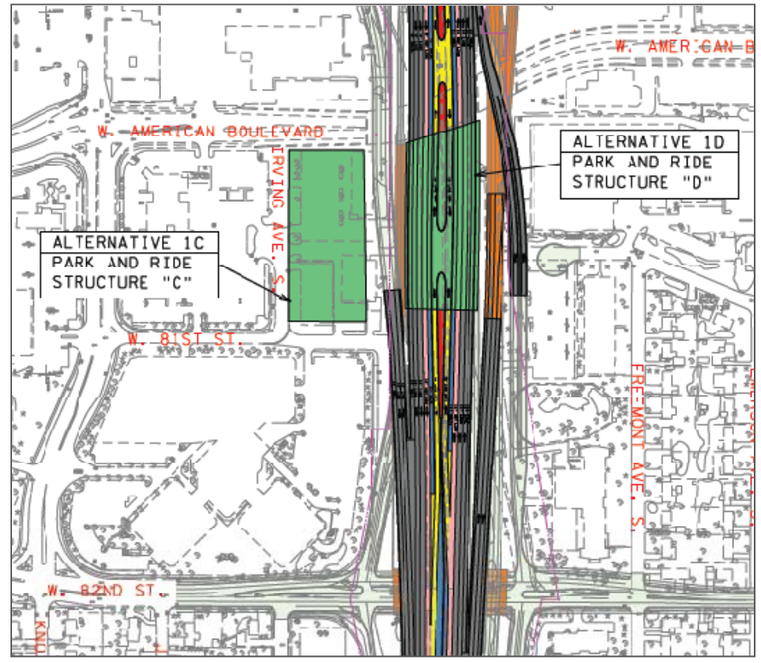
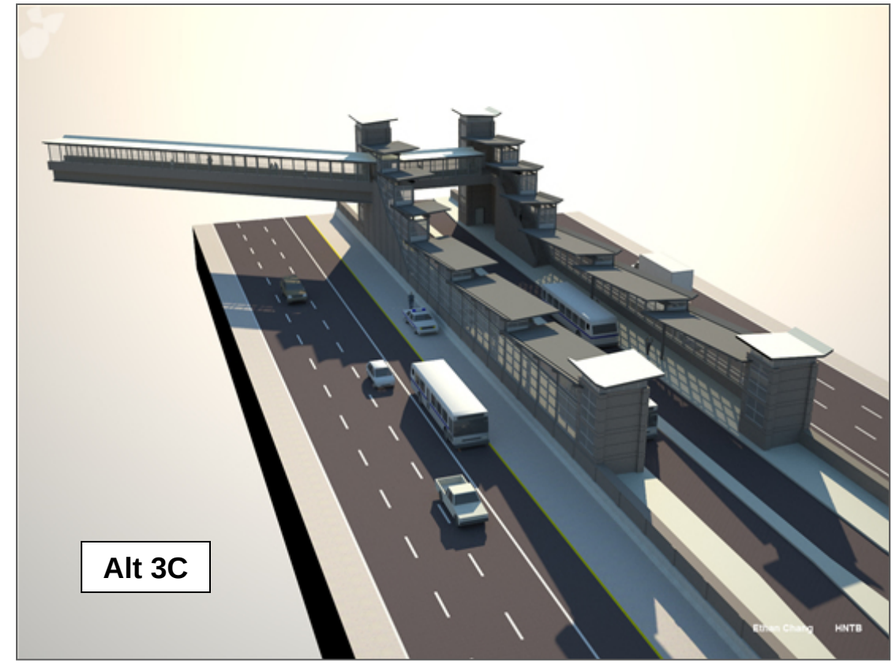
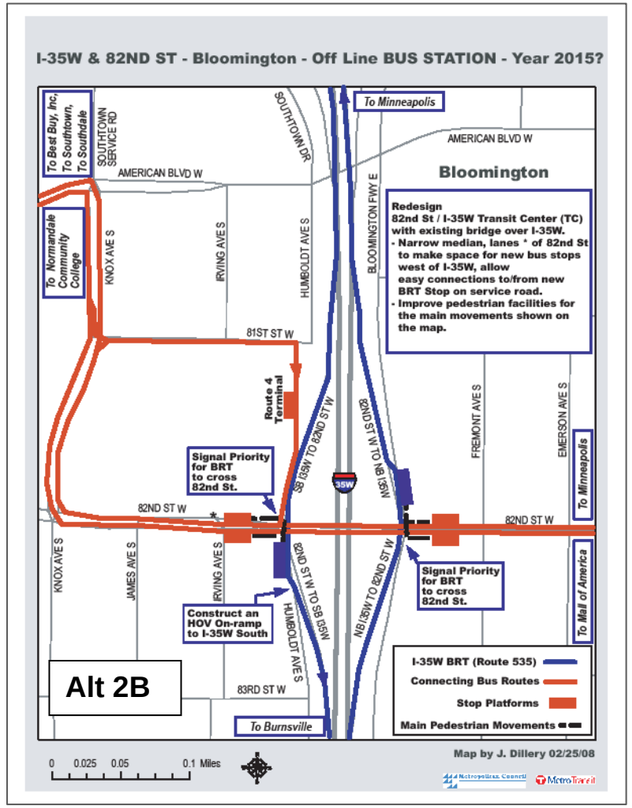
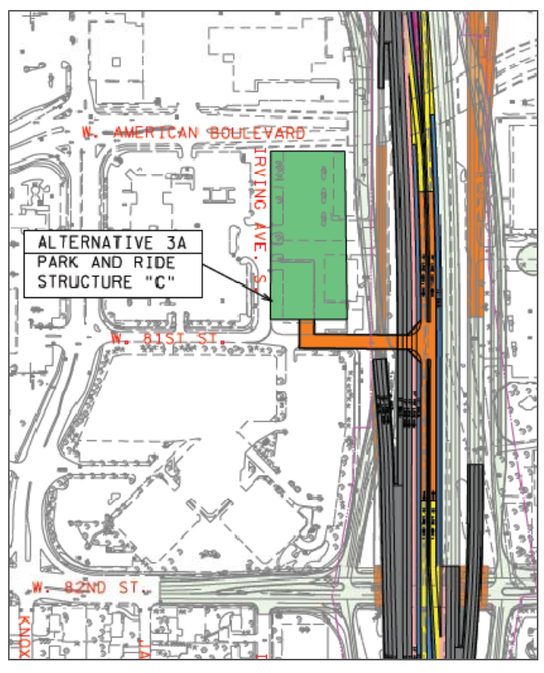
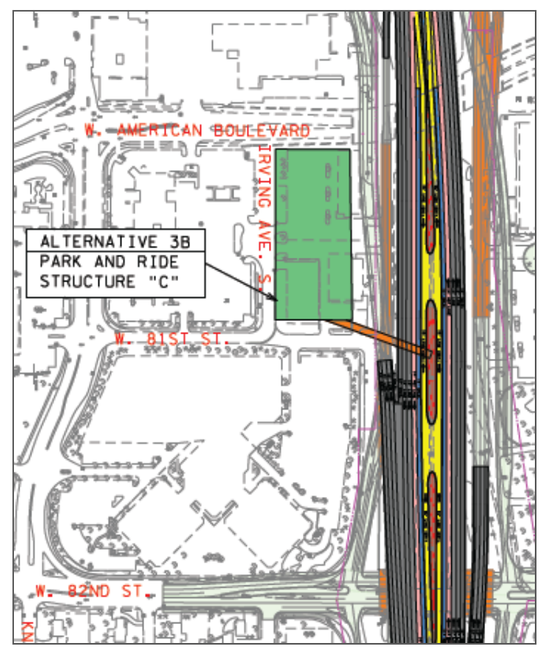


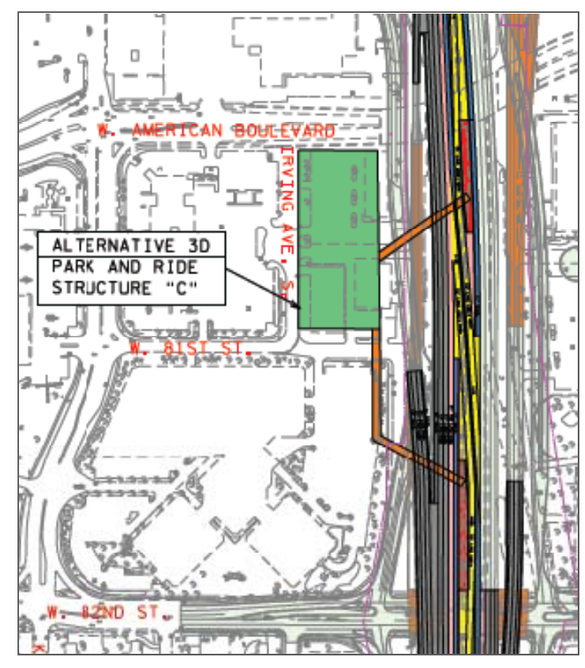










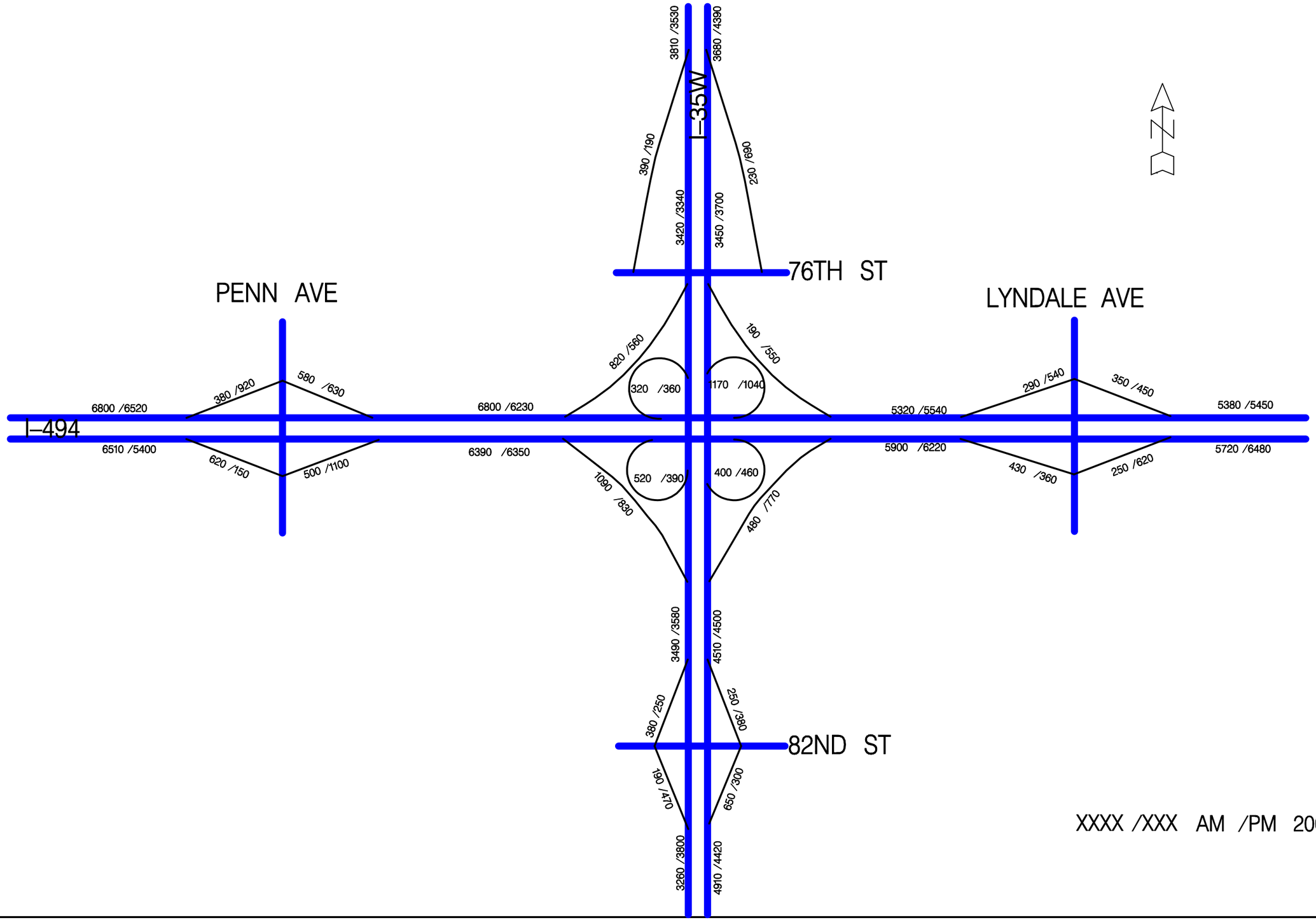


BRT PRELIMINARY ALTERNATIVES

I-494/35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785-350

FIGURE E5



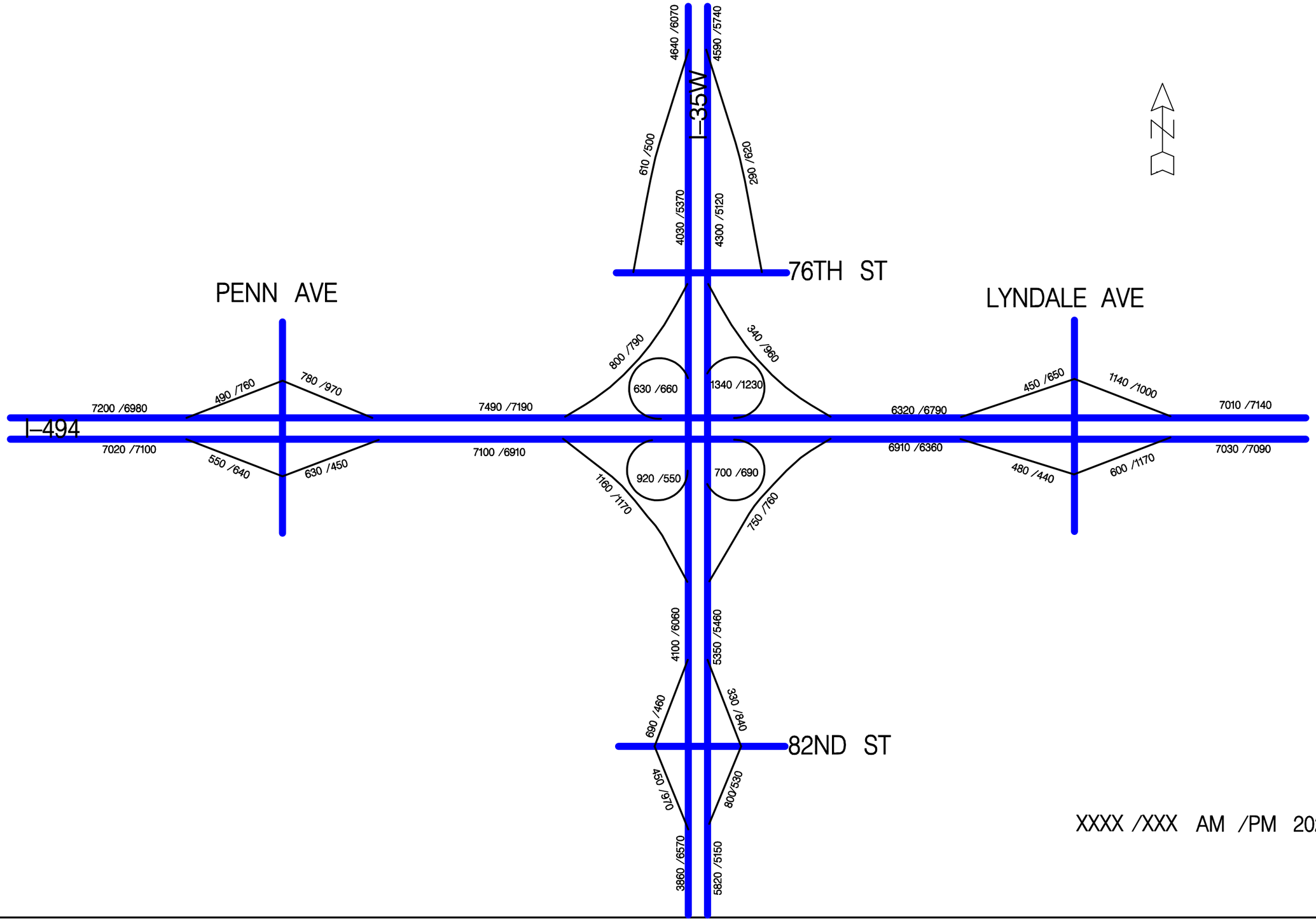
Existing Conditions – 2007 Volumes

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F1



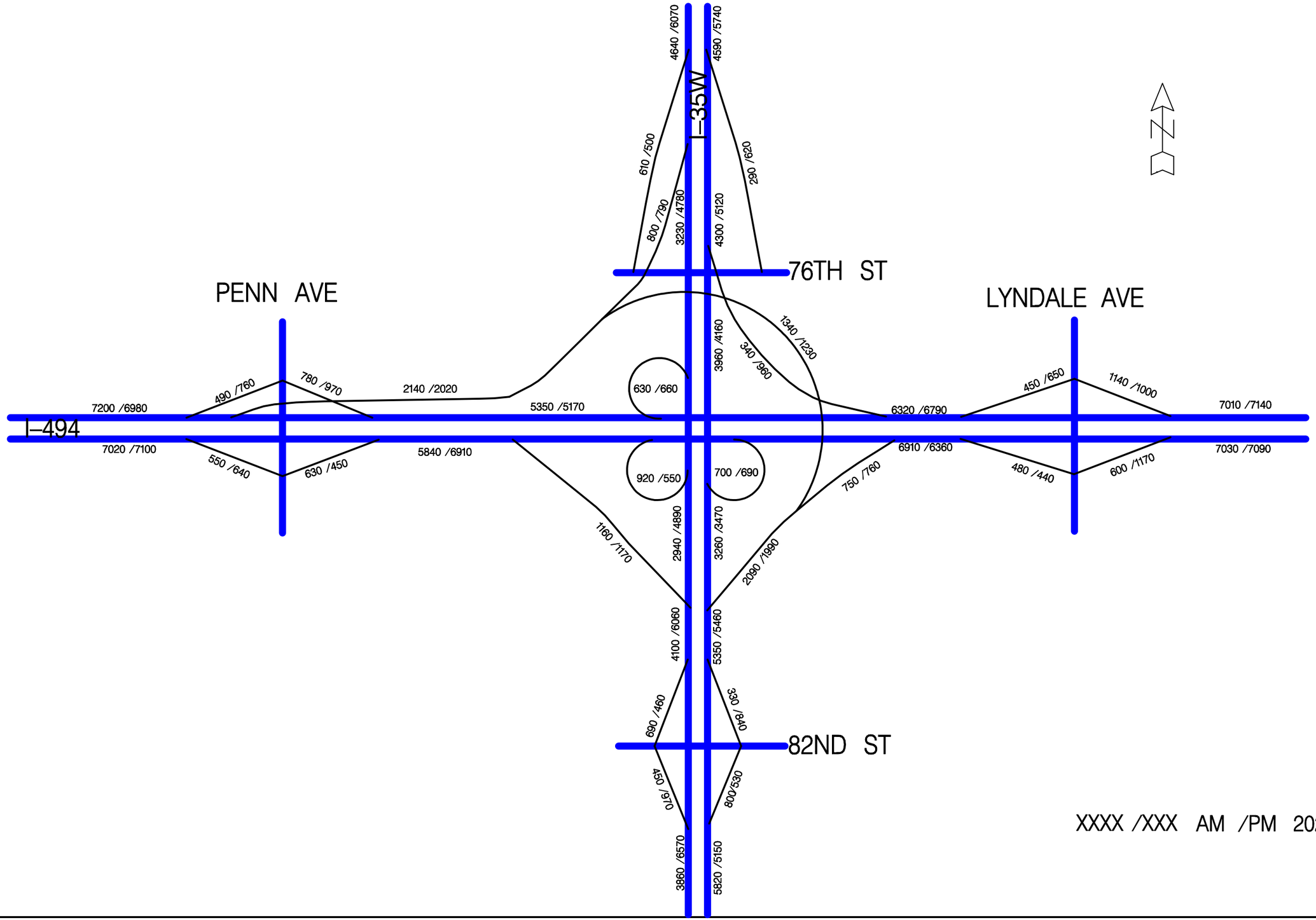
AMNTCO107371

No Build Alternative – 2020 Forecasts

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

FIGURE F2



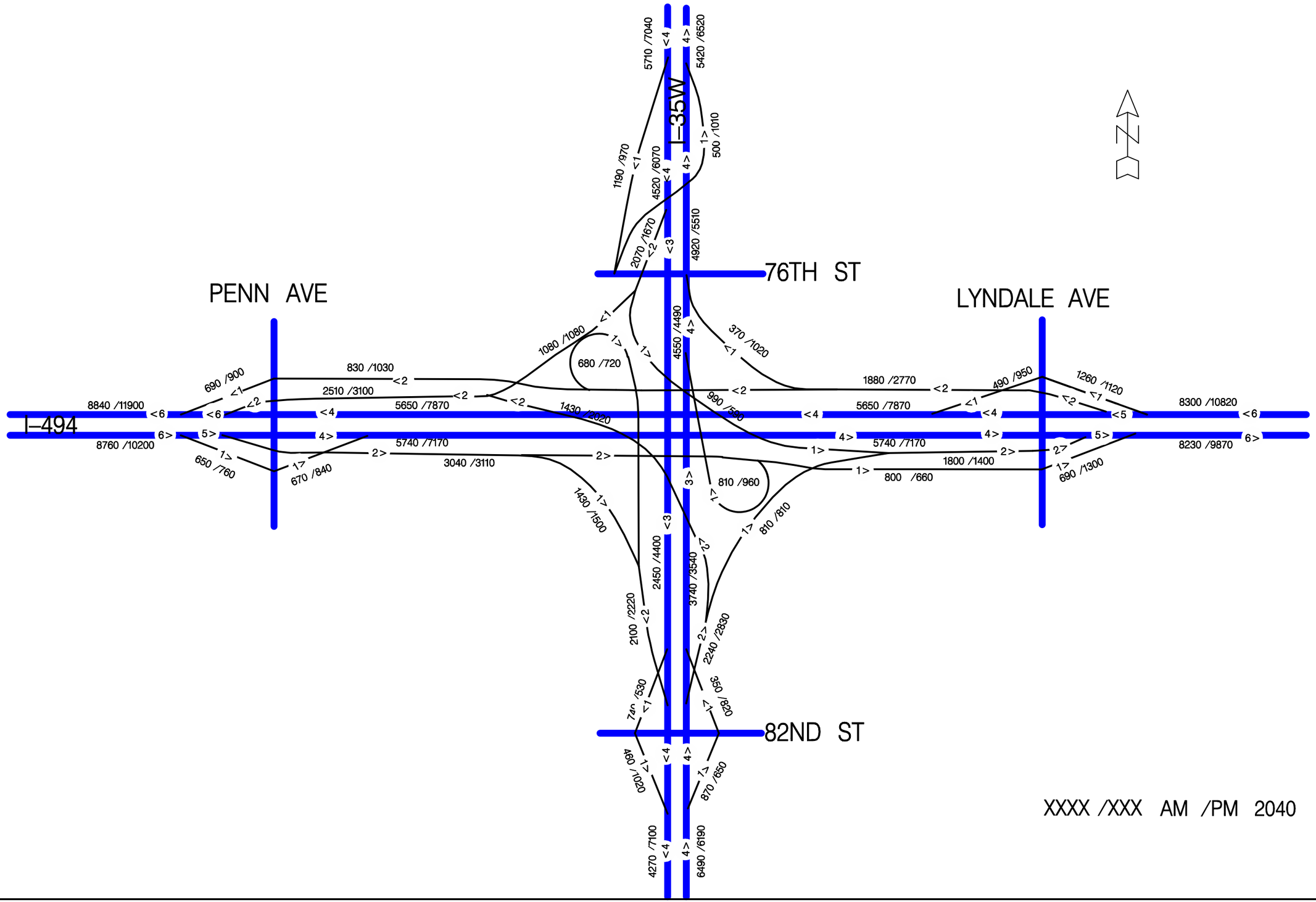
Alternative 3 Turbine Phase 1 – 2020 Forecasts

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F3



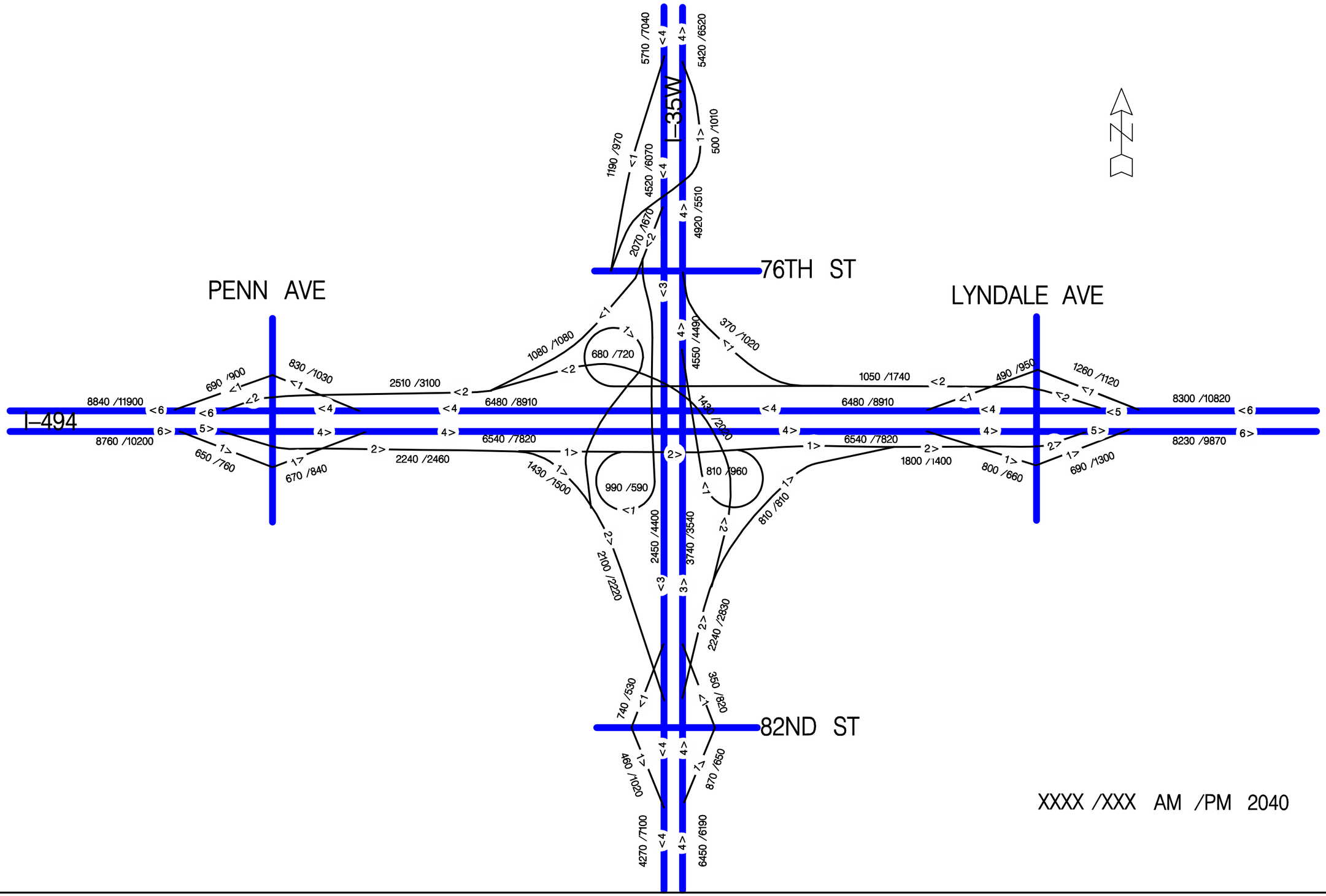
Alternative 1 FEIS – 2040 Forecasts

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F4



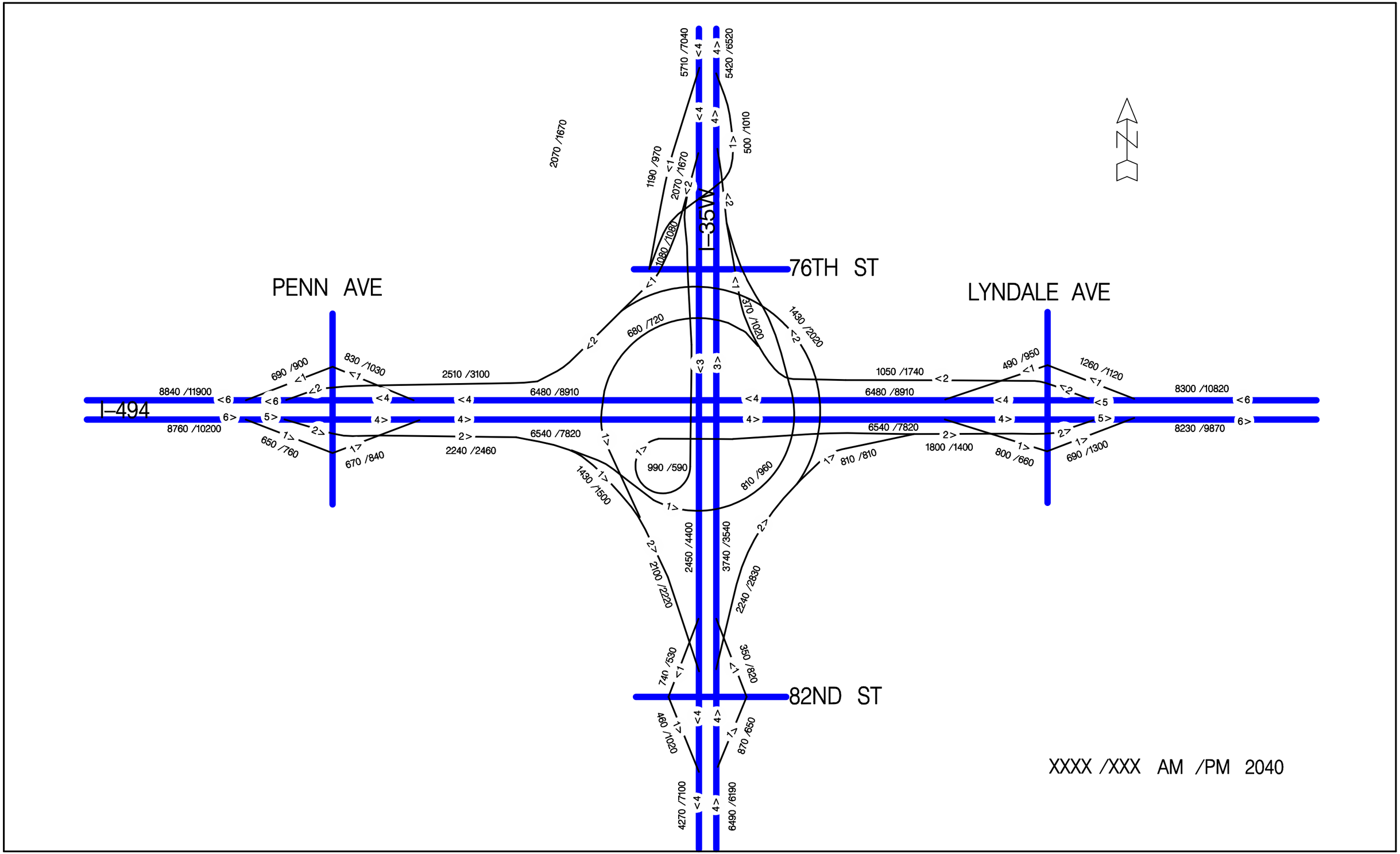
Alternative 2 3 Quad Cloverleaf – 2040 Forecasts

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F5



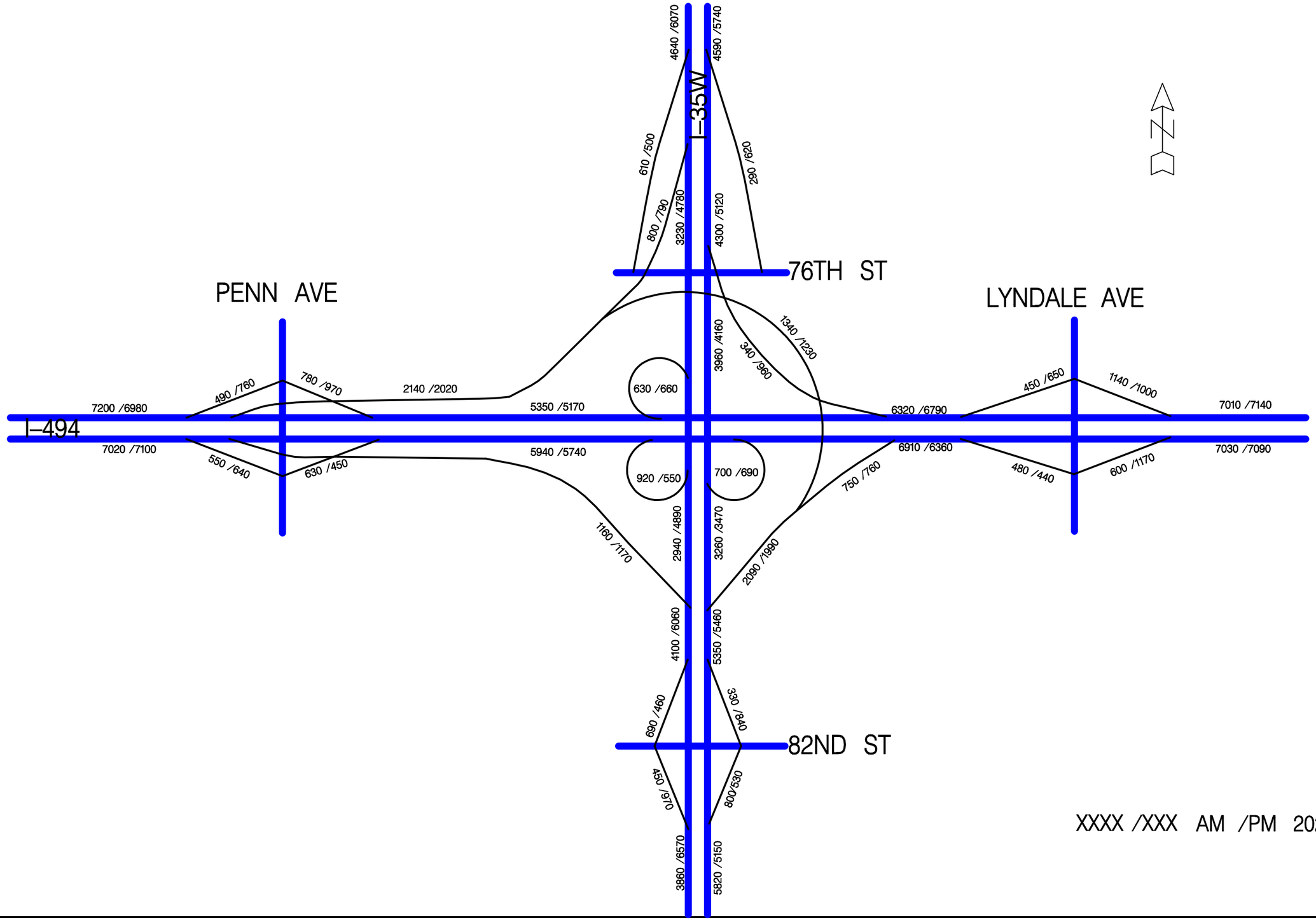
Alternative 3 Turbine – 2040 Forecasts

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F6



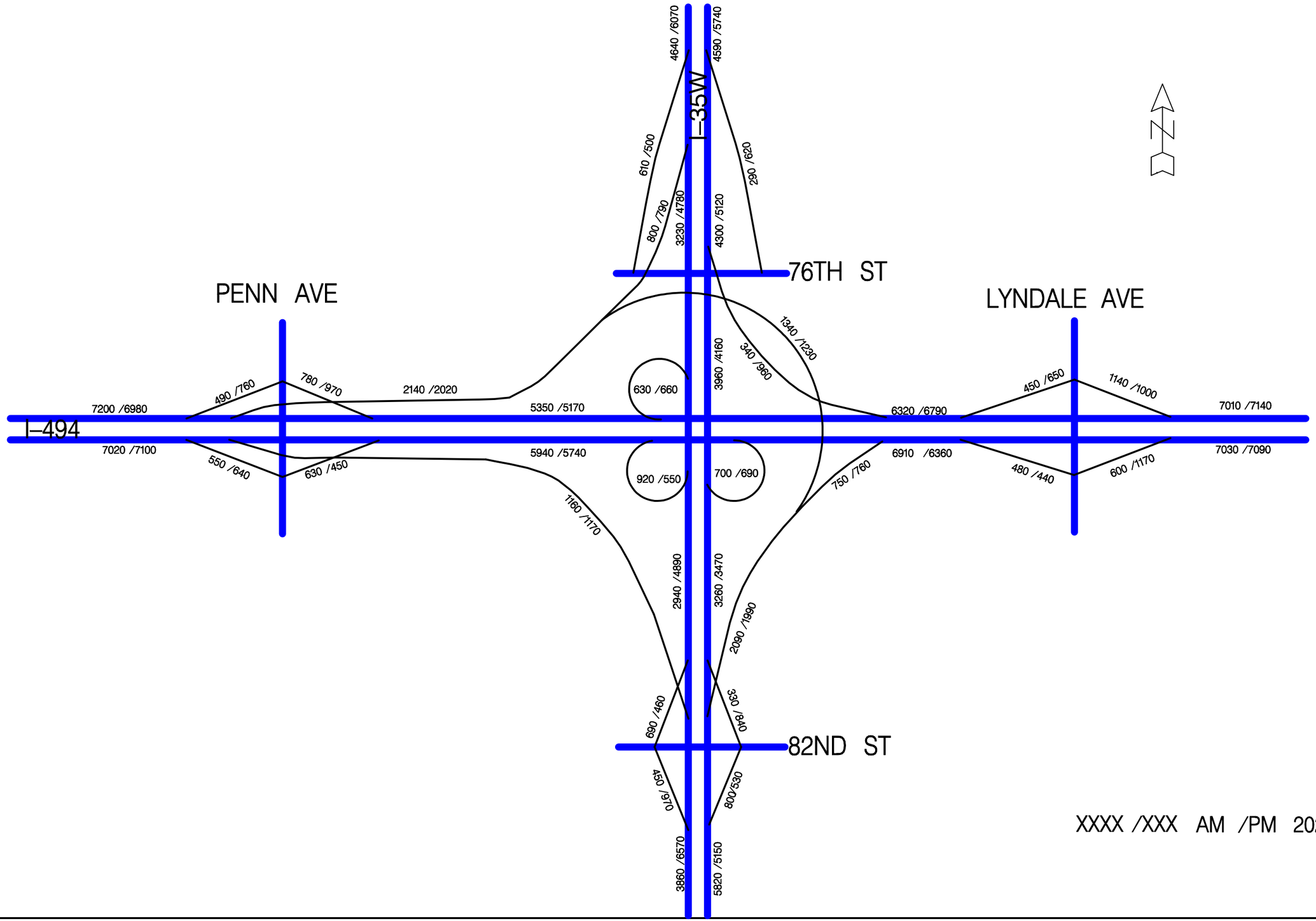
Alternative 3 Turbine Phase 1A – 2040 Forecasts

FIGURE F7

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371



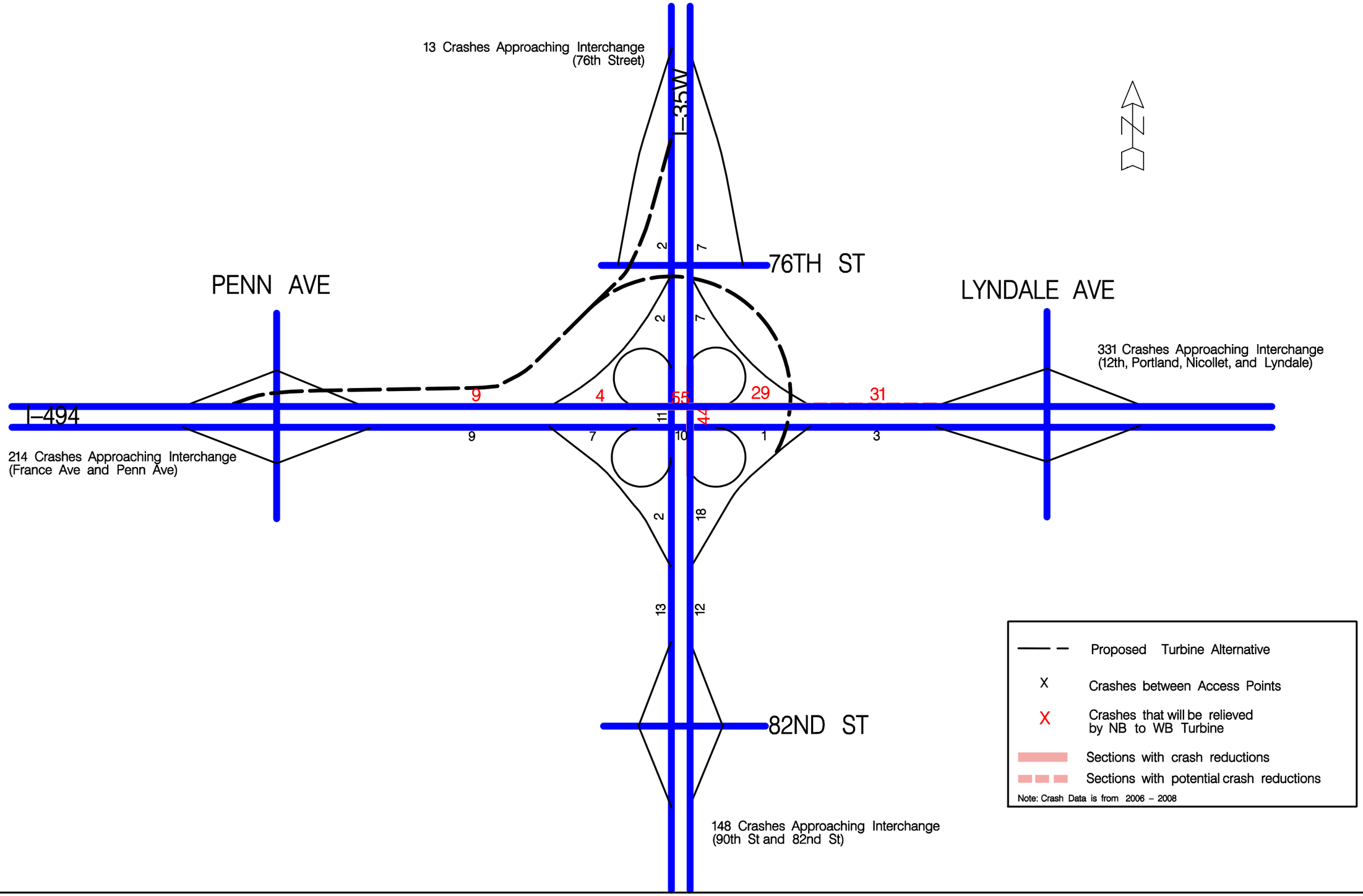
Alternative 3 Turbine Phase 1B – 2040 Forecasts

FIGURE F8

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371



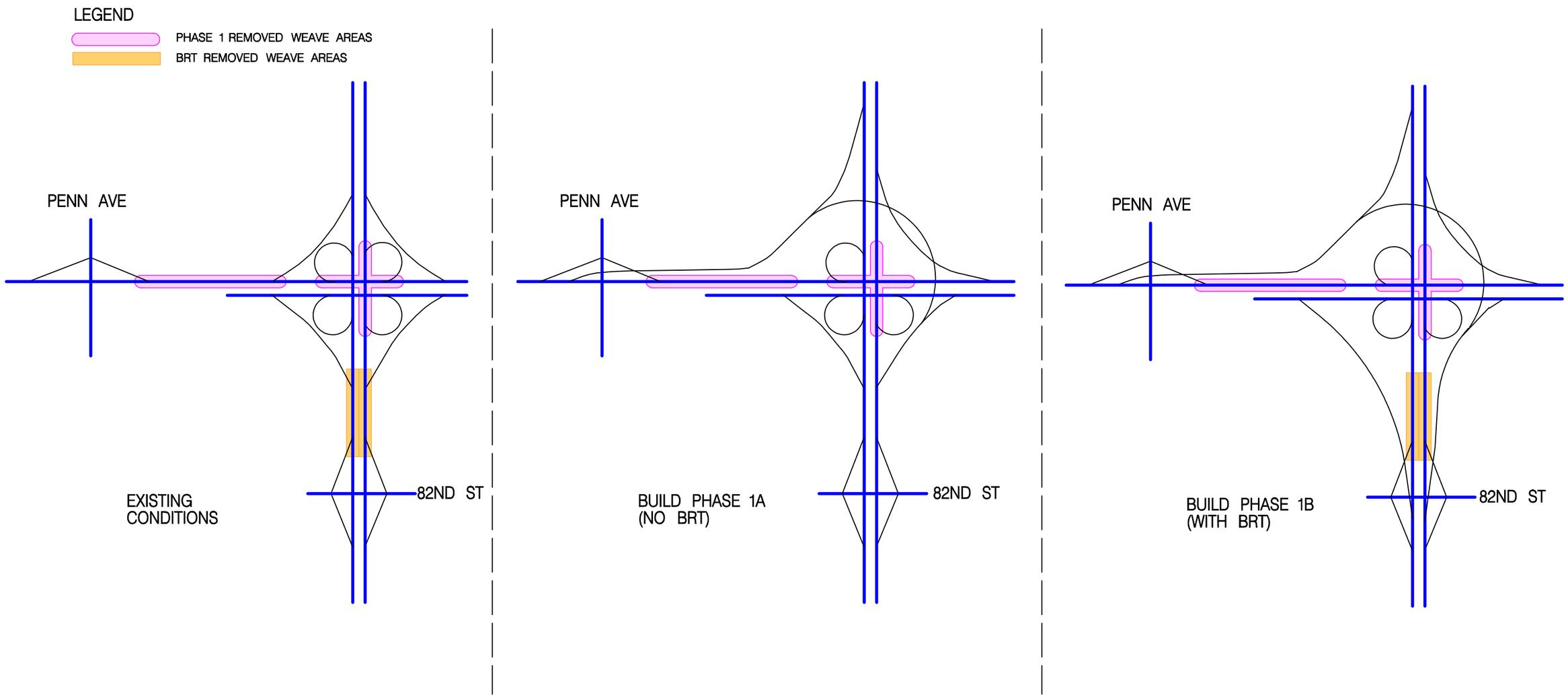
Crash Reduction

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

AMNTCO107371

FIGURE F9



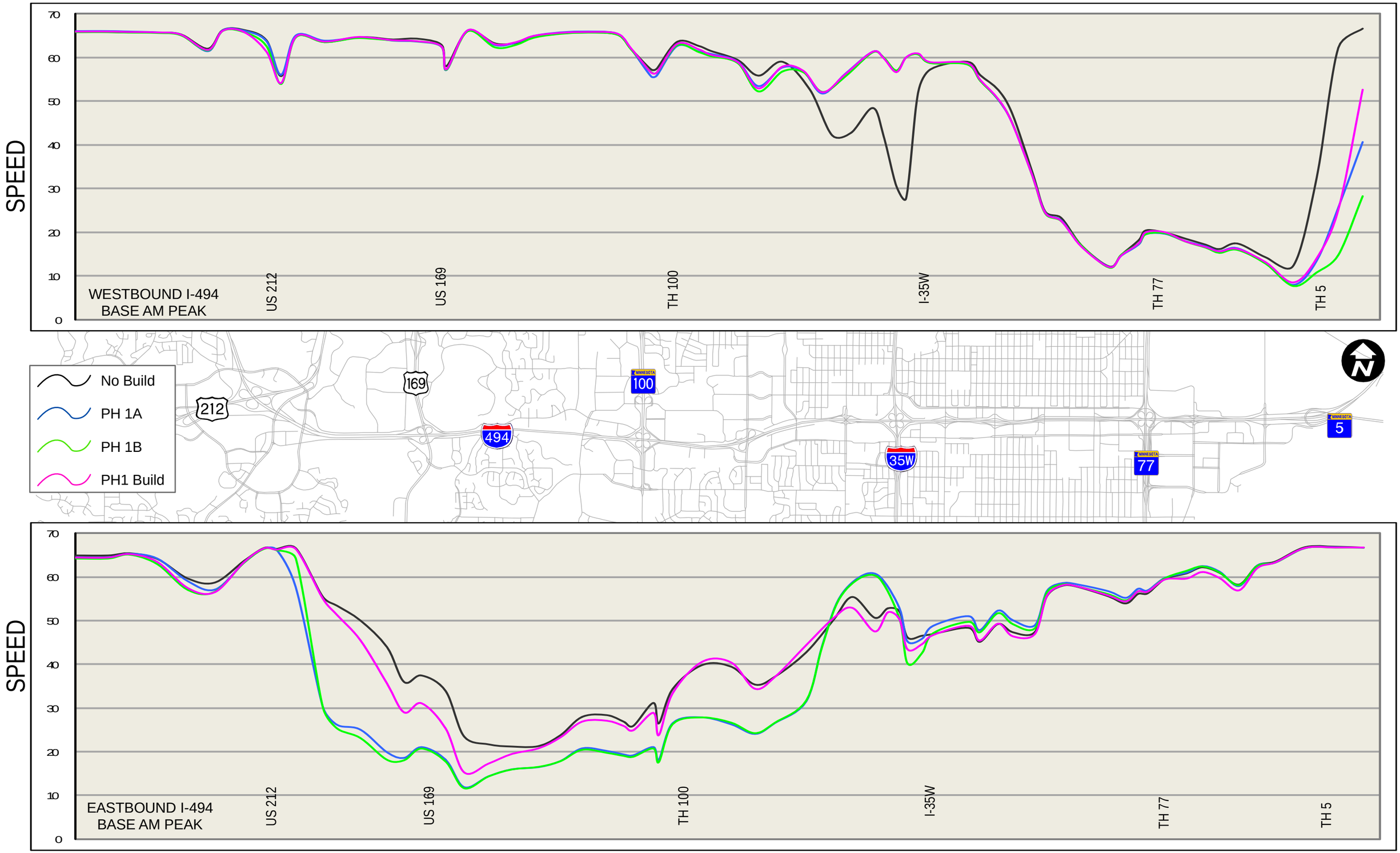
AMNTCO107371

INTERCHANGE WEAVE AREAS

I–494 /35W INTERCHANGE PRELIMINARY DESIGN PROJECT

S.P. 2785–350

FIGURE F10

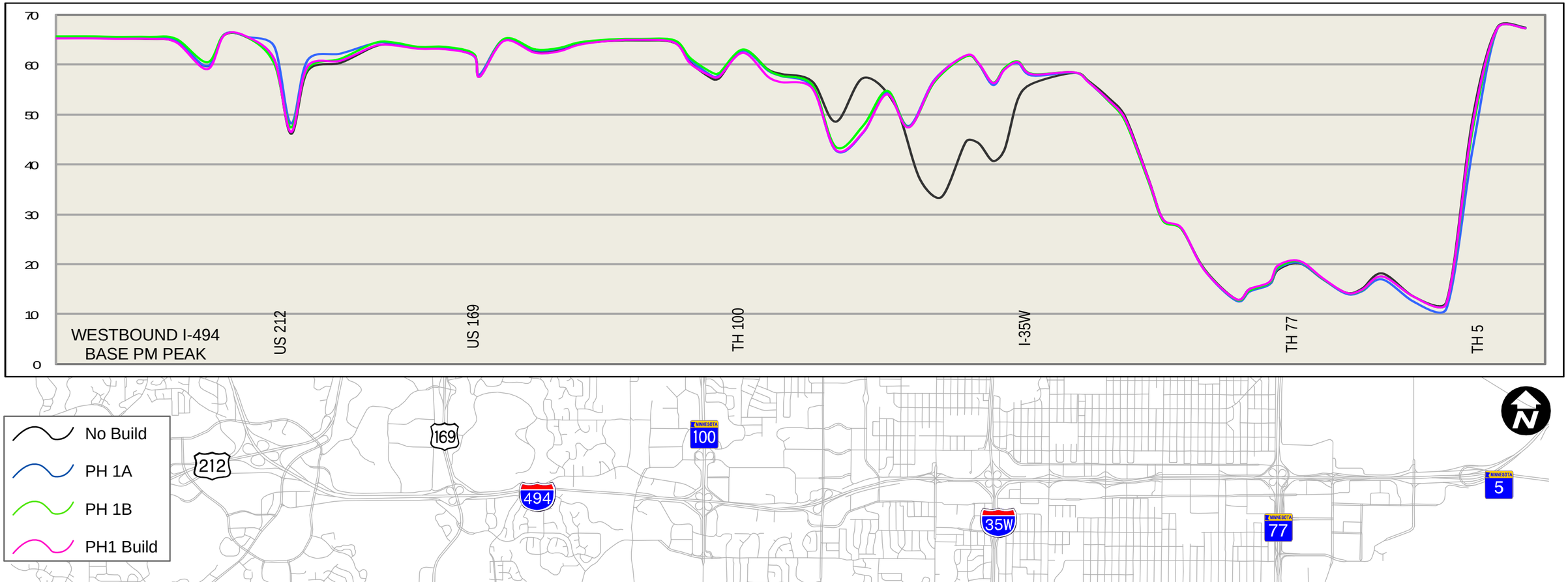


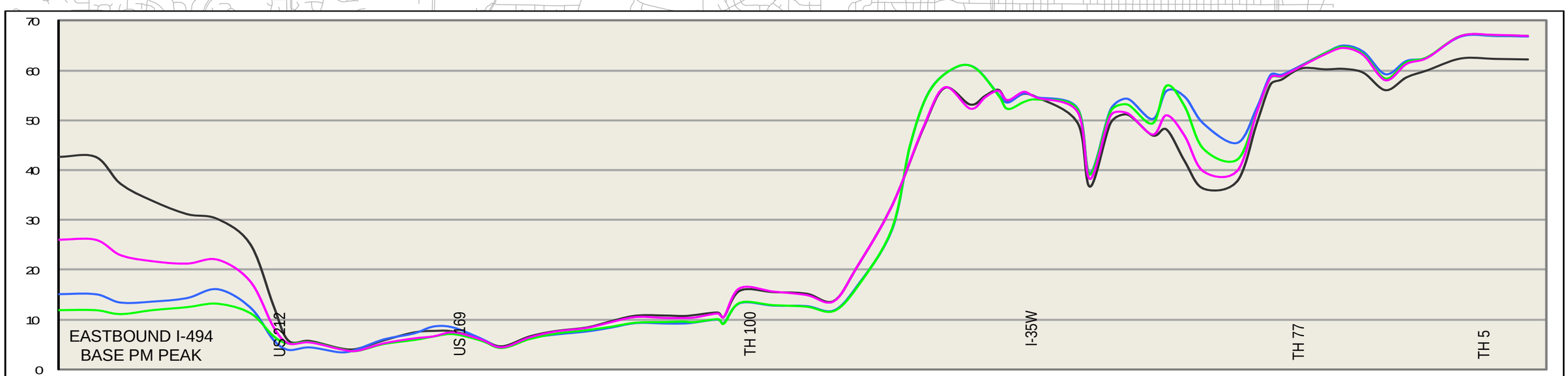
2020 Corsim Speeds - 494 Base AM

I-494 / 35W Interchange Preliminary Design Project

Figure F11

AMNTCO107371





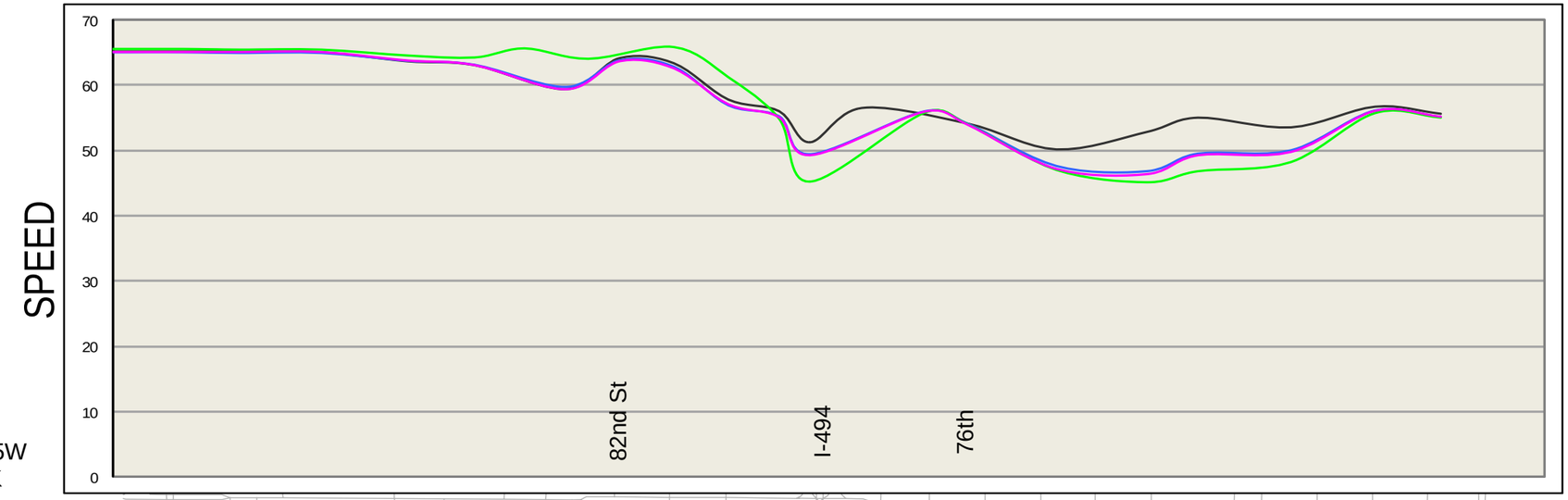
2020 Corsim Speeds - 494 Base PM

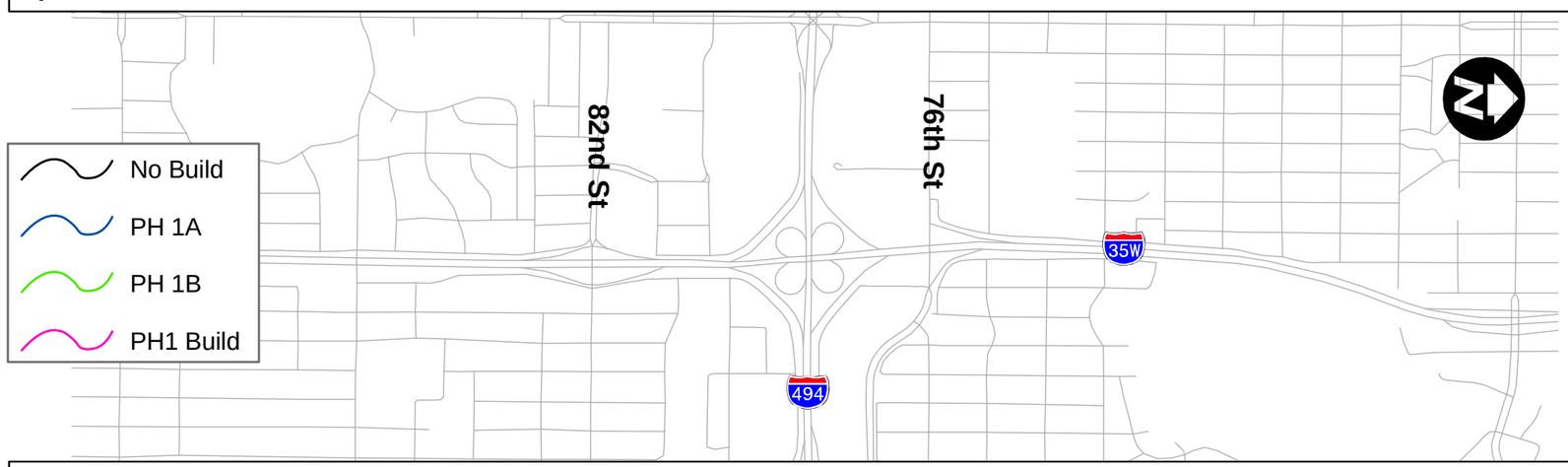
I-494 / 35W Interchange Preliminary Design Project

Figure F12

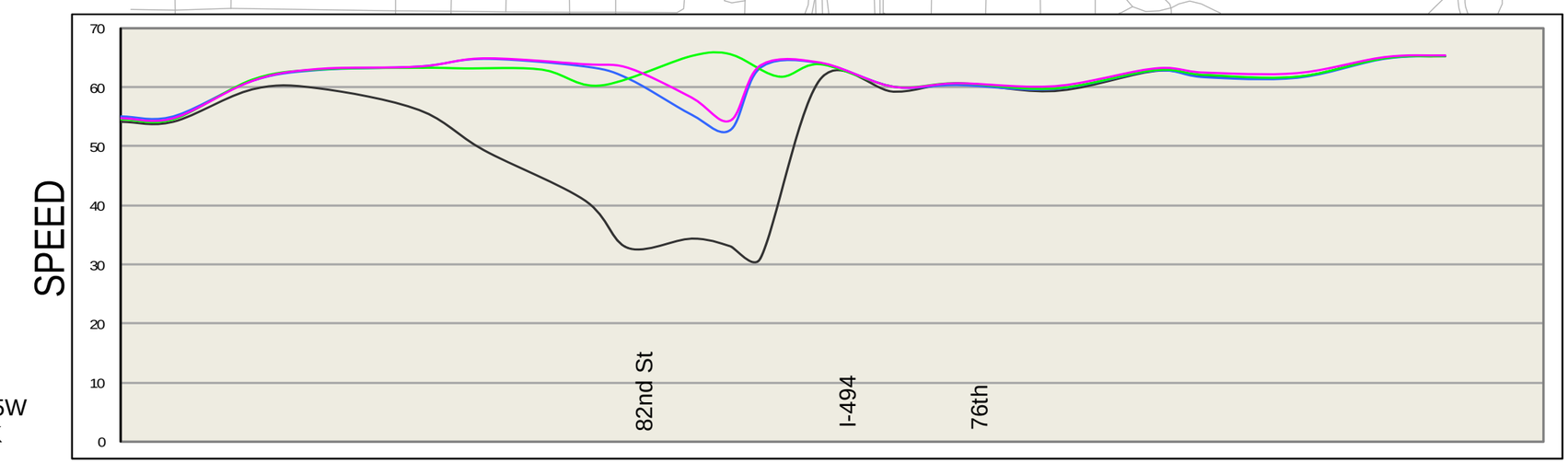
AMNTCO107371

SOUTHBOUND 35W
BASE AM PEAK





NORTHBOUND 35W
BASE AM PEAK



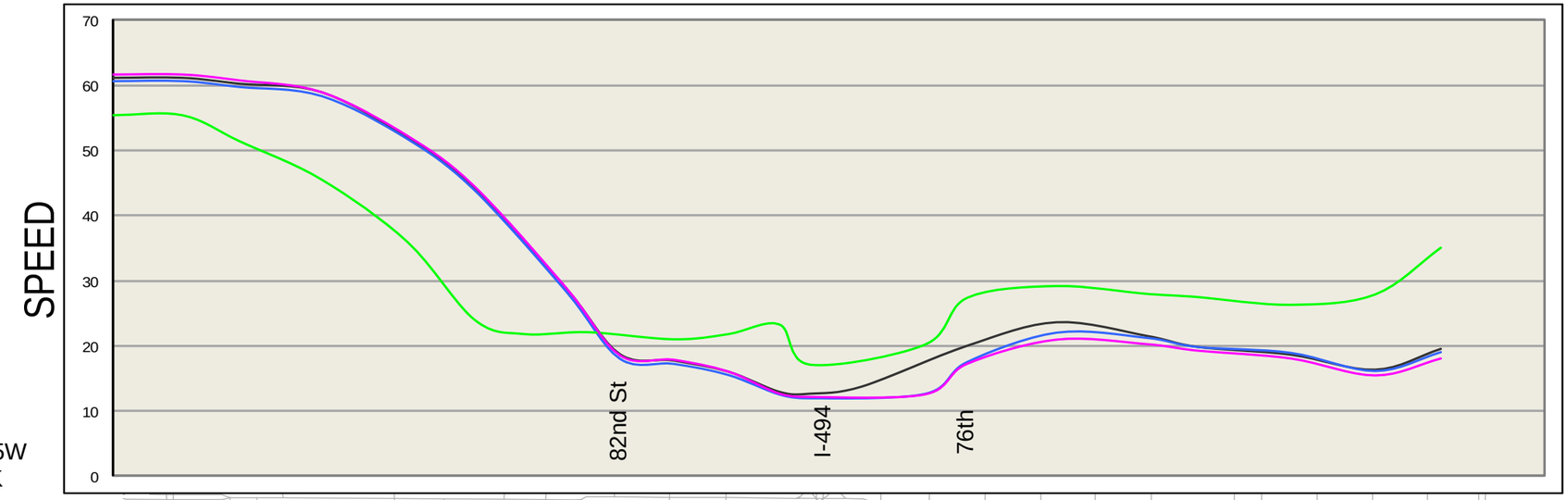
2020 Corsim Speeds - 35W Base AM

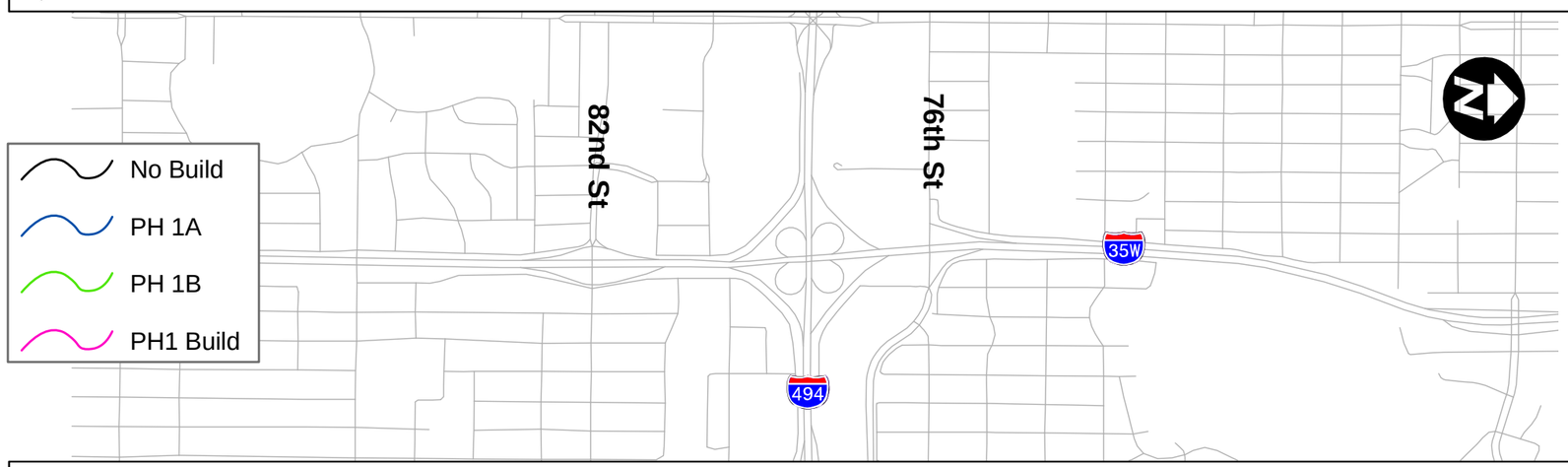
I-494 / 35W Interchange Preliminary Design Project

Figure F13

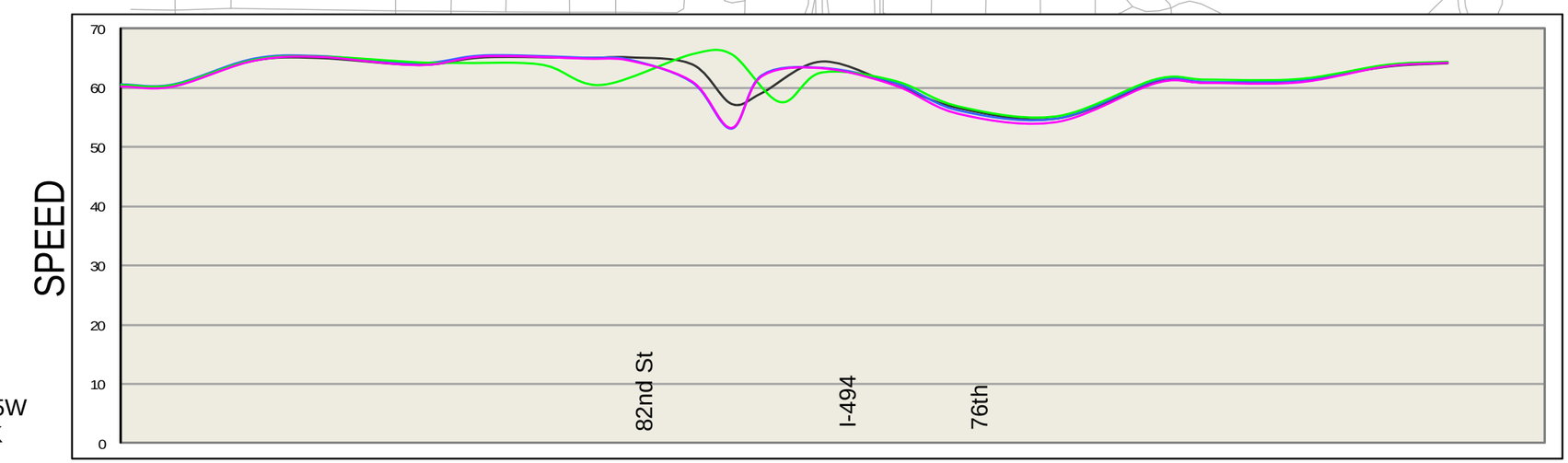
AMNTCO107371

SOUTHBOUND 35W
BASE PM PEAK





NORTHBOUND 35W
BASE PM PEAK

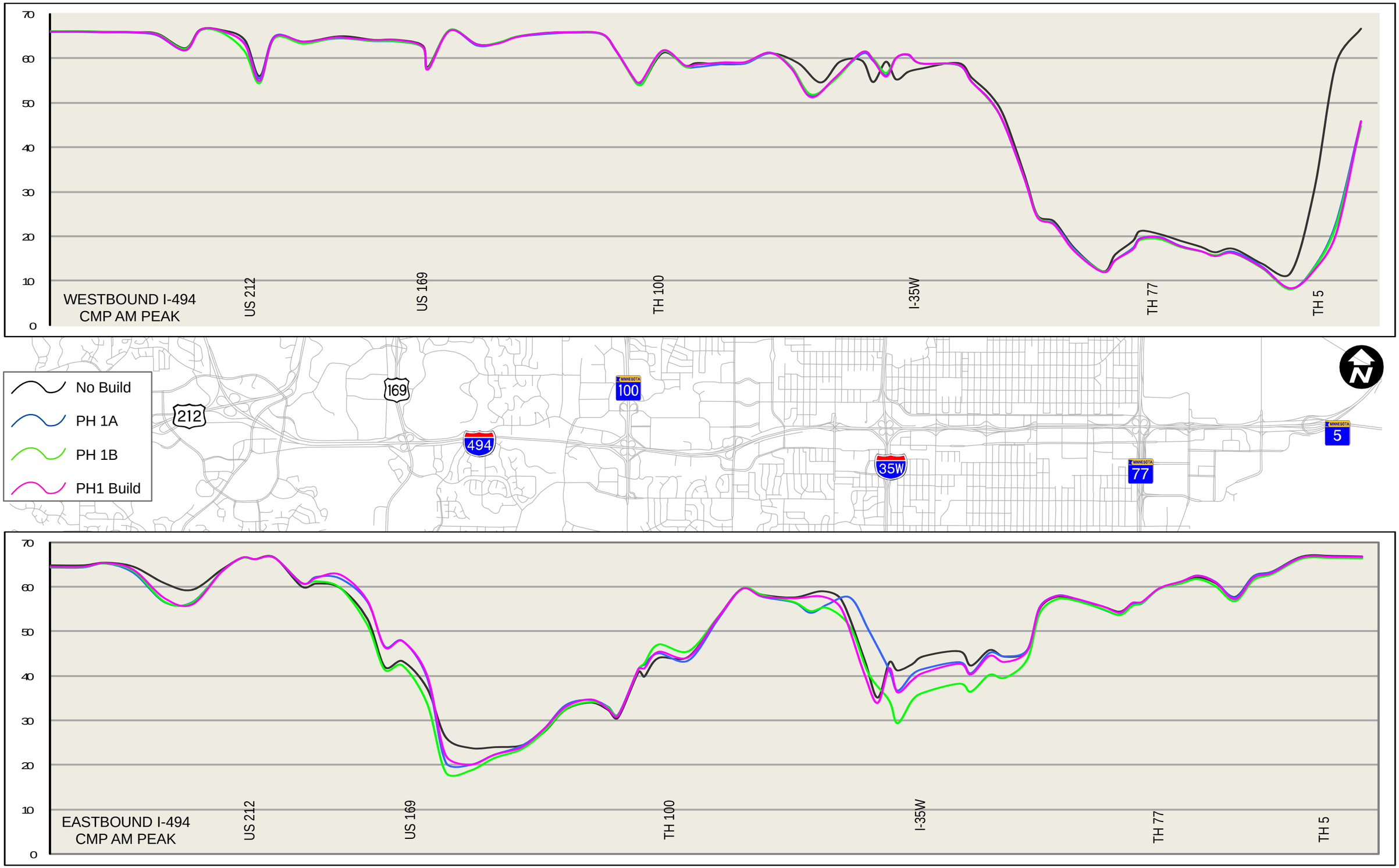


2020 Corsim Speeds - 35W Base PM

I-494 / 35W Interchange Preliminary Design Project

AMNTCO107371

Figure F14

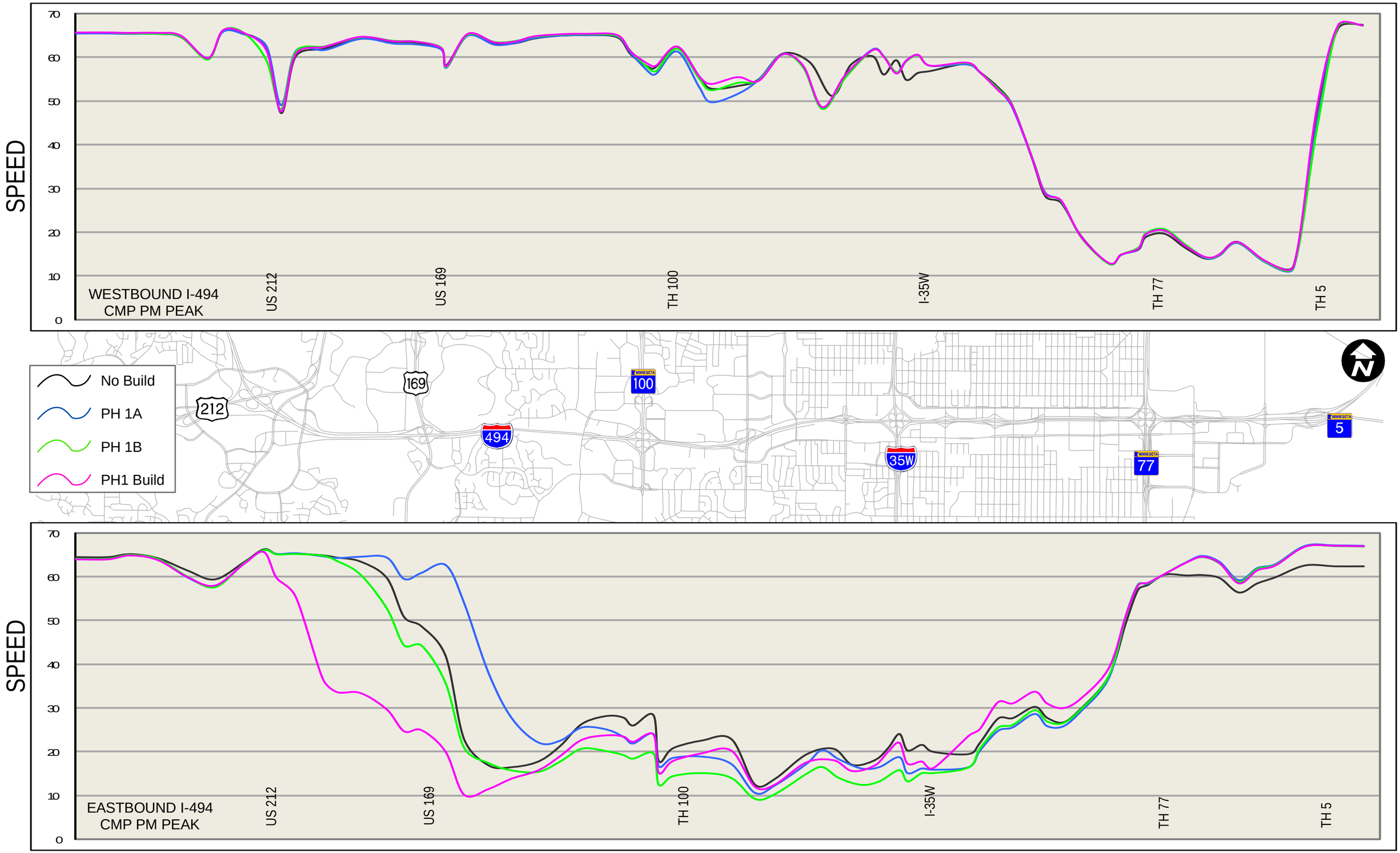


2020 Corsim Speeds - 494 CMP AM

I-494 / 35W Interchange Preliminary Design Project

Figure F15

AMNTCO107371



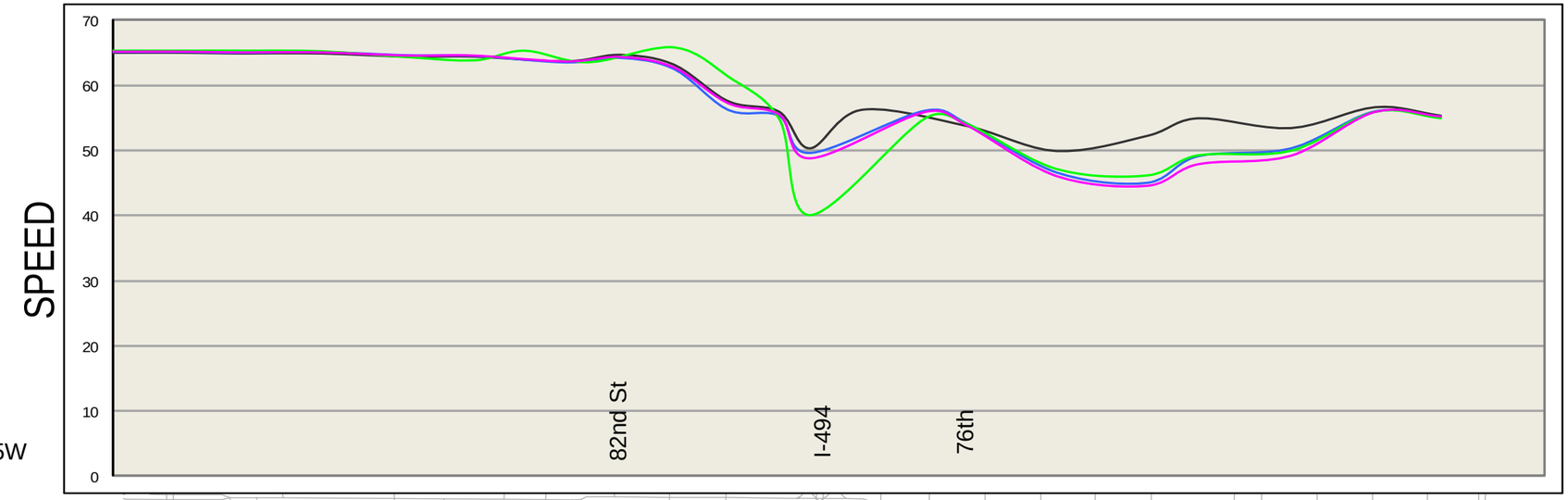
2020 Corsim Speeds - 494 CMP PM

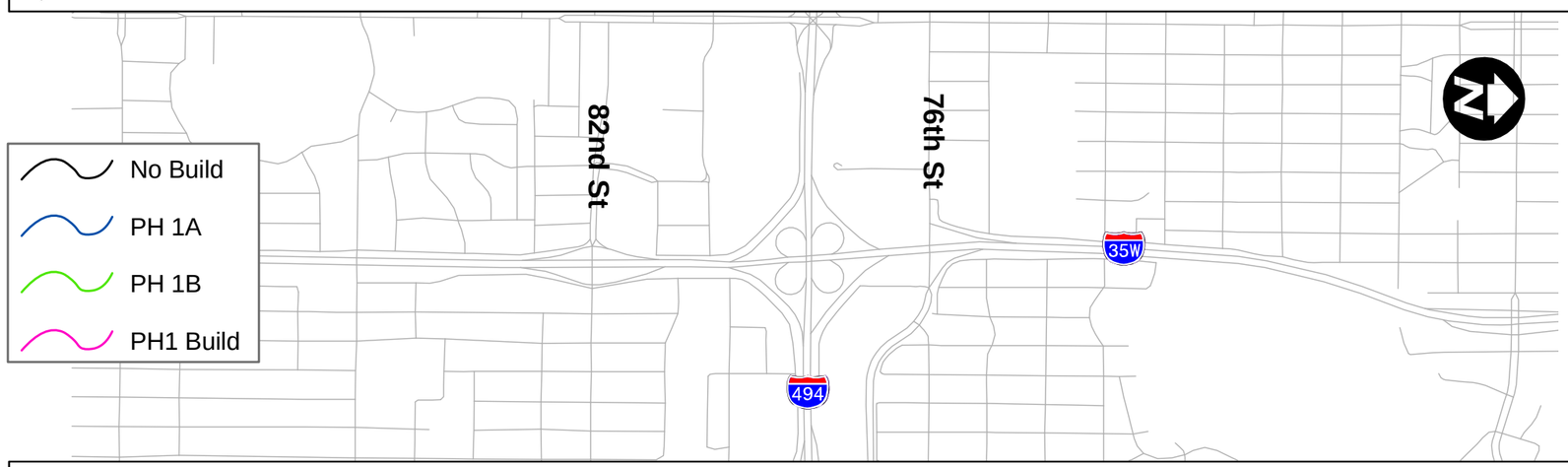
I-494 / 35W Interchange Preliminary Design Project

Figure F16

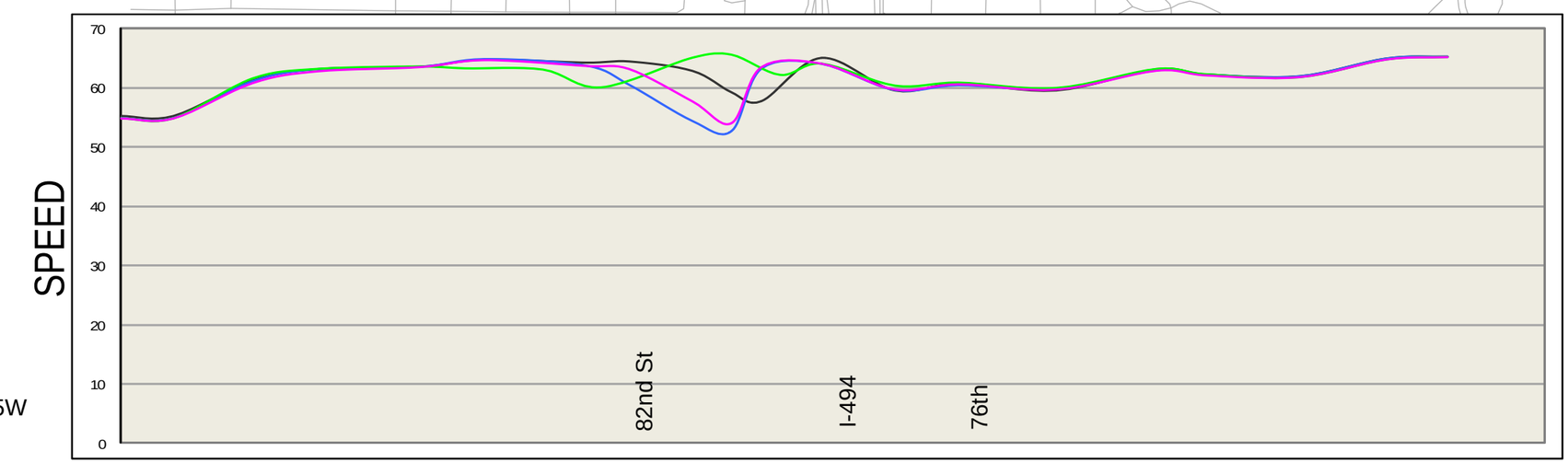
AMNTCO107371

SOUTHBOUND 35W
CMP AM PEAK





NORTHBOUND 35W
CMP AM PEAK



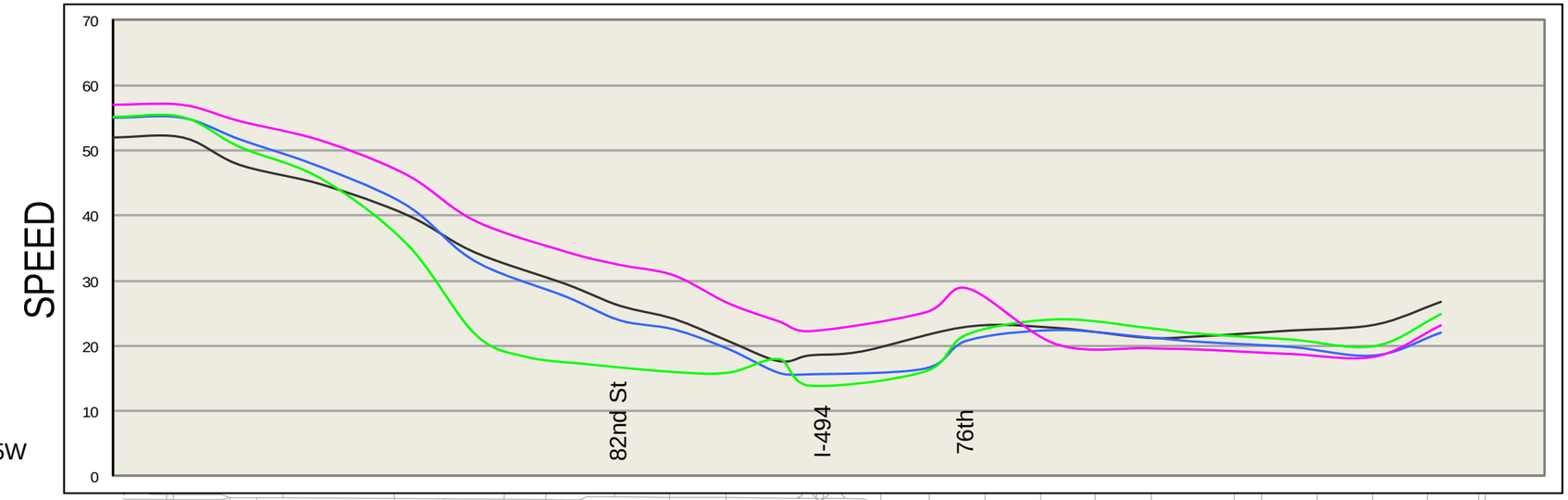
2020 Corsim Speeds - 35W CMP AM

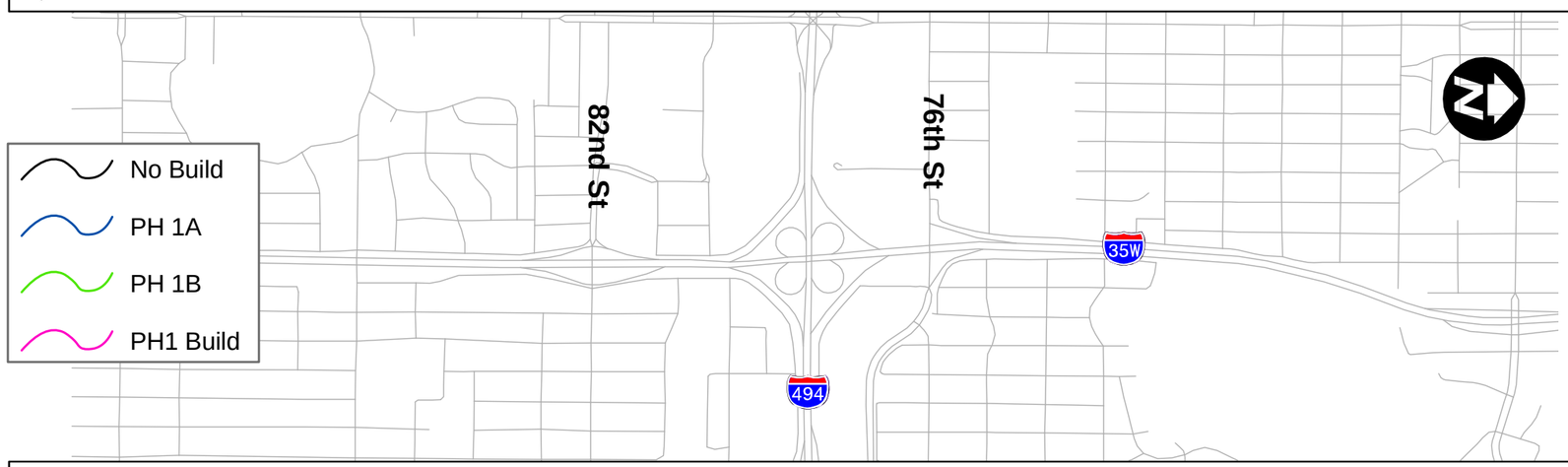
I-494 / 35W Interchange Preliminary Design Project

Figure F17

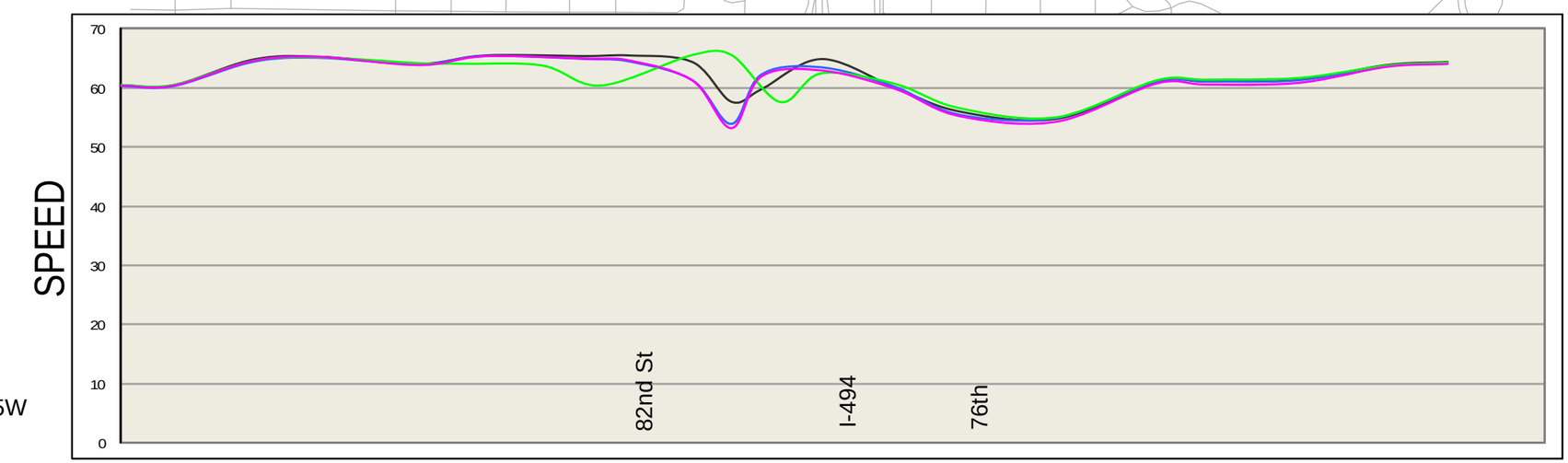
AMNTCO107371

SOUTHBOUND 35W
CMP PM PEAK





NORTHBOUND 35W
CMP PM PEAK

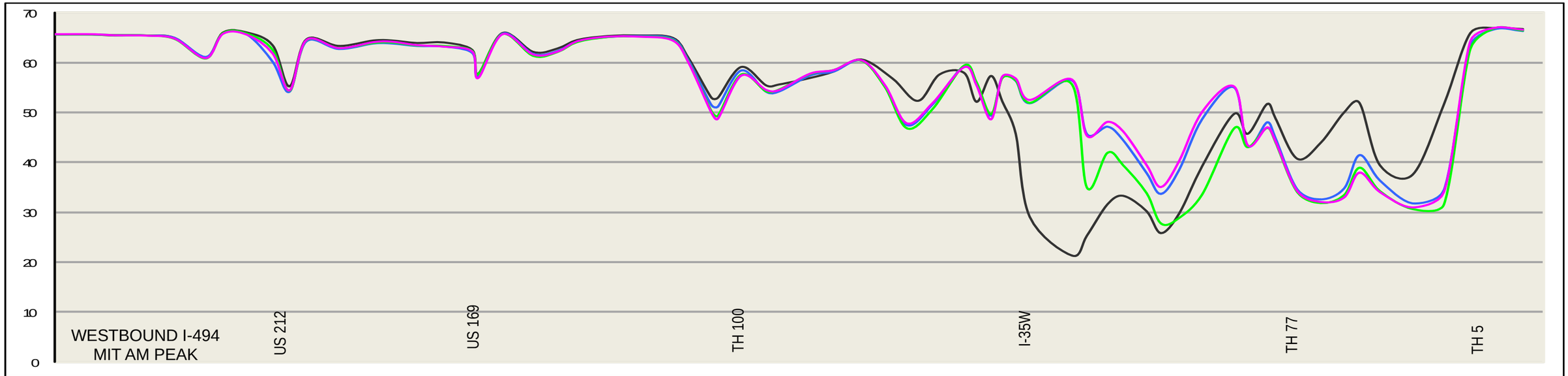


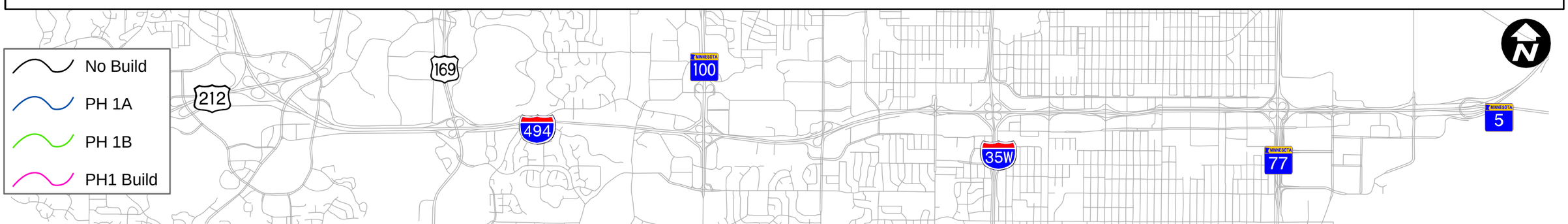
2020 Corsim Speeds - 35W CMP PM

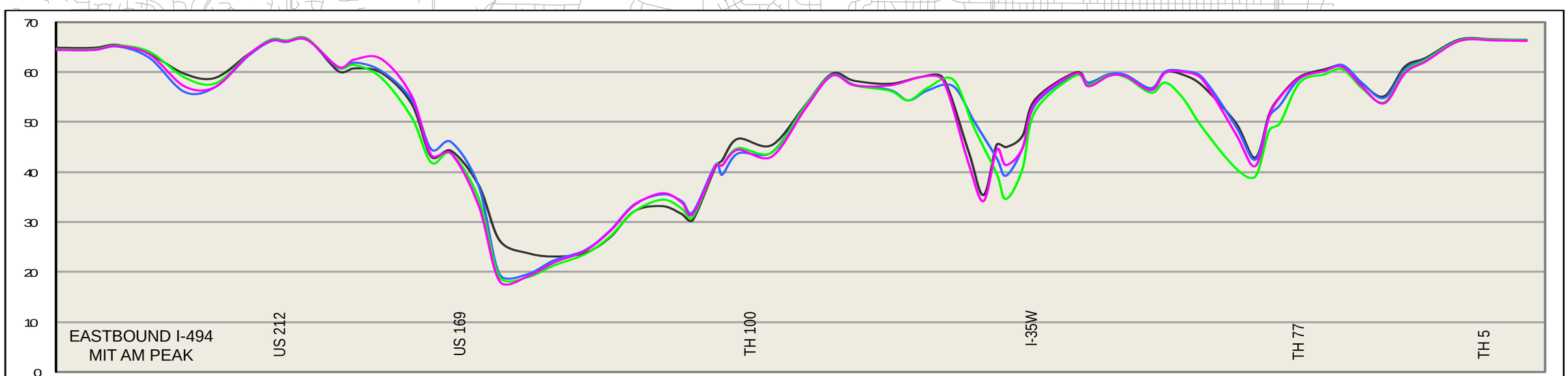
I-494 / 35W Interchange Preliminary Design Project

AMNTCO107371

Figure F18





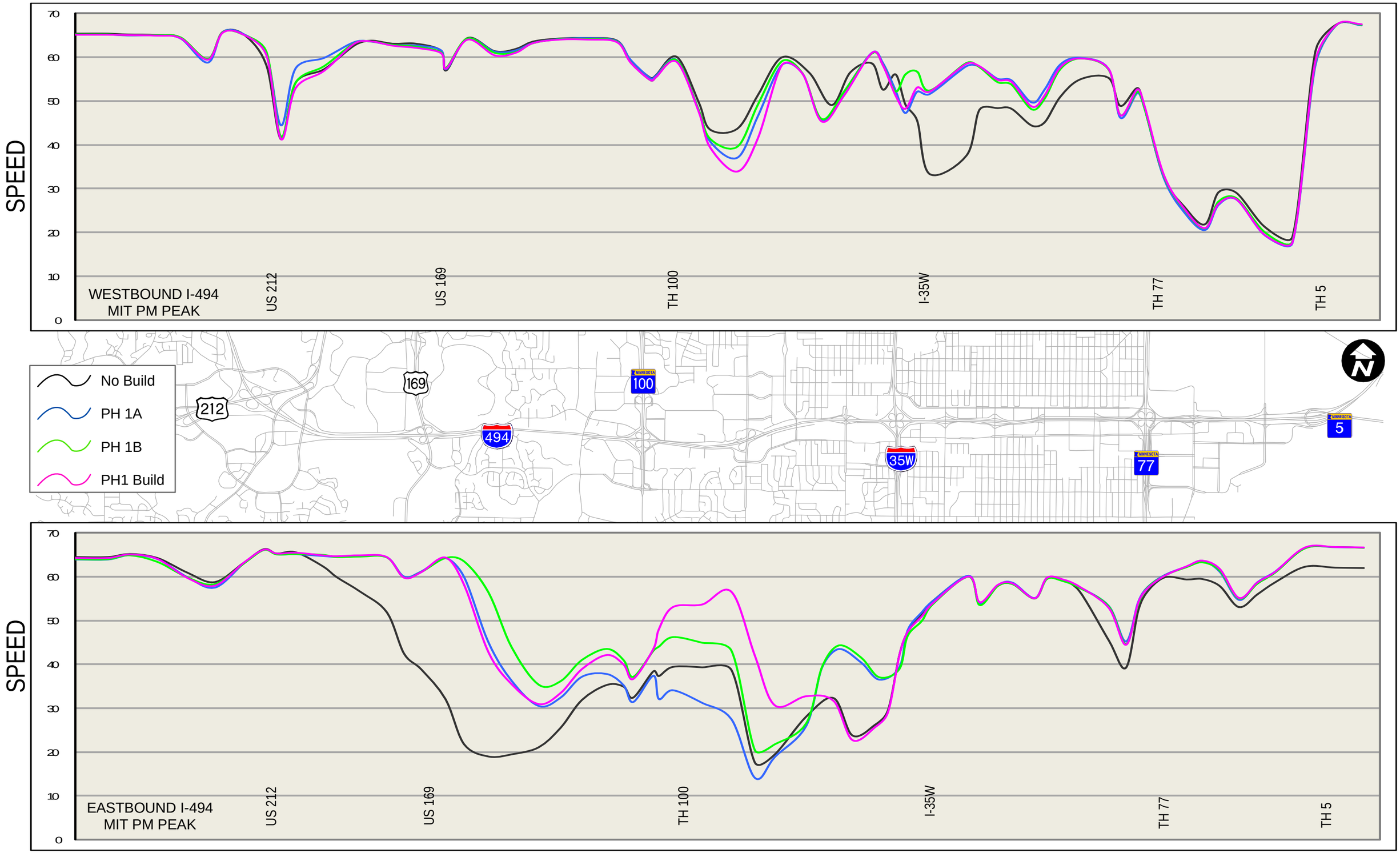


2020 Corsim Speeds - 494 MIT AM

I-494 / 35W Interchange Preliminary Design Project

Figure F19

AMNTCO107371



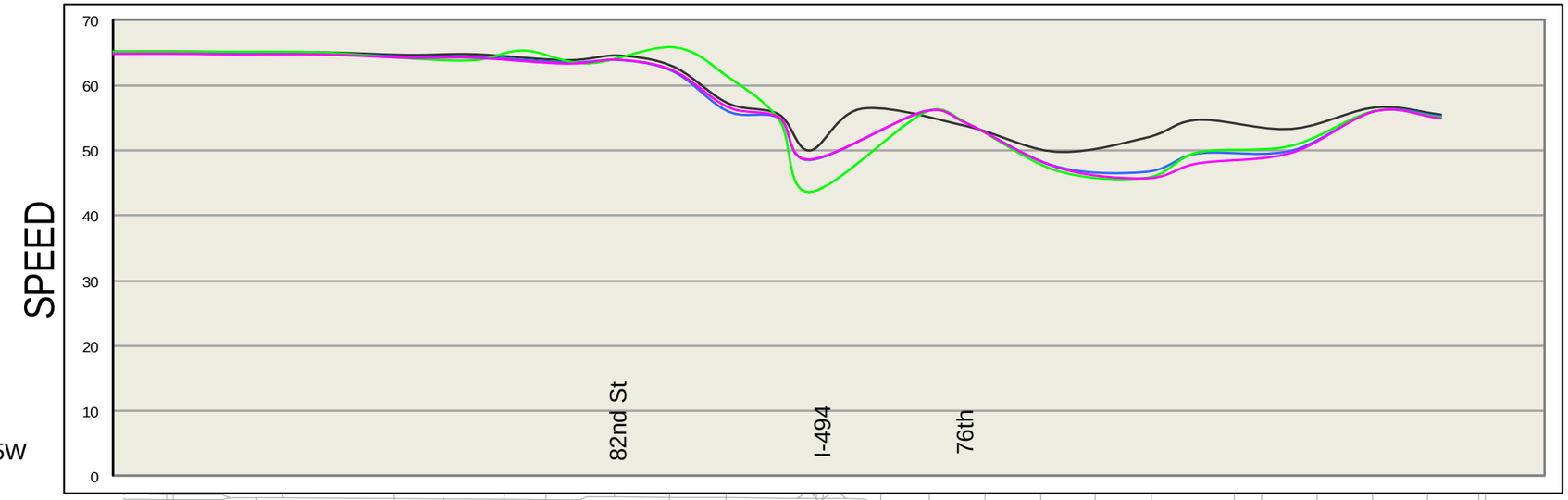
2020 Corsim Speeds - 494 MIT PM

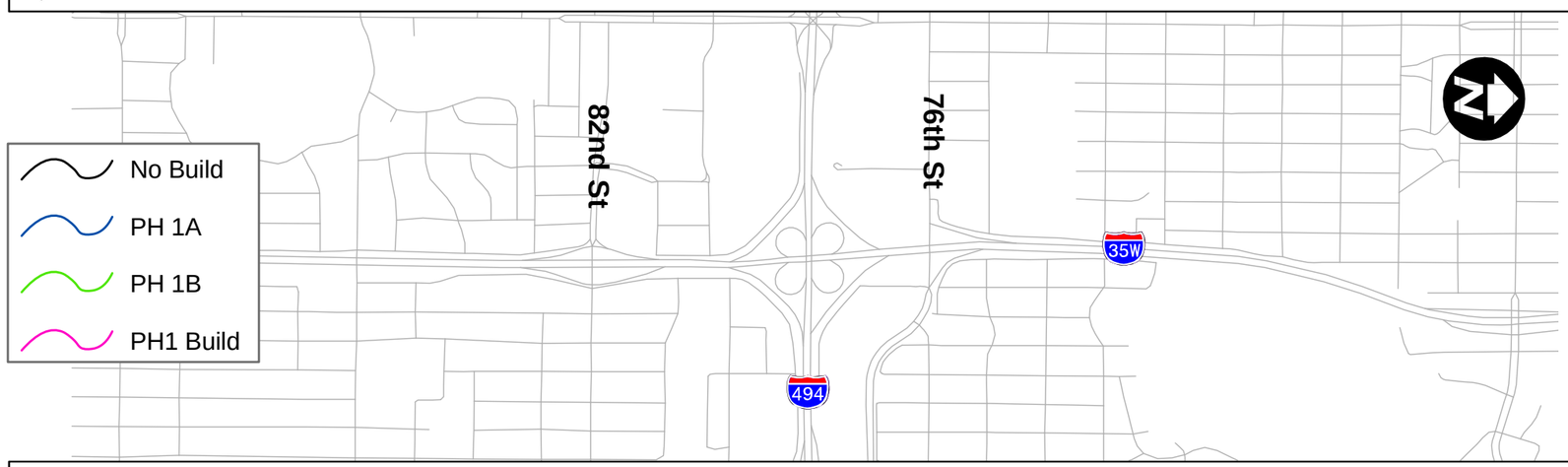
I-494 / 35W Interchange Preliminary Design Project

Figure F20

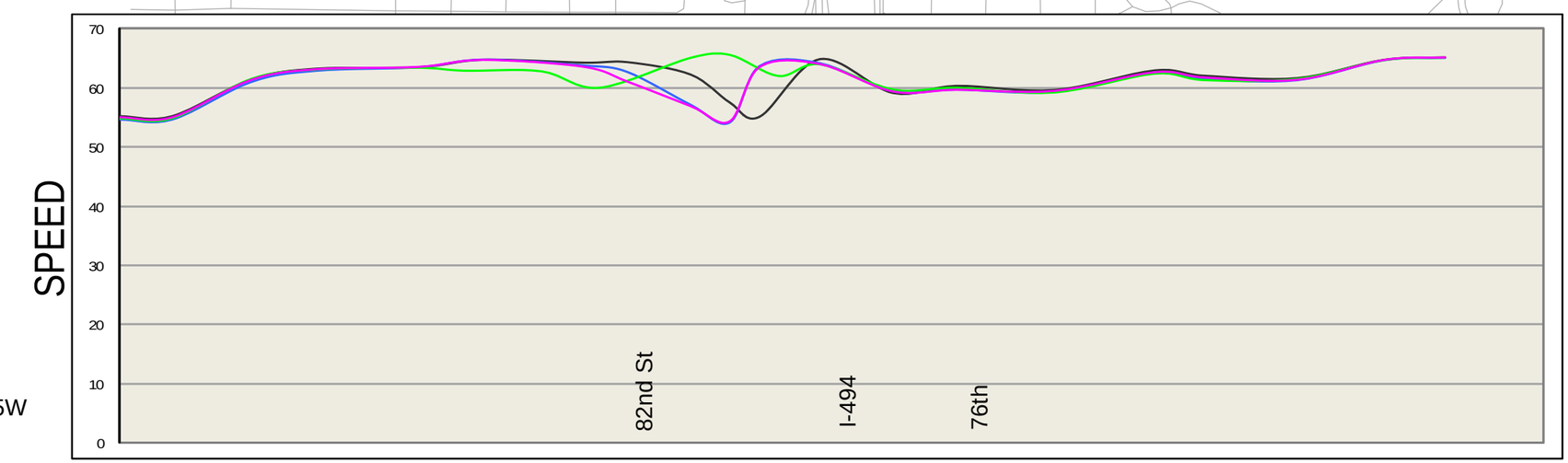
AMNTCO107371

SOUTHBOUND 35W
MIT AM PEAK





NORTHBOUND 35W
MIT AM PEAK



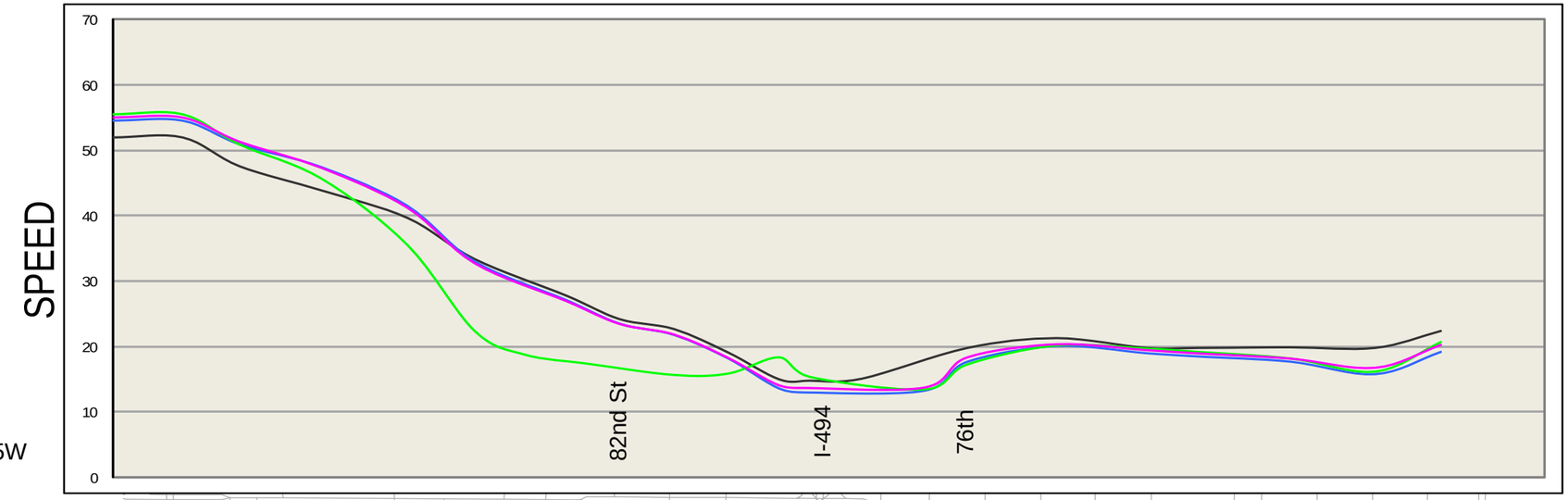
2020 Corsim Speeds - 35W MIT AM

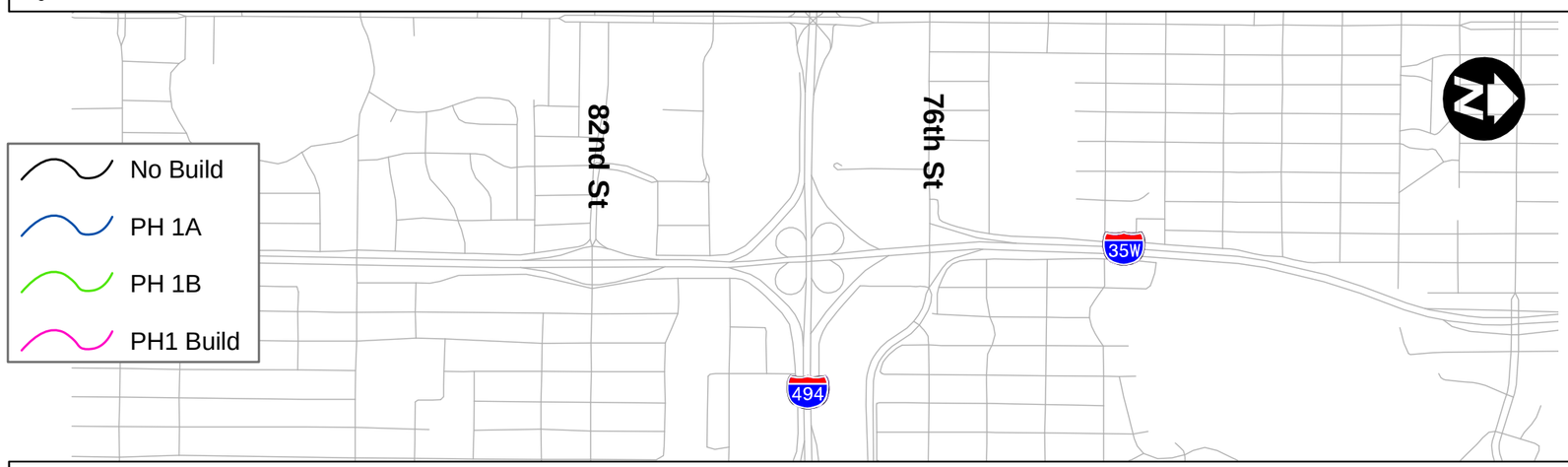
I-494 / 35W Interchange Preliminary Design Project

AMNTCO107371

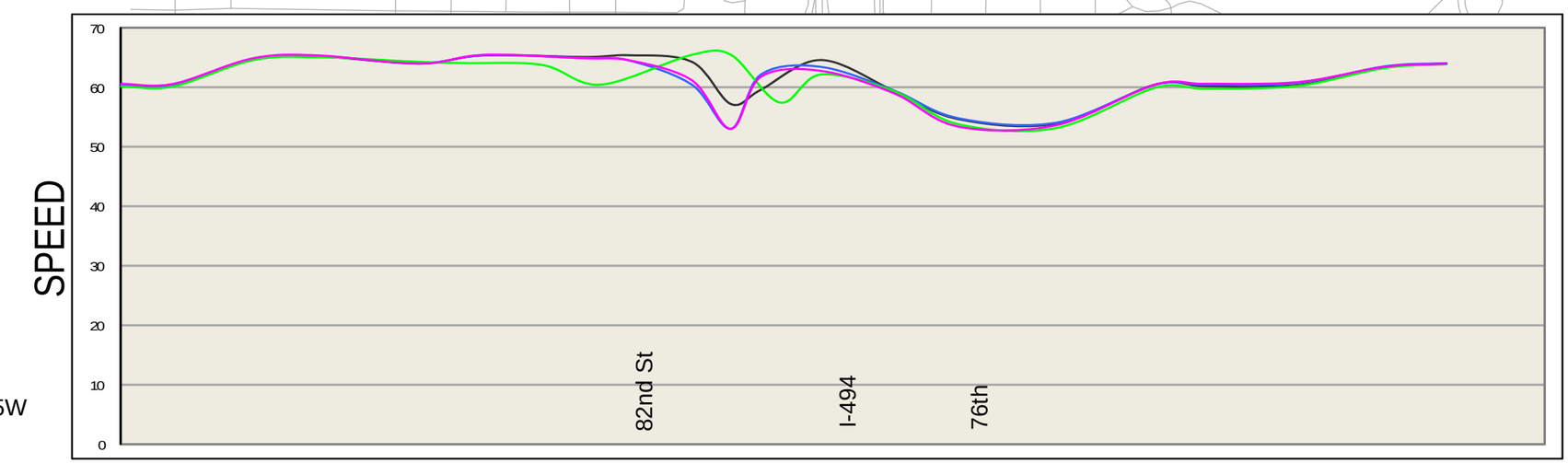
Figure F21

SOUTHBOUND 35W
MIT PM PEAK





NORTHBOUND 35W
MIT PM PEAK



2020 Corsim Speeds - 35W MIT PM

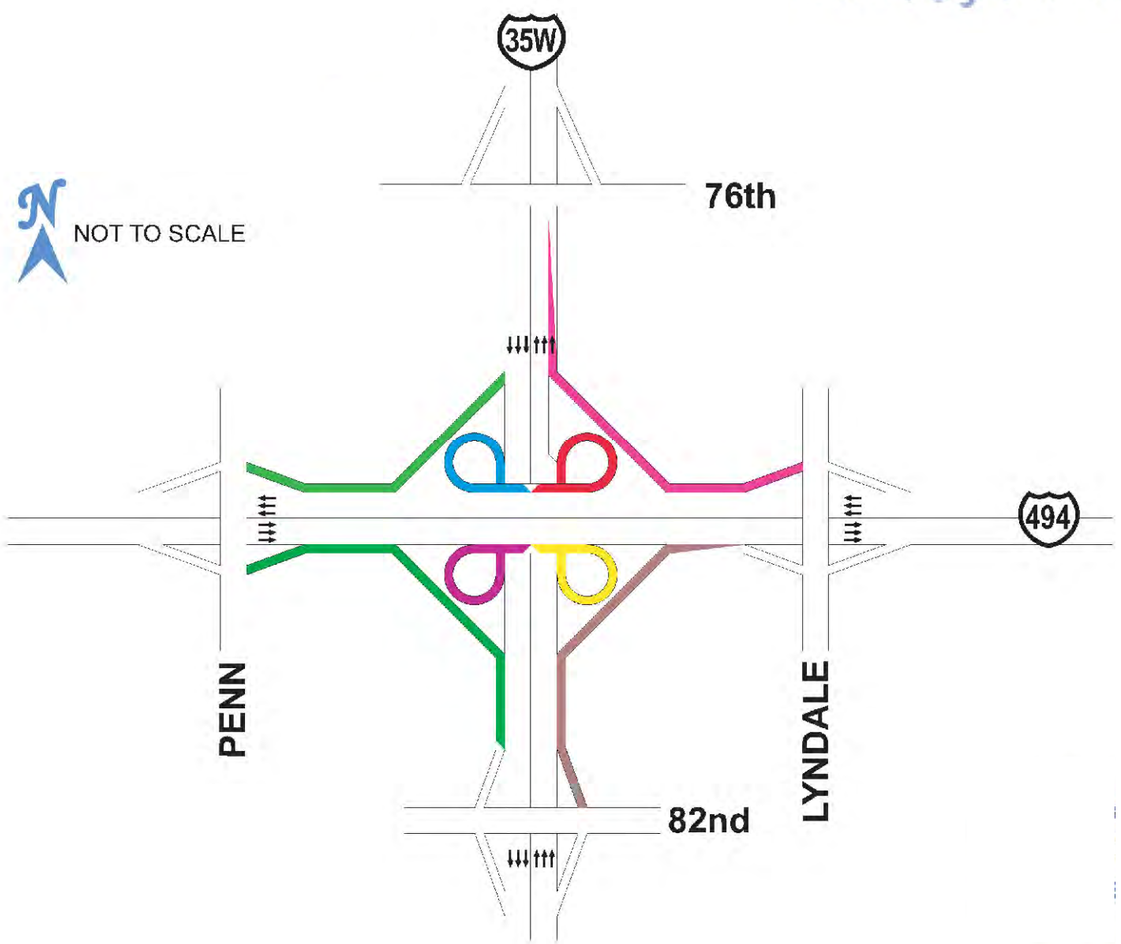
I-494 / 35W Interchange Preliminary Design Project

AMNTCO107371

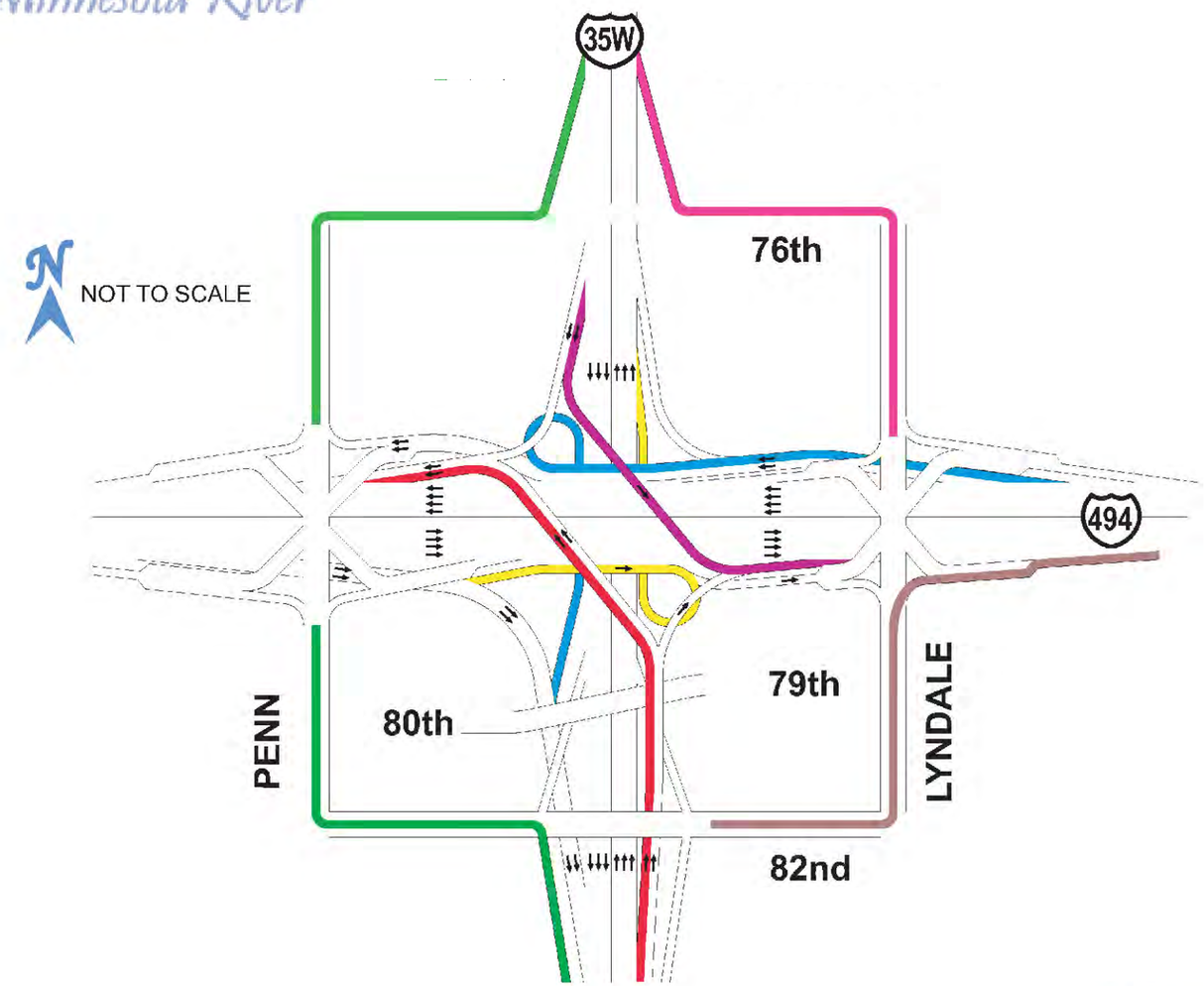
Figure F22

I-494 Reconstruction

From I-394 to the Minnesota River



EXISTING



PROPOSED

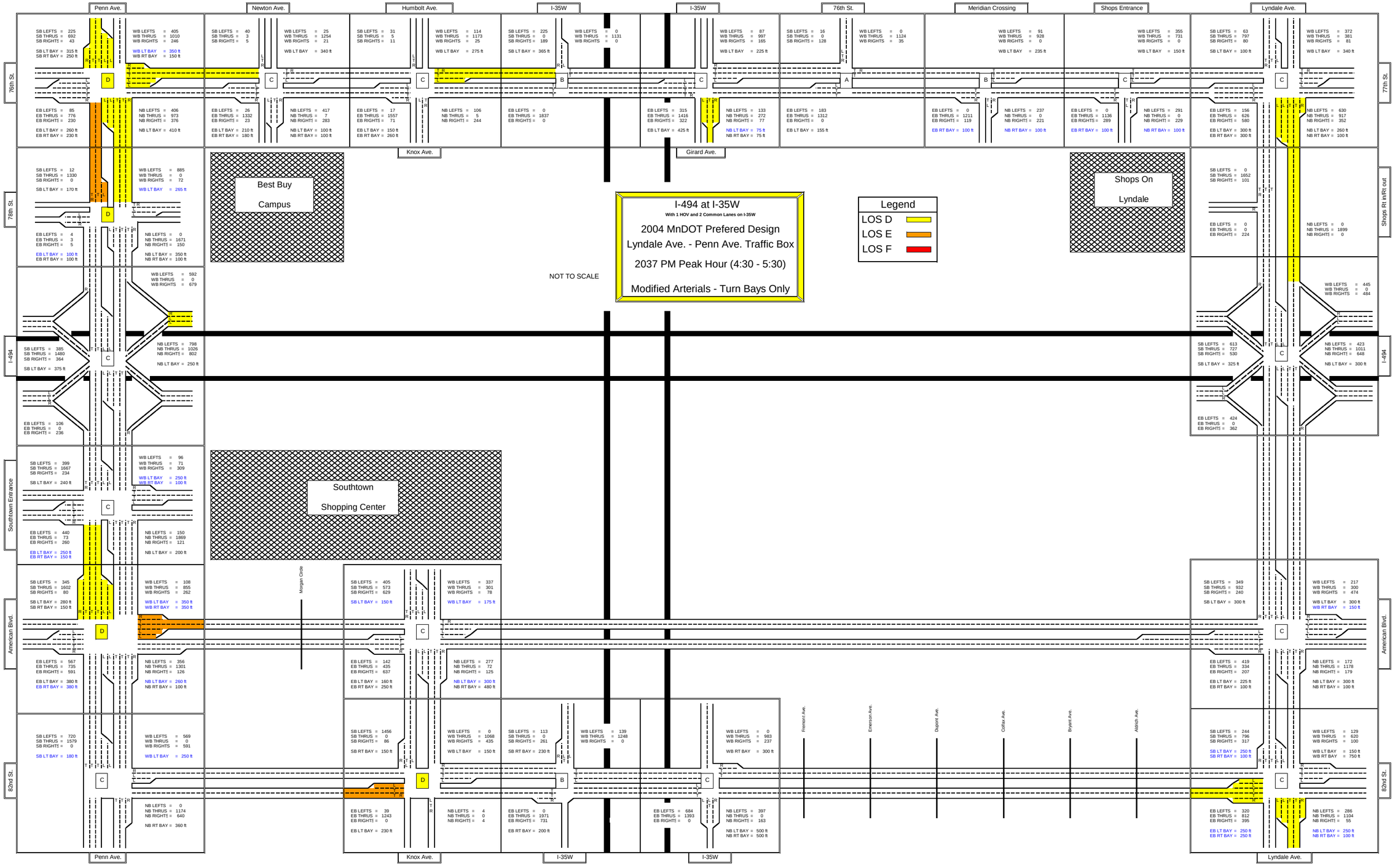
SOURCE: IMAGES OBTAINED FROM MNDOT WEBSITE

Penn - Lyndale "Box" Network - Access to I-494 / 35W

I-494 / 35W Interchange Preliminary Design Project

AMNTCO107371

Figure F23



Lyndale - Penn Avenue Traffic Box (from Lyndale IAR)

Table F1
BRT Analysis MOE's
Synchro/SimTraffic Results

	Intersection	Approach	Existing										2020 No Build									
			Delay (s/veh)						LOS By Approach		LOS By Intersection		Delay (s/veh)						LOS By Approach		LOS By Intersection	
			Left		Thru		Right						Left		Thru		Right					
			Delay	LOS	Delay	LOS	Delay	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS
AM	American at Knox (Signal)	EB	34.3	C	9.9	A	4.4	A	8.8	A			37.6	D	11.5	B	4.3	A	10.3	B		
		WB	33.2	C	7.7	A	4.9	A	10.3	B			33.1	C	8.4	A	7.4	A	11.4	B		
		NB	26.8	C	17.4	B	1.7	A	21.6	C	12.0	B	27.6	C	13.2	B	1.7	A	21.6	C	12.9	B
		SB	30.4	C	39.5	D	5.3	A	29.6	C			39.2	D	39.4	D	6.0	A	31.4	C		
	81st at Knox	EB	5.4	A	0.0	A	0.0	A	5.4	A			0.0	A	0.0	A	0.0	A	0.0	A		
	(Signal to Mitigate Build)	WB	9.3	A	0.0	A	5.7	A	7.4	A			8.2	A	0.0	A	5.8	A	6.9	A		
		NB	4.8	A	2.8	A	3.1	A	2.9	A	3.7	A	4.7	A	2.8	A	3.2	A	3.0	A	3.8	A
		SB	7.0	A	2.7	A	4.7	A	4.8	A			7.1	A	2.2	A	0.0	A	4.8	A		
	82nd at Knox (Signal)	EB	47.3	D	5.3	A	0.0	A	14.8	B			47.5	D	10.4	B	0.0	A	16.8	B		
		WB	61.9	E	11.2	B	4.9	A	8.5	A			50.7	D	16.9	B	6.4	A	12.6	B		
		NB	51.8	D	0.0	A	7.0	A	12.0	B	11.4	B	0.0	A	0.0	A	6.7	A	6.7	A	14.5	B
		SB	40.9	D	0.2	A	1.6	A	26.3	C			39.4	D	0.2	A	1.5	A	25.3	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	2.5	A	2.5	A	2.5	A			0.0	A	5.9	A	2.8	A	4.5	A		
		WB	6.5	A	5.4	A	0.0	A	5.5	A	9.6	A	13.2	B	9.6	A	0.0	A	10.6	B	15.1	B
		SB	41.7	D	41.5	D	8.7	A	24.9	C			40.0	D	42.9	D	11.5	B	26.8	C		
	82nd at NB I-35W Ramp (Signal)	EB	19.7	B	8.4	A	0.0	A	13.2	B			21.0	C	10.4	B	0.0	A	13.7	B		
		WB	0.0	A	11.9	B	7.6	A	11.1	B	19.6	B	0.0	A	14.2	B	9.0	A	13.1	B	19.2	B
		NB	28.9	C	31.9	C	5.3	A	25.8	C			29.8	C	31.2	C	7.1	A	26.3	C		
	82nd at Penn (Signal)	WB	47.0	D	0.0	A	5.0	A	14.1	B			48.5	D	2.6	A	8.1	A	16.1	B		
		NB	0.0	A	18.9	B	2.0	A	16.6	B	15.0	B	0.0	A	17.9	B	2.3	A	15.7	B	15.0	B
		SB	43.3	D	2.6	A	0.0	A	12.1	B			37.3	D	3.4	A	0.0	A	11.2	B		
	American at Dupont	EB																				
	(Signal to Mitigate Build)	WB																				
		NB																				
		SB																				
	American at Lyndale (Signal)	EB																				
		WB																				
		NB																				
		SB																				
PM	American at Knox (Signal)	EB	53.0	D	35.7	D	36.2	D	36.6	D			73.7	E	47.0	D	50.1	D	49.0	D		
		WB	41.9	D	19.9	B	16.6	B	21.5	C			51.5	D	21.2	C	18.9	B	24.8	C		
		NB	29.5	C	28.0	C	2.8	A	22.7	C	29.4	C	48.1	D	38.3	D	2.9	A	35.9	D	38.5	D
		SB	31.0	C	39.9	D	6.3	A	27.0	C			35.7	D	48.7	D	9.4	A	32.9	C		
	81st at Knox	EB	0.0	A	0.0	A	9.2	A	9.2	A			0.0	A	0.0	A	10.2	B	10.2	B		
	(Signal to Mitigate Build)	WB	10.4	B	0.0	A	6.5	A	8.4	A			16.9	C	0.0	A	6.6	A	12.6	B		
		NB	6.0	A	2.7	A	2.8	A	2.9	A	5.0	A	6.3	A	2.9	A	2.8	A	3.1	A	6.0	A
		SB	6.4	A	3.6	A	1.4	A	3.8	A			5.7	A	3.6	A	0.0	A	3.7	A		
	82nd at Knox (Signal)	EB	45.6	D	23.2	C	18.0	B	24.3	C			54.3	D	27.0	C	27.9	C	28.1	C		
		WB	52.9	D	23.0	C	3.3	A	13.9	B			0.0	A	26.2	C	4.2	A	15.9	B		
		NB	41.1	D	0.0	A	11.5	B	22.9	C	20.8	C	33.2	C	0.0	A	18.2	B	25.7	C	23.7	C
		SB	25.9	C	0.0	A	4.3	A	23.3	C			28.6	C	0.0	A	4.5	A	25.1	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	4.8	A	5.1	A	4.9	A			0.0	A	8.3	A	10.9	B	9.6	A		
		WB	8.2	A	2.8	A	0.0	A	4.2	A	8.2	A	22.3	C	5.0	A	0.0	A	12.5	B	14.4	B
		SB	50.3	D	52.4	D	8.1	A	30.8	C			48.6	D	48.4	D	9.9	A	30.7	C		
	82nd at NB I-35W Ramp (Signal)	EB	12.3	B	6.6	A	0.0	A	8.8	A			27.8	C	10.8	B	0.0	A	19.1	B		
		WB	0.0	A	4.6	A	2.6	A	4.0	A	13.0	B	0.0	A	7.0	A	5.3	A	6.1	A	18.4	B
		NB	46.0	D	44.2	D	6.7	A	31.8	C			45.7	D	45.5	D	12.5	B	30.7	C		
	82nd at Penn (Signal)	WB	50.1	D	2.6	A	3.9	A	26.5	C			47.9	D	2.7	A	5.0	A	24.8	C		
		NB	0.0	A	21.6	C	3.9	A	17.3	B	17.5	B	0.0	A	21.4	C	8.7	A	17.1	B	19.0	B
		SB	41.8	D	5.3	A	0.0	A	14.9	B			42.0	D	7.1	A	0.0	A	18.6	B		
	American at Dupont	EB																				
	(Signal to Mitigate Build)	WB																				
		NB																				
		SB																				
	American at Lyndale (Signal)	EB																				
		WB																				
		NB																				
		SB																				

	Intersection	Approach	2020 Build (West Parking Ramp) - No Mitigations										2020 Build (West Parking Ramp) - Mitigated									
			Delay (s/veh)						LOS By Approach		LOS By Intersection		Delay (s/veh)						LOS By Approach		LOS By Intersection	
			Left		Thru		Right						Left		Thru		Right					
			Delay	LOS	Delay	LOS	Delay	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS
AM	American at Knox (Signal)	EB	43.4	D	13.9	B	6.2	A	12.5	B			40.3	D	13.6	B	6.1	A	12.2	B		
		WB	34.5	C	9.2	A	9.2	A	13.6	B			36.2	D	9.7	A	9.6	A	14.2	B		
		NB	29.3	C	15.2	B	2.0	A	22.3	C	14.9	B	31.3	C	16.4	B	2.8	A	24.0	C	15.4	B
		SB	38.1	D	42.6	D	6.4	A	34.0	C			47.9	D	38.3	D	6.3	A	34.8	C		
	81st at Knox	EB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A		
	(Signal to Mitigate Build)	WB	19.9	C	0.0	A	6.3	A	15.1	C			19.9	B	0.0	A	6.3	A	15.1	B		
		NB	4.8	A	2.9	A	4.0	A	3.5	A	6.0	A	7.3	A	6.1	A	5.8	A	6.0	A	7.9	A
		SB	12.3	B	2.2	A	0.0	A	8.6	A			13.0	B	4.5	A	0.0	A	9.8	A		
	82nd at Knox (Signal)	EB	50.3	D	10.8	B	0.0	A	23.2	C			50.3	D	10.8	B	0.0	A	23.2	C		
		WB	48.0	D	19.3	B	8.2	A	13.8	B			48.0	D	19.4	B	8.2	A	13.9	B		
		NB	0.0	A	0.0	A	7.1	A	7.1	A	17.0	B	0.0	A	0.0	A	7.3	A	7.3	A	17.1	B
		SB	41.0	D	0.4	A	1.9	A	26.9	C			40.8	D	0.6	A	2.2	A	27.1	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	5.6	A	3.3	A	4.5	A			0.0	A	5.5	A	3.2	A	4.4	A		
		WB	13.0	B	12.0	B	0.0	A	12.2	B	15.2	B	13.1	B	12.0	B	0.0	A	12.3	B	15.2	B
		SB	39.1	D	40.8	D	11.6	B	26.3	C			39.0	D	40.9	D	11.6	B	26.3	C		
	82nd at NB I-35W Ramp (Signal)	EB	30.0	C	12.8	B	0.0	A	18.1	B			30.3	C	12.9	B	0.0	A	18.3	B		
		WB	0.0	A	16.1	B	13.1	B	15.5	B	21.2	C	0.0	A	16.2	B	13.1	B	15.6	B	21.2	C
		NB	29.6	C	30.7	C	8.0	A	26.4	C			29.3	C	29.8	C	7.9	A	26.1	C		
	82nd at Penn (Signal)	WB	46.2	D	2.9	A	9.3	A	17.1	B			45.9	D	3.1	A	9.4	A	17.1	B		
		NB	0.0	A	18.4	B	2.8	A	15.5	B	15.4	B	0.0	A	18.5	B	2.8	A	15.6	B	15.5	B
		SB	39.5	D	3.3	A	0.0	A	12.3	B			39.5	D	3.3	A	0.0	A	12.3	B		
	American at Dupont	EB																				
	(Signal to Mitigate Build)	WB																				
		NB																				
		SB																				
	American at Lyndale (Signal)	EB																				
		WB																				
		NB																				
		SB																				
PM	American at Knox (Signal)	EB	75.8	E	43.1	D	44.8	D	45.4	D			74.0	E	44.2	D	45.3	D	46.3	D		
		WB	54.8	D	22.9	C	19.6	B	26.7	C			54.1	D	23.1	C	22.0	C	27.0	C		
		NB	61.0	E	43.2	D	3.4	A	40.8	D	37.9	D	61.5	E	43.0	D	4.3	A	41.3	D	38.5	D
		SB	38.1	D	48.7	D	10.5	B	34.0	C			37.7	D	49.0	D	9.4	A	33.7	C		
	81st at Knox	EB	0.0	A	0.0	A	13.1	B	13.1	B			0.0	A	0.0	A	8.3	A	8.3	A		
	(Signal to Mitigate Build)	WB	85.4	F	0.0	A	47.1	E	71.6	F			18.2	B	0.0	A	8.3	A	14.7	B		
		NB	5.6	A	2.9	A	2.9	A	3.0	A	29.2	D	13.3	B	12.6	B	4.2	A	11.0	B	12.9	B
		SB	6.5	A	3.5	A	0.0	A	3.8	A			13.7	B	12.4	B	0.0	A	12.5	B		
	82nd at Knox (Signal)	EB	55.4	E	28.5	C	27.0	C	30.0	C			55.4	E	28.5	C	26.9	C	30.0	C		
		WB	0.0	A	27.7	C	4.3	A	15.7	B			0.0	A	27.5	C	4.2	A	15.5	B		
		NB	43.7	D	0.0	A	20.9	C	33.6	C	25.0	C	43.7	D	0.0	A	19.8	B	33.1	C	25.2	C
		SB	31.2	C	0.0	A	5.2	A	26.7	C			31.9	C	0.0	A	6.1	A	27.4	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	10.7	B	13.6	B	12.2	B			0.0	A	10.4	B	13.0	B	11.8	B		
		WB	34.3	C	5.6	A	0.0	A	17.0	B	16.7	B	32.1	C	5.3	A	0.0	A	16.0	B	16.1	B
		SB	48.8	D	47.0	D	9.6	A	31.2	C			47.3	D	45.8	D	9.5	A	30.4	C		
	82nd at NB I-35W Ramp (Signal)	EB	33.2	C	12.5	B	0.0	A	22.1	C			31.9	C	12.5	B	0.0	A	21.5	C		
		WB	0.0	A	7.5	A	4.8	A	6.2	A	20.2	C	0.0	A	7.2	A	4.9	A	6.1	A	19.7	B
		NB	46.1	D	45.0	D	13.7	B	31.6	C			44.9	D	44.9	D	13.4	B	31.0	C		
	82nd at Penn (Signal)	WB	47.5	D	3.7	A	4.9	A	26.3	C			50.2	D	3.3	A	4.9	A	27.5	C		
		NB	0.0	A	23.1	C	8.8	A	17.8	B	20.1	C	0.0	A	23.1	C	8.8	A	17.8	B	20.3	C
		SB	44.6	D	7.7	A	0.0	A	19.9	B			44.5	D	7.6	A	0.0	A	19.8	B		
	American at Dupont	EB																				
	(Signal to Mitigate Build)	WB																				
		NB																				
		SB																				
	American at Lyndale (Signal)	EB																				
		WB																				
		NB																				
		SB																				

	Intersection	Approach	2020 Build (East Parking Ramp) - Mitigated									
			Delay (s/veh)						LOS By Approach		LOS By Intersection	
			Left		Thru		Right					
			Delay	LOS	Delay	LOS	Delay	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS
AM	American at Knox (Signal)	EB	45.9	D	21.8	C	11.3	B	19.8	B		
		WB	50.4	D	18.3	B	16.5	B	21.9	C		
		NB	21.7	C	9.2	A	2.0	A	11.7	B	19.3	B
		SB	22.0	C	20.2	C	5.5	A	17.3	B		
	81st at Knox	EB	0.0	A	0.0	A	0.0	A	0.0	A		
	(Signal to Mitigate Build)	WB	12.2	B	0.0	A	5.8	A	9.2	A		
		NB	4.9	A	2.9	A	3.2	A	3.0	A	4.1	A
		SB	8.6	A	3.3	A	0.0	A	5.8	A		
	82nd at Knox (Signal)	EB	44.5	D	9.9	A	0.0	A	16.2	B		
		WB	53.3	D	15.3	B	7.7	A	11.7	B		
		NB	0.0	A	0.0	A	8.1	A	8.1	A	13.5	B
		SB	32.2	C	0.3	A	1.6	A	22.1	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	5.3	A	3.2	A	4.3	A		
		WB	14.5	B	11.9	B	0.0	A	12.6	B	14.8	B
		SB	35.9	D	37.8	D	11.9	B	24.5	C		
	82nd at NB I-35W Ramp (Signal)	EB	25.6	C	11.8	B	0.0	A	15.9	B		
		WB	0.0	A	14.6	B	10.6	B	13.9	B	19.3	B
		NB	26.9	C	30.0	C	8.0	A	24.3	C		
	82nd at Penn (Signal)	WB	48.0	D	3.0	A	7.7	A	16.3	B		
		NB	0.0	A	18.5	B	2.6	A	16.3	B	15.6	B
		SB	41.2	D	3.2	A	0.0	A	12.6	B		
	American at Dupont	EB	24.2	C	13.0	B	10.7	B	12.2	B		
	(Signal to Mitigate Build)	WB	22.7	C	10.7	B	4.3	A	12.0	B		
		NB	17.1	B	0.0	A	6.6	A	11.5	B	12.0	B
		SB	15.5	B	14.3	B	6.5	A	13.0	B		
	American at Lyndale (Signal)	EB	40.5	D	11.0	B	3.9	A	14.2	B		
		WB	41.6	D	27.7	C	22.8	C	28.8	C		
		NB	35.7	D	21.4	C	3.8	A	19.5	B	22.7	C
		SB	39.8	D	23.6	C	7.5	A	20.7	C		
PM	American at Knox (Signal)	EB	77.6	E	42.8	D	41.0	D	44.6	D		
		WB	57.0	E	27.5	C	24.0	C	31.6	C		
		NB	42.5	D	40.2	D	3.3	A	30.9	C	37.6	D
		SB	38.3	D	46.6	D	8.7	A	32.8	C		
	81st at Knox	EB	0.0	A	0.0	A	12.3	B	12.3	B		
	(Signal to Mitigate Build)	WB	24.8	C	0.0	A	8.4	A	17.7	C		
		NB	6.1	A	2.9	A	2.7	A	3.0	A	6.7	A
		SB	5.0	A	2.4	A	0.0	A	2.5	A		
	82nd at Knox (Signal)	EB	46.3	D	22.5	C	19.2	B	23.4	C		
		WB	0.0	A	22.1	C	4.4	A	13.2	B		
		NB	41.5	D	0.0	A	17.5	B	30.8	C	23.4	C
		SB	35.1	D	0.0	A	5.7	A	31.1	C		
	82nd at SB I-35W Ramp (Signal)	EB	0.0	A	17.0	B	14.4	B	15.6	B		
		WB	49.6	D	6.8	A	0.0	A	26.1	C	21.3	C
		SB	49.4	D	49.9	D	9.8	A	32.1	C		
	82nd at NB I-35W Ramp (Signal)	EB	42.3	D	11.6	B	0.0	A	26.5	C		
		WB	0.0	A	11.2	B	7.8	A	9.7	A	26.3	C
		NB	69.3	E	57.6	E	15.5	B	44.6	D		
	82nd at Penn (Signal)	WB	33.7	C	2.0	A	4.7	A	17.4	B		
		NB	0.0	A	16.8	B	7.7	A	13.8	B	13.9	B
		SB	26.9	C	6.2	A	0.0	A	12.8	B		
	American at Dupont	EB	39.3	D	36.5	D	35.9	D	36.5	D		
	(Signal to Mitigate Build)	WB	27.9	C	5.6	A	3.7	A	6.5	A		
		NB	33.1	C	0.0	A	23.9	C	28.1	C	24.8	C
		SB	41.7	D	43.4	D	22.3	C	32.5	C		
	American at Lyndale (Signal)	EB	47.6	D	22.0	C	9.0	A	26.3	C		
		WB	48.9	D	35.2	D	32.4	C	37.2	D		
		NB	44.1	D	35.8	D	6.6	A	30.3	C	30.8	C
		SB	48.4	D	31.5	C	10.0	B	31.1	C		

NOTES:

Table F2
2040 Build Conditions
HCM/Synchro Results

		AM Peak Hour										PM Peak Hour										PM Peak 2037 Analysis
		Delay (s/veh)						LOS By Approach		LOS By Intersection		Delay (s/veh)						LOS By Approach		LOS By Intersection		
	Approach	Left		Thru		Right		Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Left		Thru		Right		Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	INT. LOS
Intersection		Delay	LOS	Delay	LOS	Delay	LOS					Delay	LOS	Delay	LOS	Delay	LOS					
Penn Ave at 76th St (Signal)	EB	45.5	D	36.5	D	32.1	C	35.4	D			55.8	E	45.7	D	25.9	C	44.1	D			
	WB	27.9	C	23.2	C	6.7	A	23.2	C			50.9	D	19.0	B	10.8	B	28.3	C			
	NB	26.7	C	18.3	B	24.9	C	24.8	C	26.6	C	51.2	D	53.2	D	71.3	E	59.0	E	44.4	D	D
	SB	37.9	D	23.0	C	19.8	B	28.2	C			63.7	E	55.6	E	38.3	D	56.9	E			
Penn Ave at Best Buy (Signal)	EB	39.2	D	39.3	D	37.5	D	38.4	D			48.3	D	50.6	D	58.9	E	55.6	E			
	WB	32.7	C	32.7	C	32.7	C	32.7	C			40.4	D	39.0	D	39.0	D	40.0	D			
	NB	45.5	D	5.0	A	4.6	A	7.4	A	9.0	A	70.4	E	17.3	B	29.5	C	26.5	C	32.9	C	D
	SB	30.1	C	2.9	A	2.9	A	6.4	A			0.0	A	25.6	C	25.6	C	25.6	C			
Penn Ave SPUI at 494 (Signal)	EB	34.7	C	0.0	A	0.3	A	23.2	C			49.3	D	0.0	A	0.2	A	36.5	D			
	WB	33.7	C	0.0	A	0.5	A	17.7	B			49.4	D	0.0	A	0.5	A	27.2	C			
	NB	24.6	C	8.8	A	0.2	A	11.8	B	14.9	B	31.6	C	18.3	B	1.1	A	17.8	B	22.7	C	C
	SB	20.4	C	5.7	A	0.2	A	11.4	B			33.4	C	26.4	C	0.5	A	20.5	C			
Penn Ave at 79th St (Signal)	EB	36.9	D	30.2	C	30.4	C	33.9	C			52.0	D	37.2	D	39.6	D	44.9	D			
	WB	47.5	D	35.7	D	35.9	D	38.1	D			64.9	E	48.7	D	52.0	D	53.6	D			
	NB	22.9	C	7.5	A	1.2	A	8.2	A	14.0	B	14.9	B	9.7	A	1.8	A	9.4	A	24.1	C	C
	SB	41.7	D	10.9	B	0.2	A	12.2	B			50.6	D	12.5	B	0.3	A	17.0	B			
Penn Ave at American Blvd (Signal)	EB	37.0	D	27.1	C	25.7	C	29.9	C			51.3	D	35.7	D	24.3	C	38.7	D			
	WB	39.1	D	33.2	C	0.3	A	22.1	C			53.2	D	31.2	C	0.4	A	22.2	C			
	NB	17.0	B	16.5	B	10.5	B	16.4	B	19.3	B	45.0	D	33.0	C	37.4	D	36.5	D	32.2	C	D
	SB	51.7	D	9.5	A	0.2	A	12.8	B			65.7	E	20.6	C	0.1	A	28.5	C			
Penn Ave at 82nd St (Signal)	EB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
	WB	23.4	C	0.0	A	46.2	D	40.9	D			51.9	D	0.0	A	49.2	D	50.2	D			
	NB	0.0	A	20.7	C	12.9	B	19.6	B	26.6	C	0.0	A	11.0	B	9.8	A	10.6	B	19.2	B	C
	SB	53.3	D	0.6	A	0.0	A	24.9	C			31.2	C	4.6	A	0.0	A	12.8	B			
Knox Ave at American Blvd (Signal)	EB	59.0	E	9.2	A	5.3	A	9.6	A			69.4	E	10.9	B	2.6	A	12.9	B			
	WB	51.5	D	9.9	A	9.9	A	15.0	B			48.7	D	17.5	B	17.5	B	21.1	C			
	NB	41.7	D	45.8	D	45.5	D	42.9	D	18.5	B	33.9	C	40.0	D	39.5	D	36.3	D	20.6	C	C
	SB	50.7	D	53.6	D	53.6	D	52.2	D			38.8	D	44.5	D	44.5	D	42.5	D			
Knox Ave at 81 St	EB	19.4	C	19.4	C	19.4	C	19.4	C			0.0	A	0.0	A	7.0	A	7.0	A			
	WB	13.8	B	13.8	B	13.8	B	13.8	B			8.5	A	8.5	A	7.3	A	7.9	A			
	NB	7.4	A	0.0	A	0.0	A	0.2	A	3.0	A	7.0	A	7.7	A	6.8	A	7.6	A	7.7	A	
	SB	8.8	A	0.0	A	0.0	A	5.2	A			7.2	A	7.8	A	7.8	A	7.7	A			
Knox Ave at 82nd St (Signal)	EB	38.2	D	7.9	A	7.9	A	14.5	B			37.7	D	17.4	B	17.4	B	18.5	B			
	WB	39.7	D	11.2	B	40.1	D	25.0	C			35.4	D	17.1	B	23.5	C	19.8	B			
	NB	27.0	C	27.0	C	27.0	C	27.0	C	24.3	C	16.7	B	16.7	B	16.7	B	16.7	B	24.8	C	D
	SB	40.7	D	40.8	D	40.1	D	40.6	D			36.9	D	36.9	D	25.3	C	35.5	D			
SB 35W at 76th St (Signal)	EB	0.0	A	2.7	A	0.0	A	2.7	A			0.0	A	26.9	C	0.0	A	26.9	C			
	WB	0.0	A	5.8	A	0.0	A	5.8	A			0.0	A	4.4	A	0.0	A	4.4	A			
	NB	0.0	A	0.0	A	0.0	A	0.0	A	16.9	B	0.0	A	0.0	A	0.0	A	0.0	A	25.2	C	B
	SB	28.3	C	0.0	A	42.9	D	39.0	D			36.1	D	0.0	A	63.0	E	48.8	D			
SB 35W at 82nd St (Signal)	EB	0.0	A	20.4	C	38.3	D	27.3	C			0.0	A	6.3	A	33.3	C	19.7	B			
	WB	16.9	B	19.8	B	0.0	A	19.1	B			5.8	A	2.6	A	0.0	A	3.6	A			
	NB	0.0	A	0.0	A	0.0	A	0.0	A	19.1	B	0.0	A	0.0	A	0.0	A	0.0	A	17.1	B	B
	SB	13.8	B	13.8	B	15.9	B	14.9	B			30.7	C	30.7	C	28.8	C	29.8	C			
NB 35W at 76th St (Signal)	EB	31.3	C	1.1	A	1.1	A	8.3	A			33.8	C	5.5	A	5.5	A	12.3	B			
	WB	41.2	D	5.3	A	2.6	A	6.0	A			68.7	E	21.0	C	15.4	B	22.0	C			
	NB	44.6	D	0.0	A	0.0	A	44.6	D	6.8	A	56.9	E	0.0	A	51.4	D	54.6	D	17.0	B	C
	SB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
NB 35W at 82nd St (Signal)	EB	51.7	D	17.5	B	0.0	A	29.6	C			18.3	B	2.5	A	0.0	A	10.4	B			
	WB	0.0	A	25.3	C	22.3	C	24.5	C			0.0	A	5.6	A	6.0	A	5.8	A			
	NB	9.6	A	10.7	B	8.8	A	9.4	A	19.5	B	27.9	C	29.7	C	28.0	C	28.0	C	13.6	B	C
	SB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
Lyndale Ave at 77th St (Signal)	EB	51.8	D	23.9	C	0.1	A	21.3	C			84.8	F	63.4	E	1.0	A	43.1	D			
	WB	46.5	D	40.4	D	21.5	C	39.6	D			62.5	E	50.3	D	32.6	C	50.1	D			
	NB	64.9	E	35.0	D	36.6	D	48.6	D	40.8	D	71.3	E	26.2	C	12.5	B	42.7	D	46.4	D	C
	SB	39.4	D	45.4	D	28.9	C	43.0	D			64.2	E	55.1	E	33.0	C	53.3	D			
Lyundale Ave SPUI at 494 (Signal)	EB	32.6	C	0.0	A	0.4	A	17.5	B			46.5	D	0.0	A	0.3	A	25.6	C			
	WB	37.1	D	0.0	A	0.2	A	18.0	B			53.6	D	0.0	A	0.2	A	25.4	C			
	NB	15.2	B	5.7	A	0.3	A	6.2	A	13.5	B	15.6	B	12.8	B	0.6	A	8.9	A	16.9	B	C
	SB	18.0	B	9.9	A	0.2	A	9.8	A			30.1	C	15.3	B	0.5	A	15.9	B			
Lyndale Ave at American Blvd (Signal)	EB	46.1	D	28.3	C	0.0	A	27.9	C			52.9	D	53.8	D	0.2	A	46.8	D			
	WB	45.1	D	32.7	C	24.7	C	33.5	C			66.4	E	52.9	D	0.2	A	45.2	D			
	NB	40.3	D	18.5	B	0.1	A	16.5	B	21.6	C	36.9	D	22.3	C	0.2	A	19.8	B	33.4	C	C
	SB	44.0	D	12.1	B	0.2	A	13.2	B			60.6	E	20.1	C	0.1	A	24.4	C			
Lyndale Ave at 82nd St (Signal)	EB	38.5	D	40.3	D	33.8	C	39.4	D			57.1	E	56.8	E	44.0	D	54.2	D			
	WB	36.5	D	40.0	D	33.9	C	39.2	D			63.3	E	54.5	D	44.7	D	53.8	D			
	NB	4.0	A	4.4	A	3.5	A	4.3	A	16.4	B	61.5	E	22.6	C	14.3	B	27.2	C	30.6	C	C
	SB	2.7	A	3.1	A	3.2	A	3.1	A			36.6	D	9.0	A	4.1	A	9.5	A			
Morgan Ave at American Blvd (Signal)	EB	54.3	D	3.9	A	3.9	A	7.7	A			55.8	E	17.3	B	17.3	B	21.0	C			
	WB	58.4	E	2.1	A	2.1	A	3.2	A			62.8	E	13.7	B	13.7	B	17.6	B			
	NB	50.4	D	50.4	D	49.5	D	50.0	D	7.4	A	59.7	E	59.7	E	35.2	D	52.5	D	25.9	C	
	SB	53.3	D	53.3	D	49.5	D	52.4	D			73.7	E	73.7	E	35.7	D	58.2	E			

P:\KO\M\Mntco\107371\Traffic\[Report Table (BRT and Arterial).xlsx]Table F1

Table F3
2040 Build Conditions
SimTraffic Results

		AM Peak Hour										PM Peak Hour										PM Peak 2037 Analysis
		Delay (s/veh)						LOS By Approach		LOS By Intersection		Delay (s/veh)						LOS By Approach		LOS By Intersection		
	Approach	Left		Thru		Right		Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Left		Thru		Right		Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	INT. LOS
Intersection		Delay	LOS	Delay	LOS	Delay	LOS					Delay	LOS	Delay	LOS	Delay	LOS					
Penn Ave at 76th St (Signal)	EB	55.2	E	33.2	C	10.1	B	26.9	C			97.0	F	98.3	F	76.7	E	95.7	F			
	WB	31.1	C	18.6	B	6.6	A	20.9	C			135.5	F	15.5	B	9.5	A	54.1	D			
	NB	30.4	C	22.1	C	5.2	A	14.5	B	23.2	C	50.9	D	66.8	E	9.5	A	43.2	D	66.7	E	D
	SB	44.4	D	28.5	C	13.4	B	32.7	C			81.0	F	83.3	F	24.5	C	80.8	F			
Penn Ave at Best Buy (Signal)	EB	50.1	D	48.6	D	7.2	A	29.5	C			31.0	C	198.8	F	184.3	F	140.4	F			
	WB	50.0	D	43.6	D	4.1	A	33.4	C			98.0	F	61.9	E	34.4	C	82.2	F			
	NB	60.1	E	15.8	B	16.9	B	19.0	B	16.9	B	76.9	E	29.1	C	12.6	B	36.0	D	58.6	E	D
	SB	49.1	D	4.2	A	2.9	A	9.9	A			0.0	A	34.3	C	34.1	C	34.3	C			
Penn Ave SPUI at 494 (Signal)	EB	79.1	E	0.0	A	4.6	A	53.9	D			58.0	E	0.0	A	4.2	A	43.6	D			
	WB	40.5	D	0.0	A	6.4	A	23.3	C			47.2	D	0.0	A	6.4	A	28.5	C			
	NB	52.9	D	95.5	F	34.4	C	74.3	E	47.0	D	37.5	D	28.9	C	16.9	B	28.1	C	30.3	C	C
	SB	31.6	C	10.4	B	3.6	A	18.6	B			33.5	C	40.5	D	11.8	B	28.6	C			
Penn Ave at 79th St (Signal)	EB	38.6	D	40.3	D	6.1	A	26.0	C			58.3	E	36.3	D	17.8	B	38.5	D			
	WB	43.4	D	37.2	D	25.9	C	30.7	C			65.1	E	43.2	D	25.3	C	34.9	C			
	NB	41.9	D	61.2	E	17.4	B	56.4	E	38.9	D	49.5	D	37.8	D	7.8	A	35.6	D	32.2	C	C
	SB	47.7	D	14.7	B	7.1	A	17.1	B			56.8	E	18.6	B	9.0	A	23.7	C			
Penn Ave at American Blvd (Signal)	EB	61.5	E	29.6	C	6.0	A	37.5	D			251.5	F	70.4	E	28.5	C	111.9	F			
	WB	45.7	D	41.8	D	18.3	B	34.0	C			58.9	E	32.7	C	5.5	A	26.2	C			
	NB	89.9	F	128.9	F	106.3	F	115.9	F	65.7	E	111.9	F	98.3	F	25.5	C	88.4	F	69.6	E	D
	SB	46.0	D	17.3	B	4.4	A	16.1	B			67.6	E	31.1	C	4.2	A	36.1	D			
Penn Ave at 82nd St (Signal)	EB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
	WB	37.6	D	1.1	A	14.6	B	20.1	C			58.2	E	0.0	A	7.0	A	24.9	C			
	NB	0.0	A	106.2	F	73.4	E	101.7	F	62.6	E	0.0	A	18.1	B	12.5	B	16.4	B	18.7	B	C
	SB	44.7	D	2.0	A	0.0	A	14.7	B			45.5	D	6.4	A	0.0	A	18.2	B			
Knox Ave at American Blvd (Signal)	EB	52.6	D	12.5	B	4.1	A	11.5	B			70.7	E	13.6	B	7.7	A	16.1	B			
	WB	58.7	E	11.5	B	9.9	A	17.2	B			59.4	E	22.5	C	22.5	C	27.0	C			
	NB	47.4	D	50.7	D	1.5	A	40.9	D	19.9	B	44.6	D	44.8	D	4.0	A	34.7	C	23.4	C	C
	SB	62.4	E	48.4	D	6.1	A	48.8	D			43.9	D	56.0	E	9.9	A	37.5	D			
Knox Ave at 81 St	EB	7.7	A	0.0	A	0.0	A	7.7	A			0.0	A	0.0	A	7.3	A	7.3	A			
	WB	15.5	C	0.0	A	5.8	A	11.0	B			16.3	C	0.0	A	7.1	A	11.8	B			
	NB	1.6	A	0.2	A	0.2	A	0.2	A	3.3	A	10.0	B	4.6	A	0.5	A	4.7	A	8.1	A	
	SB	10.1	B	2.7	A	2.9	A	7.2	A			12.7	B	7.7	A	0.0	A	8.1	A			
Knox Ave at 82nd St (Signal)	EB	45.2	D	3.1	A	0.0	A	12.4	B			45.8	D	10.6	B	8.6	A	12.9	B			
	WB	51.8	D	8.3	A	8.9	A	8.8	A			72.5	E	9.9	A	6.2	A	8.6	A			
	NB	34.4	C	0.0	A	4.2	A	11.8	B	11.4	B	28.3	C	0.0	A	12.1	B	20.7	C	18.7	B	D
	SB	41.6	D	0.2	A	1.3	A	34.3	C			37.2	D	0.0	A	7.8	A	33.3	C			
SB 35W at 76th St (Signal)	EB	0.0	A	4.0	A	0.0	A	4.0	A			0.0	A	25.1	C	0.0	A	25.1	C			
	WB	0.0	A	9.3	A	0.0	A	9.3	A			0.0	A	5.8	A	0.0	A	5.8	A			
	NB	0.0	A	0.0	A	0.0	A	0.0	A	11.1	B	0.0	A	0.0	A	0.0	A	0.0	A	24.2	C	B
	SB	36.8	D	0.0	A	26.6	C	29.3	C			50.0	D	0.0	A	39.9	D	45.3	D			
SB 35W at 82nd St (Signal)	EB	0.0	A	7.4	A	3.1	A	5.8	A			0.0	A	11.6	B	9.1	A	10.3	B			
	WB	8.5	A	7.0	A	0.0	A	7.3	A			18.3	B	3.8	A	0.0	A	8.5	A			
	NB	0.0	A	0.0	A	0.0	A	0.0	A	12.2	B	0.0	A	0.0	A	0.0	A	0.0	A	12.5	B	B
	SB	39.0	D	0.0	A	8.6	A	23.1	C			39.6	D	0.0	A	7.4	A	24.0	C			
NB 35W at 76th St (Signal)	EB	40.2	D	3.0	A	2.6	A	8.4	A			28.9	C	11.3	B	11.8	B	15.6	B			
	WB	56.9	E	11.7	B	11.0	B	13.2	B			70.4	E	33.8	C	26.8	C	34.0	C			
	NB	55.6	E	0.0	A	0.0	A	55.6	E	12.0	B	55.7	E	0.0	A	28.6	C	43.3	D	23.2	C	C
	SB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
NB 35W at 82nd St (Signal)	EB	17.1	B	5.8	A	0.0	A	9.8	A			44.3	D	4.9	A	0.0	A	23.8	C			
	WB	0.0	A	14.9	B	8.1	A	13.2	B			0.0	A	11.7	B	12.1	B	11.9	B			
	NB	33.4	C	0.0	A	11.1	B	28.9	C	19.2	B	47.6	D	0.0	A	13.2	B	29.3	C	21.4	C	C
	SB	0.0	A	0.0	A	0.0	A	0.0	A			0.0	A	0.0	A	0.0	A	0.0	A			
Lyndale Ave at 77th St (Signal)	EB	51.1	D	26.6	C	3.9	A	23.2	C			88.6	F	66.9	E	32.3	C	56.6	E			
	WB	59.7	E	56.1	E	45.8	D	55.6	E			87.7	F	70.8	E	47.5	D	70.4	E			
	NB	95.9	F	42.3	D	31.4	C	65.4	E	54.2	D	117.0	F	41.4	D	28.1	C	69.2	E	162.0	F	C
	SB	78.3	E	51.6	D	34.7	C	51.4	D			679.2	F	631.5	F	545.0	F	624.1	F			
Lyundale Ave SPUI at 494 (Signal)	EB	37.2	D	0.0	A	4.6	A	21.4	C			49.9	D	0.0	A	4.2	A	29.0	C			
	WB	31.8	C	0.0	A	11.5	B	21.2	C			45.6	D	0.0	A	6.0	A	24.3	C			
	NB	24.3	C	32.1	C	6.3	A	19.0	B	19.6	B	25.4	C	65.8	E	15.6	B	34.8	C	29.0	C	C
	SB	21.7	C	18.9	B	7.8	A	16.1	B			31.9	C	34.0	C	11.9	B	26.2	C			
Lyndale Ave at American Blvd (Signal)	EB	48.0	D	29.1	C	3.4	A	29.3	C			62.6	E	59.0	E	14.2	B	54.5	D			
	WB	50.7	D	35.8	D	13.5	B	35.4	D			73.0	E	58.0	E	14.6	B	52.7	D			
	NB	56.0	E	25.6	C	3.9	A	23.7	C	27.2	C	66.6	E	55.7	E	7.5	A	49.0	D	46.7	D	C
	SB	57.7	E	20.4	C	7.7	A	22.0	C			70.2	E	25.9	C	7.3	A	30.9	C			
Lyndale Ave at 82nd St (Signal)	EB	50.0	D	30.4	C	4.3	A	31.7	C			53.3	D	51.0	D	7.7	A	41.8	D			
	WB	48.5	D	31.0	C	5.1	A	29.0	C			76.9	E	53.8	D	5.8	A	47.2	D			
	NB	24.9	C	9.4	A	9.4	A	11.5	B	18.7	B	68.4	E	25.3	C	19.2	B	30.3	C	33.1	C	C
	SB	21.1	C	12.9	B	4.5	A	12.8	B			50.4	D	25.5	C	7.7	A	24.1	C			
Morgan Ave at American Blvd (Signal)	EB	59.8	E	9.4	A	8.7	A	13.2	B			60.6	E	29.7	C	30.3	C	32.7	C			
	WB	67.5	E	6.2	A	4.6	A	7.0	A			60.9	E	15.6	B	11.5	B	18.7	B			
	NB	43.4	D	0.0	A	3.6	A	27.2	C	10.4	B	42.4	D	42.8	D	16.9	B	35.2	D	28.2	C	
	SB	42.9	D	0.0	A	3.4	A	34.9	C			47.7	D	46.3	D	4.7	A	30.5	C			

P:\KO\M\Mntco\107371\Traffic\[Report Table (BRT and Arterial).xlsx]Table F1

ESTIMATE FOR: 2001 FEIS Preferred Alternative

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 11/05/09

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		1,471,452	12.0	278.68	$100,000	$27,868,000
I-35W Shoulders		439,861	6.0	41.65	$100,000	$4,165,000
I-494 mainline		1,937,029	12.0	366.86	$100,000	$36,686,000
I-494 Shoulders		587,722	6.0	55.65	$100,000	$5,565,000
SB 35W to 76th st Ramp		33,621	8.0	4.24	$100,000	$424,000
SB 35W to WB 494 Ramp		6,630	8.0	0.83	$100,000	$83,000
SB 35W to WB 494 Ramp Shoulders		4,224	8.0	0.53	$100,000	$53,000
SB 35W to EB 494 Ramp		27,280	8.0	3.44	$100,000	$344,000
SB 35W to EB 494 Ramp Shoulders		5,033	8.0	0.63	$100,000	$63,000
SB 35W to 82nd Ramp		22,305	8.0	2.81	$100,000	$281,000
SB 35W to 82nd Ramp Shoulders		2,802	8.0	0.35	$100,000	$35,000
82nd to SB 35W Ramp		54,869	8.0	6.92	$100,000	$692,000
SB 35W to 90th Ramp		3,900	8.0	0.49	$100,000	$49,000
90th to SB 35W Ramp		10,460	8.0	1.32	$100,000	$132,000
NB 35W to 90th Ramp		10,988	8.0	1.38	$100,000	$138,000
90th to NB 35W Ramp		11,754	8.0	1.48	$100,000	$148,000
NB 35W to 82nd Ramp		42,916	8.0	5.41	$100,000	$541,000
NB 35W to 82nd Ramp Shoulders		3,993	8.0	0.50	$100,000	$50,000
NB 35W to WB 494 Ramp		57,669	8.0	7.28	$100,000	$728,000
NB 35W to WB 494 Ramp Shoulders		27,240	8.0	3.43	$100,000	$343,000
NB 35W to EB 494 Ramp		11,376	8.0	1.43	$100,000	$143,000
NB 35W to EB 494 Ramp Shoulders		528	8.0	0.06	$100,000	$6,000
82nd to NB 35W Ramp		45,790	8.0	5.78	$100,000	$578,000
EB 494 to NB 35W Loop		23,601	8.0	2.97	$100,000	$297,000
WB 494 to NB 35W Ramp		21,785	8.0	2.75	$100,000	$275,000
76th to NB 35W Ramp		21,505	8.0	2.71	$100,000	$271,000
EB 494 to PENN Ramp		30,005	8.0	3.78	$100,000	$378,000
EB 494 to PENN Ramp Shoulders		2,414	8.0	0.30	$100,000	$30,000
EB 494 to SB 35W Ramp		131,697	8.0	16.62	$100,000	$1,662,000
EB 494 to SB 35W Ramp Shoulders		50,594	8.0	6.38	$100,000	$638,000
PENN to EB 494 Ramp		21,600	8.0	2.72	$100,000	$272,000
PENN to EB 494 Ramp Shoulders		2,885	8.0	0.36	$100,000	$36,000
EB 494 to LYNDALE Ramp		51,440	8.0	6.49	$100,000	$649,000
EB 494 to LYNDALE Ramp Shoulders		24,651	8.0	3.11	$100,000	$311,000
Lyndale to EB 494 Ramp		36,149	8.0	4.56	$100,000	$456,000
Lyndale to EB 494 Ramp Shoulders		3,438	8.0	0.43	$100,000	$43,000
EB 494 to Portland Ramp		23,671	8.0	2.98	$100,000	$298,000
EB 494 to Portland Ramp Shoulders		3,273	8.0	0.41	$100,000	$41,000
Portland to WB 494 Ramp		37,548	8.0	4.74	$100,000	$474,000
Portland to WB 494 Ramp Shoulders		4,972	8.0	0.62	$100,000	$62,000
WB 494 to Lyndale Ramp		34,006	8.0	4.29	$100,000	$429,000
WB 494 to Lyndale Ramp Shoulders		16,278	8.0	2.05	$100,000	$205,000
WB 494 to SB 35W Ramp		114,526	8.0	14.46	$100,000	$1,446,000
WB 494 to SB 35W Ramp Shoulders		23,604	8.0	2.98	$100,000	$298,000
LYNDALE to WB 494 Ramp		20,075	8.0	2.53	$100,000	$253,000
LYNDALE to WB 494 Ramp Shoulders		8,445	8.0	1.06	$100,000	$106,000
WB 494 to PENN Ramp		65,154	8.0	8.22	$100,000	$822,000
WB 494 to PENN Ramp Shoulders		19,259	8.0	2.43	$100,000	$243,000
Penn to WB 494 Ramp		40,443	8.0	5.10	$100,000	$510,000
Penn to WB 494 Ramp Shoulders		5,028	8.0	0.63	$100,000	$63,000
BRT mainline		112,328	12.0	21.27	$100,000	$2,127,000
BRT shoulders		28,520	6.0	2.70	$100,000	$270,000
Xerxes Ave.		25,496	6.0	2.41	$100,000	$241,000
90th St.		101,552	6.0	9.61	$100,000	$961,000
86th St.		30,424	6.0	2.88	$100,000	$288,000
82nd St.		86,660	6.0	8.20	$100,000	$820,000
Local Street		388,566	6.0	36.79	$100,000	$3,679,000
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		6,431,034		**980.69**		**$98,069,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W				82,175	$150	$12,326,250
NB 35W to WB 494 ramp over 35W & 494				129,331	$200	$25,866,200
NB 35W to EB 494 ramp				29,484	$150	$4,422,600
SB 35W to EB 494 ramp				66,042	$150	$9,906,300
SB 35W to WB 494 ramp				22,573	$200	$4,514,600
SB 35W to 82nd ramp over ramp				21,549	$200	$4,309,800
PENN to EB 494 ramp over ramp				45,023	$200	$9,004,600
LYNDALE to WB 494 over ramp				21,054	$200	$4,210,800
76th to NB 35W ramp over 35W				22,059	$200	$4,411,800
Xerxes Ave over 494				30,713	$150	$4,606,950
90th over 35W				19,206	$150	$2,880,900
86th over 35W				16,709	$150	$2,506,350
82nd over 35W				39,400	$150	$5,910,000
Ped over 494				7,391	$150	$1,108,650
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
			BRIDGE COST TOTALS			**$95,985,800**

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$98,069,000	$117,682,800
BRIDGE COST	(From Bridge)				20%	$95,985,800	$115,182,960
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	25265 LIN FT, 16' HIGH, $75/SQFT	25600	16	75	20%	$30,720,000	$36,864,000
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	15381 LIN FT, $47/FT	15725		47	20%	$739,075	$886,890
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$15.25

LWD PORTION COST	**OTHER** COSTS
43.5%	56.5%

ROADWAY ONLY	PVMT. $ / MILE	$98,069,000
	$ / LANE MILE	$24,517,250
TOTAL PROJECT	PROJ. $ / MILE	$270,616,650
	$ / LANE MILE	$67,654,163

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$54,123,330**

ESTIMATED CONSTRUCTION COST		**$225,513,875**
SUB-TOTAL (CONSTRUCTION + RISK) >>>		**$270,616,650**
OVERALL PROJECT RISK	**20.00%**	
RIGHT-OF-WAY COST	0%	$0 / $0
RAILROAD AGREEMENT COST	0%	$0 / $0
MAJOR UTILITY RELOCATION COST	0%	$0 / $0
OTHER EXTERNAL PROJECT COST	0%	$0 / $0
ESTIMATED PROJECT LANDSCAPE COST	0%	$0 / $0
(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)		
TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>>		**$270,616,650**

DATE		
11/5/2009	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$270,616,650**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	**2010**	**0%**	**$270,616,650**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: 2001 FEIS Preferred Alternative

TABLE G1

ESTIMATE FOR: Turbine Interchange - Full Layout

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC,
AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX
LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 11/05/09

ESTIMATE COMPLETED BY :
Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		1,471,809	12.0	278.75	$100,000	$27,875,000
I-35W Shoulders		466,381	6.0	44.16	$100,000	$4,416,000
I-494 mainline		1,924,115	12.0	364.41	$100,000	$36,441,000
I-494 Shoulders		578,256	6.0	54.75	$100,000	$5,475,000
SB 35W to 76th st Ramp		33,621	8.0	4.24	$100,000	$424,000
SB 35W to WB 494 Ramp		17,700	8.0	2.23	$100,000	$223,000
SB 35W to WB 494 Ramp Shoulders		9,109	8.0	1.15	$100,000	$115,000
SB 35W to EB 494 Ramp		89,482	8.0	11.29	$100,000	$1,129,000
SB 35W to EB 494 Ramp Shoulders		18,223	8.0	2.30	$100,000	$230,000
SB 35W to 82nd Ramp		11,226	8.0	1.41	$100,000	$141,000
SB 35W to 82nd Ramp Shoulders		4,291	8.0	0.54	$100,000	$54,000
82nd to SB 35W Ramp		54,869	8.0	6.92	$100,000	$692,000
SB 35W to 90th Ramp		3,900	8.0	0.49	$100,000	$49,000
90th to SB 35W Ramp		10,460	8.0	1.32	$100,000	$132,000
NB 35W to 90th Ramp		10,988	8.0	1.38	$100,000	$138,000
90th to NB 35W Ramp		11,754	8.0	1.48	$100,000	$148,000
NB 35W to 82nd Ramp		42,916	8.0	5.41	$100,000	$541,000
NB 35W to 82nd Ramp Shoulders		3,993	8.0	0.50	$100,000	$50,000
NB 35W to WB 494 Ramp		150,370	8.0	18.98	$100,000	$1,898,000
NB 35W to WB 494 Ramp Shoulders		55,206	8.0	6.97	$100,000	$697,000
NB 35W to EB 494 Ramp		6,429	8.0	0.81	$100,000	$81,000
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp		35,499	8.0	4.48	$100,000	$448,000
76th to NB 35W Ramp		19,471	8.0	2.45	$100,000	$245,000
EB 494 to PENN Ramp		30,005	8.0	3.78	$100,000	$378,000
EB 494 to PENN Ramp Shoulders		2,414	8.0	0.30	$100,000	$30,000
EB 494 to SB 35W Ramp		135,793	8.0	17.14	$100,000	$1,714,000
EB 494 to SB 35W Ramp Shoulders		46,775	8.0	5.90	$100,000	$590,000
EB 494 to NB 35W Ramp		27,459	8.0	3.46	$100,000	$346,000
EB 494 to NB 35W Ramp Shoulders		11,833	8.0	1.49	$100,000	$149,000
PENN to EB 494 Ramp		14,282	8.0	1.80	$100,000	$180,000
PENN to EB 494 Ramp Shoulders		5,789	8.0	0.73	$100,000	$73,000
EB 494 to LYNDALE Ramp		16,993	8.0	2.14	$100,000	$214,000
EB 494 to LYNDALE Ramp Shoulders		6,003	8.0	0.75	$100,000	$75,000
Lyndale to EB 494 Ramp		36,149	8.0	4.56	$100,000	$456,000
Lyndale to EB 494 Ramp Shoulders		3,438	8.0	0.43	$100,000	$43,000
EB 494 to Portland Ramp		23,671	8.0	2.98	$100,000	$298,000
EB 494 to Portland Ramp Shoulders		3,274	8.0	0.41	$100,000	$41,000
Portland to WB 494 Ramp		37,548	8.0	4.74	$100,000	$474,000
Portland to WB 494 Ramp Shoulders		4,972	8.0	0.62	$100,000	$62,000
WB 494 to Lyndale Ramp		34,006	8.0	4.29	$100,000	$429,000
WB 494 to Lyndale Ramp Shoulders		16,278	8.0	2.05	$100,000	$205,000
WB 494 to NB 35W Ramp		28,878	8.0	3.64	$100,000	$364,000
WB 494 to NB 35W Ramp Shoulders		6,500	8.0	0.82	$100,000	$82,000
WB 494 to SB 35W Ramp		75,897	8.0	9.58	$100,000	$958,000
WB 494 to SB 35W Ramp Shoulders		25,284	8.0	3.19	$100,000	$319,000
LYNDALE to WB 494 Ramp		18,089	8.0	2.28	$100,000	$228,000
LYNDALE to WB 494 Ramp Shoulders		9,094	8.0	1.14	$100,000	$114,000
WB 494 to PENN Ramp		22,958	8.0	2.89	$100,000	$289,000
WB 494 to PENN Ramp Shoulders		2,728	8.0	0.34	$100,000	$34,000
Penn to WB 494 Ramp		40,443	8.0	5.10	$100,000	$510,000
Penn to WB 494 Ramp Shoulders		5,028	8.0	0.63	$100,000	$63,000
BRT mainline		65,627	12.0	12.42	$100,000	$1,242,000
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.		25,496	6.0	2.41	$100,000	$241,000
90th St.		101,552	6.0	9.61	$100,000	$961,000
86th St.		30,424	6.0	2.88	$100,000	$288,000
82nd St.		87,021	6.0	8.24	$100,000	$824,000
Local Street		388,566	6.0	36.79	$100,000	$3,679,000
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		6,420,335		**975.95**		**$97,595,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W				58,898	$150	$8,834,700
494 over west ramp				15,894	$150	$2,384,100
494 over east ramps				27,538	$150	$4,130,700
WB 494 to NB 35W ramp over east ramp				4,509	$200	$901,800
WB 494 to SB 35W ramp over east ramp				3,927	$200	$785,400
WB 494 to SB 35W ramp over 35W				7,068	$200	$1,413,600
EB 494 to NB35W ramp over west ramps				5,804	$200	$1,160,800
EB 494 to NB 35W ramp over 35W				7,629	$200	$1,525,800
NB 35W to WB 494 ramp over 35W				19,421	$200	$3,884,200
82nd to NB 35W ramp over ramp				5,485	$200	$1,097,000
SB 35W to 82nd ramp over ramp				13,159	$200	$2,631,800
PENN to EB 494 ramp over ramp				14,966	$200	$2,993,200
NB 35W to WB 494 ramp over WB 494 to PENN ramp				11,805	$200	$2,361,000
EB 494 to LYNDALE over ramp				12,907	$200	$2,581,400
LYNDALE to WB 494 over ramp				21,054	$200	$4,210,800
76th to NB 35W ramp over 35W				22,059	$200	$4,411,800
American Blvd over 35W				12,385	$160	$1,981,600
Xerxes Ave over 494				30,713	$150	$4,606,950
90th over 35W				19,206	$150	$2,880,900
86th over 35W				16,709	$150	$2,506,350
82nd over 35W				31,770	$150	$4,765,500
Ped over 494				7,391	$150	$1,108,650
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
				BRIDGE COST TOTALS		**$63,158,050**

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$97,595,000	$117,114,000
BRIDGE COST	(From Bridge)				20%	$63,158,050	$75,789,660
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	29310 LIN FT, 16' HIGH, $75/SQFT	30408	16	75	20%	$36,489,600	$43,787,520
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	15725 LIN FT, $47/FT	15725		47	20%	$739,075	$886,890
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$15.20

LWD PORTION COST	**OTHER** COSTS
49.3%	50.7%

ROADWAY ONLY	PVMT. $ / MILE	$97,595,000
	$ / LANE MILE	$24,398,750
TOTAL PROJECT	PROJ. $ / MILE	$237,578,070
	$ / LANE MILE	$59,394,518

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$47,515,614**

ESTIMATED CONSTRUCTION COST **$197,981,725**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$237,578,070**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	**$0**	$0
RAILROAD AGREEMENT COST	0%	**$0**	$0
MAJOR UTILITY RELOCATION COST	0%	**$0**	$0
OTHER EXTERNAL PROJECT COST	0%	**$0**	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	**$0**	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , RAILROAD AGREEMENTS AND UTILITIES >>> **$237,578,070**

DATE		
11/5/2009	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$237,578,070**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$237,578,070**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - Full Layout

TABLE G2

ESTIMATE FOR: Turbine Interchange - Phase 1 with BRT (permanent pavements)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 02/08/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		157,100	12.0	29.75	$100,000	$2,975,000
I-35W Shoulders		40,659	6.0	3.85	$100,000	$385,000
I-494 mainline			12.0	0.00	$100,000	$0
I-494 Shoulders			6.0	0.00	$100,000	$0
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp		3,501	8.0	0.44	$100,000	$44,000
SB 35W to WB 494 Ramp Shoulders		1,729	8.0	0.21	$100,000	$21,000
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp		11,228	8.0	1.41	$100,000	$141,000
SB 35W to 82nd Ramp Shoulders		4,296	8.0	0.54	$100,000	$54,000
82nd to SB 35W Ramp		45,071	8.0	5.69	$100,000	$569,000
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp		22,723	8.0	2.86	$100,000	$286,000
NB 35W to 82nd Ramp Shoulders		3,873	8.0	0.48	$100,000	$48,000
NB 35W to WB 494 Ramp		128,831	8.0	16.26	$100,000	$1,626,000
NB 35W to WB 494 Ramp Shoulders		44,834	8.0	5.66	$100,000	$566,000
NB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp		35,840	8.0	4.52	$100,000	$452,000
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp		20,930	8.0	2.64	$100,000	$264,000
WB 494 to PENN Ramp Shoulders		2,728	8.0	0.34	$100,000	$34,000
Penn to WB 494 Ramp			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline		51,405	12.0	9.73	$100,000	$973,000
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.		87,017	6.0	8.24	$100,000	$824,000
Local Street		52,116	6.0	4.93	$100,000	$493,000
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		713,881		**97.55**		**$9,755,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps				27,538	$150	$4,130,700
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W				12,385	$160	$1,981,600
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W				19,421	$200	$3,884,200
82nd to NB 35W ramp over ramp				5,485	$200	$1,097,000
SB 35W to 82nd ramp over ramp				13,159	$200	$2,631,800
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp				11,805	$200	$2,361,000
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W				31,770	$150	$4,765,500
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
					BRIDGE COST TOTALS	**$20,851,800**

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$9,755,000	$11,706,000
BRIDGE COST	(From Bridge)				20%	$20,851,800	$25,022,160
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	9100 LIN FT, 18' HIGH, $75/SQFT	6490	16	75	20%	$7,788,000	$9,345,600
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	5500 LIN FT, $47/FT	4710		47	20%	$221,370	$265,644
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$13.66

LWD PORTION COST	**OTHER** COSTS
25.3%	74.7%

ROADWAY ONLY	PVMT. $ / MILE	$9,755,000
	$ / LANE MILE	$2,438,750
TOTAL PROJECT	PROJ. $ / MILE	$46,339,404
	$ / LANE MILE	$11,584,851

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$9,267,881**

ESTIMATED CONSTRUCTION COST	**$38,616,170**	
SUB-TOTAL (CONSTRUCTION + RISK) >>>		**$46,339,404**
OVERALL PROJECT RISK	**20.00%**	
RIGHT-OF-WAY COST	**0%** **$0**	$0
RAILROAD AGREEMENT COST	**0%** **$0**	$0
MAJOR UTILITY RELOCATION COST	**0%** **$0**	$0
OTHER EXTERNAL PROJECT COST	**0%** **$0**	$0
ESTIMATED PROJECT LANDSCAPE COST	**0%** **$0**	$0
(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)		
TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>>	**$46,339,404**	

DATE		
2/8/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$46,339,404**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	**2010**	**0%**	**$46,339,404**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - Phase 1 with BRT (permanent pavements)

TABLE G3

ESTIMATE FOR: Turbine Interchange - Phase 1 with BRT (interim pavements)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 02/08/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		307,643	12.0	58.26	$100,000	$5,826,000
I-35W Shoulders		52,200	6.0	4.94	$100,000	$494,000
I-494 mainline		81,852	12.0	15.50	$100,000	$1,550,000
I-494 Shoulders		24,054	6.0	2.27	$100,000	$227,000
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp		4,526	8.0	0.57	$100,000	$57,000
SB 35W to WB 494 Ramp Shoulders		121	8.0	0.01	$100,000	$1,000
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to SB 35W Ramp		6,353	8.0	0.80	$100,000	$80,000
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp		8,179	8.0	1.03	$100,000	$103,000
NB 35W to 82nd Ramp Shoulders		90	8.0	0.01	$100,000	$1,000
NB 35W to WB 494 Ramp		10,533	8.0	1.32	$100,000	$132,000
NB 35W to WB 494 Ramp Shoulders		5,756	8.0	0.72	$100,000	$72,000
NB 35W to EB 494 Ramp		6,097	8.0	0.76	$100,000	$76,000
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp		12,290	8.0	1.55	$100,000	$155,000
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp		16,887	8.0	2.13	$100,000	$213,000
EB 494 to SB 35W Ramp Shoulders		3,159	8.0	0.39	$100,000	$39,000
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp		13,423	8.0	1.69	$100,000	$169,000
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp		7,685	8.0	0.97	$100,000	$97,000
WB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp		5,293	8.0	0.66	$100,000	$66,000
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline		4,417	12.0	0.83	$100,000	$83,000
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.			6.0	0.00	$100,000	$0
Local Street			6.0	0.00	$100,000	$0
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		570,558		**94.41**		**$9,441,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps					$150	$0
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W					$160	$0
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W					$200	$0
82nd to NB 35W ramp over ramp					$200	$0
SB 35W to 82nd ramp over ramp					$200	$0
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp					$200	$0
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W					$150	$0
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
		BRIDGE COST TOTALS		**$0**		

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$9,441,000	$11,329,200
BRIDGE COST	(From Bridge)				20%	$0	$0
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	9100 LIN FT, 18' HIGH, $75/SQFT	381	16	75	20%	$457,200	$548,640
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	5500 LIN FT, $47/FT	747		47	20%	$35,109	$42,131
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$16.55

LWD PORTION COST	**OTHER** COSTS
95.0%	5.0%

ROADWAY ONLY	PVMT. $ / MILE	$9,441,000
	$ / LANE MILE	$2,360,250
TOTAL PROJECT	PROJ. $ / MILE	$11,919,971
	$ / LANE MILE	$2,979,993

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$2,383,994**

ESTIMATED CONSTRUCTION COST **$9,933,309**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$11,919,971**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	$0	$0
RAILROAD AGREEMENT COST	0%	$0	$0
MAJOR UTILITY RELOCATION COST	0%	$0	$0
OTHER EXTERNAL PROJECT COST	0%	$0	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	$0	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>> **$11,919,971**

DATE		
2/8/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$11,919,971**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$11,919,971**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - Phase 1 with BRT (interim pavements)

TABLE G4

ESTIMATE FOR: Turbine Interchange - Phase 1 without BRT (permanent pavements)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 01/20/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline			12.0	0.00	$100,000	$0
I-35W Shoulders			6.0	0.00	$100,000	$0
I-494 mainline			12.0	0.00	$100,000	$0
I-494 Shoulders			6.0	0.00	$100,000	$0
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp		3,502	8.0	0.44	$100,000	$44,000
SB 35W to WB 494 Ramp Shoulders		1,730	8.0	0.21	$100,000	$21,000
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to SB 35W Ramp			8.0	0.00	$100,000	$0
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
NB 35W to WB 494 Ramp		70,110	8.0	8.85	$100,000	$885,000
NB 35W to WB 494 Ramp Shoulders		27,325	8.0	3.45	$100,000	$345,000
NB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp			8.0	0.00	$100,000	$0
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp		20,930	8.0	2.64	$100,000	$264,000
WB 494 to PENN Ramp Shoulders		2,728	8.0	0.34	$100,000	$34,000
Penn to WB 494 Ramp			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline			12.0	0.00	$100,000	$0
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.			6.0	0.00	$100,000	$0
Local Street			6.0	0.00	$100,000	$0
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		126,325		**15.93**		**$1,593,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps				27,538	$150	$4,130,700
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W					$160	$0
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W				19,421	$200	$3,884,200
82nd to NB 35W ramp over ramp					$200	$0
SB 35W to 82nd ramp over ramp					$200	$0
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp				11,805	$200	$2,361,000
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W					$150	$0
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
			BRIDGE COST TOTALS			**$10,375,900**

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$1,593,000	$1,911,600
BRIDGE COST	(From Bridge)				20%	$10,375,900	$12,451,080
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	6650 LIN FT, 18' HIGH, $75/SQFT	3950	16	75	20%	$4,740,000	$5,688,000
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	1100 LIN FT, $47/FT			47	20%	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$12.61

LWD PORTION COST	**OTHER** COSTS
9.5%	90.5%

ROADWAY ONLY	PVMT. $ / MILE	$1,593,000
	$ / LANE MILE	$398,250
TOTAL PROJECT	PROJ. $ / MILE	$20,050,680
	$ / LANE MILE	$5,012,670

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$4,010,136**

ESTIMATED CONSTRUCTION COST **$16,708,900**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$20,050,680**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	**$0**	$0
RAILROAD AGREEMENT COST	0%	**$0**	$0
MAJOR UTILITY RELOCATION COST	0%	**$0**	$0
OTHER EXTERNAL PROJECT COST	0%	**$0**	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	**$0**	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>> **$20,050,680**

DATE		
1/20/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$20,050,680**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$20,050,680**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - Phase 1 without BRT (permanent pavements)

TABLE G5

ESTIMATE FOR: Turbine Interchange - Phase 1 without BRT (interim pavements)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 01/20/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		88,341	12.0	16.73	$100,000	$1,673,000
I-35W Shoulders		14,362	6.0	1.36	$100,000	$136,000
I-494 mainline		81,857	12.0	15.50	$100,000	$1,550,000
I-494 Shoulders		24,053	6.0	2.27	$100,000	$227,000
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp		4,528	8.0	0.57	$100,000	$57,000
SB 35W to WB 494 Ramp Shoulders		120	8.0	0.01	$100,000	$1,000
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to SB 35W Ramp			8.0	0.00	$100,000	$0
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
NB 35W to WB 494 Ramp		29,695	8.0	3.74	$100,000	$374,000
NB 35W to WB 494 Ramp Shoulders		9,018	8.0	1.13	$100,000	$113,000
NB 35W to EB 494 Ramp		7,696	8.0	0.97	$100,000	$97,000
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp			8.0	0.00	$100,000	$0
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp		13,423	8.0	1.69	$100,000	$169,000
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp		7,682	8.0	0.96	$100,000	$96,000
WB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp		5,293	8.0	0.66	$100,000	$66,000
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline			12.0	0.00	$100,000	$0
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.			6.0	0.00	$100,000	$0
Local Street			6.0	0.00	$100,000	$0
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		286,068		**45.59**		**$4,559,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps					$150	$0
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W					$160	$0
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W					$200	$0
82nd to NB 35W ramp over ramp					$200	$0
SB 35W to 82nd ramp over ramp					$200	$0
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp					$200	$0
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W					$150	$0
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
		BRIDGE COST TOTALS		**$0**		

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$4,559,000	$5,470,800
BRIDGE COST	(From Bridge)				20%	$0	$0
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	6650 LIN FT, 18' HIGH, $75/SQFT	382	16	75	20%	$458,400	$550,080
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	1100 LIN FT, $47/FT	1100		47	20%	$51,700	$62,040
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$15.94

LWD PORTION COST	**OTHER** COSTS
89.9%	10.1%

ROADWAY ONLY	PVMT. $ / MILE	$4,559,000
	$ / LANE MILE	$1,139,750
TOTAL PROJECT	PROJ. $ / MILE	$6,082,920
	$ / LANE MILE	$1,520,730

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$1,216,584**

ESTIMATED CONSTRUCTION COST **$5,069,100**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$6,082,920**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	$0	$0
RAILROAD AGREEMENT COST	0%	$0	$0
MAJOR UTILITY RELOCATION COST	0%	$0	$0
OTHER EXTERNAL PROJECT COST	0%	$0	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	$0	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>> **$6,082,920**

DATE		
1/20/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$6,082,920**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$6,082,920**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - Phase 1 without BRT (interim pavements)

TABLE G6

ESTIMATE FOR: Turbine Interchange - BRT Only (permanent pavement)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 01/20/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS

IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		157,100	12.0	29.75	$100,000	$2,975,000
I-35W Shoulders		45,668	6.0	4.32	$100,000	$432,000
I-494 mainline			12.0	0.00	$100,000	$0
I-494 Shoulders			6.0	0.00	$100,000	$0
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp		11,228	8.0	1.41	$100,000	$141,000
SB 35W to 82nd Ramp Shoulders		4,292	8.0	0.54	$100,000	$54,000
82nd to SB 35W Ramp			8.0	0.00	$100,000	$0
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp		22,722	8.0	2.86	$100,000	$286,000
NB 35W to 82nd Ramp Shoulders		3,873	8.0	0.48	$100,000	$48,000
NB 35W to WB 494 Ramp		33,013	8.0	4.16	$100,000	$416,000
NB 35W to WB 494 Ramp Shoulders		13,767	8.0	1.73	$100,000	$173,000
NB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp		24,752	8.0	3.12	$100,000	$312,000
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp		26,461	8.0	3.34	$100,000	$334,000
EB 494 to SB 35W Ramp Shoulders		11,659	8.0	1.47	$100,000	$147,000
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline		51,405	12.0	9.73	$100,000	$973,000
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.		87,452	6.0	8.28	$100,000	$828,000
Local Street		35,705	6.0	3.38	$100,000	$338,000
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0
		529,097		**74.57**		**$7,457,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps					$150	$0
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W				12,385	$160	$1,981,600
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W					$200	$0
82nd to NB 35W ramp over ramp				5,485	$200	$1,097,000
SB 35W to 82nd ramp over ramp				13,159	$200	$2,631,800
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp					$200	$0
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W				31,770	$150	$4,765,500
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				0	$0	$0
			BRIDGE COST TOTALS	**$10,475,900**		

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS				% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:				20%	$7,457,000	$8,948,400
BRIDGE COST	(From Bridge)				20%	$10,475,900	$12,571,080
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)				0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)				0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)				0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT				0%	$0	$0
RETAINING WALL COST	7132 LIN FT, 18' HIGH, $75/SQFT	2305	16	75	20%	$2,766,000	$3,319,200
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)				0%	$0	$0
MEDIAN BARRIER	5500 LIN FT, $47/FT	5000		47	20%	$235,000	$282,000
NEED MORE LINES? ADD ADDITIONAL ROWS HERE (HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)						$0	$0

PVMT. $ / SQ FT	$14.09

LWD PORTION COST	**OTHER** COSTS
35.6%	64.4%

ROADWAY ONLY	PVMT. $ / MILE	$7,457,000
	$ / LANE MILE	$1,864,250
TOTAL PROJECT	PROJ. $ / MILE	$25,120,680
	$ / LANE MILE	$6,280,170

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST	
(20% OF CONSTRUCTION COST)	**$5,024,136**

ESTIMATED CONSTRUCTION COST **$20,933,900**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$25,120,680**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	**$0**	$0
RAILROAD AGREEMENT COST	0%	**$0**	$0
MAJOR UTILITY RELOCATION COST	0%	**$0**	$0
OTHER EXTERNAL PROJECT COST	0%	**$0**	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	**$0**	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>> **$25,120,680**

DATE		
1/20/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$25,120,680**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$25,120,680**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - BRT Only (permanent pavement)

TABLE G7

ESTIMATE FOR: Turbine Interchange - BRT Only (interim pavement)

PROJ. ID: SP

GRADING, SURFACING, DRAINAGE, UTILITIES, NOISE WALLS, RETAINING WALLS, TMC, AND BRIDGE NO'S. _.

SP xxxx-xxx TH xx, LETTING DATE / YEAR: XX/XX/XX

LOCATED ON I-494 at I-35W

VALIDATED ESTIMATE DATE

ESTIMATE

ESTIMATE DATE 01/20/10

ESTIMATE COMPLETED BY :

Scott Hotchkin

LINKS TO SUPPORTING DOCUMENTS			
PROJECT SCOPING REPORT	Concept/Layout (Cost Estimate)	Cost Risk Evaluation	
XXXXXX	XXXXXX	XXXXXX	

PROJECT SCOPE

HIGHWAY MAINLINE IMPROVEMENTS DESCRIPTION:
-
-

SIDE STREET IMPROVEMENT DESCRIPTION:
-
-

INTERSECTION IMPROVEMENTS DESCRIPTION (SIGNALS, GEOMETRIC, INTERCHANGES)
-
-

PROJECT ROADWAY COST CALCULATIONS IN INCHES

ROADWAY	LOCATION (FROM/TO)	AREA (square feet)	DEPTH (inch)	LWD FACTOR	LWD COST MULTIPLIER	CONST. COST
I-35W mainline		327,936	12.0	62.10	$100,000	$6,210,000
I-35W Shoulders		56,075	6.0	5.31	$100,000	$531,000
I-494 mainline			12.0	0.00	$100,000	$0
I-494 Shoulders			6.0	0.00	$100,000	$0
SB 35W to 76th st Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp			8.0	0.00	$100,000	$0
SB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp			8.0	0.00	$100,000	$0
SB 35W to 82nd Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to SB 35W Ramp		13,691	8.0	1.72	$100,000	$172,000
SB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to SB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 90th Ramp			8.0	0.00	$100,000	$0
90th to NB 35W Ramp			8.0	0.00	$100,000	$0
NB 35W to 82nd Ramp		8,181	8.0	1.03	$100,000	$103,000
NB 35W to 82nd Ramp Shoulders		90	8.0	0.01	$100,000	$1,000
NB 35W to WB 494 Ramp		23,181	8.0	2.92	$100,000	$292,000
NB 35W to WB 494 Ramp Shoulders		2,893	8.0	0.36	$100,000	$36,000
NB 35W to EB 494 Ramp		6,146	8.0	0.77	$100,000	$77,000
NB 35W to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
82nd to NB 35W Ramp		7,212	8.0	0.91	$100,000	$91,000
76th to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp			8.0	0.00	$100,000	$0
EB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to SB 35W Ramp		16,887	8.0	2.13	$100,000	$213,000
EB 494 to SB 35W Ramp Shoulders		3,159	8.0	0.39	$100,000	$39,000
EB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
EB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp			8.0	0.00	$100,000	$0
PENN to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp			8.0	0.00	$100,000	$0
EB 494 to LYNDALE Ramp Shoulders			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp			8.0	0.00	$100,000	$0
Lyndale to EB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp			8.0	0.00	$100,000	$0
EB 494 to Portland Ramp Shoulders			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp			8.0	0.00	$100,000	$0
Portland to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp			8.0	0.00	$100,000	$0
WB 494 to Lyndale Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to NB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp			8.0	0.00	$100,000	$0
WB 494 to SB 35W Ramp Shoulders			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp			8.0	0.00	$100,000	$0
LYNDALE to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp			8.0	0.00	$100,000	$0
WB 494 to PENN Ramp Shoulders			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp			8.0	0.00	$100,000	$0
Penn to WB 494 Ramp Shoulders			8.0	0.00	$100,000	$0
BRT mainline		4,417	12.0	0.83	$100,000	$83,000
BRT shoulders			6.0	0.00	$100,000	$0
Xerxes Ave.			6.0	0.00	$100,000	$0
90th St.			6.0	0.00	$100,000	$0
86th St.			6.0	0.00	$100,000	$0
82nd St.			6.0	0.00	$100,000	$0
Local Street			6.0	0.00	$100,000	$0
				0.00	$100,000	$0
						$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE	(HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)					$0
		469,868		**78.48**		**$7,848,000**

PROJECT BRIDGE COST CALCULATIONS

LOCATION	BRIDGE NUMBER	LENGTH (FEET)	WIDTH (FEET)	SQUARE FEET	$ / SQ FT	COST
494 over 35W					$150	$0
494 over west ramp					$150	$0
494 over east ramps					$150	$0
WB 494 to NB 35W ramp over east ramp					$200	$0
WB 494 to SB 35W ramp over 35W					$200	$0
American Blvd over 35W					$160	$0
EB 494 to NB 35W ramp over 35W					$200	$0
NB 35W to WB 494 ramp over 35W					$200	$0
82nd to NB 35W ramp over ramp					$200	$0
SB 35W to 82nd ramp over ramp					$200	$0
PENN to EB 494 ramp over ramp					$200	$0
NB 35W to WB 494 ramp over WB 494 to PENN ramp					$200	$0
EB 494 to LYNDALE over ramp					$200	$0
LYNDALE to WB 494 over ramp					$200	$0
76th to NB 35W ramp over 35W					$200	$0
Xerxes Ave over 494					$150	$0
90th over 35W					$150	$0
86th over 35W					$150	$0
82nd over 35W					$150	$0
Ped over 494					$150	$0
				0	$0	$0
NEED MORE LINES? ADD ADDITIONAL ROWS HERE	(HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)			0	$0	$0
			BRIDGE COST TOTALS	**$0**		

PROJECT COST TOTALS

CONSTRUCTION SUB-ITEM	DETAILS			% OF RISK	CONST. COST	CONST + RISK
ROADWAY COST **(PAVEMENT)**	RISK FOR:			20%	$7,848,000	$9,417,600
BRIDGE COST	(From Bridge)			20%	$0	$0
DRAINAGE COSTS ABOVE NORMAL PROJECT NEEDS	(From _)			0%	$0	$0
ROADWAY LIGHTING COST	(From Metro Lighting Office_)			0%	$0	$0
SIGNAL SYSTEM COST	(From Metro Traffic Office_)			0%		$0
NOISE WALL COST	2400' x 20' @ $25/SQFT			0%	$0	$0
RETAINING WALL COST	7132 LIN FT, 18' HIGH, $75/SQFT	16	75	20%	$0	$0
TMS - TRAFFIC MANAGEMENT SYSTEM	(From TMC)			0%	$0	$0
MEDIAN BARRIER	5500 LIN FT, $47/FT	747	47	20%	$35,109	$42,131
NEED MORE LINES? ADD ADDITIONAL ROWS HERE	(HIGHLIGHT THIS LINE, RIGHT CLICK, SELECT INSERT)				$0	$0

PVMT. $ / SQ FT	$16.70

LWD PORTION COST	**OTHER** COSTS
99.6%	0.4%

ROADWAY ONLY	PVMT. $ / MILE	$7,848,000
	$ / LANE MILE	$1,962,000
TOTAL PROJECT	PROJ. $ / MILE	$9,459,731
	$ / LANE MILE	$2,364,933

TOTAL PROJECT MILES	1
TOTAL PROJECT LANE MILES	4
TOTAL PROJECT AUX. LANE MILES	0.5

PROJECT DEVELOPMENT / DELIVERY COST
(20% OF CONSTRUCTION COST) **$1,891,946**

ESTIMATED CONSTRUCTION COST **$7,883,109**

SUB-TOTAL (CONSTRUCTION + RISK) >>> **$9,459,731**

OVERALL PROJECT RISK 20.00%

RIGHT-OF-WAY COST	0%	$0	$0
RAILROAD AGREEMENT COST	0%	$0	$0
MAJOR UTILITY RELOCATION COST	0%	$0	$0
OTHER EXTERNAL PROJECT COST	0%	$0	$0
ESTIMATED PROJECT LANDSCAPE COST	0%	$0	$0

(LANDSCAPING NOT INCLUDED IN TOTAL COST BUT IS A REMINDER FOR FUTURE PROGRAMMING NEEDS)

TOTAL COST OF CONSTRUCTION, RISK , R-O-W, RAILROAD AGREEMENTS AND UTILITIES >>> **$9,459,731**

DATE		
1/20/2010	**CURRENT PROJECT COST TOTAL (CONSTRUCTION + RISK + OTHER EXTERNAL COSTS) >>**	**$9,459,731**

DATE		FISCAL YEAR	PERCENT INFLATION	
	SCOPING DATABASE INFLATION ADJUSTED COST	2010	0%	**$9,459,731**
	REVISED SCOPING DATABASE INFLATION ADJUSTED COST			

ESTIMATE FOR: Turbine Interchange - BRT Only (interim pavement)

TABLE G8

Bus Rapid Transit
Alternative Concepts
Comparative Costs Summary

TABLE G9

BRT Alternative	Bus Rapid Transit Cost Breakdowns								Park and Ride Cost Breakdowns					**Total**
	Building	Bus Platform Site	Roadway Access	Bus Bridge	Bridge Modifications	Skywalks	Contingency (20%)	Sub Total	Parking decks	Other decks	Facilities	Contingency (20%)	Subtotal	
Single Platform with weave	$ 3,108,000	$ 650,000	$ 1,100,000	N/A	$ 2,000,000	$ 1,200,000	$ 1,611,600	$ 9,669,600	$ 5,750,000	N/A	$ 315,500	$ 1,213,100	$ 7,278,600	**$ 16,948,200**
Dual Platforms with out weave, direct to Park and Ride	$ 3,729,600	$ 780,000	$ 880,000	N/A	$ -	$ 3,000,000	$ 1,677,920	$ 10,067,520	$ 5,750,000	N/A	$ 315,500	$ 1,213,100	$ 7,278,600	**$ 17,346,120**
Dual Platforms with out weave, direct to American	$ 3,729,600	$ 780,000	$ 880,000	N/A	$ 2,000,000	$ 4,680,000	$ 2,413,920	$ 14,483,520	$ 5,750,000	N/A	$ 315,500	$ 1,213,100	$ 7,278,600	**$ 21,762,120**
Off-Line T	N/A	$ 650,000	$ 1,045,000	$ 3,066,000	N/A	$ -	$ 952,200	$ 5,713,200	$ 5,750,000	$ 6,094,000	$ 631,000	$ 2,495,000	$ 14,970,000	**$ 20,683,200**

Notes:

	Arch, Structural, Mech, Elec.	From 46th St BRT Utilties, sidewalks, stormwater	Accel/Decel Lanes	$35 per sq per stall, 250 stalls per floor, 2 floors per structure	$75 per sq ft, used 250 stalls per floor to figure out sq ft of each floor	main stairwell and elevator area

RICHFIELD

Public Works Department
Engineering

MAYOR
DEBBIE GOETTEL

CITY COUNCIL
PAT ELLIOTT
TOM FITZHENRY
SUZANNE M. SANDAHL
FRED L. WROGE, JR.

CITY MANAGER
STEVEN L. DEVICH

March 19, 2010

Mr. Scott Pedersen, P.E.
Mn/DOT Metro District
West Metro Area Engineer
1500 West Co. Rd. B-2
Roseville, MN 55113

Subject: I-494/35W Interchange Preliminary Design Report Comments

Dear Mr. Pedersen:

Immediate Request
Please incorporate the following elements into the I-494/35W Interchange Preliminary Design Report:

- In April 2000, an agency transportation committee comprised of Mn/DOT, Hennepin County, Metropolitan Council, FHWA, and the Cities of Bloomington and Richfield published a revised Preferred Alternative for the I-494/35W Interchange. The 2000 Preferred Alternative included:
  - Elimination of the interchanges at Nicollet and 12th Avenues
  - Full access interchanges at Lyndale and Portland Avenues
  - Access to NB and to/from SB I-35W and full access to I-494 from Penn Avenue
  - 26 feet in the median for future transit needs
  - Access to I-35W at 76th and 82nd Streets
  - Collector-Distributor (C-D) Roads
  - Viability of land use of remaining parcels

- Since 2000, Mn/DOT's advancement of the I-494 layout has included several proposed modifications to the layout. These changes include, but are not limited to:
  - Grade separating the westbound C-D road under the Lyndale Avenue Ramp eliminating access to I-35W from the Lyndale Avenue Interchange
  - Increased right-of-way impacts that compromise the viability of the adjacent land uses
  - Restricting the connection from NB I-35W to Lyndale Avenue
  - Restricting the connection from SB I-35W to Penn Avenue

Richfield's Perspective
The overall goal of the 1999 agency transportation committee and the product that came out of that group was to produce a Preferred Alternative that was realistic and that would provide a context sensitive solution to the regional and local transportation systems. The City believes that each of the elements agreed to in

2000 work together to provide acceptable transportation routes for both local and regional traffic.

The City also believes that the turbine design is superior to the 2000 Preferred Layout's design in that it reduces construction costs and provides construction phasing options. However, the new interchange design should not compromise any of the fundamental elements agreed to in 2000.

Collector-Distributor Roads to/from Lyndale
In 2005, the City and WSB & Associates staff worked diligently with Mn/DOT staff to determine if access to/from Lyndale Avenue to the C-D roads were workable alternatives at the interchange. Design efforts and CORSIM analysis proved that both access to the WB C-D road and from the EB C-D road to be functional. The benefits of these connections include:

- Retaining access to I-35W to/from Lyndale Avenue.
- Substantial operational and safety improvements on the regional system without compromising the safety and operations on the local system.
- Avoiding unnecessary damages to the economic viability of the adjacent property owners.
- Construction cost savings.
- Further mitigation to regional access losses (Nicollet, 12th, and NB I-35W to Penn Avenue) and subsequent impacts to the local system.
- Aiding the regional system by providing an additional choice for motorists where incident management is a concern.
- Decreased travel times for motorists going to I-35W.

Because this is a freeway in a fully developed area, the City believes that what's acceptable and/or reasonable better reflects a context sensitive solution rather than what is optimum or desirable.

Thank you for the opportunity to comment on this document. We look forward to working with you on regional projects and advancement of this interchange reconstruction in the future.

Sincerely,

Michael Eastling
Director

Copy: Mr. Jeff Rhoda, P.E.
Short Elliot Hendrickson, Inc.