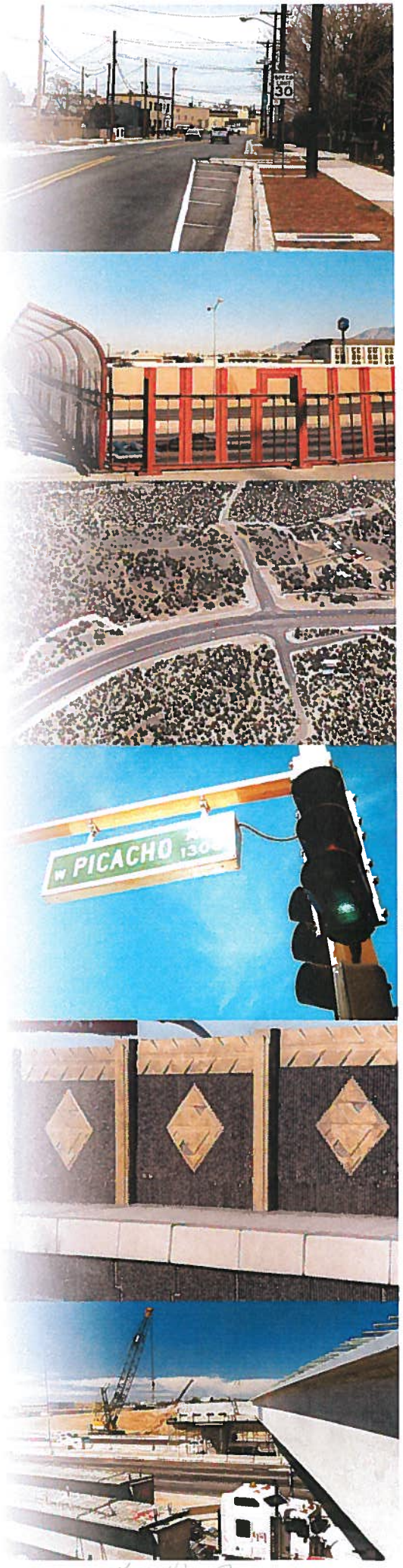
COORS BLVD/BATAAN DRIVE INTERSECTION ACCESS STUDY



AUGUST 6, 2010

Prepared for:

City of Albuquerque

Department of Municipal Development

400 Marquette NW, 3rd Floor, Room 304

Albuquerque, NM 87103

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K-10-2

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ITEM NO.	QUANTITY	DESCRIPTION
1	1	Coors Blvd / Bataan Drive Intersection Access Study, dated August 6, 2010

COMMENTS / INSTRUCTIONS

*REC'D BY:*_____ *DATE:*_____ *TIME:*_____

COORS BLVD/ BATAAN DRIVE INTERSECTION
ACCESS STUDY

AUGUST 6, 2010

PREPARED FOR:

CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPEMENT
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ALBUQUERQUE, NM 87103

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COORS BLVD / BATAAN DRIVE
ACCESS STUDY
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I. INTRODUCTION

The City of Albuquerque owns approximately 2 acres of land between Bataan Dr and Coors Blvd that is zoned for Offices. There is an approved plat for the Hubbell Heights Shops just east of the City of Albuquerque property which will contain 4.4 acres of commercial development. In addition, there are 9.78 acres of vacant land zoned for single family and multi-family residential just south of the City of Albuquerque property. It has been proposed to modify the Coors Blvd. / Bataan Drive intersection to include a southbound to eastbound left turn. The vicinity map and conceptual site plan are illustrated in Figure 1 on page 2.

A. Study Purpose

The purpose of the study is to determine the impact of the proposed modifications to the Coors Blvd. / Bataan Drive intersection. The study will also analyze the sight distance requirements for approaching traffic at this intersection.

B. Study Procedure

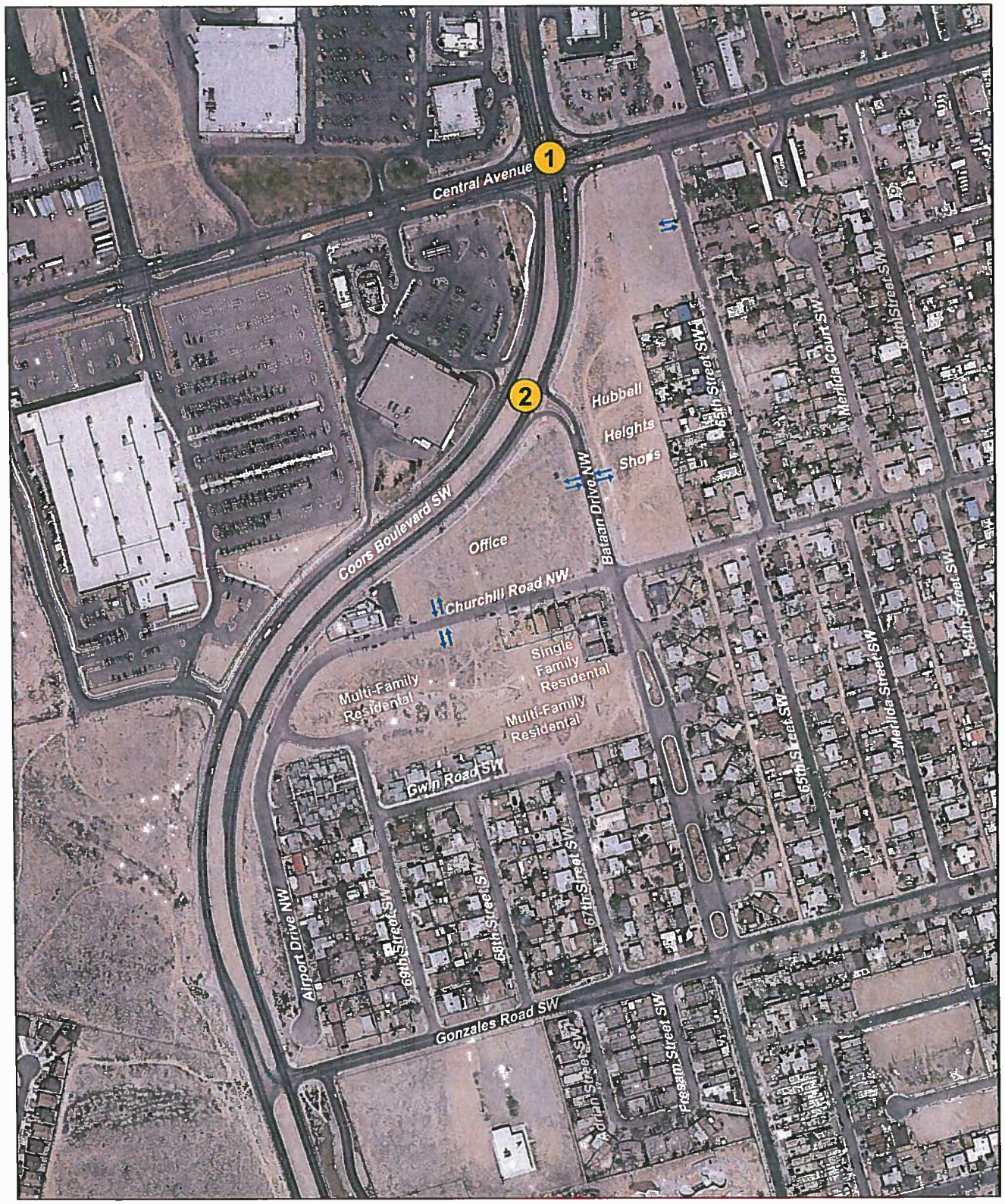
The study includes analysis of the following intersections:

- Central and Coors Blvd
- Coors Blvd and Bataan Drive SW

The intersection evaluations include analysis for the AM and PM peak hours for the following traffic conditions:

- Year 2010 No Build
- Year 2010 Projected traffic with full build out

Existing traffic counts were provided by the Mid Region Council of Governments. The Central and Coors Blvd Signalized Intersection was counted in December 2006. The Bataan Drive / Coors Blvd Unsignalized Intersection was counted in September 2004. The traffic counts were projected to 2010 assuming a 2.5% growth rate.



N

NTS

⇆ ASSUMED ENTRANCE

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FIGURE 1
VICINITY MAP & CONCEPTUAL
SITE PLAN

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II. EXISTING AREA CHARACTERISTICS

A. General Area Characteristics

The office site is located on City of Albuquerque property. The site is bounded on the south by Churchill Rd, on the east by Bataan Drive, and west and northwest by Coors Blvd.

The Hubbell Heights Shops site is bounded on the south by Churchill Road, on the west by Bataan Drive, on the east by family residences and 65th Street, and on the north by Central Avenue. The site is also bounded on the northwest by Coors Blvd.

The single-family and multi-family site is bounded on the north by Churchill Road, on the west by 69th Street, on the south by Gwin Road SW and a multi-family complex in the Alamosa Neighborhood, and on the east by Bataan Drive and single-family homes.

The site is currently undeveloped. At full build out, the development will provide access from Coors to Bataan via a left-in/right-in/right-out access entrance approximately midway between Gonzales Road SW and Central Avenue on Coors intersections. There will also be access from 65th Street, Churchill Street, and Gonzales Road. The existing right-in, right-out Bataan Drive intersection on Coors Blvd is located approximately 550 feet south of the Central Avenue. These are shown on the site plan in Figure 1 on page 2.

Existing development in the vicinity of the proposed development includes the Alamosa and Skyview Neighborhoods, Verizon call center, Albertson's, Walgreens, Dion's Pizza, Smith's, Carls Jr., and Precious Moments Child Care Center.

Central Avenue and Coors Blvd are the principal arterial streets, and Bataan Drive, Churchill Road, Gonzales Road, and 68th Street, are minor arterial streets that provide primary access to the site.

Coors Blvd. from Central Avenue to Gonzales is a four-lane street with a 50 foot median. Currently there are no median cuts for turning. Coors Blvd. turns into a six-lane street with median cuts north of Central Avenue.

Central Avenue is a four-lane facility east and west of Coors Blvd with median cuts.

The intersection at Central and Coors has two left turn lanes, two through lanes, and one right turn lane for north and southbound traffic on Coors. East and westbound traffic on Central have one left turn lane, two through lanes, and one right turn lane.

Bataan Drive, Churchill Road, and 68th Street are two-lane facilities that are unmarked with stop signs at the intersections.

Gonzales Road is a two lane street until just west of Bataan. It then turns into a two lane divided street with medians and median cuts. All streets that enter onto Gonzales have stop signs. All traffic on Gonzales appears to not have any stop signs.

It is proposed to add a southbound to eastbound left turn lane at the Coors / Bataan Intersection.

B. Existing Traffic Volumes

The Middle Rio Grande Council of Governments provided existing traffic counts for the Coors / Central and Coors / Bataan intersections. The Coors / Central traffic count was taken in December 2006. The Coors / Bataan traffic count was taken in September 2004. This traffic was adjusted to the current year analysis (2010) using a 2.5% annual growth rate.

Figure 2 on page 6 is a summary of the 2010 peak hour traffic volumes. Existing traffic counts are included in Appendix A.

C. Existing Transit Service

The site is served on Coors Blvd by Route 155, which runs every thirty minutes in the AM and PM peak hours, Monday through Friday, and every fifty to fifty five minutes in the AM and PM hours, Saturday and Sunday. Central Avenue is also served by Route 766 that also runs every sixteen minutes in the peak hours Monday through Friday, every twenty minutes on Saturday, and every thirty three minutes on Sunday. There is a Park and Ride located at Central and Unser.

III. BACKGROUND TRAFFIC PROJECTIONS

As discussed previously, the proposed development on all three parcels is assumed to be constructed in one phase. The procedures for developing the background traffic projections will be discussed in this section.

A. Traffic Data from Approved Developments

There are no additional approved developments that will affect the traffic projections.

B. Year 2010 No Build Intersection Capacity Analysis

The 2000 Highway Capacity Manual (HCM) defines Level of Service (LOS) for signalized and unsignalized intersections as follows:

TABLE 1 – LEVEL OF SERVICE DEFINITIONS

Level of Service	Signalized Delay (sec/veh)	Definition	Unsignalized Delay (sec/veh)
A	≤10	Most vehicles do not stop.	≤10
B	>10 and ≤20	Some vehicles stop.	>10 and ≤15
C	>20 and ≤35	Significant numbers of vehicles stop.	>15 and ≤25
D	>35 and ≤55	Many vehicles stop.	>25 and ≤35
E	>55 and ≤80	Limit of acceptable delay.	>35 and ≤50
F	>80	Unacceptable delay.	>50

LOS D is generally considered acceptable in urban areas and is the desirable base condition for analysis in a traffic study.

The intersections were analyzed using Synchro Version 7 to perform the capacity analysis. Table 2 and Table 3 below summarize the 2005 No-Build results. Synchro Version 7 output is included in Appendix B.

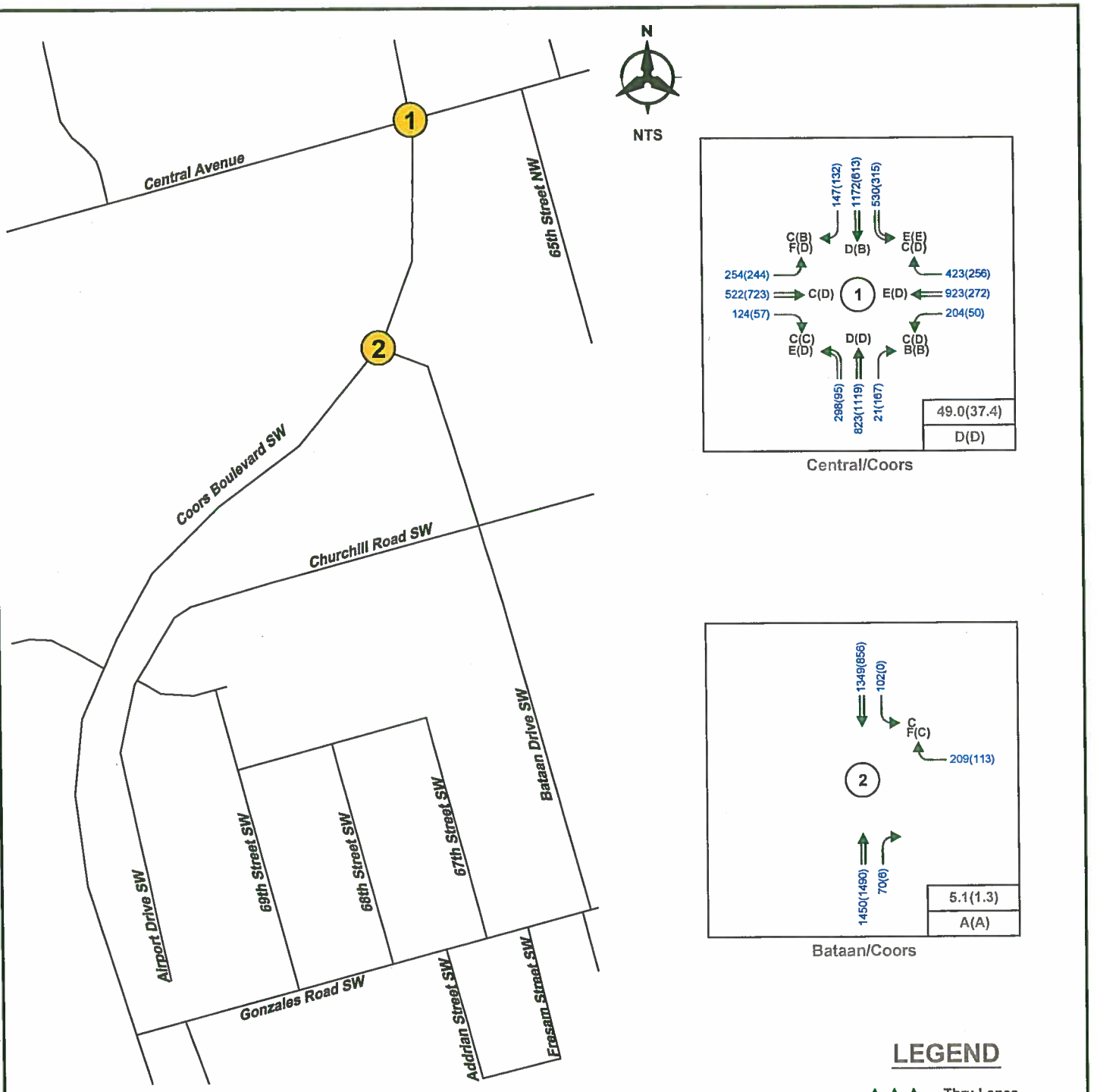
TABLE 2 - 2010 NO-BUILD SIGNALIZED CAPACITY ANALYSIS RESULTS

Intersection	2005 AM Peak No Build			2005 PM Peak No Build		
	Delay	V/C	LOS	Delay	V/C	LOS
Central & Coors	37.4	0.87	D	45.5	0.99	D

TABLE 3 - 2010 NO-BUILD UNSIGNALIZED CAPACITY ANALYSIS RESULTS

Intersection	2005 AM Peak No Build			2005 PM Peak No Build		
	Delay	Utilization	LOS	Delay	Utilization	LOS
Coors & Bataan	1.3	54.9%	A	0.8	51.9%	A

Both intersections operate at an acceptable level of service in the No Build condition.



LEGEND

- Thru Lanes (# as indicated)
- Turning Lanes (# as indicated)
- 1234(1234) AM(PM) Traffic Counts
- X(X) AM(PM) Level of Service (LOS)
- N Entering
- X Exiting

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FIGURE 2
2010 BUILD PEAK HOUR TRAFFIC VOLUMES - AM(PM)

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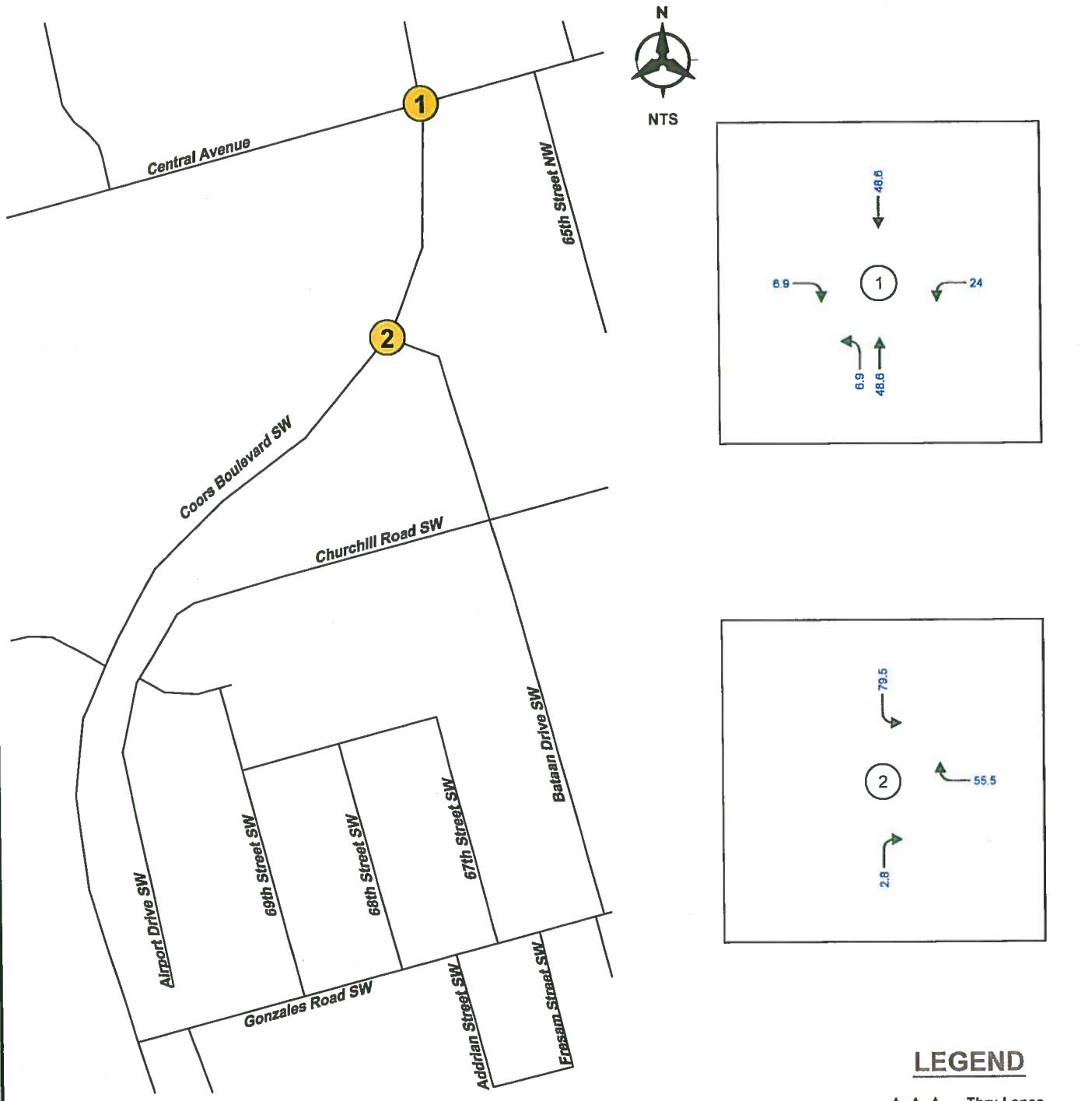
TABLE 4 - TRIP GENERATION							
Land Use	**ITE Land Use Code**	**Size**	**24 Hour Two-Way Volume**	**AM Peak Hour**		**PM Peak Hour**	
				Enter	**Exit**	**Enter**	**Exit**
Single Family	210	6	58	1	4	4	2
Multi-Family	220	112	802	12	47	51	28
Office	710	4370	705	85	12	22	106
Shopping	820	15300	2779	41	27	124	129
High Turnover Restaurant	932	6000	763	36	33	40	27
Total			**5,107**	**175**	**123**	**241**	**292**

C. Trip Distribution and Assignment

A modified gravity model was used to distribute the projected traffic. The model assumes that the distribution for office and residential is directly proportional to population and inversely proportional to the distance to the subareas. For retail businesses the same model is used but it assumes that retail trips are only generated for a 5 mile radius. 2010 population for Subareas and Data Analysis Subzones (DASZ) were determined by interpolating between the 2004 and 2015 data. Year 2004 and 2015 population for Subareas and 2025 population for DASZ's were taken from the Mid-Region Council of Governments ***2025 Socioeconomic Forecasts by Data Analysis Subzones for the Mid-Region of New Mexico*** (S-03-01). Spreadsheets showing the development of the trip distribution are included in Appendix C.

Trip assignment percentages to the Coors / Central and Coors / Bataan intersections are shown in Figure 3 through Figure 5. Figure 3 on page 9 shows the residential trip assignment percentages. The office trip assignment percentages are shown in Figure 4 on page 10. The retail trip assignment percentages are shown in Figure 5 on page 11. The trip assignment percentages were used to determine the trip volumes for the residential, office and retail trips. The projected volumes are shown in Figure 6 through Figure 8 on pages 12 through 14.



LEGEND

	Thru Lanes (# as indicated)
	Turning Lanes (# as indicated)
1234(1234)	AM(PM) Traffic Counts
X(X)	AM(PM) Level of Service (LOS)
N	Entering
X	Exiting

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FIGURE 3
TRIP DISTRIBUTION
PERCENTAGES - RESIDENTIAL

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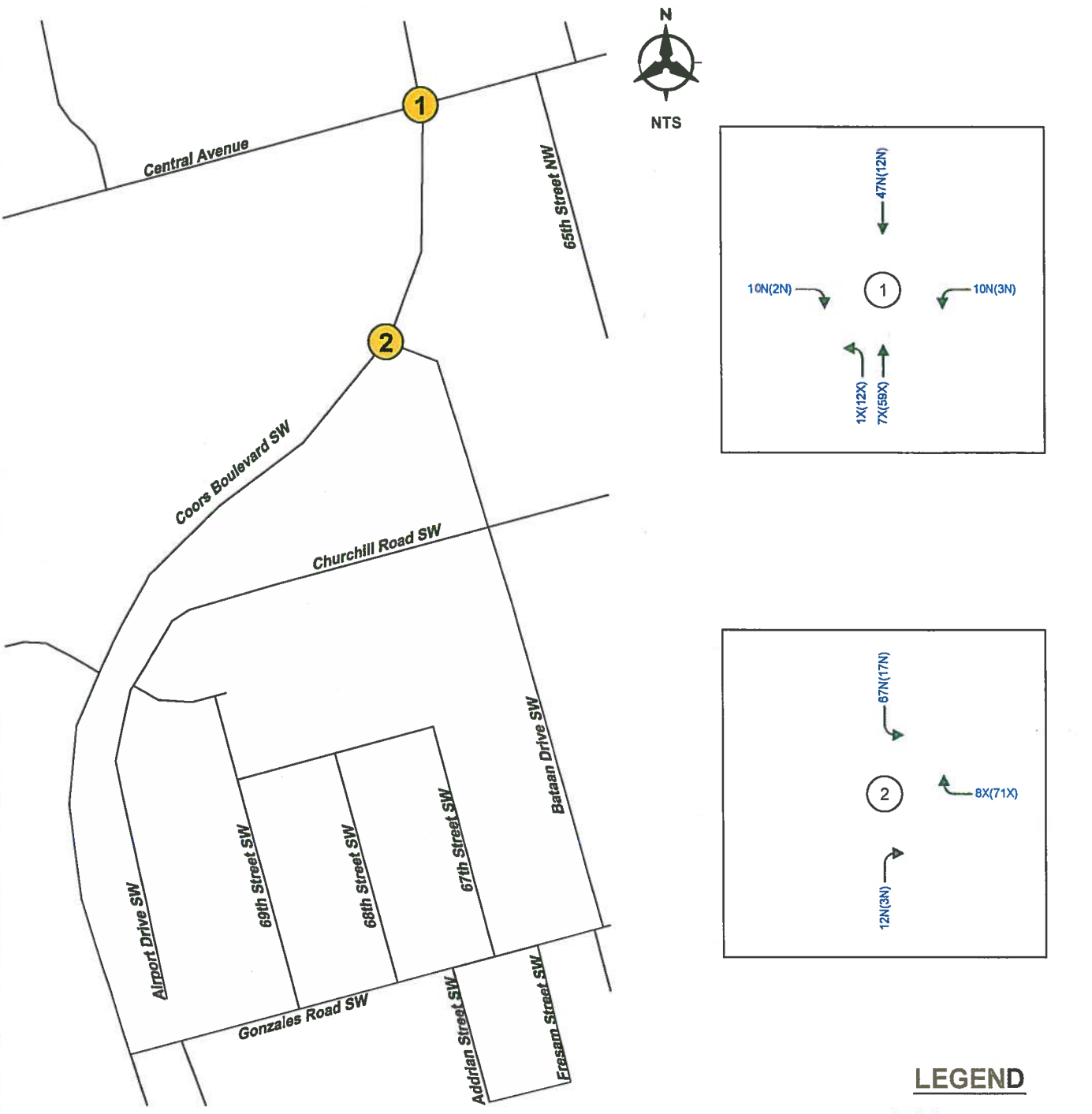

LEGEND

	Thru Lanes (# as Indicated)
	Turning Lanes (# as Indicated)
1234(1234)	AM(PM) Traffic Counts
X(X)	AM(PM) Level of Service (LOS)
N	Entering
X	Exiting

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FIGURE 7
TRIP DISTRIBUTION VOLUMES - OFFICE - AM(PM)

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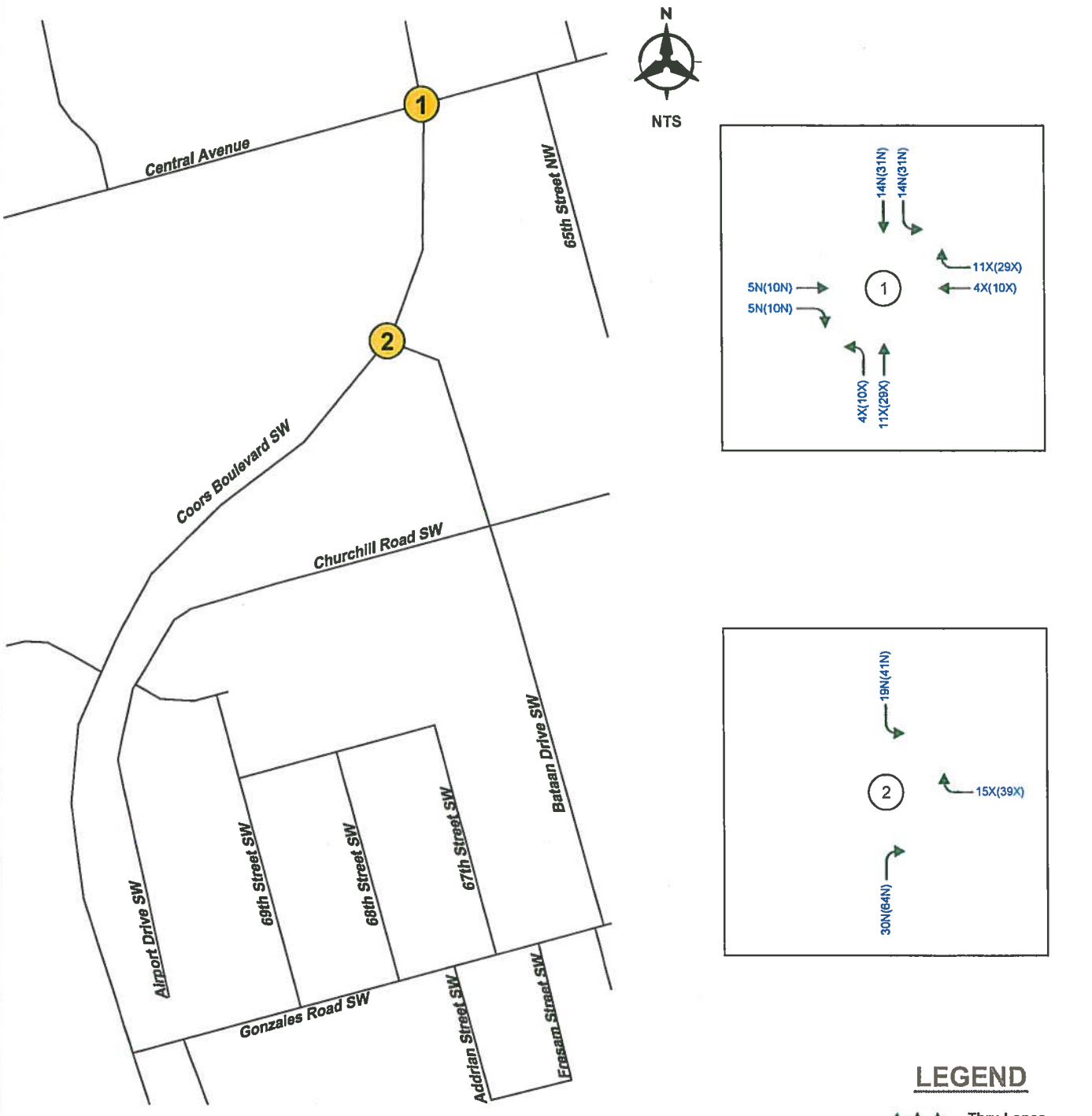

LEGEND

	Thru Lanes (# as indicated)
	Turning Lanes (# as indicated)
1234(1234)	AM(PM) Traffic Counts
X(X)	AM(PM) Level of Service (LOS)
N	Entering
X	Exiting

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FIGURE 8
TRIP DISTRIBUTION VOLUMES - RETAIL - AM(PM)

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V. BUILD TRAFFIC ANALYSES

A. 2010 Build Traffic Volumes

Based on the trip distribution and assignments, the estimated traffic generated by the proposed development (Figure 6 through Figure 8) was then added to the 2010 No-Build traffic projections (Figure 2). Details of the 2010 Build traffic volume computations are included in Appendix D. Figure 9, page 16 summarizes the 2010 Build peak hour traffic projections.

B. 2010 Build Intersection Capacity Analysis

The results for the 2010 Build condition are summarized in Table 5 and Table 6. Synchro version 7 output is included in Appendix E.

TABLE 5 - 2010 BUILD SIGNALIZED CAPACITY ANALYSIS RESULTS

Intersection	2010 AM Peak Build			2010 PM Peak Build		
	Delay	V/C	LOS	Delay	V/C	LOS
Central & Coors	39.1	0.89	D	50.3	1.02	D

TABLE 6 - 2010 BUILD UNSIGNALIZED CAPACITY ANALYSIS RESULTS

Intersection	2010 AM Peak Build			2010 PM Peak Build		
	Delay	Utilization	LOS	Delay	Utilization	LOS
Coors & Bataan	2.9	58%	B	5.1	59.7%	B

The signalized intersection at Central Avenue and Coors Blvd again operates at an acceptable level of service in the peak hours. The unsignalized intersection at Coors Blvd. and Bataan Drive also operates at an acceptable level of service. The analysis results are shown on Figure 9 with the peak Hour traffic projections.

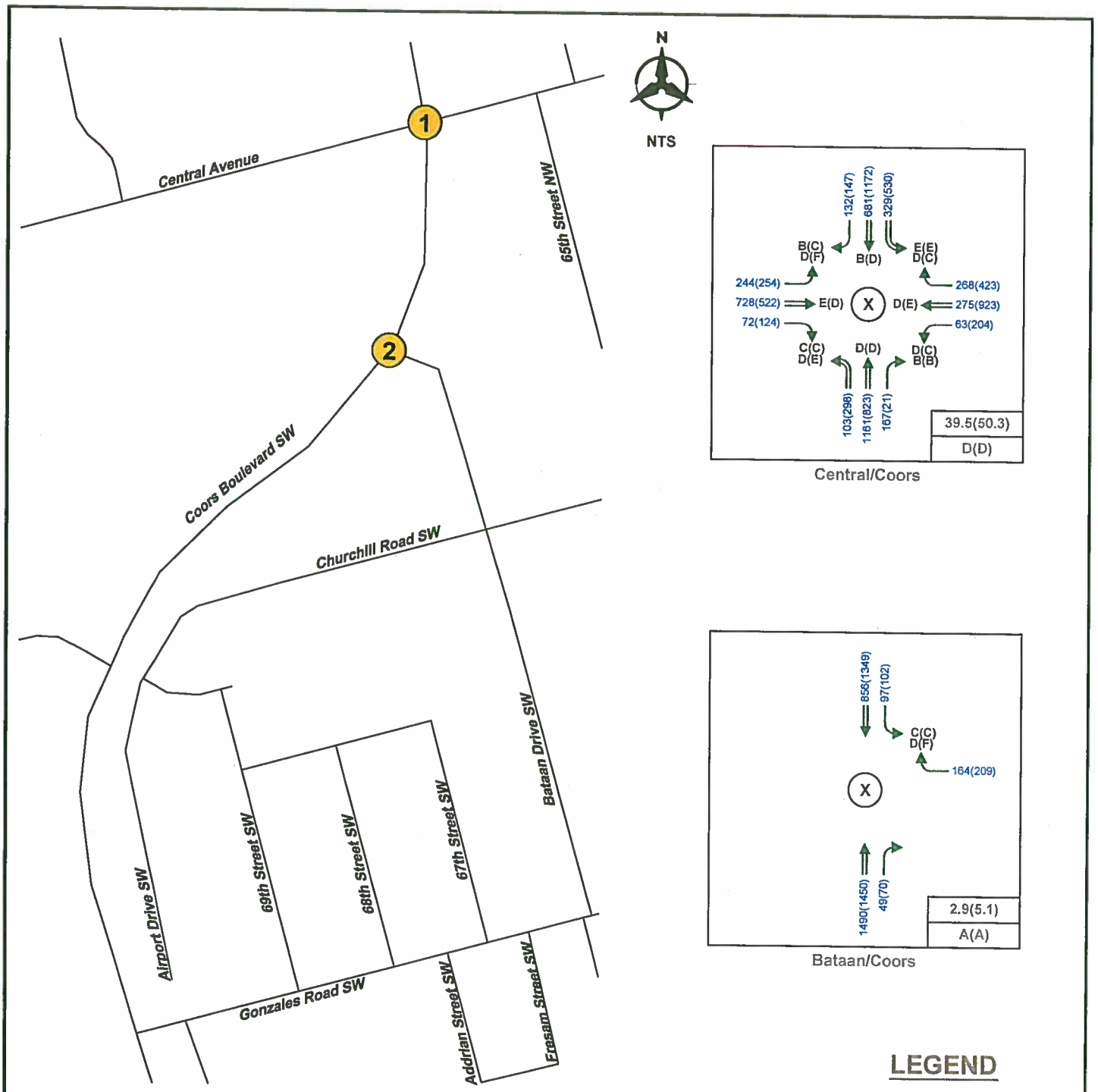

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FIGURE 9
2010 BUILD PEAK HOUR
TRAFFIC VOLUMES - AM(PM)

C. Proposed Queuing Analysis

The northbound queue lengths at Central Avenue and Coors Blvd are a concern because of the geometry of Coors Blvd and the proposed southbound left turn bay at Coors Blvd. and Bataan Dr.

A queuing analysis of the Central Avenue and Coors Blvd intersection was conducted and the results are shown in Table 7 on page 17. This analysis can be found in Appendix F.

TABLE 7 - PROPOSED QUEUING DISTANCES (FT*)

Intersection & Movement	AM Peak Hour	PM Peak Hour
Central & Coors**		
NB Left	75	200***
NB Through	525	350
NB Right	125	25

* Round to next 25 foot vehicle length
** SIGNAL97 Queue (estimated 90th percentile)
*** Volume exceeds capacity, queue may be longer
Queues for all movements are included in Appendix B

Table 7 shows that the northbound through movement has the longest queue. The queue is 525 feet in the AM peak hour and 350 feet in the PM peak hour. These distances will be used to analysis the required sight distance approaching the intersection.

VI. SIGHT DISTANCE ANALYSIS

Coors Blvd curves as it approaches Central Avenue. For this reason, there is a concern that northbound traffic on Coors Blvd may not see the end of the queue at Central Avenue if a left turn bay is added at Bataan Drive.

The posted speed limit on Coors Blvd is 45 mph. The design speed is assumed to be 50 mph. The stopping sight distance requirement for 50 mph is 425 feet. Figure 10 shows geometry for a left turn bay with the queue and required stopping sight distances. At the design speed the median would need to be 18 feet wide in order to not block the sight distance. Since drivers typically pull forward at an unsignalized intersection in order to get the best sight distance themselves, it is likely that the sight distance requirement for the stopped queue at Central Ave will not be met.

Figure 11 shows the stopping sight distance requirements for a design speed of 45 with a posted speed of 40 mph. The median width would only need to be 8 feet in order to not block the sight distance.

Conceptual drawings for various intersection layouts and other design speeds can be found in Appendix G.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

The intersection of Central Avenue and Coors Blvd. operates at an acceptable level of service with the proposed development.

There are potential sight distance conflicts with the end of the queue at Central Avenue if a left turn bay is added at Bataan Drive. There conflicts can be mitigated by reducing the speed limit on Coors Blvd to 40 mph in the vicinity.

B. Recommendations

No improvements are required at the Central Avenue and Coors Blvd intersection for the proposed development.

It is recommended that the posted speed on Coors Blvd be reduced to 40 mph south of Central Avenue in order to provide the required sight distance for a southbound left turn bay at Bataan Drive.

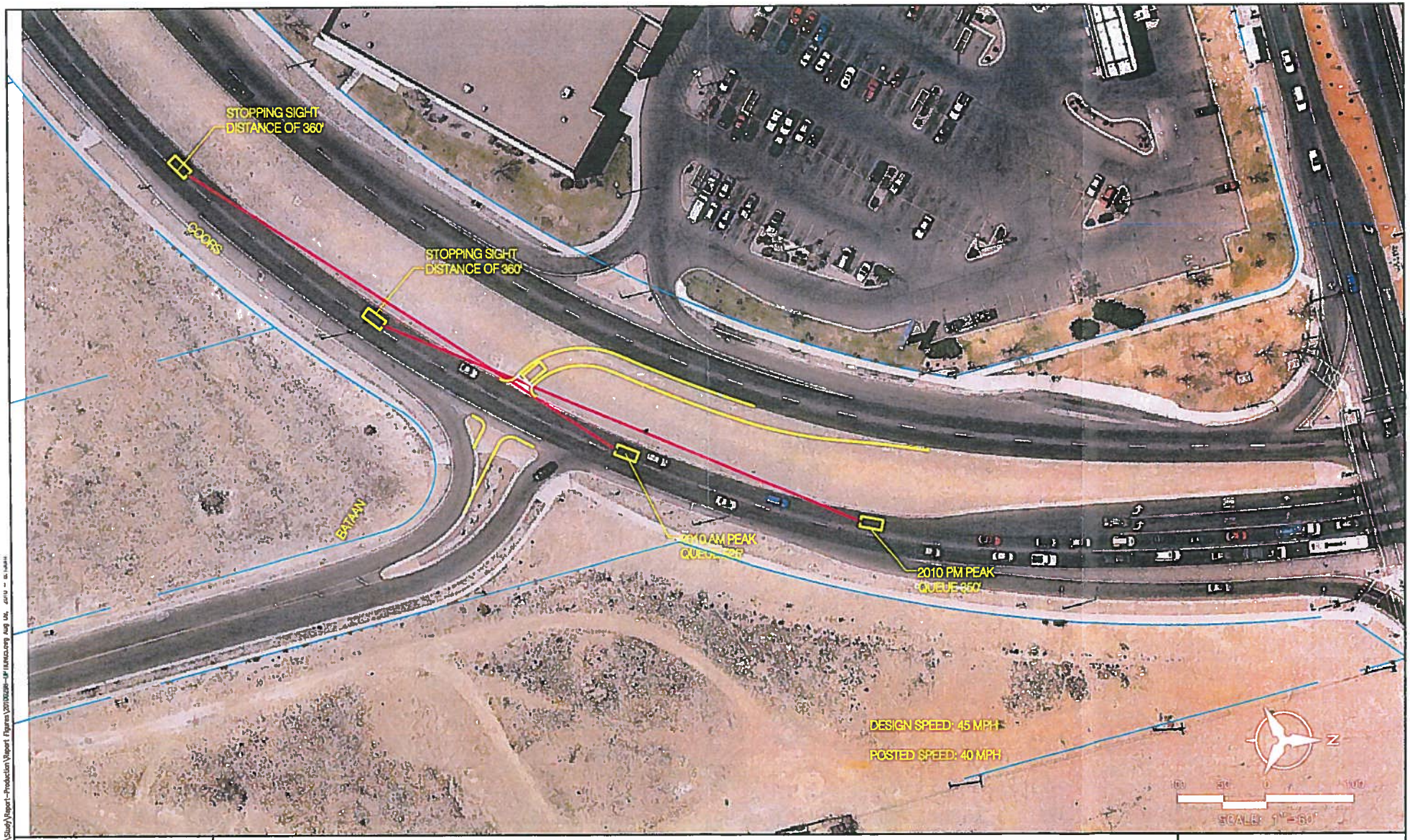

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FIGURE 11
45 MPH DESIGN SPEED SIGHT REQUIREMENTS FOR LEFT TURN BAY AT BATAAN DRIVE

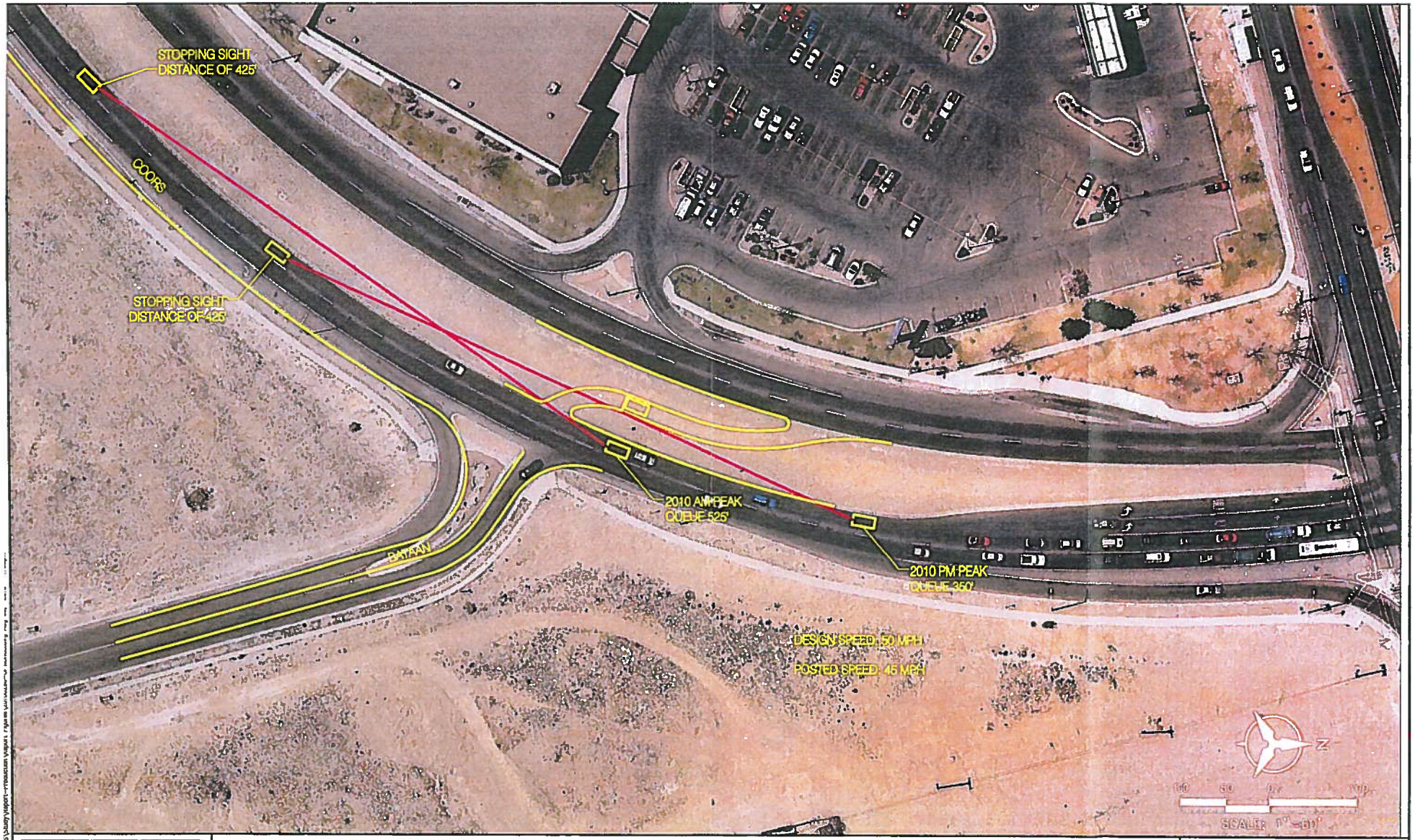

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FIGURE 10
50 MPH DESIGN SPEED REQUIREMENTS FOR LEFT TURN BAY AT BATAAN DRIVE

APPENDIX A

EXISTING TURNING MOVEMENT COUNTS

Turning Movement Count Data

Date: 12/5/2006 **Day:** Tuesday

E-W Street: Central Ave **N-S-Street:** Coors Blvd

AM Peak Period

	Eastbound					Westbound					Northbound					Southbound					
Time	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	Sum
6:30-6:45					0					0					0					0	0
6:45-7:00	23	104	6	4	133	7	38	52	4	101	22	217	25	11	275	36	118	21	3	178	687
7:00-7:15	59	120	11	5	190	13	44	57	5	119	24	247	29	14	314	51	110	23	8	192	815
7:15-7:30	55	185	9	4	249	13	63	63	2	141	27	309	39	6	381	69	150	36	4	259	1030
7:30-7:45	68	198	19	5	285	10	68	48	7	133	16	287	51	10	364	80	153	23	2	258	1040
7:45-8:00	40	154	13	7	207	9	72	65	4	150	19	174	33	3	229	86	144	38	8	276	862
8:00-8:15	54	136	13	8	203	12	68	48	4	132	16	158	27	4	205	60	148	37	11	256	796
8:15-8:30	35	101	18	7	154	11	71	59	5	146	15	148	18	10	191	47	122	22	6	197	688
8:30-8:45	41	116	9	10	166	13	61	53	5	132	9	138	22	8	177	65	115	32	10	222	697
8:45-9:00					0					0					0					0	0
Peak Hour	222	657	52	21	**931**	45	247	233	18	**543**	86	1017	152	33	**1288**	286	557	120	22	**985**	3747
PHF	0.82	0.83	0.68	0.75	**0.82**	0.87	0.86	0.90	0.64	**0.91**	0.80	0.82	0.75	0.59	**0.85**	0.83	0.91	0.79	0.69	**0.89**	**0.90**
Trucks				21	2%				18	3%				33	3%				22	2%	3%

PM Peak Period

	Eastbound					Westbound					Northbound					Southbound					
Time	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	LT	TH	RT	Tr	Sum	Sum
4:00-4:15	47	121	25	4	197	20	164	82	5	271	46	151	0	3	200	125	263	17	7	412	1080
4:15-4:30	50	101	26	5	182	38	180	87	3	308	37	159	0	3	196	112	233	26	6	377	1063
4:30-4:45	64	136	21	6	227	34	173	82	3	292	68	137	0	4	205	97	227	37	5	366	1090
4:45-5:00	57	117	22	1	197	44	193	95	3	335	70	173	0	0	243	139	228	45	3	415	1190
5:00-5:15	61	117	32	4	214	47	203	99	4	353	60	180	0	4	240	110	254	37	2	403	1210
5:15-5:30	62	125	30	2	219	41	216	73	0	330	61	176	3	2	240	107	259	26	6	398	1187
5:30-5:45	51	106	14	4	175	39	218	91	7	355	58	126	16	1	200	98	261	26	2	387	1117
5:45-6:00	57	105	36	2	200	40	237	75	7	359	53	113	6	3	172	97	234	25	3	359	1090
6:00-6:15					0					0					0					0	0
6:15-6:30					0					0					0					0	0
Peak Hour	231	465	98	11	**805**	171	830	358	14	**1373**	249	655	19	7	**923**	454	1002	134	13	**1603**	4704
PHF	0.93	0.93	0.77	0.69	**0.92**	0.91	0.95	0.90	0.50	**0.97**	0.89	0.91	0.30	0.44	**0.95**	0.82	0.96	0.74	0.54	**0.97**	**0.97**
Trucks				11	1%				14	1%				7	1%				13	1%	1%

Bataan @ Coors

Turning Movement Count Data

Date: 9/28/2004 **Day:** Tuesday

E-W Street: Coors Blvd **N-S-Street:** Bataan Dr

AM Peak Period

	Eastbound (Coors NB)					Westbound (Coors SB)					Northbound					Southbound					
Time	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**Sum**
6:30-6:45					0					0					0					0	**0**
6:45-7:00					0					0					0					0	**0**
7:00-7:15		370	1		371		196			196			16		16					0	**583**
7:15-7:30		338	2		340		196			196			28		28					0	**564**
7:30-7:45		298	1		299		186			186			24		24					0	**509**
7:45-8:00		290	1		291		166			166			30		30					0	**487**
8:00-8:15		253	0		253		181			181			16		16					0	**450**
8:15-8:30		224	0		224		158			158			13		13					0	**395**
8:30-8:45		276	0		276		153			153			11		11					0	**440**
8:45-9:00		228	0		228		143			143			13		13					0	**384**
Peak Hour	0	1296	5	0	**1301**	0	744	0	0	**744**	0	0	98	0	**98**	0	0	0	0	**0**	**2143**
PHF	#####	0.88	0.63	#####	**0.88**	#####	0.95	#####	#####	**0.95**	#####	#####	0.82	#####	**0.82**	#####	#####	#####	#####	#####	**0.92**
Trucks				0	0%				0	0%				0	0%				0	#####	**0%**

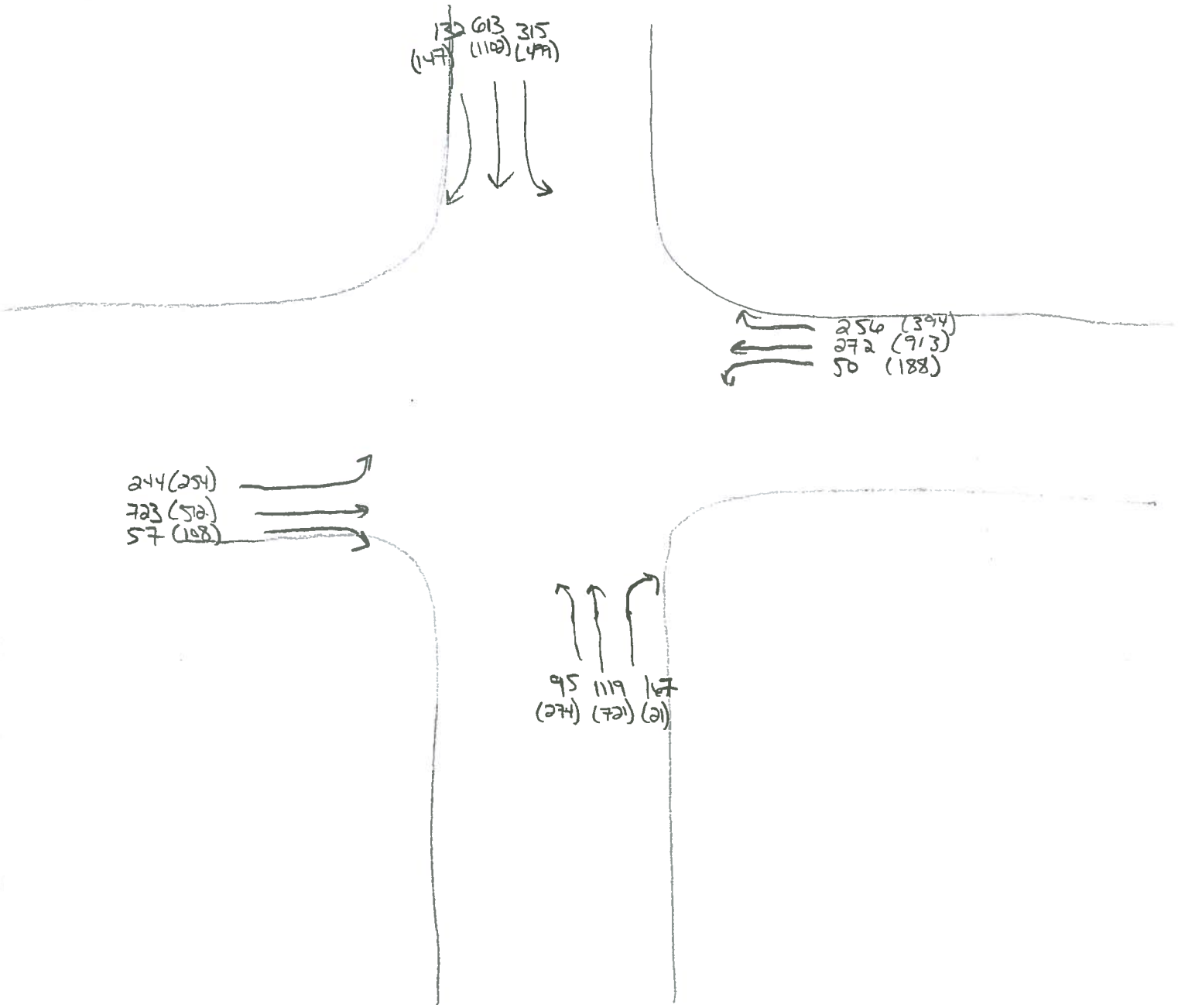
PM Peak Period

	Eastbound (Coors NB)					Westbound (Coors SB)					Northbound					Southbound					
Time	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**LT**	**TH**	**RT**	**Tr**	**Sum**	**Sum**
4:00-4:15		282	1		283		251			251			16		16					0	**550**
4:15-4:30		322	0		322		230			230			17		17					0	**569**
4:30-4:45		304	2		306		0			0			18		18					0	**324**
4:45-5:00		271	1		272		268			268			21		21					0	**561**
5:00-5:15		368	0		368		312			312			14		14					0	**694**
5:15-5:30		301	1		302		298			298			21		21					0	**621**
5:30-5:45		307	0		307		271			271			24		24					0	**602**
5:45-6:00		285	0		285		292			292			13		13					0	**590**
6:00-6:15					0					0					0					0	**0**
6:15-6:30					0					0					0					0	**0**
Peak Hour	0	1261	1	0	**1262**	0	1173	0	0	**1173**	0	0	72	0	**72**	0	0	0	0	**0**	**2507**
PHF	#####	0.86	0.25	#####	**0.86**	#####	0.94	#####	#####	**0.94**	#####	#####	0.75	#####	**0.75**	#####	#####	#####	#####	#####	**0.90**
Trucks				0	0%				0	0%				0	0%				0	#####	**0%**

APPENDIX B

2010 NO BUILD INTERSECTION CAPACITY ANALYSIS

Central / Coors
2010 No Build
Am Peak
(Pm Peak)



Bohannan Huston Inc.

PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

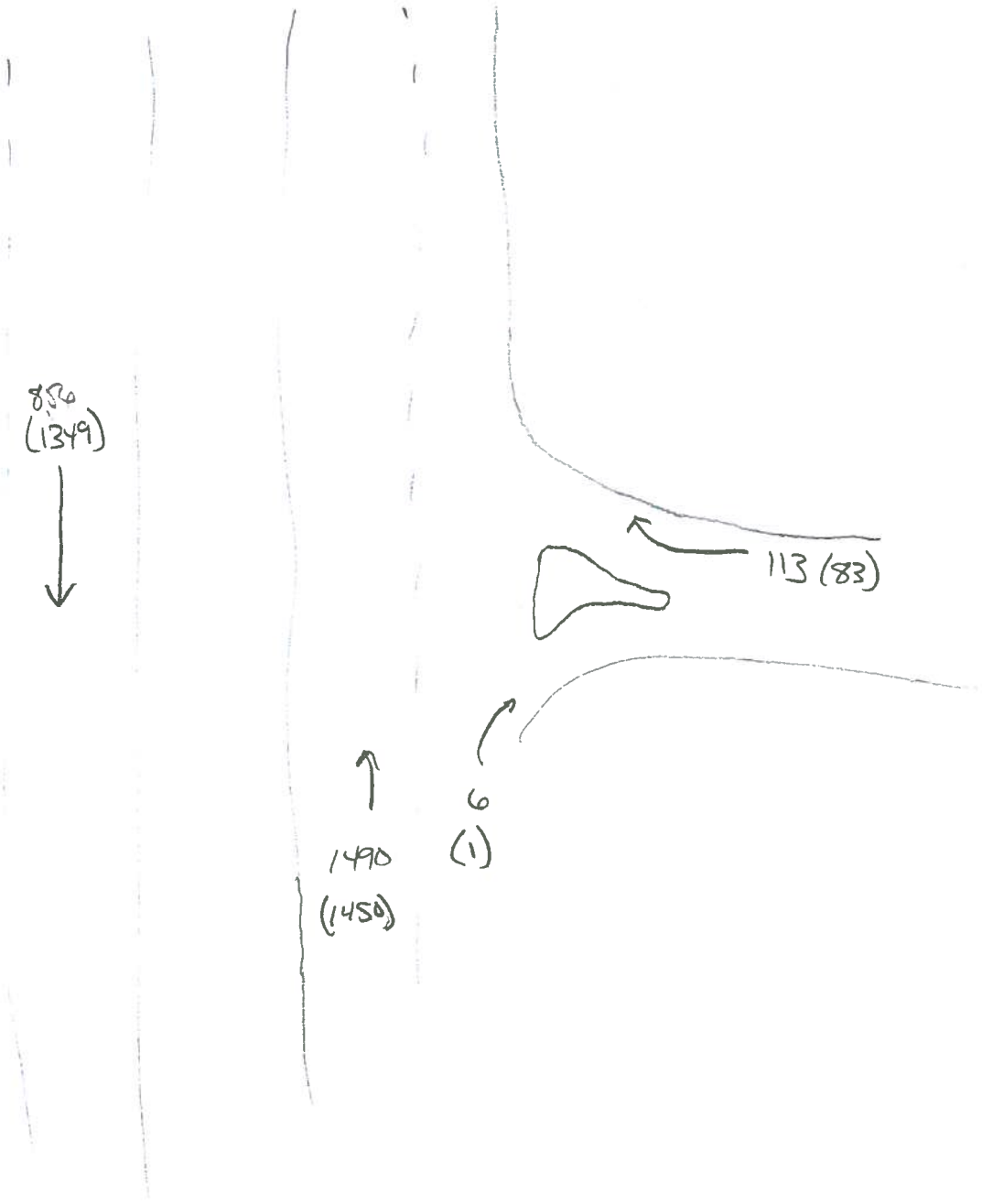
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	723	57	50	272	256	95	1119	167	315	613	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.36	1.00	1.00	0.21	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	677	3539	1583	390	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.82	0.82	0.82	0.91	0.91	0.91	0.85	0.85	0.85	0.89	0.89	0.89
Adj. Flow (vph)	298	882	70	55	299	281	112	1316	196	354	689	148
RTOR Reduction (vph)	0	0	33	0	0	153	0	0	8	0	0	38
Lane Group Flow (vph)	298	882	37	55	299	128	112	1316	188	354	689	110
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	37.0	29.0	29.0	23.1	19.1	19.1	7.6	44.3	48.3	12.9	49.6	49.6
Effective Green, g (s)	37.0	29.0	29.0	23.1	19.1	19.1	7.6	44.3	48.3	12.9	49.6	49.6
Actuated g/C Ratio	0.35	0.27	0.27	0.22	0.18	0.18	0.07	0.42	0.45	0.12	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	379	966	432	137	636	285	246	1476	780	417	1653	739
v/s Ratio Prot	c0.10	c0.25		0.02	0.08		0.03	c0.37	0.01	c0.10	0.19	
v/s Ratio Perm	0.17		0.02	0.07		0.08			0.11			0.07
v/c Ratio	0.79	0.91	0.09	0.40	0.47	0.45	0.46	0.89	0.24	0.85	0.42	0.15
Uniform Delay, d1	27.6	37.4	28.7	34.4	39.0	38.9	47.3	28.7	17.7	45.7	18.7	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.3	12.7	0.1	1.9	0.6	1.1	1.3	7.2	0.2	14.8	0.2	0.1
Delay (s)	37.9	50.0	28.8	36.3	39.6	40.0	48.7	35.9	17.9	60.5	18.9	16.3
Level of Service	D	D	C	D	D	D	D	D	B	E	B	B
Approach Delay (s)		46.0			39.5			34.6			30.9	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	37.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	106.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	254	512	108	188	913	394	274	721	21	499	1102	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.16	1.00	1.00	0.24	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	297	3539	1583	451	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.97	0.97	0.97	0.95	0.95	0.95	0.97	0.97	0.97
Adj. Flow (vph)	276	557	117	194	941	406	288	759	22	514	1136	152
RTOR Reduction (vph)	0	0	87	0	0	207	0	0	13	0	0	26
Lane Group Flow (vph)	276	557	30	194	941	199	288	759	9	514	1136	126
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	35.1	25.1	25.1	38.9	27.0	27.0	10.0	29.9	41.8	16.0	35.9	35.9
Effective Green, g (s)	35.1	25.1	25.1	38.9	27.0	27.0	10.0	29.9	41.8	16.0	35.9	35.9
Actuated g/C Ratio	0.35	0.25	0.25	0.39	0.27	0.27	0.10	0.30	0.42	0.16	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	254	898	402	336	966	432	347	1070	733	555	1285	575
v/s Ratio Prot	c0.11	0.16		c0.07	0.27		0.08	0.21	0.00	c0.15	c0.32	
v/s Ratio Perm	c0.28		0.02	0.16		0.13			0.00			0.08
v/c Ratio	1.09	0.62	0.07	0.58	0.97	0.46	0.83	0.71	0.01	0.93	0.88	0.22
Uniform Delay, d1	27.7	32.7	28.1	21.4	35.6	29.9	43.6	30.6	16.6	40.9	29.5	21.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	81.5	1.3	0.1	2.4	22.7	0.8	15.1	2.2	0.0	21.5	7.5	0.2
Delay (s)	109.1	34.0	28.1	23.8	58.3	30.7	58.7	32.8	16.6	62.4	37.1	22.0
Level of Service	F	C	C	C	E	C	E	C	B	E	D	C
Approach Delay (s)		55.1			46.7			39.5			43.0	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM Average Control Delay	45.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	98.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Coors / Bataan
2010 No Build
AM Peak
(PM Peak)



Bohannan Huston INC.

PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	113	1490	6	0	856
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	0	138	1620	7	0	901
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						599
pX, platoon unblocked	0.88					
vC, conflicting volume	2070	810			1626	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1941	810			1626	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	57			100	
cM capacity (veh/h)	50	323			396	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	138	810	810	7	0	451	451
Volume Left	0	0	0	0	0	0	0
Volume Right	138	0	0	7	0	0	0
cSH	323	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.43	0.48	0.48	0.00	0.00	0.27	0.27
Queue Length 95th (ft)	51	0	0	0	0	0	0
Control Delay (s)	24.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C						
Approach Delay (s)	24.2	0.0			0.0		
Approach LOS	C						

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	83	1450	1	0	1349
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.90	0.90	0.95	0.95
Hourly flow rate (vph)	0	111	1611	1	0	1420
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						599
pX, platoon unblocked	0.69					
vC, conflicting volume	2321	806			1612	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2020	806			1612	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	66			100	
cM capacity (veh/h)	35	325			401	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	111	806	806	1	0	710	710
Volume Left	0	0	0	0	0	0	0
Volume Right	111	0	0	1	0	0	0
cSH	325	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.34	0.47	0.47	0.00	0.00	0.42	0.42
Queue Length 95th (ft)	37	0	0	0	0	0	0
Control Delay (s)	21.7	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C						
Approach Delay (s)	21.7	0.0			0.0		
Approach LOS	C						

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX C

TRIP DISTRIBUTION AND ASSIGNMENT

Shopping 820

25.3

Average

$Ln(T) = .67(x) + 5.83$

$Ln(T) = .67(25.3) + 5.83$

$T = 2779$

Entering 50% = 1390

Exit 50% = 1389

Peak Hour AM

$Ln(T) = .59\,Ln(x) + 2.32$

$Ln(T) = .59\,Ln(25.3) + 2.32$

$T = 68$

Entering 61% = 41

Exit 39% = 27

Peak Hour PM

$Ln(T) = .67\,Ln(x) + 3.37$

$Ln(T) = .67\,Ln(25.3) + 3.37$

$T = 253$

Entering 49% = 124

Exit 51% = 129

High-Turnover Restaurant 932

$\frac{6000}{1000} = 6$

Average

6 * 127.15 = 763

Entering 50% = 381
Exit 50% = 382

Peak Hour AM

6 * 11.52 = 69

Entering 52% = 36
Exit 48% = 33

Peak Hour PM

6 * 11.15 = 67

Entering 59% = 40
Exit 41% = 27

20100122
Report

Single Dwelling #210

8th

Average

6 * 9.57 = 57.42 (58)

enter 50% = 29
exit 50% = 29

Peak hour Am

6 * .175 = 4.5 (5)
Enter .25% = 1
Exit 75% = 4 < 5

Peak hour Pm

6 * 1.01 = 6.06 (6)

Enter 63% = 4 < 6
Exit 37% = 2

20100296
- Trans
- study
- study Info

Admin / trans / propro / TIA Temp

105

Multi Family

D.U. 64
+48
112

Iverson Equation

$T = 6.06(x) + 123.56$

$= 6.06(112) + 123.56$

$T = 802$

Entering 50% = 401

Exit 50% = 401

Peak Hour AM

$T = .49(x) + 3.73$

$T = .49(112) + 3.73$

$T = 58.61$ (59)

Entering 20% = 12 > 59

Exit 80% = 47

Peak Hour PM

$T = .55(x) + 17.65$

$= .55(112) + 17.65$

$= 79.25$ (79)

Entering 65% = 51

Exit 35% = 28

General Offic 710

43.7

Average

$Ln(T) = .77\ Ln(x) + 3.65$

$Ln(T) = .77\ Ln(43.7) + 3.65$

$T = 705$

Entering 50% = 353

Exit 50% = 352

Peak Hour Am

$Ln(T) = .80\ Ln(x) + 1.55$

$Ln(T) = .80\ Ln(43.7) + 1.55$

$T = 97$

Entering 88% = 85

Exit 12% = 12

Peak Hour Pm

$T = 1.12(x) + 78.91$

$T = 1.12(43.7) + 78.91$

$T = 127.75$ (128)

Entering 17% = 22

Exit 83% = 106

APPENDIX D

TURNING MOVEMENT TABULATION

COORS-BATAAN TRAFFIC ANALYSIS
EXISTING & PROJECTED TURNING MOVEMENTS

INTERSECTION: Coors & Central

AM Peak Hour

	Southbound Coors			Westbound Central			Northbound Coors			Eastbound Central		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Existing Volumes (2006)	286	557	120	45	247	233	86	1,017	152	222	657	52
Background Growth (2006-2010)	29	56	12	5	25	23	9	102	15	22	66	5
Approved Development*												
2010 No Build	315	613	132	50	272	256	95	1,119	167	244	723	57
Residential Enter		6		3								1
Residential Exit							4	25				
Office Enter		47		10								10
Office Exit							1	7				
Retail Enter	14	14									5	5
Retail Exit					4	11	4	11				
2010 Build	329	681	132	63	275	268	103	1,161	167	244	728	72
PHF	*0.890*			*0.910*			*0.850*			*0.820*		
HV %		*2*			*6*			*4*			*0*	

PM Peak Hour

	Southbound Coors			Westbound Central			Northbound Coors			Eastbound Central		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Existing Volumes (2006)	454	1,002	134	171	830	358	249	655	19	231	465	98
Background Growth (2006-2010)	45	100	13	17	83	36	25	66	2	23	47	10
Approved Development*												
2010 No Build	499	1,102	147	188	913	394	274	721	21	254	512	108
Residential Enter		27		13								1
Residential Exit							2	15				
Office Enter		12		3								2
Office Exit							12	59				
Retail Enter	31	31									10	10
Retail Exit					10	29	10	29				
2010 Build	530	1,172	147	204	923	423	298	823	21	254	522	124
PHF	*0.970*			*0.970*			*0.950*			*0.920*		
HV %		*2.000*			*1.000*			*1.000*			*0.000*	

growth rates	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	
Trip Distribution % Enter		48.6%		24.0%								6.9%	Residential
Trip Distribution % Exit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.9%	48.6%	0.0%	0.0%	0.0%	0.0%	
Trip Distribution % Enter		55.7%		12.0%								11.2%	Office
Trip Distribution % Exit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.2%	55.7%	0.0%	0.0%	0.0%	0.0%	
Trip Distribution % Enter	18.8%	18.8%									6.3%	6.2%	Retail
Trip Distribution % Exit	0.0%	0.0%	0.0%	0.0%	6.3%	18.8%	6.2%	18.8%	0.0%	0.0%	0.0%	0.0%	

COORS-BATAAN TRAFFIC ANALYSIS
EXISTING & PROJECTED TURNING MOVEMENTS

INTERSECTION: Coors & Bataan

AM Peak Hour

	Southbound Coors			Westbound Bataan			Northbound Coors			Eastbound Bataan		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Existing Volumes (2004)	0	744	0	0	0	98	0	1,296	5	0	0	0
Background Growth (2004-2010)	0	112	0	0	0	15	0	194	1	0	0	0
Approved Development*												
2010 No Build	0	856	0	0	0	113	0	1,490	6	0	0	0
Residential Enter	10								0			
Residential Exit						28						
Office Enter	67								12			
Office Exit						8						
Retail Enter	19								30			
Retail Exit						15						
2010 Build	97	856	0	0	0	164	0	1,490	49	0	0	0
PHF	*0.950*			*0.820*			*0.880*			*0.910*		
HV %		*0*			*0*			*6*			*1*	

PM Peak Hour

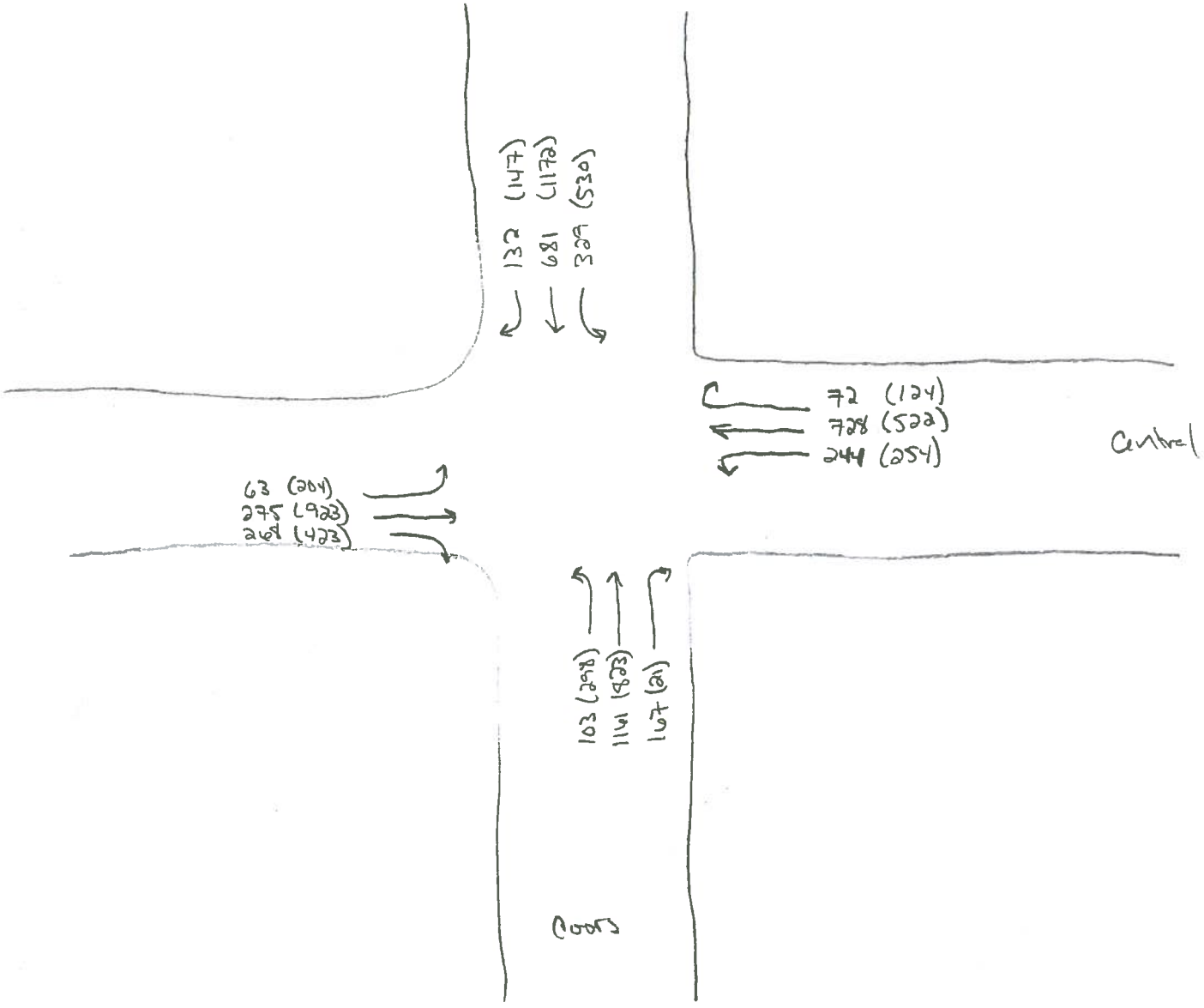
	Southbound Coors			Westbound Bataan			Northbound Coors			Eastbound Bataan		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Existing Volumes (2004)	0	1,173	0	0	0	72	0	1,261	1	0	0	0
Background Growth (2004-2010)	0	176	0	0	0	11	0	189	0	0	0	0
Approved Development*												
2010 No Build	0	1,349	0	0	0	83	0	1,450	1	0	0	0
Residential Enter	44								2			
Residential Exit						17						
Office Enter	17								3			
Office Exit						71						
Retail Enter	41								64			
Retail Exit						39						
2010 Build	102	1,349	0	0	0	209	0	1,450	70	0	0	0
PHF	*0.940*			*0.750*			*0.860*			*0.760*		
HV %					*5.000*			*5.000*			*5.000*	

growth rates	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	
Trip Distribution % Enter	79.5%								2.8%				Residential
Trip Distribution % Exit	0.0%	0.0%	0.0%	0.0%	0.0%	55.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Trip Distribution % Enter	78.9%								14.7%				Office
Trip Distribution % Exit	0.0%	0.0%	0.0%	14.7%	0.0%	66.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Trip Distribution % Enter	25.0%								39.2%				Retail
Trip Distribution % Exit	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

APPENDIX E

2010 BUILD INTERSECTION CAPACITY ANALYSIS

Central / cars
2010 Build
Am Peak
(Pm Peak)



Bohannan Huston INC.

PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

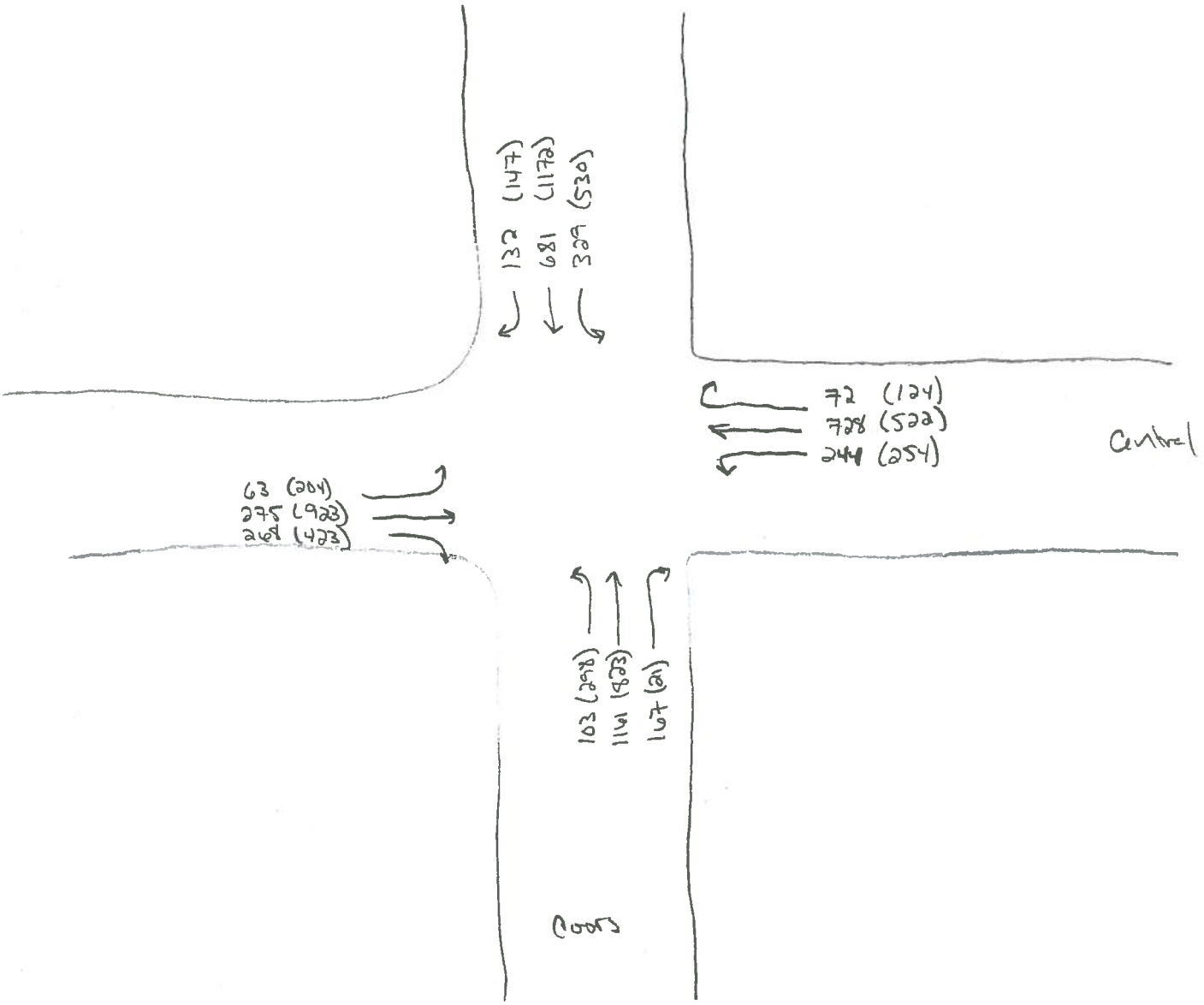
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	728	72	63	275	268	103	1161	167	329	681	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.36	1.00	1.00	0.21	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	669	3539	1583	386	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.82	0.82	0.82	0.91	0.91	0.91	0.85	0.85	0.85	0.89	0.89	0.89
Adj. Flow (vph)	298	888	88	69	302	295	121	1366	196	370	765	148
RTOR Reduction (vph)	0	0	41	0	0	151	0	0	7	0	0	34
Lane Group Flow (vph)	298	888	47	69	302	144	121	1366	189	370	765	114
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	37.2	29.2	29.2	23.3	19.3	19.3	7.7	45.4	49.4	13.0	50.7	50.7
Effective Green, g (s)	37.2	29.2	29.2	23.3	19.3	19.3	7.7	45.4	49.4	13.0	50.7	50.7
Actuated g/C Ratio	0.35	0.27	0.27	0.22	0.18	0.18	0.07	0.42	0.46	0.12	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	960	430	135	635	284	246	1493	786	415	1668	746
v/s Ratio Prot	c0.10	c0.25		0.02	0.09		0.04	c0.39	0.01	c0.11	0.22	
v/s Ratio Perm	0.17		0.03	0.09		0.09			0.11			0.07
v/c Ratio	0.80	0.92	0.11	0.51	0.48	0.51	0.49	0.91	0.24	0.89	0.46	0.15
Uniform Delay, d1	28.4	38.1	29.4	35.3	39.6	39.9	48.1	29.3	17.7	46.6	19.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.2	14.2	0.1	3.2	0.6	1.4	1.5	9.0	0.2	20.6	0.2	0.1
Delay (s)	39.6	52.3	29.6	38.5	40.2	41.3	49.6	38.3	17.9	67.3	19.4	16.3
Level of Service	D	D	C	D	D	D	D	D	B	E	B	B
Approach Delay (s)		47.8			40.5			36.7			32.8	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	107.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX E

2010 BUILD INTERSECTION CAPACITY ANALYSIS

Central / Coors
2010 Build
Am Peak
(Pm Peak)



Bohannan Huston INC.

PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

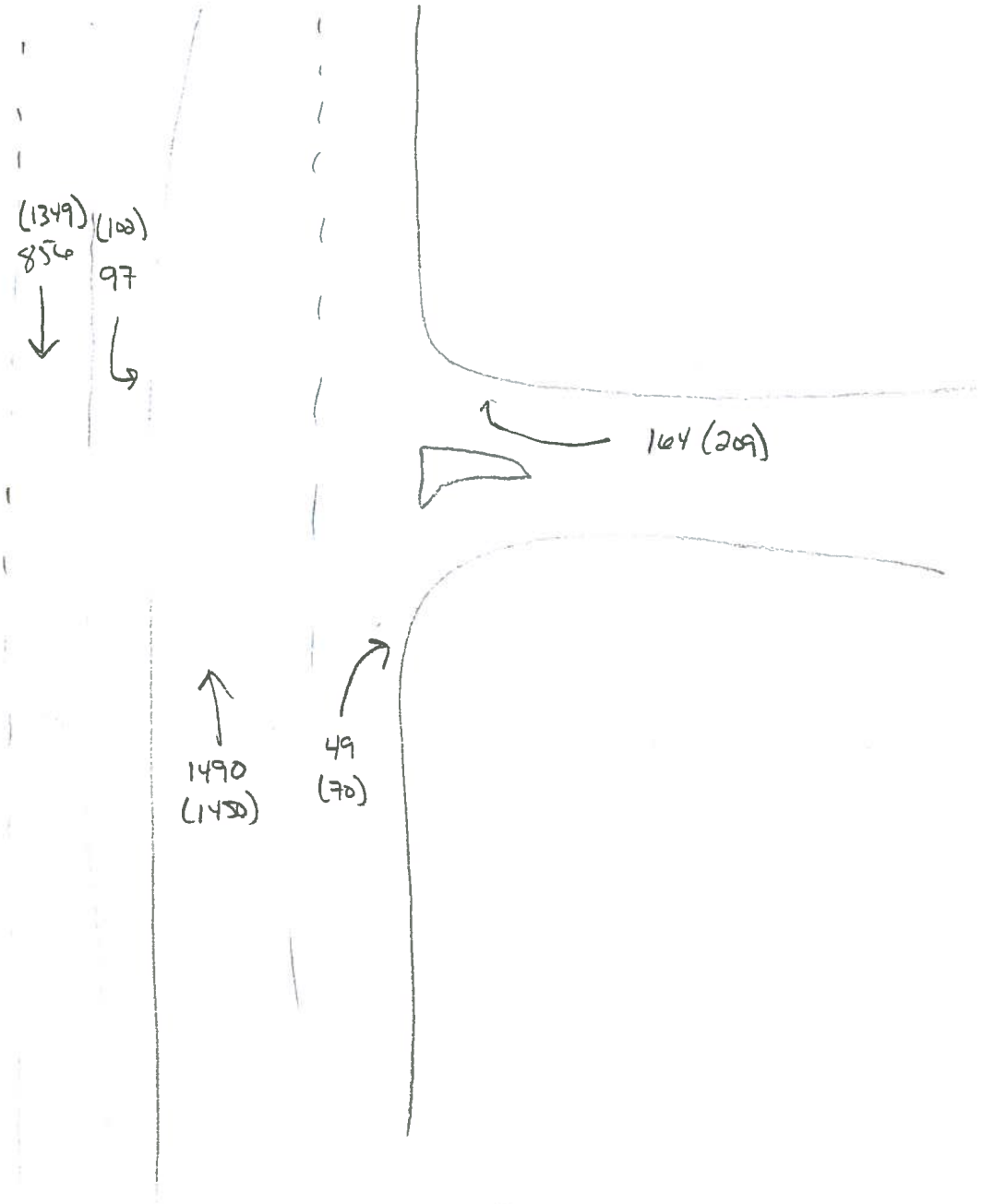
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	244	728	72	63	275	268	103	1161	167	329	681	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.36	1.00	1.00	0.21	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	669	3539	1583	386	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.82	0.82	0.82	0.91	0.91	0.91	0.85	0.85	0.85	0.89	0.89	0.89
Adj. Flow (vph)	298	888	88	69	302	295	121	1366	196	370	765	148
RTOR Reduction (vph)	0	0	41	0	0	151	0	0	7	0	0	34
Lane Group Flow (vph)	298	888	47	69	302	144	121	1366	189	370	765	114
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	37.2	29.2	29.2	23.3	19.3	19.3	7.7	45.4	49.4	13.0	50.7	50.7
Effective Green, g (s)	37.2	29.2	29.2	23.3	19.3	19.3	7.7	45.4	49.4	13.0	50.7	50.7
Actuated g/C Ratio	0.35	0.27	0.27	0.22	0.18	0.18	0.07	0.42	0.46	0.12	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	960	430	135	635	284	246	1493	786	415	1668	746
v/s Ratio Prot	c0.10	c0.25		0.02	0.09		0.04	c0.39	0.01	c0.11	0.22	
v/s Ratio Perm	0.17		0.03	0.09		0.09			0.11			0.07
v/c Ratio	0.80	0.92	0.11	0.51	0.48	0.51	0.49	0.91	0.24	0.89	0.46	0.15
Uniform Delay, d1	28.4	38.1	29.4	35.3	39.6	39.9	48.1	29.3	17.7	46.6	19.2	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.2	14.2	0.1	3.2	0.6	1.4	1.5	9.0	0.2	20.6	0.2	0.1
Delay (s)	39.6	52.3	29.6	38.5	40.2	41.3	49.6	38.3	17.9	67.3	19.4	16.3
Level of Service	D	D	C	D	D	D	D	D	B	E	B	B
Approach Delay (s)		47.8			40.5			36.7			32.8	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	39.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	107.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	254	522	124	204	923	423	298	823	21	530	1172	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.16	1.00	1.00	0.22	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	303	3539	1583	413	3539	1583	3433	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.97	0.97	0.97	0.95	0.95	0.95	0.97	0.97	0.97
Adj. Flow (vph)	276	567	135	210	952	436	314	866	22	546	1208	152
RTOR Reduction (vph)	0	0	102	0	0	201	0	0	12	0	0	24
Lane Group Flow (vph)	276	567	33	210	952	235	314	866	10	546	1208	128
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		pm+ov	Prot		Perm
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	34.6	24.6	24.6	39.4	27.0	27.0	10.0	30.9	43.3	16.0	36.9	36.9
Effective Green, g (s)	34.6	24.6	24.6	39.4	27.0	27.0	10.0	30.9	43.3	16.0	36.9	36.9
Actuated g/C Ratio	0.35	0.25	0.25	0.39	0.27	0.27	0.10	0.31	0.43	0.16	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	252	871	390	331	956	428	344	1095	750	550	1307	585
v/s Ratio Prot	c0.11	0.16		c0.08	0.27		0.09	0.24	0.00	c0.16	c0.34	
v/s Ratio Perm	c0.27		0.02	0.17		0.15			0.00			0.08
v/c Ratio	1.10	0.65	0.09	0.63	1.00	0.55	0.91	0.79	0.01	0.99	0.92	0.22
Uniform Delay, d1	28.6	33.8	29.0	22.0	36.4	31.2	44.5	31.5	16.1	41.9	30.2	21.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	84.5	1.8	0.1	3.9	27.9	1.4	27.5	4.0	0.0	36.3	11.1	0.2
Delay (s)	113.1	35.5	29.1	25.9	64.3	32.7	72.1	35.5	16.1	78.2	41.2	21.8
Level of Service	F	D	C	C	E	C	E	D	B	E	D	C
Approach Delay (s)		56.5			50.6			44.7			50.3	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM Average Control Delay	50.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	99.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Coors / Bataan
2010 Build
Am Peak
(Pm Peak)



Bohannan Huston Inc.

PROJECT NAME _____ SHEET _____ OF _____
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CH'D _____ DATE _____

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	164	1490	49	97	856
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.82	0.82	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	0	200	1620	53	102	901
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						599
pX, platoon unblocked	0.87					
vC, conflicting volume	2274	810			1673	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2169	810			1673	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	38			73	
cM capacity (veh/h)	26	323			380	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	200	810	810	53	102	451	451
Volume Left	0	0	0	0	102	0	0
Volume Right	200	0	0	53	0	0	0
cSH	323	1700	1700	1700	380	1700	1700
Volume to Capacity	0.62	0.48	0.48	0.03	0.27	0.27	0.27
Queue Length 95th (ft)	97	0	0	0	27	0	0
Control Delay (s)	32.7	0.0	0.0	0.0	17.9	0.0	0.0
Lane LOS	D				C		
Approach Delay (s)	32.7	0.0			1.8		
Approach LOS	D						

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	209	1450	70	102	1349
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.90	0.90	0.95	0.95
Hourly flow rate (vph)	0	279	1611	78	107	1420
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						599
pX, platoon unblocked	0.68					
vC, conflicting volume	2536	806			1689	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2316	806			1689	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	14			71	
cM capacity (veh/h)	15	325			374	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	279	806	806	78	107	710	710
Volume Left	0	0	0	0	107	0	0
Volume Right	279	0	0	78	0	0	0
cSH	325	1700	1700	1700	374	1700	1700
Volume to Capacity	0.86	0.47	0.47	0.05	0.29	0.42	0.42
Queue Length 95th (ft)	193	0	0	0	29	0	0
Control Delay (s)	56.7	0.0	0.0	0.0	18.4	0.0	0.0
Lane LOS	F				C		
Approach Delay (s)	56.7	0.0			1.3		
Approach LOS	F						

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

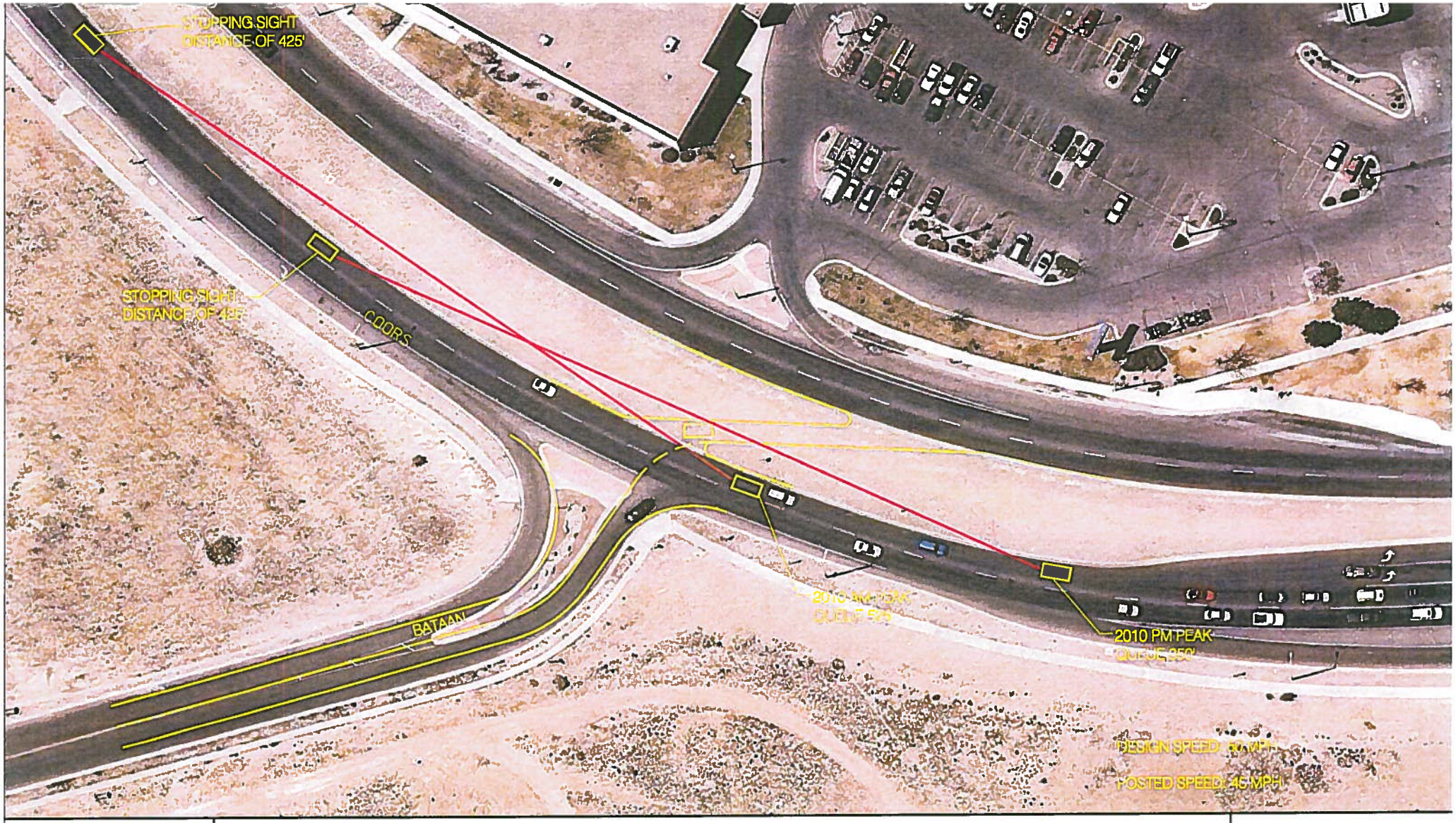
APPENDIX F

2010 BUILD QUEUE ANALYSIS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	298	888	88	69	302	295	121	1366	196	370	765	148
v/c Ratio	0.80	0.92	0.19	0.51	0.48	0.68	0.49	0.92	0.25	0.89	0.46	0.19
Control Delay	46.1	54.6	14.7	41.0	42.8	24.6	56.0	40.2	15.6	71.6	20.4	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.1	54.6	14.7	41.0	42.8	24.6	56.0	40.2	15.6	71.6	20.4	10.2
Queue Length 50th (ft)	164	320	17	33	101	70	43	464	71	135	185	32
Queue Length 95th (ft)	#225	355	48	65	145	169	69	516	109	#218	233	69
Internal Link Dist (ft)		692			237			519			174	
Turn Bay Length (ft)	140		140	150		170	275		300	200		45
Base Capacity (vph)	375	988	482	135	659	444	256	1548	792	416	1713	799
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.90	0.18	0.51	0.46	0.66	0.47	0.88	0.25	0.89	0.45	0.19

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



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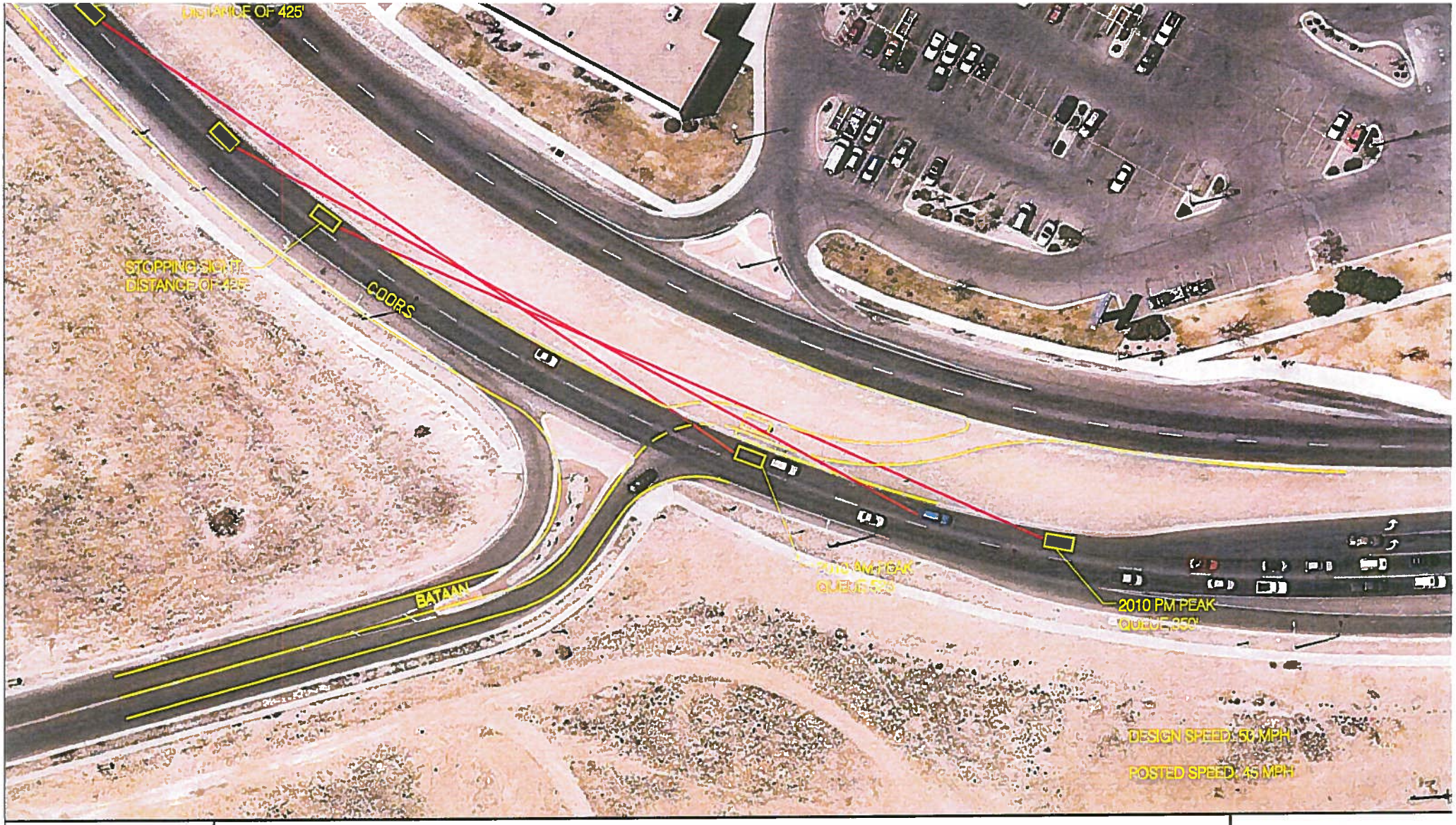

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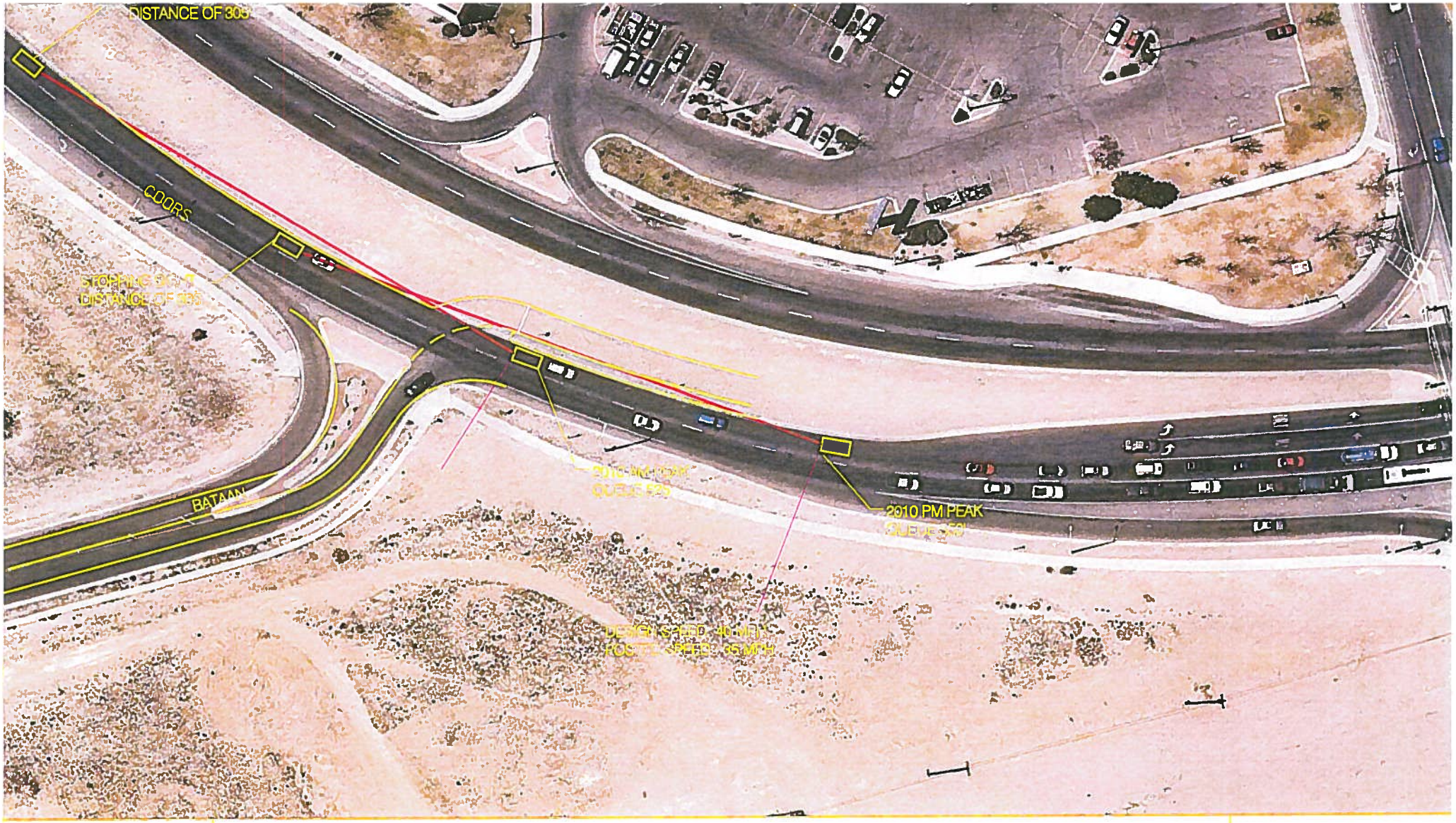

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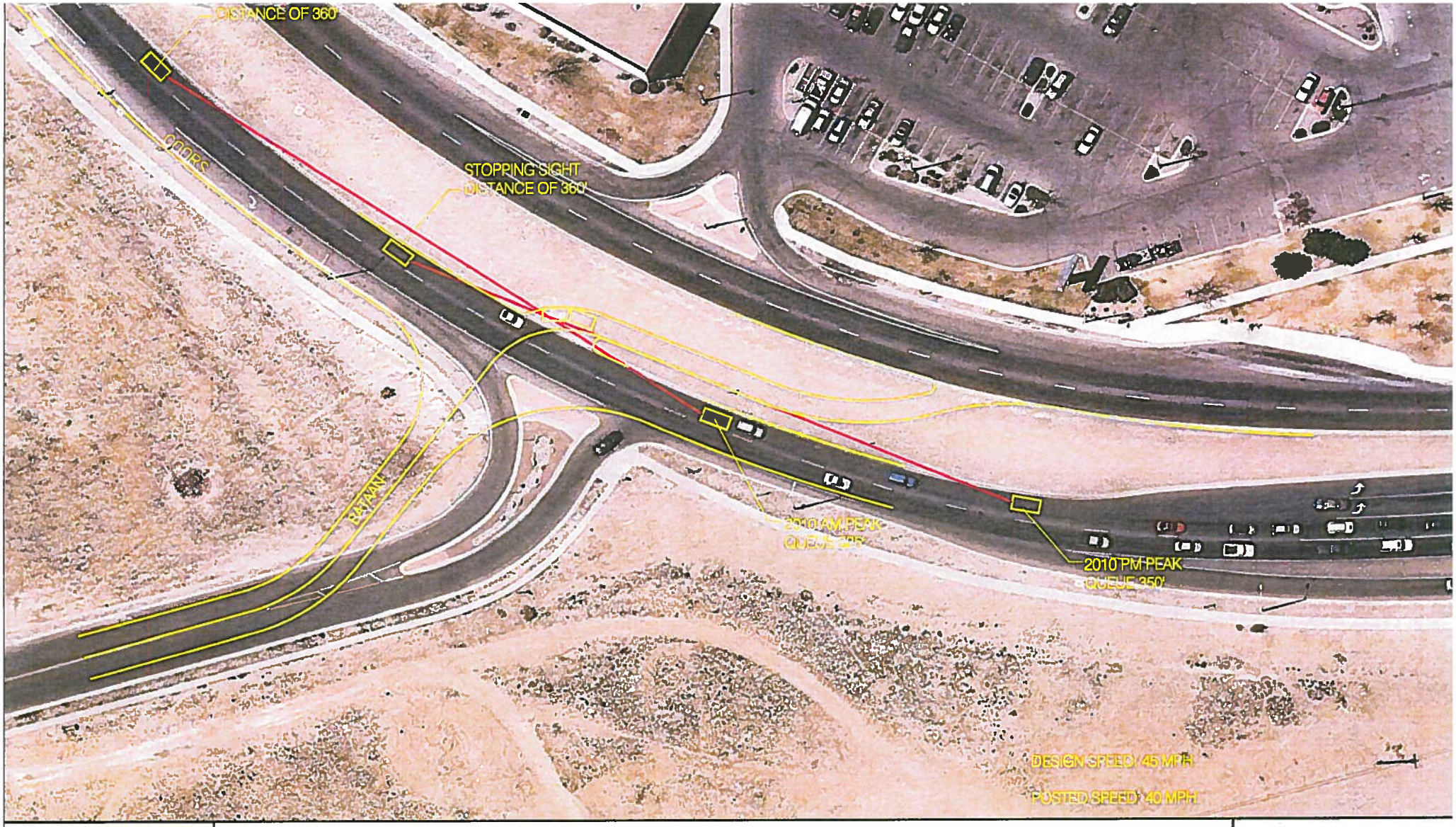

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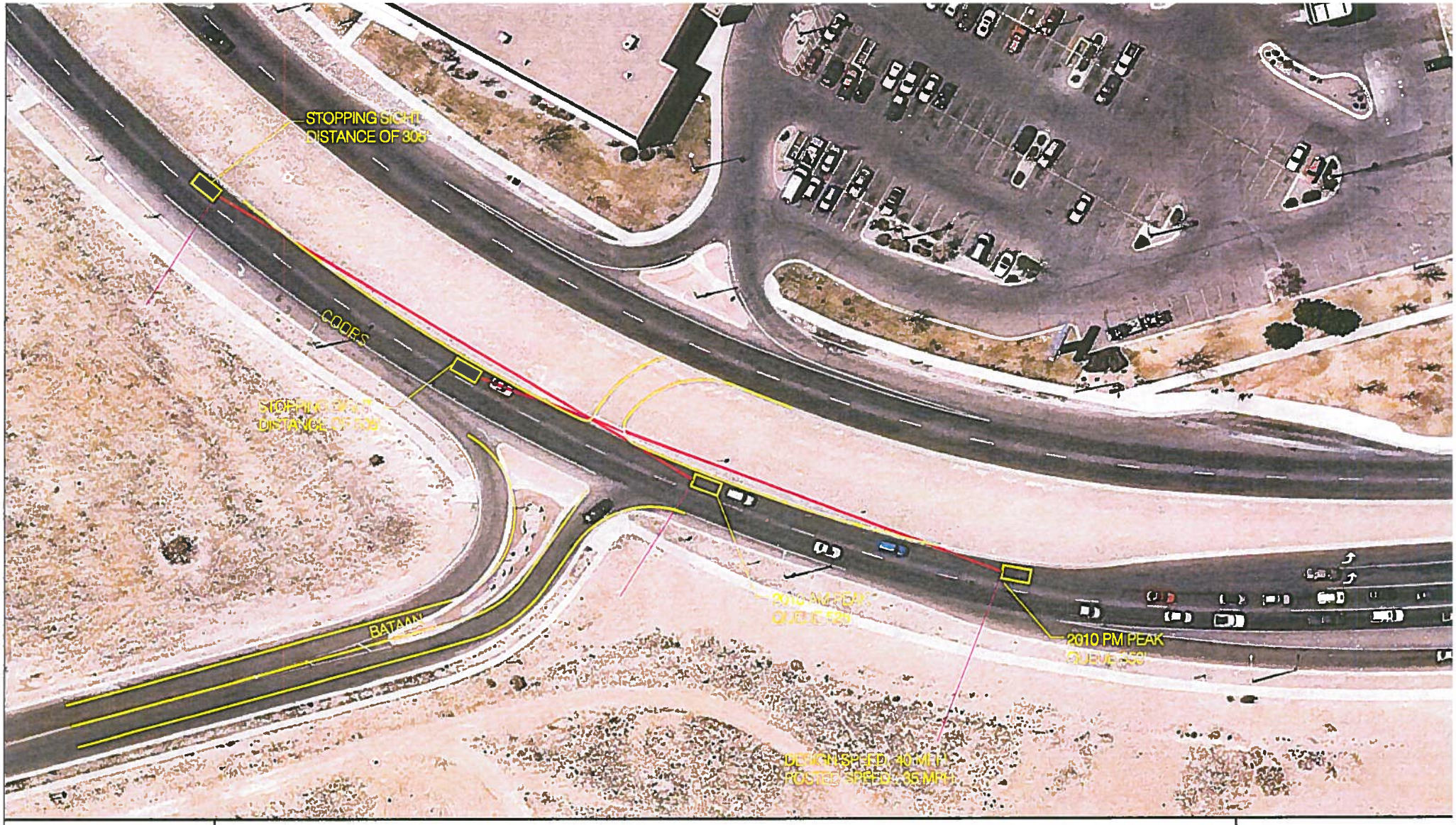

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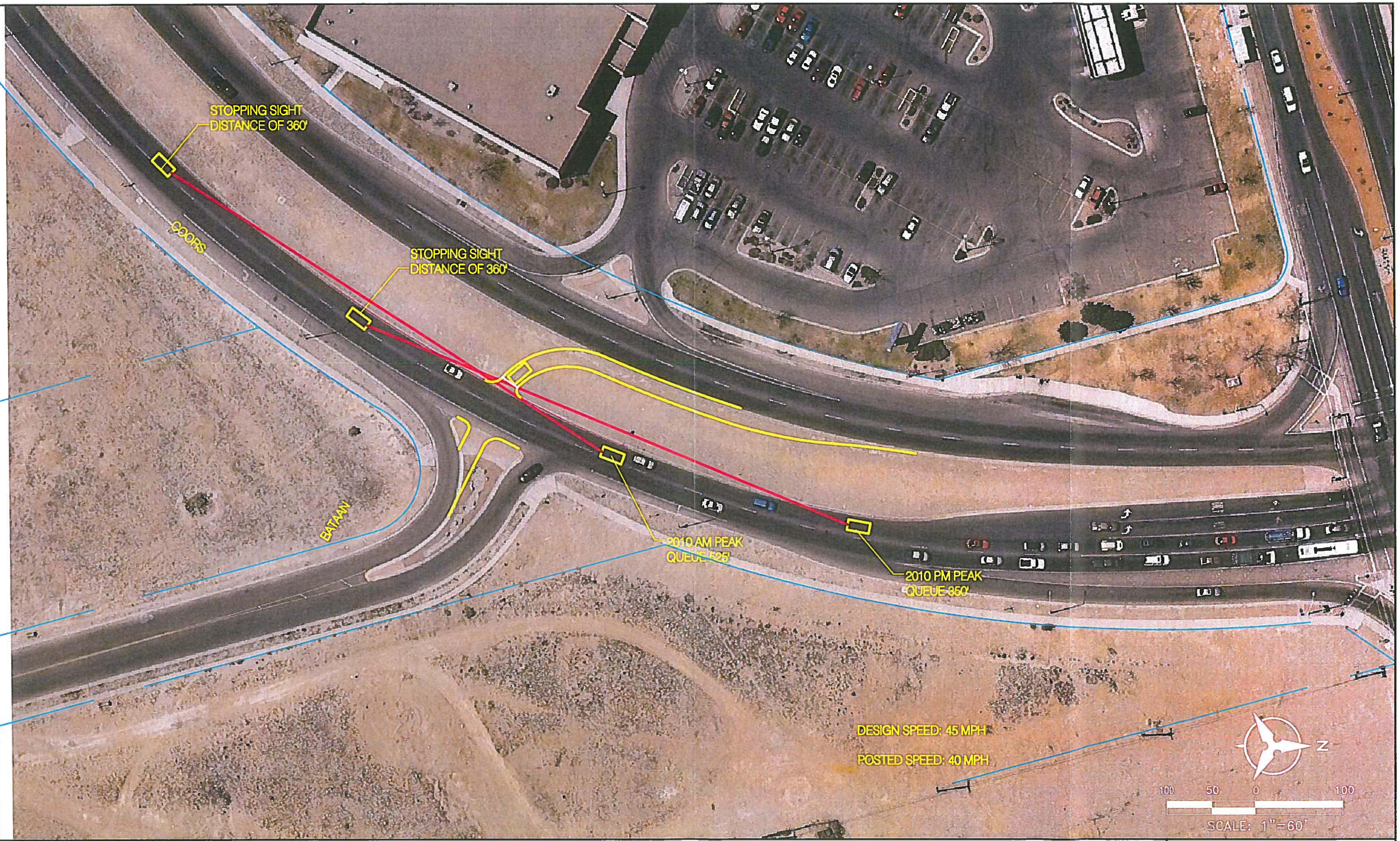

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FIGURE 11
45 MPH DESIGN SPEED SIGHT REQUIREMENTS FOR LEFT TURN BAY AT BATAAN DRIVE

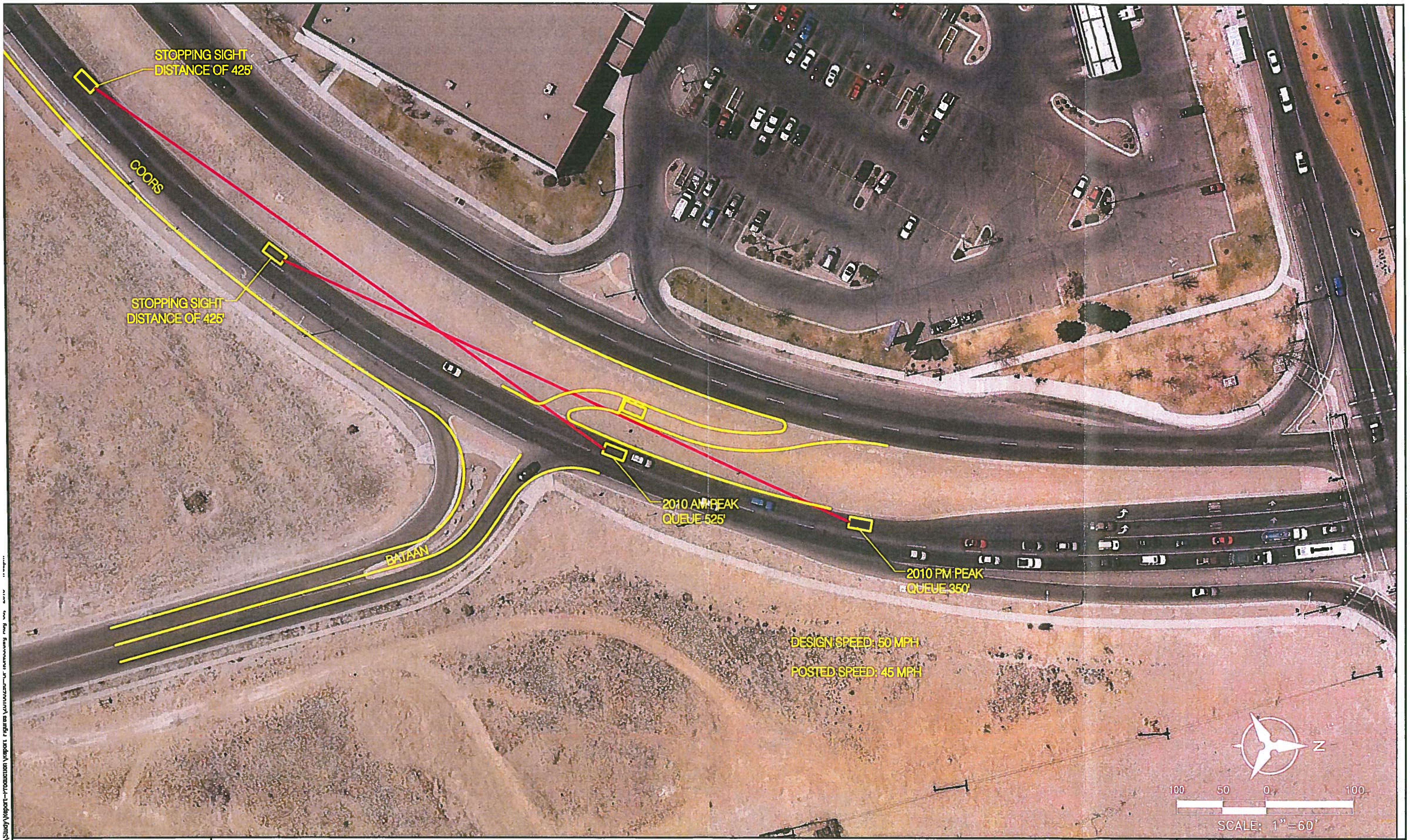

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FIGURE 10
50 MPH DESIGN SPEED
REQUIREMENTS FOR LEFT TURN
BAY AT BATAAN DRIVE

MEMO: COORS / BATAAN INTERSECTION SIGHT DISTANCE ANALYSIS

FROM: JEANETTE WALTHER

DATE: FEBRUARY 4, 2010

The design speed on Coors is 50 mph. Coors is posted at 45 mph north and south of Central. Sight distances for various speeds are:

Speed (mph)	Sight Distance (ft)
50	425
45	360
40	305
35	250

The 2010 Build Peak Hour traffic volumes for the left turn are 91 in the a.m. peak and 102 in the p.m. peak.

Figure 1 shows a sight distance of 425' (50 mph). The island between the northbound lanes and the left turn bay has to be 18' to not block sight distance. If vehicles pull forward then sight distance will be blocked.

Figure 2 shows a sight distance of 360' (45 mph) with the intersection realigned approximately 60' to the south. The island between the northbound lanes and the left turn bay is 8' wide at the nose.

Figure 3 shows a sight distance of 305' with a 6.5' island between the northbound traffic and the left turn bay. It appears on the aerial that a 305' sight distance (40 mph) can be maintained. With a design speed of 40 mph this area should be posted at 35 mph in advance of and beyond the intersection.

EUCARIZ
AIRPORT
BRIDGE
MACANAL
IVY
SUNSET GARDENS
DENNISON
PITTARD
TRUJILLO
FRESAM
ADRIAN
GONZALES
BATAAN
67TH
68TH
69TH
AIRPORT
GWIN
DELIA
COORS
BUARNE
CHURCHILL
MERLIDA
65TH
64TH
63RD
LUCCA
AMANDA
CENTRAL
VOLCANO
75TH
SUNDAY
SESAME
FOSTER
JUDITH
PALM
FLIP

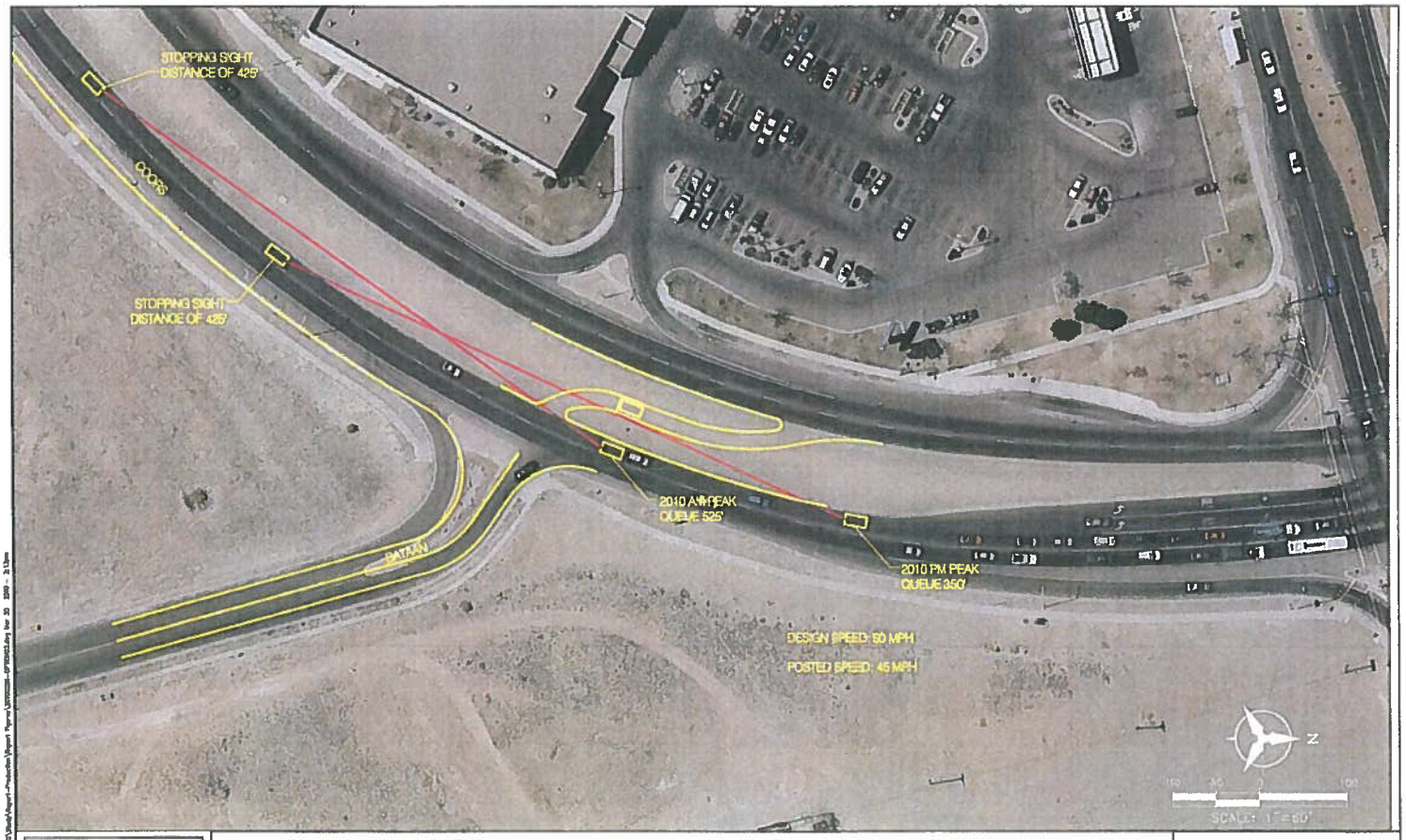

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FIGURE 1
SIGHT DISTANCE REQUIRED
50 MPH DESIGN SPEED

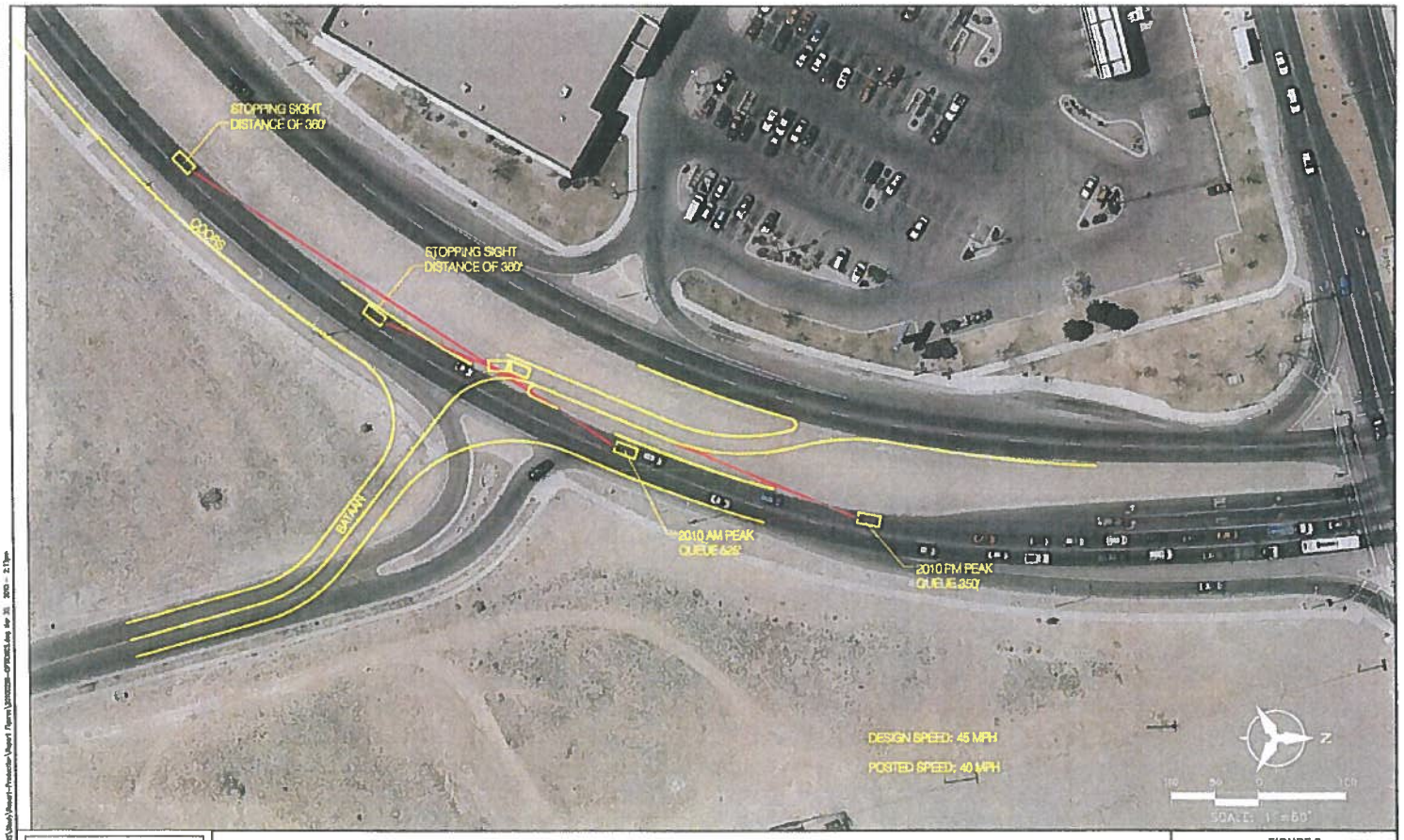

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FIGURE 2
45 MPH DESIGN SPEED SIGHT REQUIREMENTS WITH REALIGNED INTERSECTION

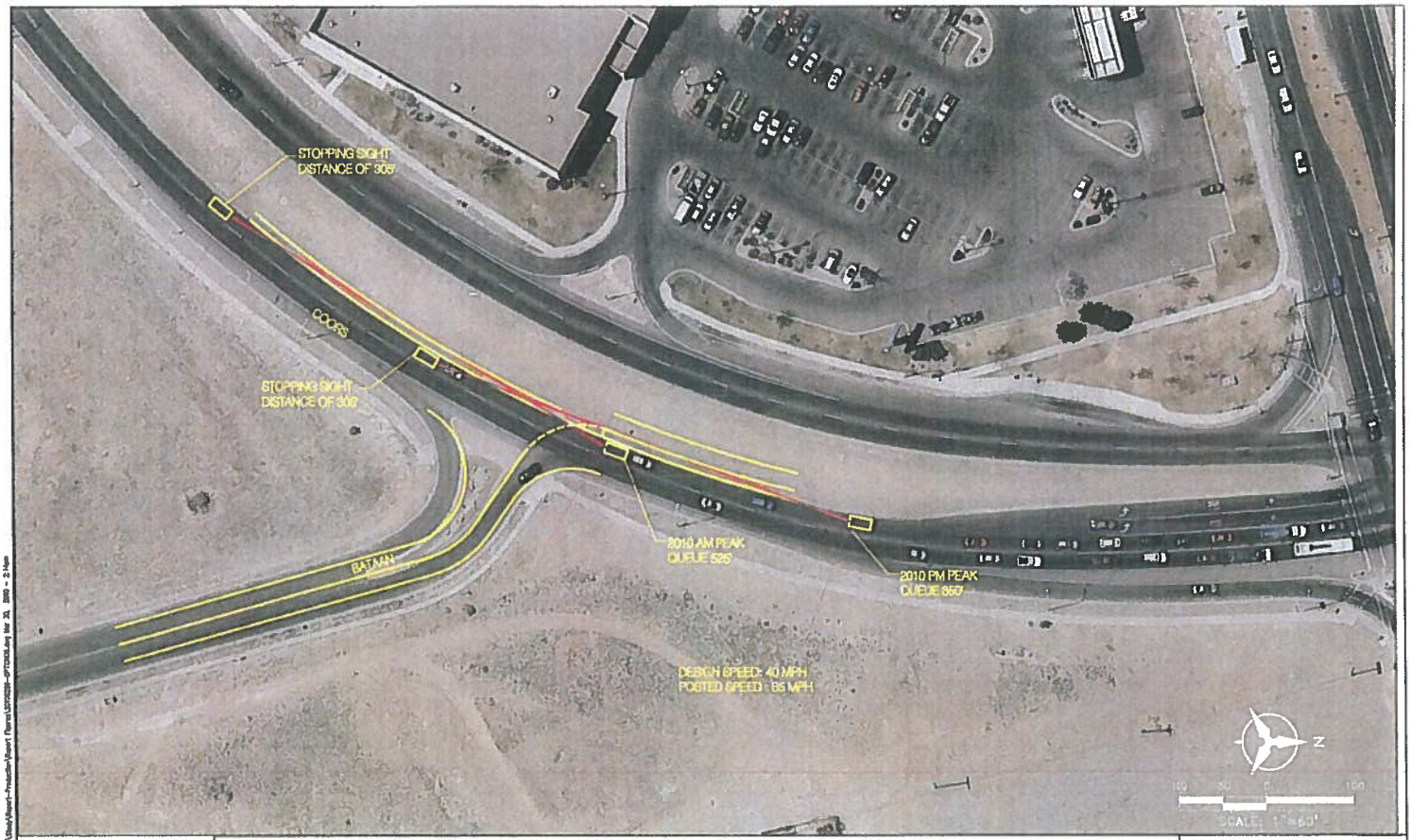

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FIGURE 3
SIGHT DISTANCE REQUIRED
40 MPH DESIGN SPEED

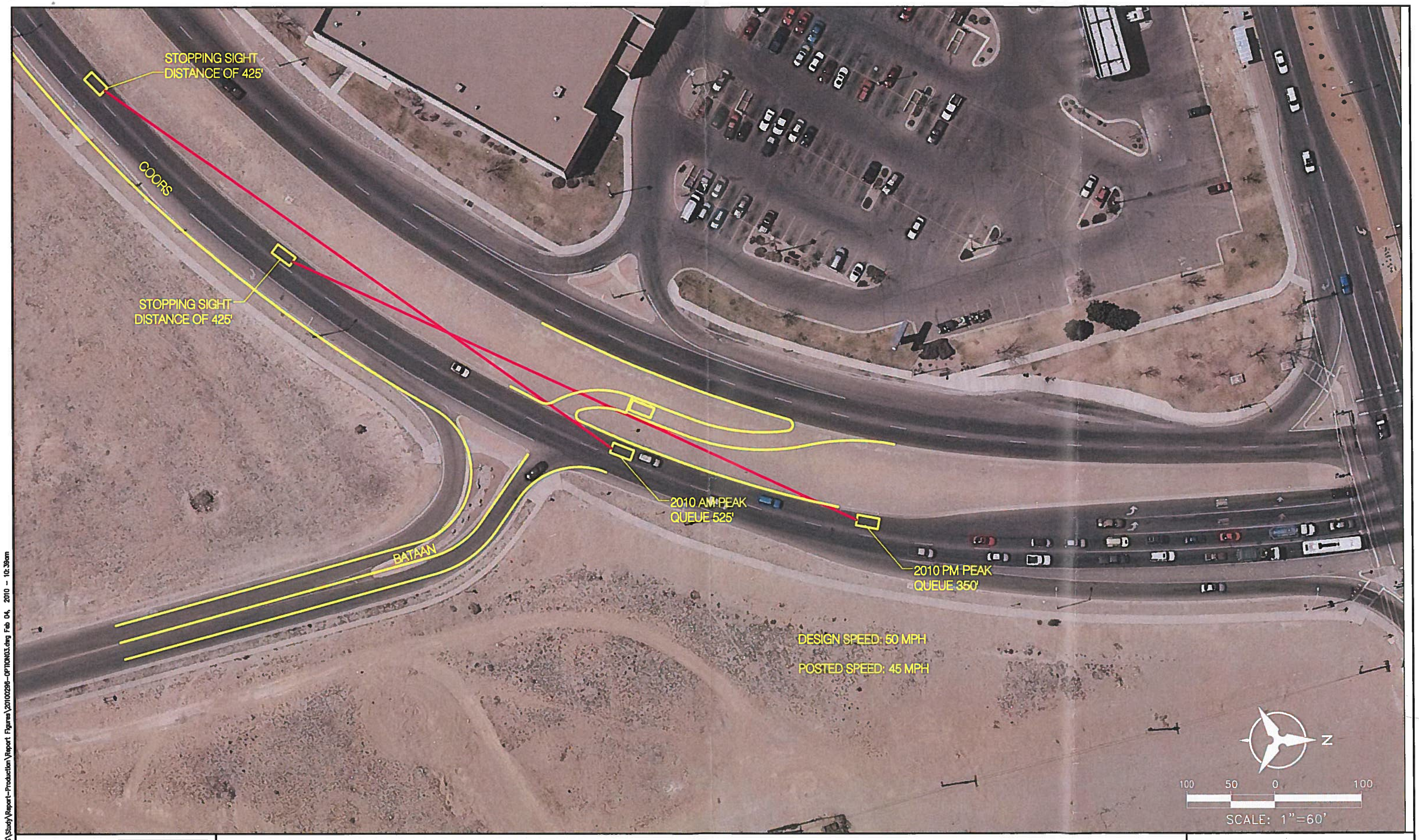

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FIGURE 1
SIGHT DISTANCE REQUIRE FOR 50 MPH DESIGN SPEED

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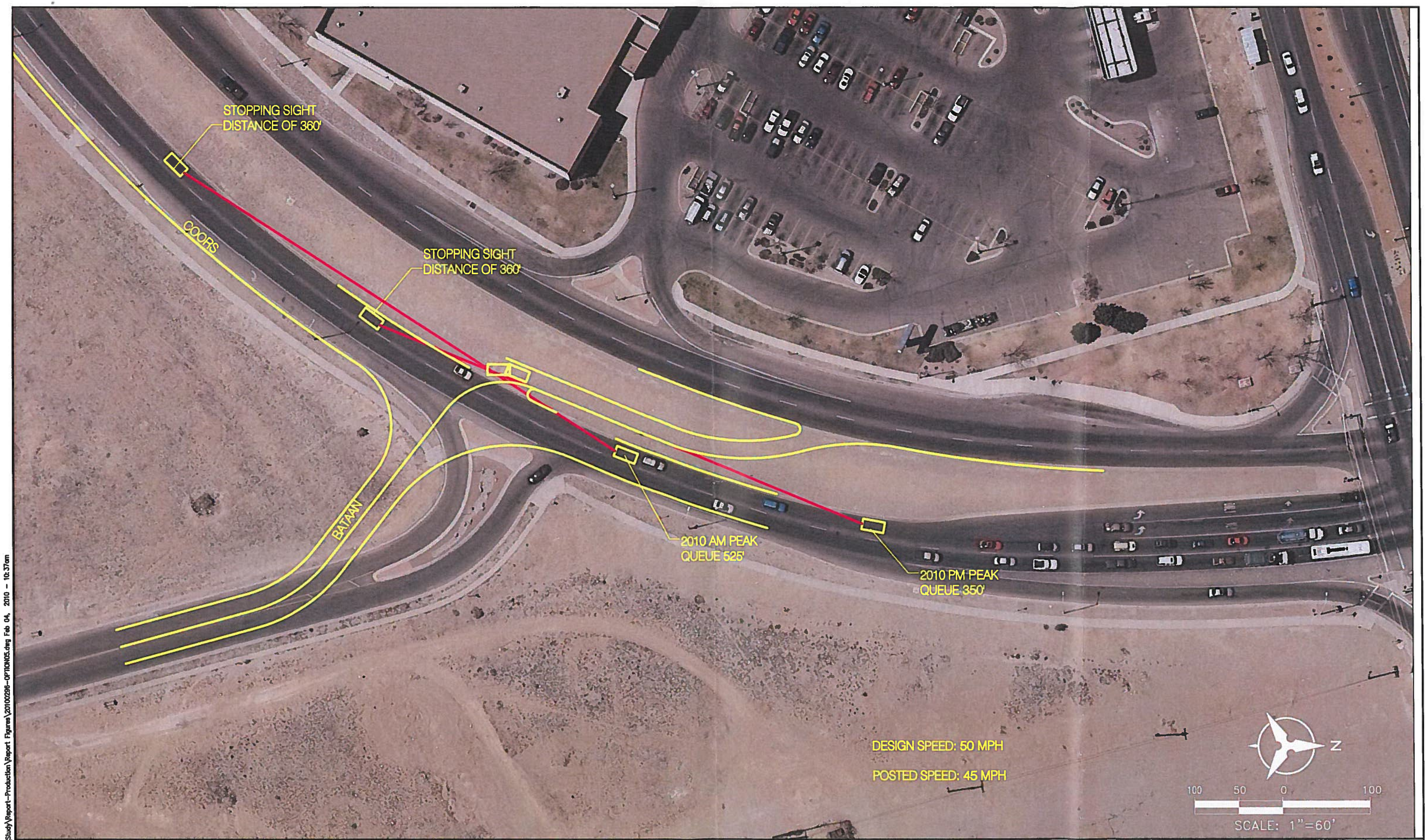

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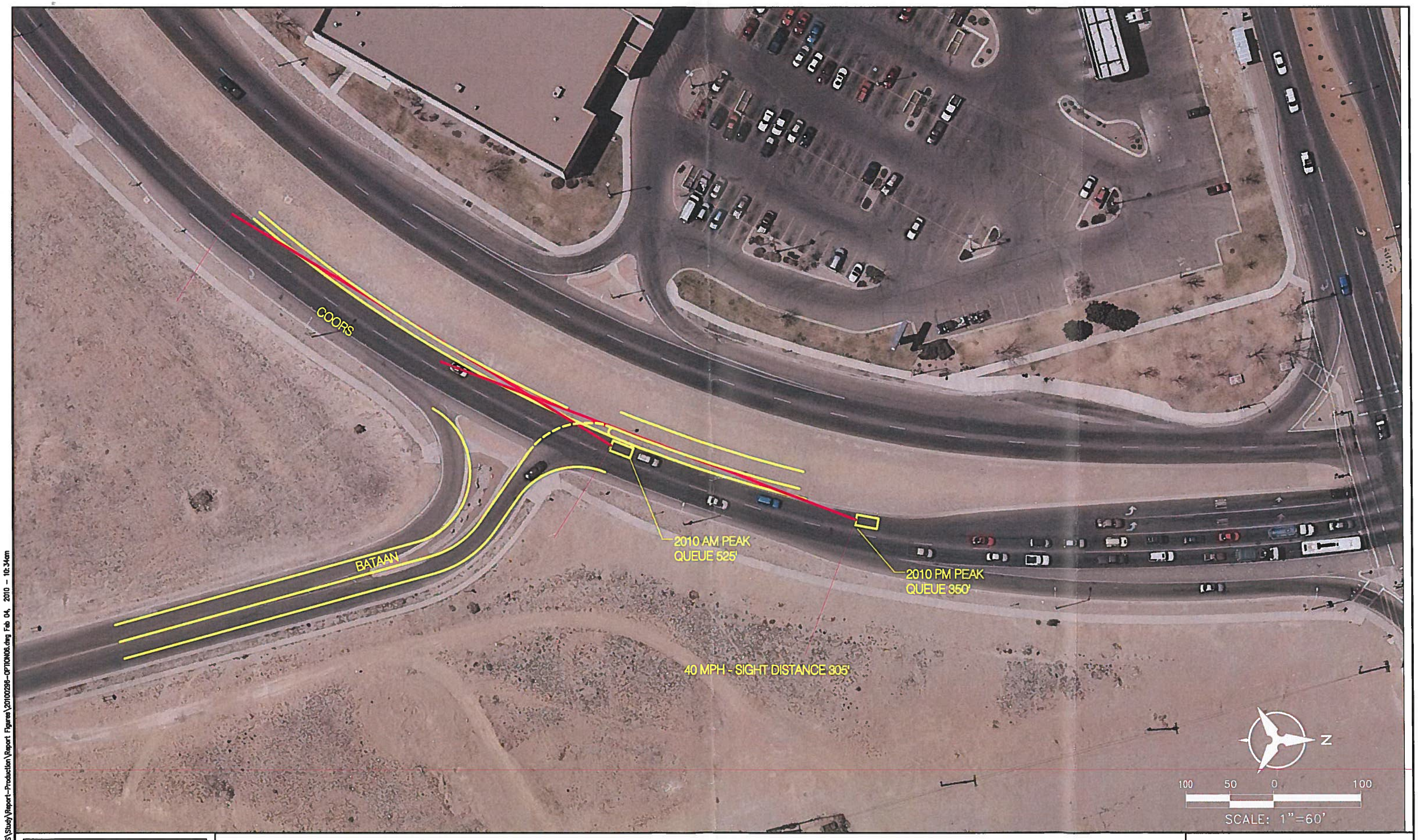
FIGURE 2
45 MPH DESIGN SPEED SIGHT REQUIREMENTS WITH REALIGNED INTERSECTION



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ACCESS STUDY

FIGURE 3
SIGHT DISTANCE REQUIRED
45 MPH DESIGN SPEED

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