MEMO

To: Chris Krueger, PE

From: Kelly Schaefer, PE, PTOE

Date: June 7, 2023

Subject: Kirkwood Road Lane Reduction Demonstration Memo

The City of Kirkwood completed a demonstration of the lane reduction currently in design for the North Kirkwood Road STP-5502(611) Improvement Project. As shown in **Exhibit 1** (attached), the demonstration reduced the number of travel lanes down to one in each direction between Bodley Avenue to the north and Adams Avenue to the south. At the signalized intersections, dedicated left- and right- turning lanes were provided at Washington and Adams Avenue. The demonstration was conducted from April 10 to May 15, 2023.

It should be noted that northbound travel had already been reduced to one lane due to the construction zone of the James Development extending into Kirkwood Road. This zone and resulting lane reduction is adjacent to their site north of Washington Avenue.

In order to assess the impact of the proposed lane reduction on traffic, Lochmueller assisted the City with the following: 1) mainline traffic counts before and during the demonstration on the adjacent parallel routes of Clay and Taylor Avenues to measure the amount of traffic diverting from Kirkwood Road due to the lane reduction, and 2) observations during the weekday midday and afternoon peak periods to assess traffic operations and safety conditions with the lane reduction in place.

The following memo summarizes the work and findings from these efforts.

Traffic Counts

Bi-directional mainline traffic counts were conducted before and during the demonstration to measure traffic volumes. **Figure 1** shows the locations of the traffic counters placed on Clay and Taylor Avenues. Both routes were counted immediately south of Essex Avenue and north of Adams Avenue to capture traffic impacts within the boundaries of the demonstration.

The “before” counts were conducted from March 27 to April 2, 2023; the “during” counts were conducted from April 19 to April 30, 2023.

It should be noted that the hose machine counter at the Taylor Avenue and Adams Avenue was partially broken shortly after the start of the “during” counts. As such, bi-directional data is only available from Wednesday, April 19, 2023 at 10AM to Thursday, April 20, 2023 at 10PM. This report will use the bi-directional where possible and otherwise the two-way counts (available for entire count period) for its count summaries and analysis.

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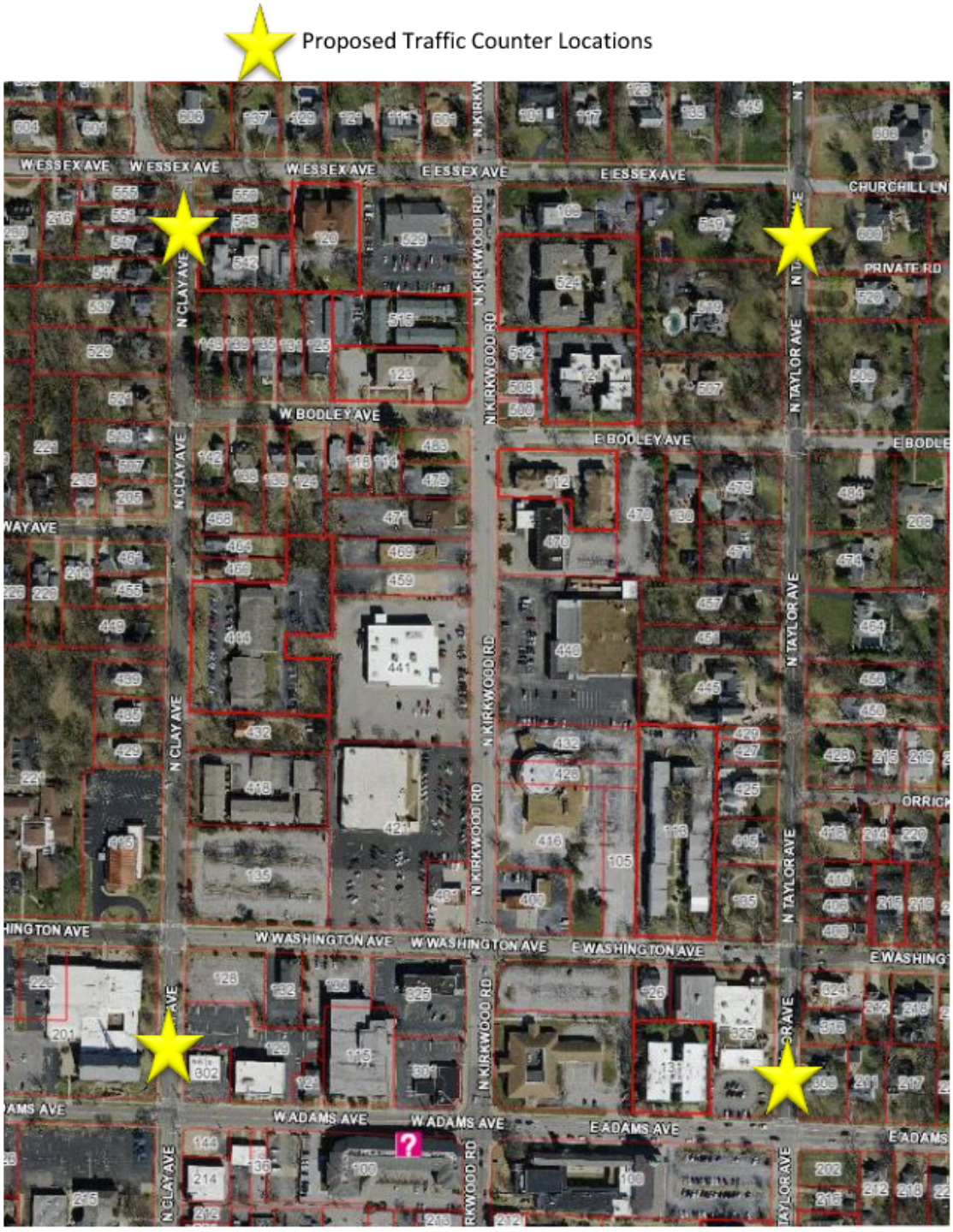
FIGURE 1: TRAFFIC COUNTER LOCATIONS



The collected traffic volumes are summarized in **Table 1**. For your information, the AM Peak is the total traffic from 7 AM to 9 AM, the Midday, or MD, Peak is the total from 11 AM to 1 PM, and the PM Peak is the total from 4 PM to 6 PM. The Average Daily Traffic, or ADT, is the total traffic for a 24-hour period. Also, count increases from 0 to 50 vehicles are highlighted yellow and over 50 vehicles are highlighted red; all decreases in traffic are highlighted in green.

TABLE 1: SUMMARY OF TRAFFIC VOLUMES BEFORE AND DURING DEMONSTRATION

CLAY AVENUE @ ESSEX AVENUE													
DIRECTION	TIME PERIOD	SUN				Weekday Average				SAT			
		BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE
NB	AM PEAK	80	43	-37	-46%	146	205	58	40%	77	82	5	6%
	MD PEAK	111	222	111	100%	136	185	49	36%	137	238	101	74%
	PM PEAK	123	130	7	6%	181	208	27	15%	145	149	4	3%
	ADT	758	983	225	30%	1024	1372	348	34%	810	1199	389	48%
SB	AM PEAK	45	58	13	29%	192	165	-27	-14%	83	99	16	19%
	MD PEAK	214	147	-67	-31%	208	158	-51	-24%	253	159	-94	-37%
	PM PEAK	142	111	-31	-22%	230	299	69	30%	196	141	-55	-28%
	ADT	1014	804	-210	-21%	1394	1296	-99	-7%	1314	906	-408	-31%
CLAY AVENUE @ ADAMS AVENUE													
DIRECTION	TIME PERIOD	SUN				Weekday Average				SAT			
		BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE
NB	AM PEAK	54	59	5	9%	258	272	14	6%	112	108	-4	-4%
	MD PEAK	251	281	30	12%	291	270	-22	-7%	357	333	-24	-7%
	PM PEAK	209	182	-27	-13%	314	274	-41	-13%	262	197	-65	-25%
	ADT	1418	1322	-96	-7%	1922	1892	-30	-2%	1806	1692	-114	-6%
SB	AM PEAK	102	75	-27	-26%	206	233	27	13%	104	102	-2	-2%
	MD PEAK	220	256	36	16%	271	283	12	4%	297	302	5	2%
	PM PEAK	181	162	-19	-10%	344	418	74	21%	224	210	-14	-6%
	ADT	1177	1121	-56	-5%	1740	1974	234	13%	1482	1459	-23	-2%
TAYLOR AVENUE @ ESSEX AVENUE													
DIRECTION	TIME PERIOD	SUN				Weekday Average				SAT			
		BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE
NB	AM PEAK	34	33	-1	-3%	194	210	16	8%	64	83	19	30%
	MD PEAK	213	215	2	1%	202	196	-6	-3%	250	242	-8	-3%
	PM PEAK	157	154	-3	-2%	228	243	15	7%	209	177	-32	-15%
	ADT	939	963	24	3%	1316	1408	92	7%	1215	1217	2	0%
SB	AM PEAK	66	64	-2	-3%	181	201	21	11%	76	116	40	53%
	MD PEAK	179	184	5	3%	212	222	11	5%	287	226	-61	-21%
	PM PEAK	173	136	-37	-21%	320	382	62	19%	178	204	26	15%
	ADT	1040	987	-53	-5%	1561	1736	175	11%	1289	1303	14	1%
TAYLOR AVENUE @ ADAMS AVENUE													
DIRECTION	TIME PERIOD	SUN				Weekday Average				SAT			
		BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE	BEFORE	DURING	COUNT INCREASE	% INCREASE
NB	AM PEAK	83	n/a	n/a	n/a	256	282	26	10%	128	n/a	n/a	n/a
	MD PEAK	238	n/a	n/a	n/a	305	261	-44	-14%	402	n/a	n/a	n/a
	PM PEAK	223	n/a	n/a	n/a	429	293	-137	-32%	221	n/a	n/a	n/a
	ADT	1222	n/a	n/a	n/a	1723	1785	62	4%	1671	n/a	n/a	n/a
SB	AM PEAK	53	n/a	n/a	n/a	243	250	7	3%	82	n/a	n/a	n/a
	MD PEAK	245	n/a	n/a	n/a	280	305	25	9%	376	n/a	n/a	n/a
	PM PEAK	191	n/a	n/a	n/a	275	449	174	63%	245	n/a	n/a	n/a
	ADT	1357	n/a	n/a	n/a	2146	2074	-72	-3%	1768	n/a	n/a	n/a

The City of Kirkwood provided traffic counts on Kirkwood Road during the demonstration. The data was collected from April 20, 2023 to April 27, 2023. The average daily weekday traffic was 13,126 vehicles per day (vpd). Understanding Kirkwood Road typically carries approximately 14,000 vpd, 844 daily vehicles, or 6% of traffic, diverted from Kirkwood Road during the lane reduction demonstration.

Table 2 provides a network summary of two-way traffic volumes before and during the demonstration. As shown, Clay Avenue and Taylor Avenue near Essex Avenue saw an increase in total daily traffic of 249 and 267 vehicles during the demonstration, respectively, which is equal to increases of 9.3% and 10.3%. Further south, the increases were less; Clay Avenue near Essex Avenue saw a daily traffic increase of 204 vehicles, or a 5.6% increase, and Taylor Avenue at Adams Avenue essentially remained the same with 9 fewer daily vehicles between the before and during counts.

TABLE 2: NETWORK SUMMARY OF WEEKDAY TRAFFIC VOLUMES BEFORE AND DURING DEMONSTRATION

Roadway/Location	Weekday Average Daily Traffic			
	Before	During	Count Increase	% Increase
Kirkwood Rd south of Bodley Ave	14,000	13,156	-844	-6.0%
Clay Ave @ Essex Ave	2,419	2,668	249	10.3%
Clay Ave @ Adams Ave	3,662	3,866	204	5.6%
Taylor Ave @ Essex Ave	2,877	3,144	267	9.3%
Taylor Ave @ Adams Ave	3,868	3,859	-9.4	-0.2%

Observations from this data are noted below:

1. Northbound on Clay Avenue at Essex Avenue saw the greatest shift in traffic throughout the week. Average daily traffic increased between 225 and 389 vehicles per day and all but the Sunday AM peak experienced more traffic during the demonstration than before, ranging from 4 to 111 more vehicles in a two-hour peak period.
2. Southbound on Clay Avenue at Essex Avenue saw little to only moderate increases in traffic throughout the week. The only time period with more than 50 vehicles was during the weekday PM peak, and it was measured at only 69 vehicles.
3. Northbound and southbound on Clay Avenue at Adams Avenue had little to only moderate increases in traffic throughout the week. The only time period with more than 50 vehicles was southbound during the weekday PM peak, and it was measured at only 74 vehicles. Average daily traffic did however increase in the southbound direction by 234 vehicles.
4. Northbound on Taylor Avenue at Essex Avenue saw a moderate shift in traffic on weekdays. Average daily traffic on weekdays increased 92 and 175 vehicles per day in the northbound and southbound directions, respectively. Most peak periods on a weekday experienced an increase in traffic, between 2 and 62 vehicles in a two-hour period, while the weekends experienced minimal to no increase in traffic.
5. From the bi-directional data available, Taylor Avenue at Adams Avenue appears to have experienced an increase in traffic in the southbound direction during the peak periods, however the total traffic throughout the day is less. Conversely, in the northbound direction, peak period traffic is lower while the traffic throughout the day is higher.

6. From the two-way data available, the average daily traffic increased from 3868 to 4124 vehicles, or a total of 255 vehicles throughout the day. Daily traffic on Sunday and Saturday were similar, both +/- 1% of the traffic counts from before the demonstration.
7. Approximately 6% of daily weekday traffic on Kirkwood Road diverted during the lane reduction demonstration. Clay Avenue and Taylor Avenue saw 9.3% and 10.3% increases in traffic near Essex Avenue. The amount of diverted traffic was less closer to Adams Avenue, where Clay Avenue saw a 5.6% increase in traffic and Adams Avenue remained about the same overall.

Conclusions from this analysis:

1. Traffic shifts were higher on both Clay and Taylor Avenues further north closer to Essex Avenue.
2. Overall, Clay Avenue saw the greatest shift in traffic during the lane reduction demonstration. Traffic increased 27% at Essex Avenue and 17% at Adams Avenue.
3. The measured traffic shifts were less than 100 more vehicles in a two-hour period at all four locations. The only two exceptions were on Clay Avenue at Essex Avenue during the midday Sunday and Saturday peak periods in the northbound direction. These shifts were measured at 111 and 101 vehicles, both of which are equal to less than one shifted vehicle per minute.
4. Overall, the measured traffic shifts due to the lane demonstration are minimal.

<u>Traffic Operations and Safety Observations</u>

Observations were conducted during the following times to assess traffic operations and safety conditions:

- Tuesday, May 11, 2023 from 4 PM to 5:30 PM
- Wednesday, May 19, 2023 from 4:30 PM to 6 PM
- Friday, May 21, 2023 from 11 AM to 1 PM

The following observations were made:

1. Traffic queues from the signal at Kirkwood Road and Washington Avenue regularly extended to or past the Walgreens/Global Foods driveways during the peak periods.
2. Typically, there was a 30- to 45-minute period during each peak period where the queue extended near or through Essex Avenue.
3. When queues extended past driveways, motorists on Kirkwood Road would leave gaps for people leaving businesses to allow them to make their turn. These gaps were also used by people turning into the businesses.
4. Southbound motorists are generally using only one lane at the signalized intersection at Essex Avenue in anticipation of the upcoming merge near Bodley Avenue.
5. Traffic on Clay and Taylor Avenues did not appear heavy or congested. Stop-controlled intersections were observed working favorably with one to four vehicles on an approach.

Conclusions from these observations:

1. Queues during the peak periods extended further than anticipated based on previous analysis.
2. Vehicles using gaps in stopped traffic to complete turns into and out of a driveway is not preferred for operational and safety reasons.
3. There were no operational or safety concerns on Clay and Taylor Avenues due to shifted traffic.

Recommendations

Based on the information presented in this document, the following recommendations are being presented for the consideration of the City with respect to the design of the North Kirkwood Road STP-5502(611) Improvement Project:

1. Provide a two-way left-turn lane (TWLTL) along Kirkwood Road from Washington Avenue north to the end of the lane reduction. This improvement will allow vehicles to have a dedicated lane to complete turns to and from existing (and future, as properties redevelop) businesses while not impeding a lane of traffic. This will help with the flow of traffic and provide safer operations along the segment.
2. Conduct a traffic signal timing evaluation of the Kirkwood Road system to study and improve traffic flows (i.e. reduce queues) along the corridor given the new lane configuration.

It should be noted that this recommendation will impact the current STP project as well as the Pedestrian Hybrid Beacon (PHB) that is to be installed on this segment of Kirkwood Road. The design of the PHB will need to be modified if the recommended TWLTL is approved.

This concludes our assessment of traffic and safety operations of the Kirkwood Road Lane Reduction Demonstration. Please contact our office at (314) 446-3791 if you have any questions or comments concerning this report.

Completed by Lochmueller Group, Inc

EXHIBIT 1

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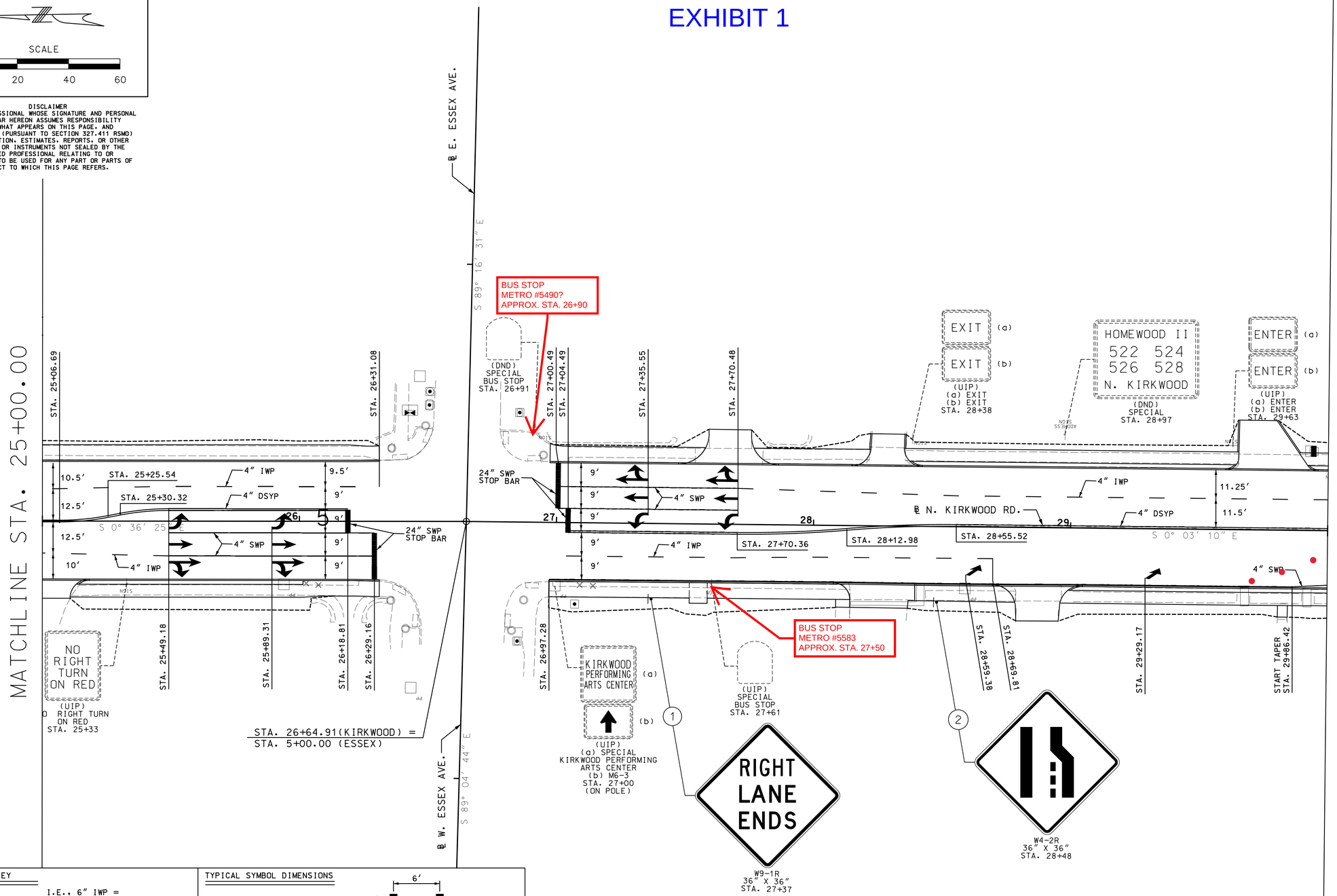

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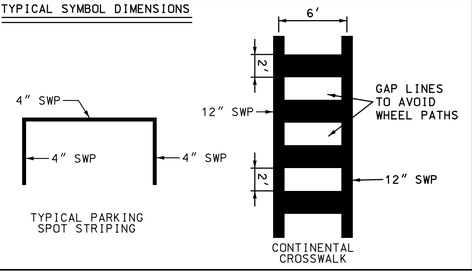

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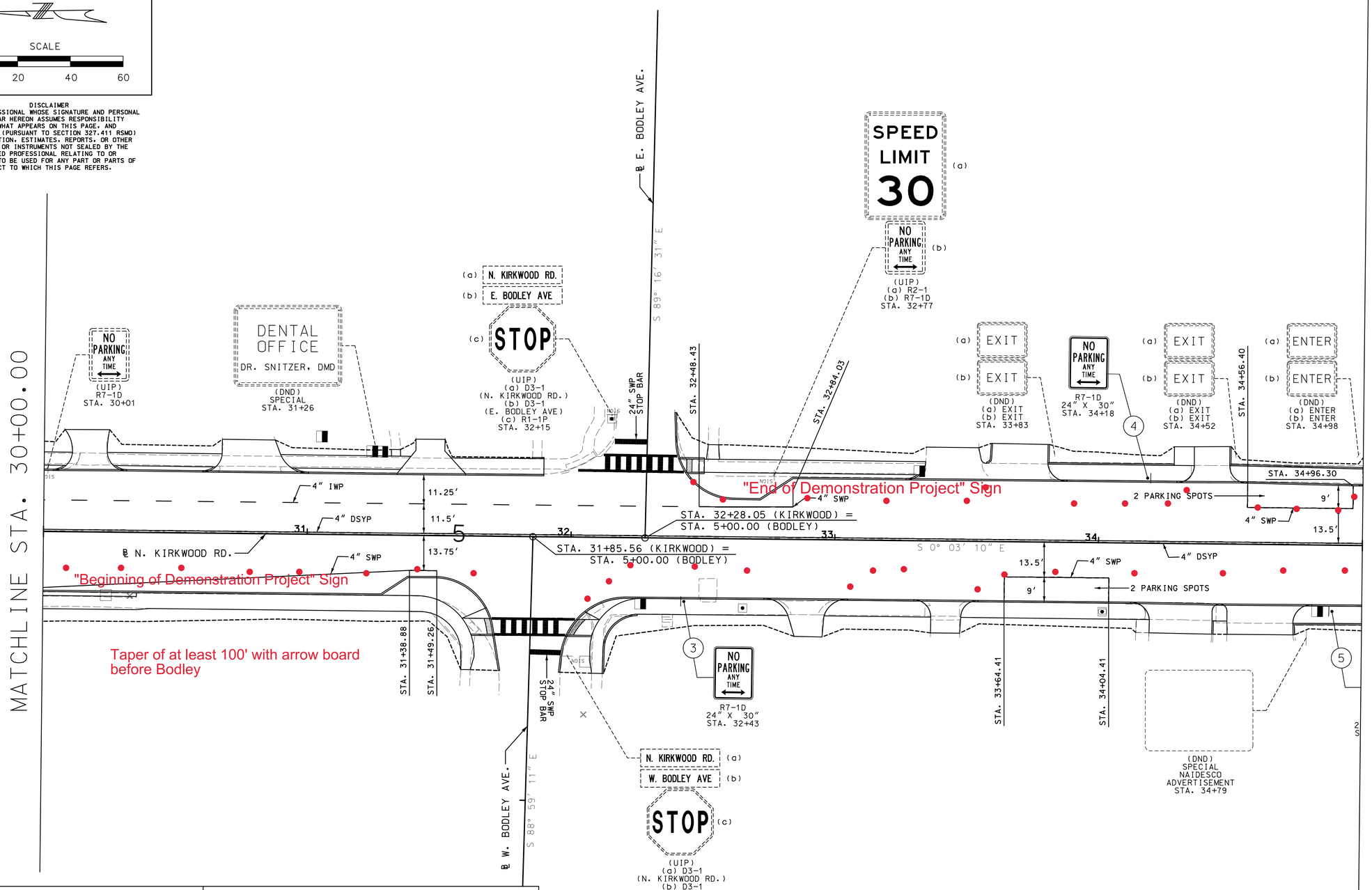

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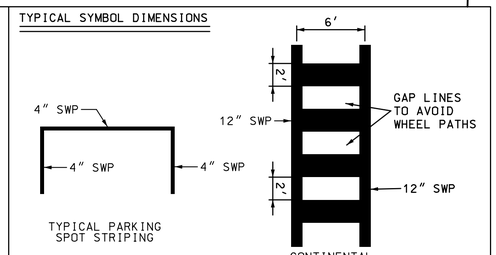

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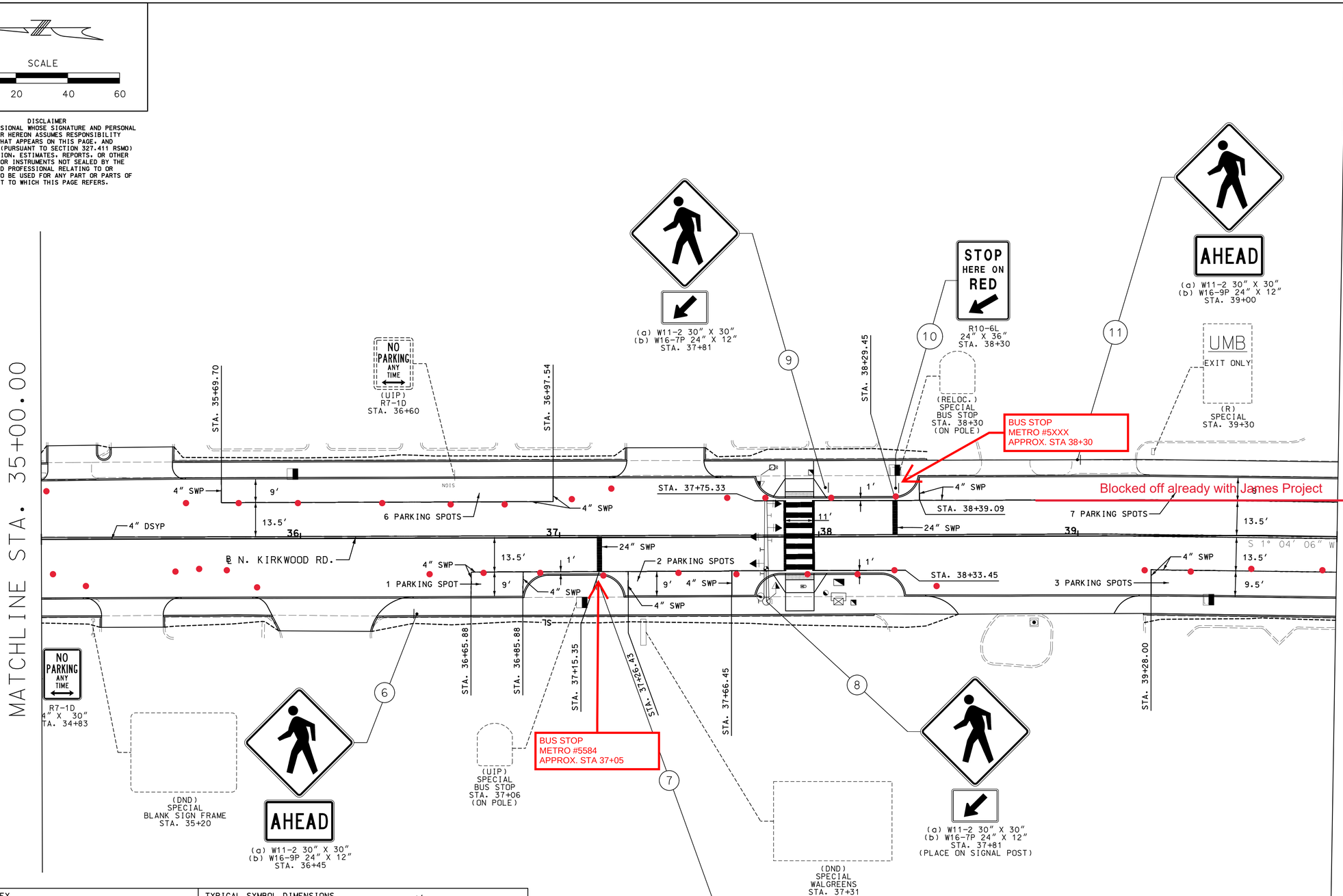

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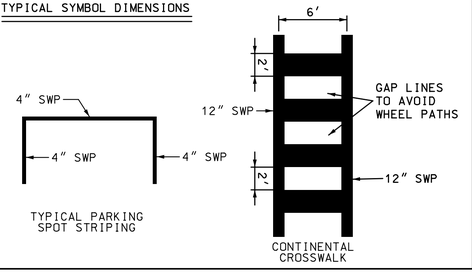

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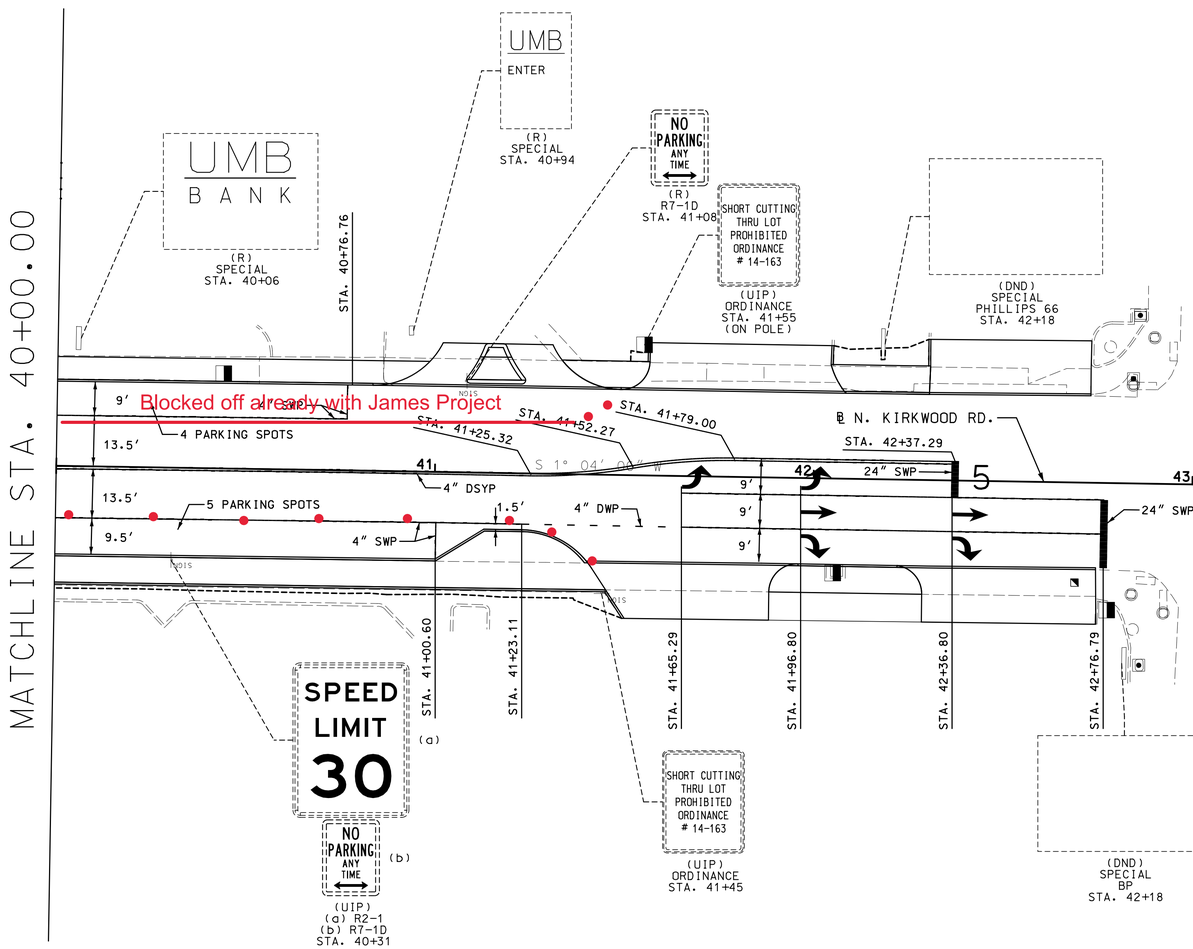

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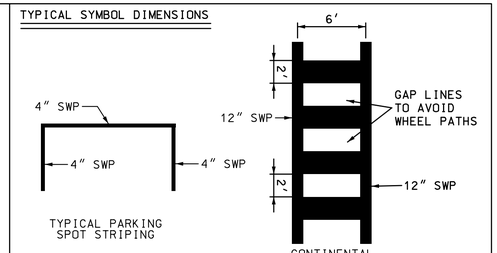

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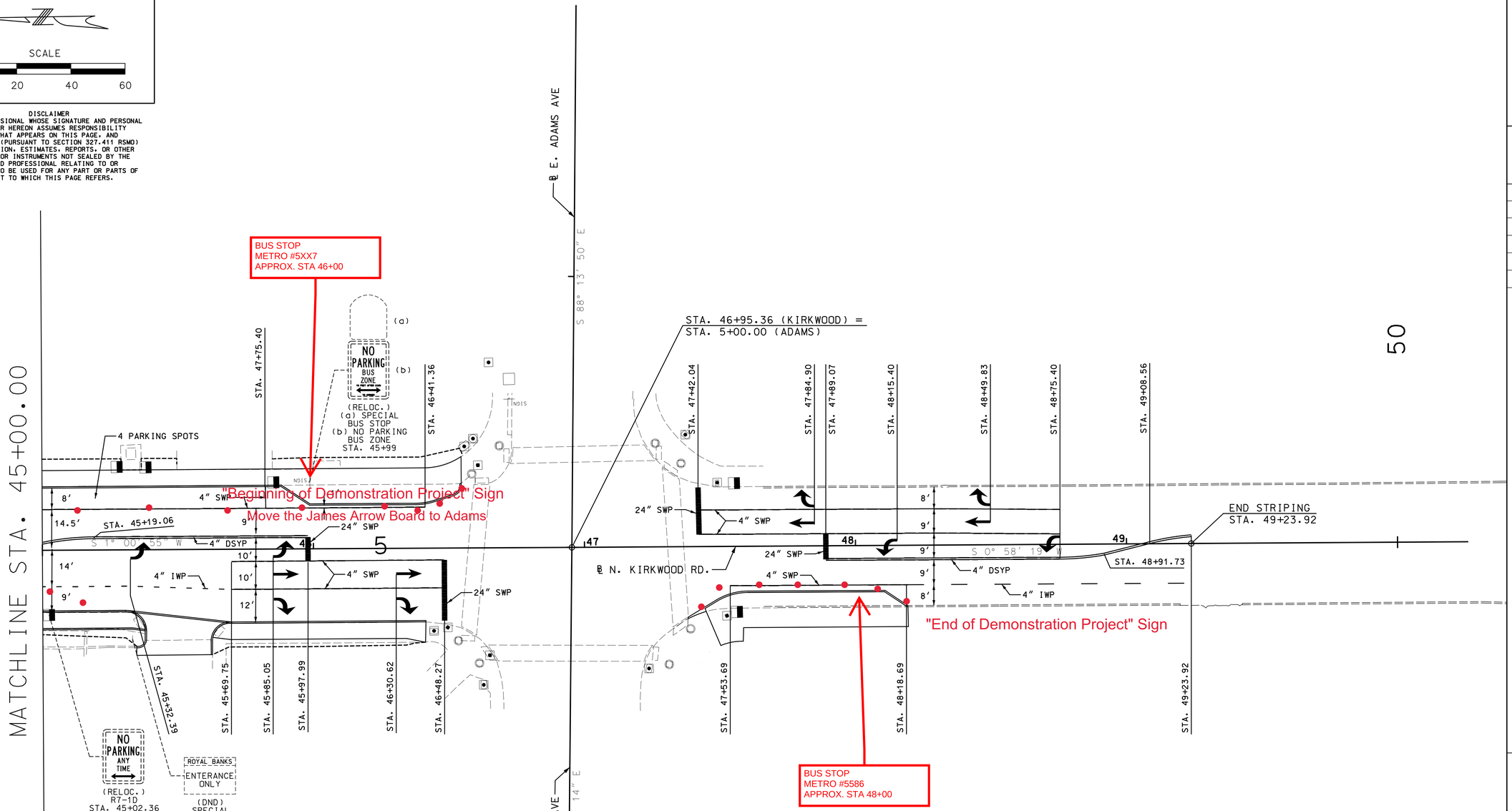

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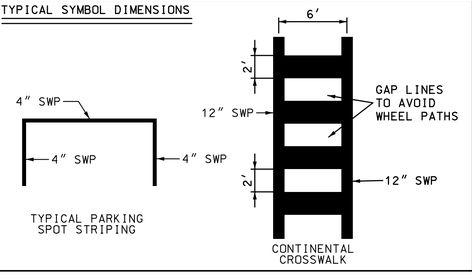

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