

I-70 and E-470 Interchange

NOISE ANALYSIS TECHNICAL MEMORANDUM

Prepared for:

Colorado Department of Transportation, Region 1
E-470 Public Highway Authority
And
City of Aurora, Colorado



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1.0 INTRODUCTION

The City of Aurora, E-470 Public Highway Authority and CDOT Region 1 are considering additional improvements to complete three system-to-system access interchanges and construct and/or improve the existing local arterial network at Picadilly Road, East Colfax Avenue, Gun Club Road, and Harvest Road.

This technical report adheres to both the Colorado Department of Transportation's (CDOT) and Federal Highway Administration's (FHWA) policy. The use of CDOT and FHWA policy has been used in this analysis to determine noise impact on existing and future planned development.

The purpose of this report is to document this work effort, including results and mitigation recommendations. This document provides the following information:

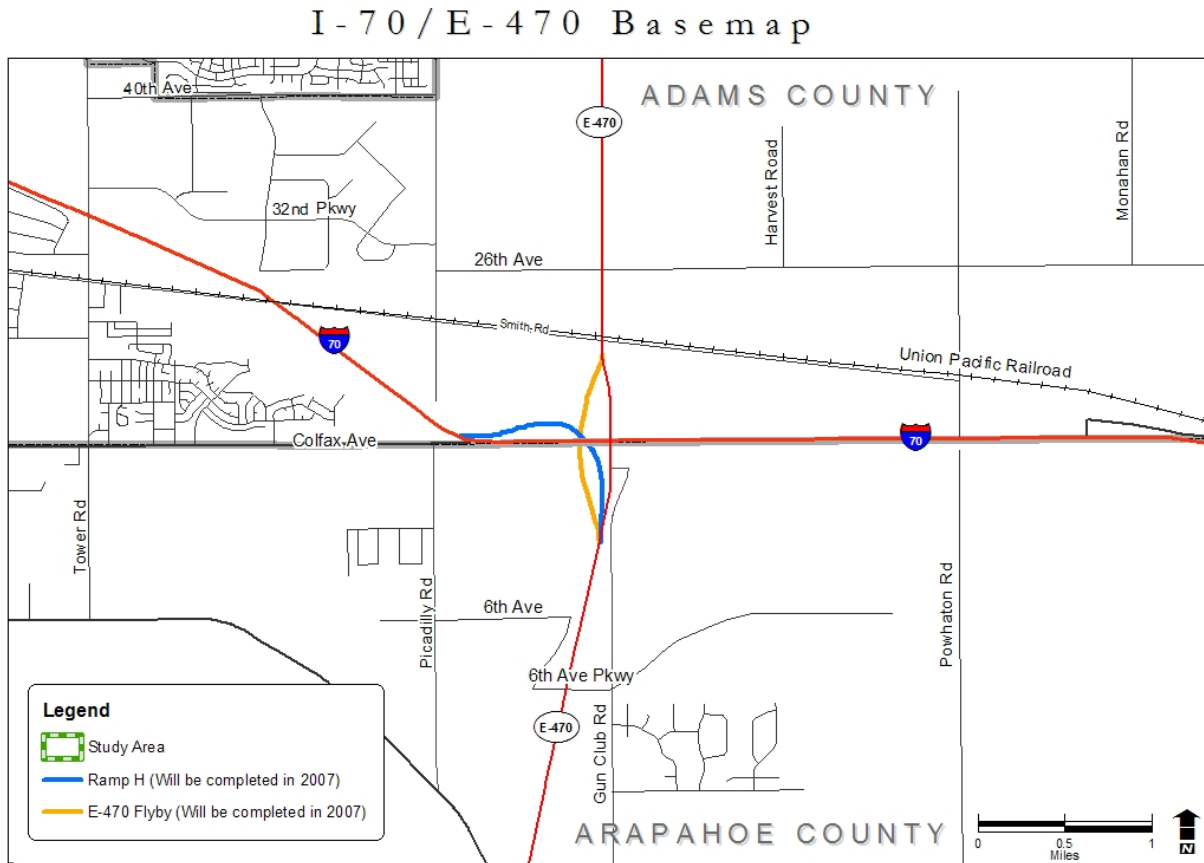
- Study area definition
- Description of the proposed action
- Overview of noise standards and fundamentals,
- Description of the methodology employed for the analysis,
- Description of the traffic data utilized in the analysis,
- Summary of the results,
- Findings from the assessment of feasibility and reasonableness of mitigation, and
- Recommended mitigation measures and next steps.

All model input and output files have been included in the appendix.

2.0 STUDY AREA

Figure 1 graphically defines the study area that was evaluated for this noise analysis. The study area for the I-70/E-470 Interchange project falls within Adams and Arapahoe Counties with portions within the city limits of Aurora. CDOT noise policy requires a noise analysis to include all receivers within a study area that is defined as a 500-foot distance in all directions from any of the proposed project's roadways. For the purposes of this EA, the study area generally extends in a 500-foot halo from the Tower Road interchange along I-70 to Powhaton Road and includes a 500-foot wide halo around E-470 from just north of 6th Parkway to Smith Road. Additionally, the study area includes areas where improvements are planned by City of Aurora along new Picadilly, East Colfax, Gun Club, and Harvest Road alignments as shown on Figure 1.

Figure 1
Study area



Q:/Jobs/e470_i70/NewsGIS/Maps/Chapter3_Maps_051129/051129_Basemap.mxd

3.0 PROPOSED ACTION

The proposed action improves the system to system connection between Interstate 70 and E-470 Toll Highway by removing the existing signalized diamond interchange at Gun Club Road and by constructing a series of frontage roads and a free-flowing interchange between E-470 and I-70. This portion of the project is to be built by a partnership of E-470 Authority and CDOT. The project does not include 2005-2006 construction of an E-470 mainline bypass over I-70 avoiding the Gun Club Road interchange and an early action project constructing a free-flowing northbound E-470 to westbound I-70 elevated ramp. These two actions help to provide immediate relief to the heaviest traffic motions utilizing the signalized intersections at I-70. Gun Club Road will be modified to pass under I-70 without interstate access.

The proposed project will include 12 ramps facilitating all individual interchange movements. Merged ramp lanes reduce the overall footprint of the interchange complex and allow for less complex highway entry motions. Five ramps have elevated sections constructed to allow clearance of both E-470 and I-70 mainlines and at grade ramps.

<u>Name</u>	<u>Traffic Motion</u>	<u>Highest point</u>
Ramp A	eastbound I-70 to northbound E470	at grade
Ramp B	local access to southbound E470	at grade
Ramp C	eastbound I-70 to southbound E470	elevated, 32 feet
Ramp D	southbound E470 to westbound I-70	at grade
Ramp E	southbound E470 to local access	at grade
Ramp F	northbound E470 to local access	at grade
Ramp G	local access to northbound E470	at grade
Ramp H	northbound E470 to westbound I-70	elevated, 68 feet
Ramp K	northbound E470 to eastbound I-70	elevated, 26 feet
Ramp L	southbound E470 to eastbound I-70	elevated, 78 feet
Ramp O	eastbound I-70 to northbound E470	at grade
Ramp T	westbound I-70 to southbound E470	elevated, 54 feet

Ramp traffic data, elevation profiles and configurations are included in Appendix A *Traffic Data*.

The project also includes locally funded construction of two new modified diamond interchanges at Picadilly and Harvest Roads. Picadilly Road will pass under I-70 with signalized, at-grade ramps and a free-flowing westbound I-70 loop exit ramp. Harvest Mile I-70 overpass is elevated 37 feet above I-70 at its highest point and includes signalized diamond ramps. This configuration includes a westbound I-70 exit loop ramp. Local agency planned and funded realignments, extensions and capacity improvements to East Colfax Avenue, Picadilly, and Harvest Roads are included in the No Action Alternative.

4.0 NOISE STANDARDS AND FUNDAMENTALS

There are three primary regulations that assist in the determination of noise impacts and when it is applicable to provide mitigation for impacted receivers:

- *Federal Highway Administration, Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772)*

- *Federal Highway Administration, Highway Traffic Noise Analysis and Abatement, Policy and Guidance, June 1995*
- *Colorado Department of Transportation, Noise Analysis and Abatement Guidelines, December 2002*

These documents collectively establish noise thresholds based on land use. Land uses are categorized and hourly noise level maximums have been established. A complete list of Noise Abatement Criteria (NAC) and each land use threshold has been included in **Table 1**.

Table 1
CDOT Noise Abatement Criteria (NAC)
Hourly A-Weighted Sound Level (dBA)

Activity Category	Leq (h), dBA	Description of Activity Category
A	56 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	71 (exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	51 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.

Source: Colorado Department of Transportation, Noise Analysis and Abatement Guidelines, December 2002

The following terms are used to quantify impacts and define sound levels. The following is a brief summary of key terminology:

Decibel – A decibel is a unit of measure for sound. Decibels are presented with the units dB(A).

dB(A) – dB(A) represents the noise levels in decibels measured with an A-weighted frequency. The A- weighting corresponds to the A-scale on a standard sound level instrument that closely approximates frequencies that the human ear can detect.

Leq(h) – Leq(h) is defined as the equivalent sound level for a one-hour time period. For normal human hearing, the actual sound level measurement is modified by applying A-

weighting. The A-weighted sound level is the most widely used measure of environmental noise.

Noise impacts occur when existing or future predicted noise levels meet or exceed the levels shown in **Table 1**. Impact also occurs when future noise levels “substantially” exceed existing noise levels by 10 decibels or more.

Table 2 provides a list of common outdoor noise levels. These noise levels can be used as a point of reference for those presented in **Table 1**.

Table 2
Common Outdoor Noise Levels

Common Outdoor Noise Levels	Noise Level (dBA)
Diesel Truck at 15 meters	90
Noisy Urban Daytime	80
Commercial Area	65
Quiet Urban Daytime	50
Quiet Urban Nighttime	40
<i>Quiet Suburban Nighttime</i>	35

Source: “Guide on Evaluation and Abatement of Traffic Noise” (American Association of State Highway and Transportation Officials, 1993).

5.0 METHODOLOGY

The major work elements associated with this traffic noise analysis included the following items:

1. Inventory of land uses (identify “noise-sensitive” developments).
2. Collect field noise measurements, traffic counts and speeds.
3. Validate the noise model.
4. Existing conditions model runs using STAMINA.
5. Peak-noise hour conditions used to represent worst-case noise scenario.
6. Future year model runs using STAMINA.
7. Determination of noise impacts.
8. Consideration of feasible and reasonable noise abatement measures for impacted properties.

The methodology employed for this analysis is consistent with both FHWA and CDOT guidelines for analyzing traffic noise. FHWA’s noise prediction model (STAMINA 2.0)

was utilized for this analysis, using Colorado 1995 vehicle noise emission factors. The basic inputs to noise modeling include roadway network layout, site characteristics, traffic volume projections, fleet mix, and vehicular operating speeds. Roadway and residential receiver geometry was included based on a civil design CAD file and aerial photography.

Because of the complexity of the I-70/E-470 interchange, Stamina 2.0 modeling capabilities for data input were exceeded in a single, comprehensive model run. The study area was divided into areas of sensitive noise receivers, and a separate Stamina model was built to incorporate contributing noise elements germane to that geographic evaluation area. There are three such areas defined within the study area. The existing I-70 Colfax interchange (new Picadilly interchange) area focused noise analysis for sensitive receivers located between I-70 and East Colfax Avenue and at Picadilly Road and 11th Avenue. The second area incorporated commercial development near the existing I-70/E-470 interchange. Last, the area surrounding the proposed Harvest Road interchange includes sensitive noise receivers in the vicinity. No one model incorporated a complete I-70/E-470 ramp configuration. Further discussion of the model configurations is included within the existing condition section.

6.0 TRAFFIC DATA

Traffic volumes from existing (2005) and future (2030) traffic models were used to derive peak-noise hour volumes for use in the noise models for this study. The existing, no-action, and preferred alternative traffic volumes are tabulated in **Appendix A**. For the purposes of this analysis, a morning and evening peak directional split of traffic for all roadways were used in the No Action and Preferred Alternatives analyses.

7.0 NOISE ANALYSIS

7.1. Land Use Inventory

Land uses in the study area are primarily commercial and industrial with pockets of residential development south of I-70. The railroad right-of-way runs along the northern perimeter the study area, with multiple tracks running east and west through the study area. "Noise-sensitive" land uses are present in the study area. There is one existing subdivision of high-density residential uses south of I-70 and north of East Colfax Avenue and a lower-density subdivision southwest of Picadilly and 11th Avenue. The Grimm Farm is located north of I-70 and west of Powhaton Road. There is a mobile home park south of I-70 and Powhaton Road immediately east of the study area.

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Much of the existing vacant land was formerly under agricultural use. However, most of the study area is planned for redevelopment to commercial and light-industrial uses, but nothing has been permitted and is not required to be considered at this time. The Horizon City Center, a 2800-unit high-density residential and retail development is planned between Picadilly Road and E-470, south of I-70. As of November 2005, this development has not yet been platted or permitted.

Two commercial receivers are present in the northeast quadrant of the E-470 interchange, a Colorado Interstate Gas compression and pumping station and one business within the Prologis Industrial Park. The northwest quadrant bounded by Smith Road, I-70 and E470 is owned and leased by East Gate Industrial Park.

7.2. Noise Measurements and Model Validation

Existing noise was measured at several locations around the study area where outdoor activity is likely to occur. These locations are shown in **Figure 2** and the results are tabulated in **Table 3**. Four field measurements were also used to verify the model of existing noise levels for all receivers in the study area, using STAMINA 2.0 software according to CDOT noise modeling guidelines. Sensitive noise receivers were sited to represent locations where actual outdoor activities might be affected by noise conditions. The model is expected to predict noise levels within +/- 3 dB(A). The existing conditions noise model predicted noise levels within 3 dBA of the measured noise levels. The reading at Picadilly Road and East 11th Street calculated 5.6 decibels higher difference. The model predicted the existing noise levels to exceed the NAC at both I-70 and Colfax residential sites.

Table 3
Field Noise Monitoring Results

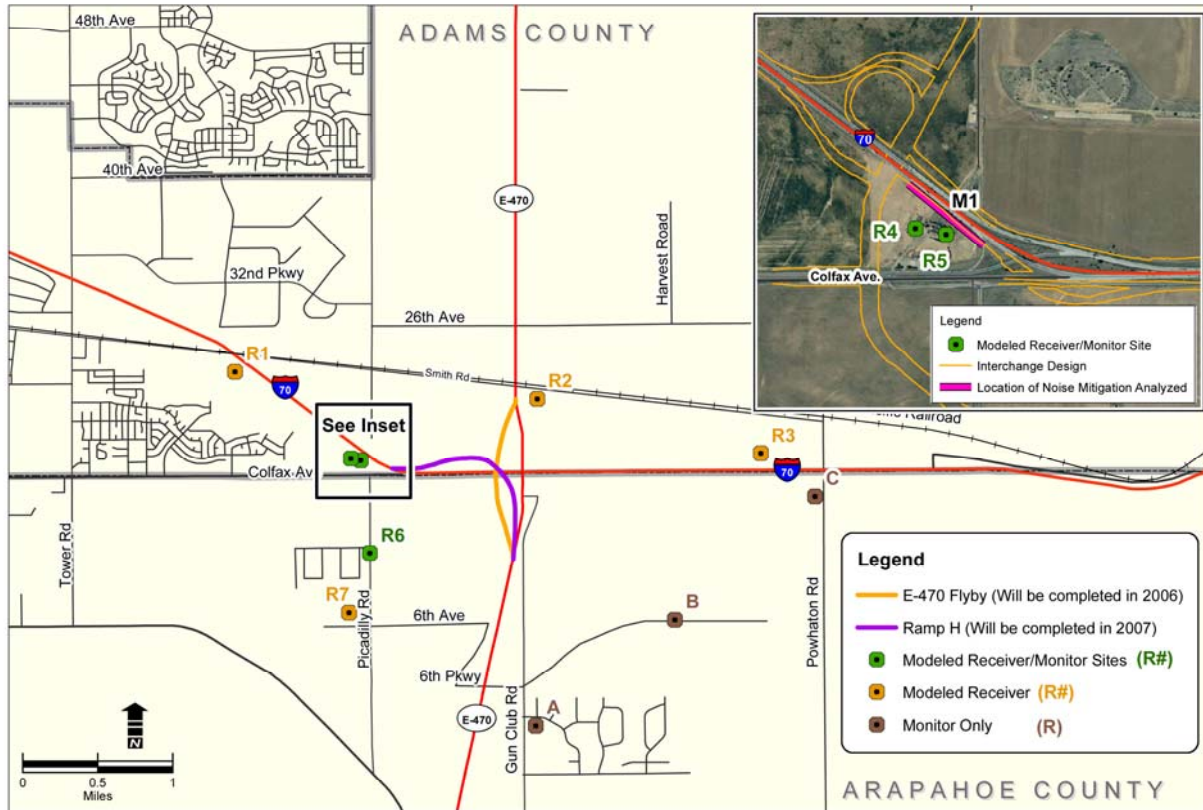
Site ID	Activity Category	Location	Monitored Noise Level (dBA) During AM Peak Hours	Monitored Noise Level (dBA) During PM Peak Hours	Modeled Noise Level During PM Peak Hours
R4	B	East end of residential motel	59.5	67.6	68.6
R5	B	West end of residential motel	57.6	71.5	67.6
R6	B	Picadilly & E. 11 th Street	53.6	54.7	60.3

7.3. Prediction of Existing and Future Noise Levels

CDOT noise policy states that noise impacts must be determined for future developments that have been platted and have issued building permits at the time of the analysis. At the time of this study most of the I-70/E-470 study area between Picadilly Road and Harvest Road, and Smith Road and Colfax Avenue has been planned or platted for development. Only the northeast quadrant of the I-70/E-470 interchange is platted and permitted for a business park. The northwest quadrant of the I-70/E-470 interchange is platted for warehouse and light industrial development. The City of Aurora has recently disclosed joint-planning for Horizon City Center, a 2800-unit residential development with associated retail and commercial development centered on the relocated Colfax Avenue.

Receivers have been placed to represent potential noise sensitive sites that meet the CDOT Noise Policy and Guidelines (2002). These represent residential and commercial

Figure 2
Location of Noise Receivers and Monitoring Sites



sites within the study area used to determine existing and future noise levels and impacts to all the sensitive land uses with both the No-Action and Preferred Alternatives. Additional noise measurements were recorded for 2 locations south of the modeled area to gauge the current noise levels associated with E 470 and local traffic along East 6th Parkway at Gun Club Road (AM 58.0/PM 58.3) and at Harvest Road (AM 54.7/PM 56.6). Another site was monitored at Powhatan Road near the Foxridge Farm Mobile Home Park (AM 60.1/PM 58.2). These receivers were not included in the interchange project noise model.

All receiver locations are shown in **Figure 2** and modeled receivers are listed in **Table 4**. Future traffic volumes and future interchange roadway alignments were modeled to determine future noise levels with the No Action and the Preferred Alternatives. The noise analysis concentrated on residential receivers in the study area.

**Table 4
Noise Model Results**

Site ID	NAC Category	Description of Receiver	Existing 2005 Traffic (dBA)	No-Action including Flyby Alternative 2030 AM/PM Traffic (dBA)	Preferred Alternative 2030 AM/PM Peak Traffic (dBA)
R1	B	Cemetery 300 ft from I-70	65.2	67.3/67.3	67.9/68.0
R2	C	Commercial site at E. 19 th St	57.8	57.8/57.4	61.5/61.2
R3	B	Grimm Farm, 2580 I-70 Frontage Rd	45.9	44.3/43.7	61.3/61.2
R4	B	Single residence I-70 Colfax ramps	69.7	63.3/63.8	63.8/64.1
R5	B	Motel at I-70 Colfax ramps	68.2	65.3/66.2	65.5/66.0
R6	B	Representative residence E. 11 th St & Picadilly	56.0	62.4/62.3	63.7/65.1
R7	BB	Representative Residence along Picadilly Rd	--	64.4/65.6	65.9/67.7

7.4. Impact Assessment

No-Action Alternative

The No-Action Alternative includes the E470 Flyby, modified Gun Club Road (old E470 alignment) and I-70 ramps, and a northbound E-470 to westbound I-70 ramp. 2030 traffic projections developed using the DRCOG regional model show that the Gun Club Road daily traffic south of Colfax Avenue will average 12,000 vehicles per day. Traffic counts on Gun Club Road in 2004 found that daily traffic was 3600 vehicles on the average day. The No Action Alternative continues to focus interstate destined traffic onto E-470 and Gun Club Road, increasing the affect of noise along those routes.

The motel R4 at the I-70 Colfax ramps and the cemetery south of I-70 (R1) would experience noise at or above the 66 dBA Colorado abatement criteria, while the Picadilly residential subdivision (R6, R7) and Grimm Farm (R3) located near I-70 at Harvest Road would not exceed the abatement criteria. The existing Category C commercial receiver

R2 located at East 19th Avenue east of E-470 would not experience noise at or above 71 dBA commercial abatement criterion. These noise levels are listed in Table 4. All modeled noise receiver locations are highlighted in Figure 2.

The No Action Alternative will allow interstate destined traffic onto Picadilly Road, Harvest Road, and the Colfax frontage road to access the interstate from Gun Club Road interchange, increasing the affect of noise along those routes. Because the Picadilly and Colfax preliminary road designs end before the Picadilly Road-East 11th Avenue intersection and the Harvest Road and East 6th Parkway area, and the analysis of noise impacts to the adjacent subdivisions contained in this study represents a scoping noise analysis.

Preferred Alternative

The Preferred Alternative is composed of three separate interchanges. A series of complex braided and flyover ramps will provide freeway-to-freeway access between I-70 and E-470. The original E-470 alignment will be reconfigured and existing signalized intersections will be preserved to provide local access at 19th Avenue and relocated Colfax Avenue. This alternative would allow the through traffic on north and southbound E-470 to flow freely, while allowing vehicles local access through the existing intersection.

The present diamond interchange at Gun Club Road will be replaced by a new full interchange with overpass at a continuous, widened Harvest Road. The Preferred Alternative will also replace the partial interchange at Colfax Avenue with a full interchange including a continuous, widened Picadilly Road. The main roadway of Picadilly Road will be depressed and pass under I-70. Colfax Avenue will be relocated to an offset location south along Picadilly Road and continued east to connect with Harvest Road.

Receivers would generally experience the same or slightly increased noise with the Preferred Alternative, as shown in Table 3-10. The motel R4 at the I-70 Colfax ramps, the cemetery south of I-70 (R1), and residences along Picadilly Road (R7) would experience noise at or above the 66 dBA Colorado abatement criteria. Noise receivers exceeding the abatement criterion require consideration of mitigation measures. The existing Category C commercial receiver R2 located at East 19th Avenue east of E-470 would not experience noise at or above 71 dBA commercial abatement criterion.

Mitigation Analysis – Feasibility and Reasonableness

When a noise impact is predicted to result from proposed highway improvements, a reasonableness and feasibility analysis must be conducted to determine if mitigation is warranted at these locations. Mitigation should consider all possible noise abatement measures for reasonableness and feasibility. These include noise barriers or walls, earthen berms, creating buffer zones of undeveloped land, planting vegetation, traffic management, installing noise insulation on buildings and relocating the highway.

According to FHWA and CDOT guidelines, the “feasibility and reasonableness” of mitigation needs to be determined for all locations that are projected to experience noise impacts. The feasibility analysis of mitigation considers such factors as the effectiveness of a barrier to achieve a 5-dBA reduction in predicted future noise levels, in addition to construction, engineering, maintenance or other design issues. Mitigation measures are considered feasible if they can achieve a minimum 5-dBA noise reduction for at least one receiver. They can not create any safety or unacceptable maintenance problems or engineering fatal flaws. Noise mitigation is considered reasonable if it meets certain criteria such as the cost per receiver per decibel of noise reduction, type of land use, overall noise levels, and changes in noise levels. Business districts typically do not desire noise mitigation, as noise barriers would block the view of businesses from motorists. This was the reason that the noise analysis focused on residential properties in the project study area.

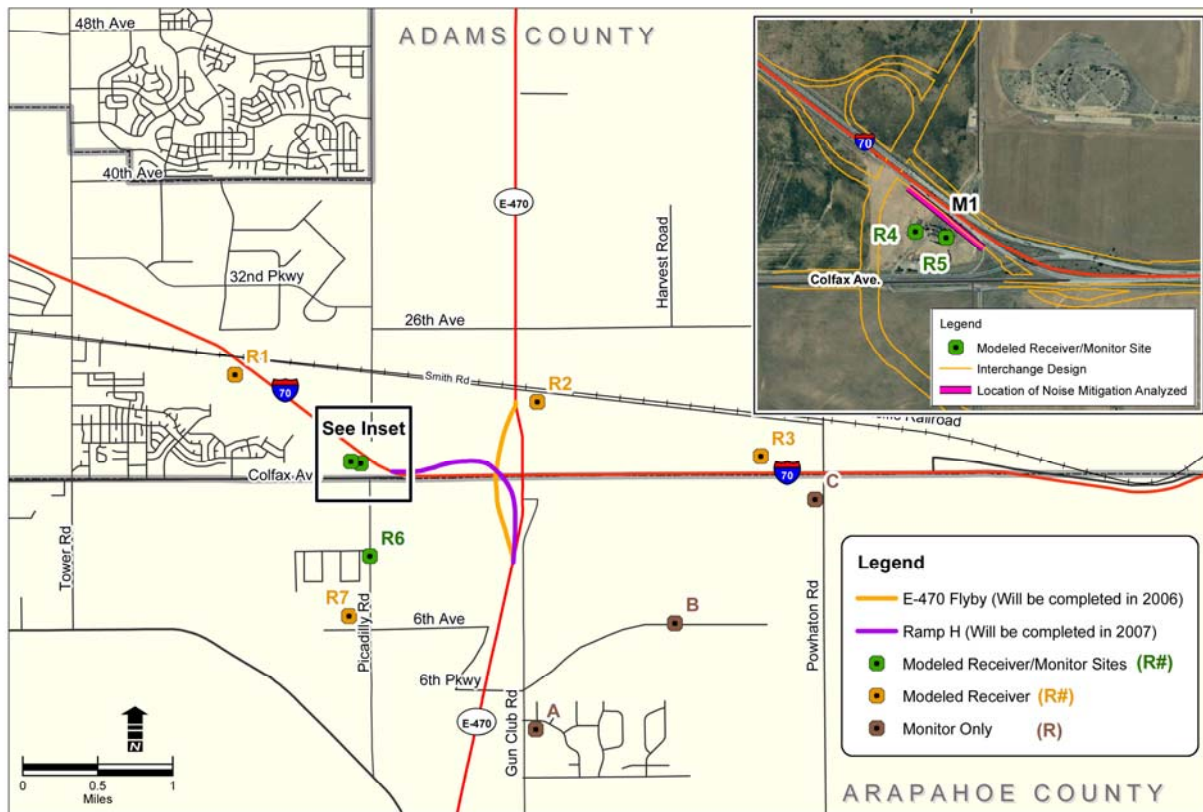
Creating buffer zones, constructing earth berms and planting vegetation may be feasible south of the I-70 corridor because although these abatement measures require large amounts of land to achieve the necessary noise reductions, the early planning stages of development and surrounding land use in the southern half of the study area could allow the City of Aurora to require dedicated landscaped buffers and set-backs for areas of development with concentrated sensitive receivers as abatement measures.

Traffic management, such as limiting truck traffic on the highway, is not feasible because the interstate is the designated national transport route. Tolling on E-470 already is effective in controlling traffic volumes and composition. However, restriction of truck traffic on arterial streets will create difficulties due to the limited local roadway network connectivity and the high demand for truck access at both the Quincy Road landfill and warehouse and light-industry businesses of the northern quadrants of the study area.

Because of the high cost, installing noise insulation on buildings is usually reserved for public buildings such as schools or hospitals. For these reasons, noise barriers were the only mitigation measure evaluated for this project.

Mitigation measures were analyzed for the impacted area according to CDOT guidelines. The results of the mitigation analyses conducted for the area are described below. The location of each barrier in **Table 8** is illustrated on **Figure 3**. A base noise wall cost of \$30 per exposed square foot was used in the cost-benefit calculations.

Figure 3
Location of Receivers and Mitigation Barrier M1



Noise mitigation is usually accomplished through construction of either concrete or masonry noise walls or earthen berms that divert the path of noise from the source to the receiver. Colorado no longer constructs wooden fences at new noise mitigation

locations. Noise mitigation is rendered less effective if it is not continuous or has gaps for driveways or sidewalks.

Mitigation Barrier 1: Noise walls of various lengths and heights were modeled for the impacted receiver at the motel location to determine if mitigation was reasonable and feasible. The mitigation analysis addressed walls located adjacent to the I-70 eastbound clear zone running at varying lengths between the Picadilly Road bridge to near the proposed E-470 southbound ramp. As shown in the summary of mitigation analysis in Table 3-11, to achieve the minimum 5-decibel reduction required by CDOT, portions of the wall would need to be at least 20 feet tall. A 20-foot tall noise barrier would exceed \$19,500 per decibel reduction for all receptors that experienced a reduction in noise. For these reasons, noise mitigation for this project was found to be not reasonable or feasible.

Table 5
Results of Mitigation Analysis for the Preferred Alternative

Barrier	Barrier Height (ft)	Barrier Length (ft)	Barrier Cost	Benefited Receivers	Average Noise Reduction (dBA)	Cost per Benefited Receiver per dBA
M1a	14	1300	\$546,000	6	1.9	\$47,890
M1b	18	1300	\$702,000	6	3.3	\$35,450
M1c	20	1300	\$780,000	6	5.4	\$21,660
M1d	20	900	\$540,000	6	4.6	\$19,565

Picadilly Road. Impacts to the Picadilly Road residential subdivision represented by receivers R6 and R7 would require mitigation analyses at the time of final Picadilly roadway design to clarify mitigation effectiveness along the actual alignment to be improved and widened by the City of Aurora as a part of planned new developments.

A qualitative mitigation analysis indicates that under the current configuration, each residence would require driveway access to the Picadilly alignment. A mitigation barrier would not be reasonable or feasible for multiple reasons. The continuity of the noise barrier would be broken by gaps created at each driveway. Line of sight restrictions from driveways accessing the existing Picadilly alignment with a noise barrier in place would be unsafe and therefore not feasible. The relatively wide spacing

of homes along Picadilly would require a 4- to 5-thousand foot long wall to achieve an effective noise reduction for the first row of receivers. To allow for access safety issues, the gaps in the barrier would make the noise barrier ineffective and not reach the required noise reduction levels for each affected residence. The cost-benefit for such a barrier with this low density housing is typically not reasonable. If the alignment of Picadilly Road is shifted east of the current alignment, noise reduction would result. A significant change of alignment would allow for other noise abatement measures to be employed to further reduce noise at this subdivision, such as use of the existing Picadilly Road as a frontage road to maintain access to existing driveways while providing limited access to a new mainline Picadilly arterial road located farther east. This scenario would address feasibility flaws created by safety issues, and allow future consideration of noise abatement barriers.

8.0 SUMMARY

At this time, as none of the evaluated noise barriers meet CDOT's feasibility and reasonableness criteria, noise mitigation is not recommended. If future substantial changes are made to design elements of the interchange project from what has been analyzed for the Preferred Alternative in this study, the noise analysis will be re-assessed in order to evaluate the impact of those changes.

APPENDIX A

CDOT FORM 1209

COLORADO DEPARTMENT OF TRANSPORTATION NOISE ABATEMENT DETERMINATION

Instructions: To complete this form refer to CDOT Noise Analysis Guidelines

Project # <i>I-70/E-470</i>	Project code (SA#)	STIP #	Project Location: <i>AURORA, Co.</i>
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A. FEASIBILITY:

1. Can a continuous noise barrier or berm be constructed? YES NO

2. Can a substantial noise reduction be achieved by constructing a noise barrier or berm? ...
 10 dBA: YES NO 7-10 dBA: YES NO 5-7 dBA: YES NO

3. Are there any "fatal flaw" safety or maintenance issues involving the proposed noise barrier or berm? YES NO

B. REASONABLENESS:

	<u>EXTREMELY REASONABLE</u>	<u>REASONABLE</u>	<u>MARGINALLY REASONABLE</u>	<u>UNREASONABLE</u>
1. Cost Benefit Index (per receiver per dBA) ..	<input type="checkbox"/> Less than \$3000	<input type="checkbox"/> \$3000-\$3750	<input type="checkbox"/> \$3750-\$4000	<input checked="" type="checkbox"/> More than \$4000
2. Average Build Noise Level	<input type="checkbox"/> 70 dBA or More	<input checked="" type="checkbox"/> 66 - 70 dBA	<input type="checkbox"/> 63 - 66 dBA	<input type="checkbox"/> Less than 63 dBA
3. Impacted persons' desires	<input type="checkbox"/> More than 75%	<input type="checkbox"/> 50% - 75%	<input type="checkbox"/> 25% - 50%	<input type="checkbox"/> Less than 25%
4. Development Type (Category B*)	<input type="checkbox"/> More than 75%	<input checked="" type="checkbox"/> 50% - 75%	<input type="checkbox"/> 25% - 50%	<input type="checkbox"/> Less than 25%
5. Development Existence (15 years or more) .	<input type="checkbox"/> More than 75%	<input checked="" type="checkbox"/> 50% - 75%	<input type="checkbox"/> 25% - 50%	<input type="checkbox"/> Less than 25%
6. Build Noise Level vs. Existing Noise Level .	<input type="checkbox"/> Greater than 10 dBA	<input type="checkbox"/> 5 - 10 dBA	<input checked="" type="checkbox"/> 0 - 5 dBA	<input type="checkbox"/> Noise Level Decrease

*Category B – Residential, School, Hospital, Park, Picnic/Active Sports Area, Motel, Church, Library

C. INSULATION CONSIDERATION:

1. Are normal noise abatement measures physically infeasible or economically unreasonable? YES NO

If the answer to 1 is YES, then:

2. a. Does this project have noise impacts to public or non-profit buildings? YES NO

b. If yes, is it reasonable and feasible to provide insulation for these buildings? YES NO

3. a. Is private residential property affected by a 30 dB(A) or more noise level increase? YES NO

b. Are private residences impacted by 75 dB(A) or more? YES NO

D. ADDITIONAL CONSIDERATIONS:

The noise reduction is only marginally 5 dBA and the wall 20 Ft tall will cause some maintenance issues with icing during winter conditions.

E. DECISION:

1. Are noise mitigation measures feasible? YES NO

2. Are noise mitigation measures reasonable? YES NO

3. Is insulation of buildings both feasible and reasonable? YES NO

4. Shall noise mitigation measures be provided? YES NO

F. DECISION DESCRIPTION AND JUSTIFICATION

The length and height of wall required to achieve 5 dBA reduction is over \$58,000/CBI and may increase icing conditions along I 70 Eastbound. It is an unreasonable mitigation and is only marginally feasible.

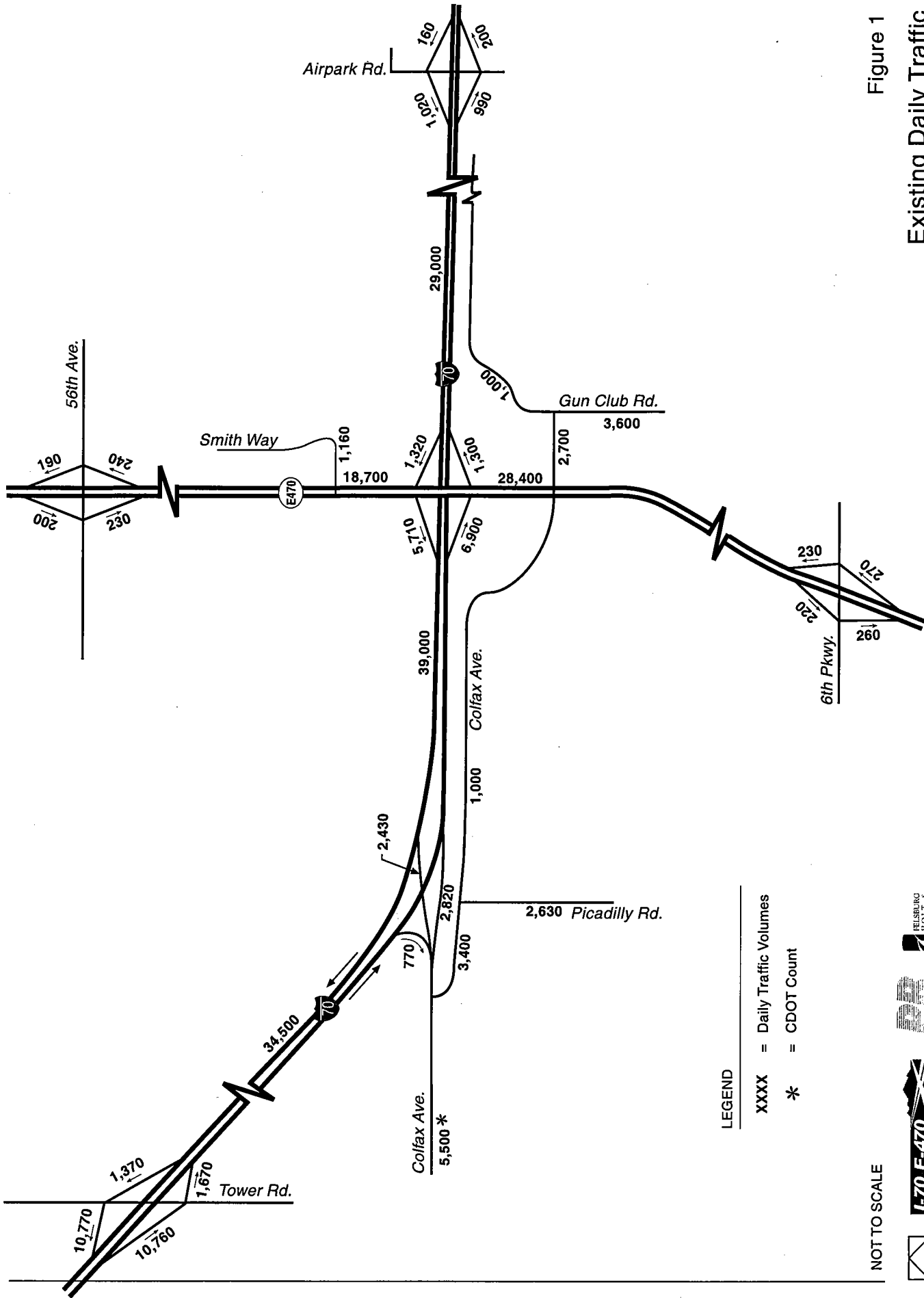
Completed by: Date: *1/13/06*

APPENDIX B

2004, 2025 AND 2030 TRAFFIC DATA

Detailed Hourly Traffic Report by Location
Average Weekday, Monday, June 14 - Friday, June 18, 2004

Location	Axles	Traffic Count																								Daily Total	
		00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00		
Plaza A - North	PC	18,873	83	50	33	34	120	284	788	1,114	1,038	778	695	760	874	947	954	1,591	2,218	2,696	1,534	758	530	478	331	185	18,873
	CV	697	3	4	1	3	3	10	33	54	52	56	49	55	56	53	53	57	52	40	27	12	10	6	3	3	697
	TO	19,570	86	54	35	38	123	294	822	1,168	1,089	834	744	815	930	1,000	1,007	1,648	2,270	2,736	1,561	770	540	484	335	188	19,570
Plaza A - 2 South	PC	20,327	117	57	26	20	76	371	1,526	2,939	2,327	1,270	1,008	1,039	966	844	948	1,110	1,302	1,404	1,097	639	446	378	244	172	20,327
	CV	716	1	2	2	2	10	35	65	80	73	63	60	50	49	51	48	43	28	24	13	6	4	4	1	716	
	TO	21,043	118	59	28	22	86	381	1,562	3,004	2,407	1,342	1,070	1,099	1,016	893	999	1,158	1,346	1,431	1,121	652	453	382	248	173	21,042
Plaza A - Total	PC	39,199	199	107	59	54	196	655	2,315	4,053	3,365	2,048	1,703	1,799	1,840	1,791	1,902	2,701	3,520	4,100	2,631	1,397	976	856	575	357	39,199
	CV	1,413	4	6	3	6	6	20	69	120	132	129	112	115	106	102	105	105	95	68	51	25	16	10	7	4	1,413
	TO	40,613	204	113	62	60	202	675	2,383	4,173	3,497	2,176	1,815	1,914	1,945	1,893	2,006	2,806	3,615	4,168	2,682	1,422	992	866	582	361	40,612
Plaza B - North	PC	13,476	26	17	12	31	189	488	1,213	1,792	1,236	858	633	526	606	670	626	852	1,045	1,044	648	370	201	183	136	75	13,476
	CV	744	1	2	0	2	4	7	21	36	56	59	57	52	56	62	65	71	68	54	35	17	10	7	2	2	744
	TO	14,221	28	19	12	33	192	495	1,233	1,828	1,292	917	690	579	662	732	690	923	1,113	1,098	683	387	211	189	138	77	14,221
Plaza B - South	PC	13,295	164	67	21	19	36	152	570	924	757	547	491	590	518	534	715	981	1,373	1,682	1,081	643	471	429	312	220	13,294
	CV	798	2	2	1	3	7	16	57	90	87	72	60	65	48	63	47	50	43	32	20	13	9	5	4	2	798
	TO	14,092	166	69	22	21	43	168	628	1,013	844	618	550	654	566	597	763	1,031	1,416	1,713	1,101	657	479	434	316	223	14,092
Plaza B - Total	PC	26,771	190	84	33	50	225	640	1,783	2,716	1,993	1,405	1,124	1,116	1,123	1,204	1,341	1,833	2,418	2,726	1,728	1,013	672	612	448	295	26,771
	CV	1,542	3	4	1	4	10	23	78	125	143	131	116	117	104	125	112	121	112	86	55	30	19	11	6	4	1,542
	TO	28,313	193	87	35	54	235	663	1,861	2,841	2,135	1,535	1,240	1,233	1,228	1,329	1,453	1,954	2,529	2,812	1,784	1,043	691	623	454	300	28,313
Plaza C - 2 North	PC	9,266	25	12	12	22	141	351	640	898	736	645	487	419	452	542	496	606	756	730	480	307	169	152	120	70	9,266
	CV	506	1	2	1	1	3	7	20	31	36	38	37	34	41	44	41	47	41	32	19	13	6	5	2	3	506
	TO	9,772	26	15	13	23	144	357	660	929	772	684	523	453	493	586	537	653	797	761	498	319	175	157	123	73	9,772
Plaza C - South	PC	8,964	145	54	12	17	24	112	331	529	511	397	403	494	405	414	542	640	731	832	656	500	402	346	266	202	8,964
	CV	519	2	1	1	1	5	15	36	51	53	43	36	38	32	35	37	38	29	24	15	10	6	4	5	2	519
	TO	9,483	147	55	13	18	29	127	367	580	563	440	439	532	437	449	579	678	760	857	670	510	409	350	271	204	9,483
Plaza C - Total	PC	18,231	169	67	24	39	164	463	971	1,427	1,247	1,042	890	913	856	955	1,038	1,247	1,487	1,562	1,135	807	571	497	386	272	18,231
	CV	1,024	3	3	2	2	8	21	56	82	89	81	72	72	73	80	78	84	70	56	33	23	13	9	7	5	1,024
	TO	19,255	172	70	26	41	173	484	1,028	1,508	1,336	1,124	962	985	930	1,035	1,116	1,331	1,557	1,618	1,169	829	584	507	394	277	19,255
Plaza D - North	PC	8,193	134	52	15	12	31	105	253	430	451	416	404	457	382	391	472	626	766	846	580	397	322	280	209	161	8,193
	CV	554	1	1	1	1	3	9	23	34	37	45	38	39	42	43	49	51	46	35	21	13	7	7	4	3	554
	TO	8,747	135	53	16	13	34	113	276	464	488	461	442	496	424	435	521	677	812	880	601	410	330	288	212	164	8,747
Plaza D - South	PC	9,084	26	10	10	20	102	303	724	964	757	587	463	419	425	512	521	617	707	660	477	287	156	142	121	76	9,084
	CV	610	1	1	2	2	6	17	43	55	56	47	43	41	39	46	43	45	33	32	20	19	10	5	3	1	610
	TO	9,694	27	12	12	22	108	319	767	1,019	813	634	506	460	463	558	564	663	740	692	497	306	165	147	124	77	9,694
Plaza D - Total	PC	17,277	160	62	25	33	133	408	977	1,393	1,208	1,004	866	876	806	903	993	1,244	1,473	1,506	1,057	684	478	423	330	237	17,277
	CV	1,164	3	3	3	3	9	25	66	89	93	91	81	80	80	89	92	96	79	67	41	32	17	12	7	5	1,164
	TO	18,442	162	65	28	36	142	433	1,043	1,483	1,301	1,095	947	956	887	993	1,085	1,340	1,552	1,572	1,098	716	495	435	337	241	18,442
Plaza E - North	PC	6,235	135	58	16	9	14	60	147	284	306	299	293	356	296	289	342	451	561	644	465	334	279	257	187	153	6,235
	CV	345	1	1	1	0	2	9	25	22	26	21	19	24	20	26	29	30	29	24	14	8	4	6	2	1	345
	TO	6,580	136	59	17	9	17	69	173	306	332	321	312	380	317	315	371	481	589	667	479	342	283	262	190	154	6,580
Plaza E - South	PC	6,938	14	7	7	15	106	247	550	714	584	473	351	306	346	383	372	476	543	499	371	204	112	112	96	48	6,938
	CV	380	2	0	1	0	4	16	21	33	33	28	25	24	21	28	28	25	26	23	12	15	7	3	2	1	380
	TO	7,318	17	7	9	15	111	263	571	747	616	501	377	330	367	411	401	501	568	522	383	219	119	115	97	49	7,318
Plaza E - Total	PC	13,173	149	65	23	24	120	307	698	998	890	772	645	663	642	672	714	927	1,103	1,143	836	538	391	369	283	201	13,173
	CV	725	3	1	2	1	7	25	46	55	58	50	44	48	42	54	57	55	54	47	26	23	11	8	4	3	725
	TO	13,898	153	66	26	24	127	332	744	1,053	948	822	689	710	684	726	772	982	1,158	1,190	862	561	403	377	287	203	13,898



LEGEND

XXXX = Daily Traffic Volumes

* = CDOT Count

NOT TO SCALE



North E-470 / I-70 Interchange Study Task Order #3 04-054 9/29/05

Figure 1
Existing Daily Traffic

Figure 2-13
No-Action Year 2030 Peak Hour Traffic Forecasts

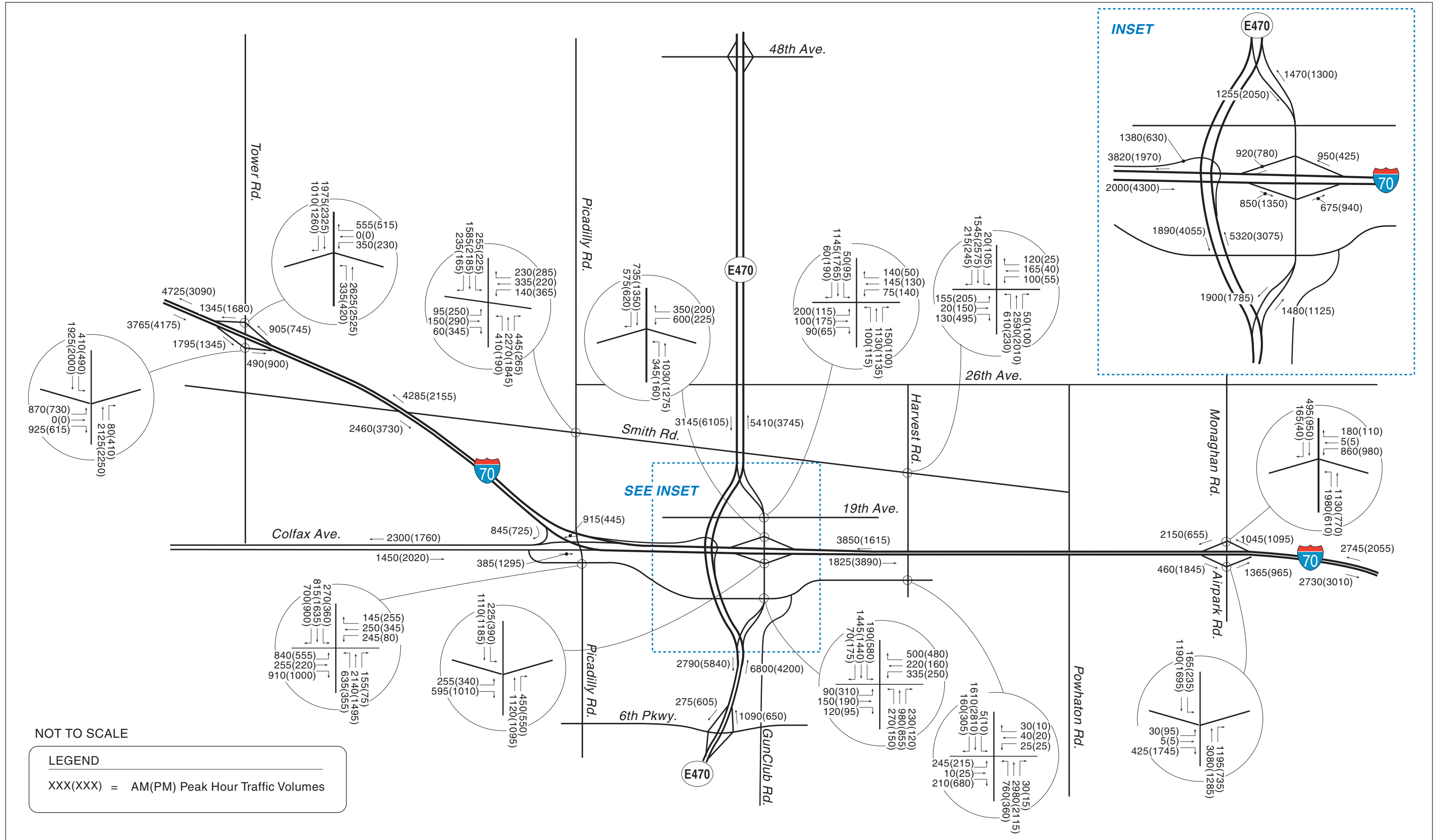
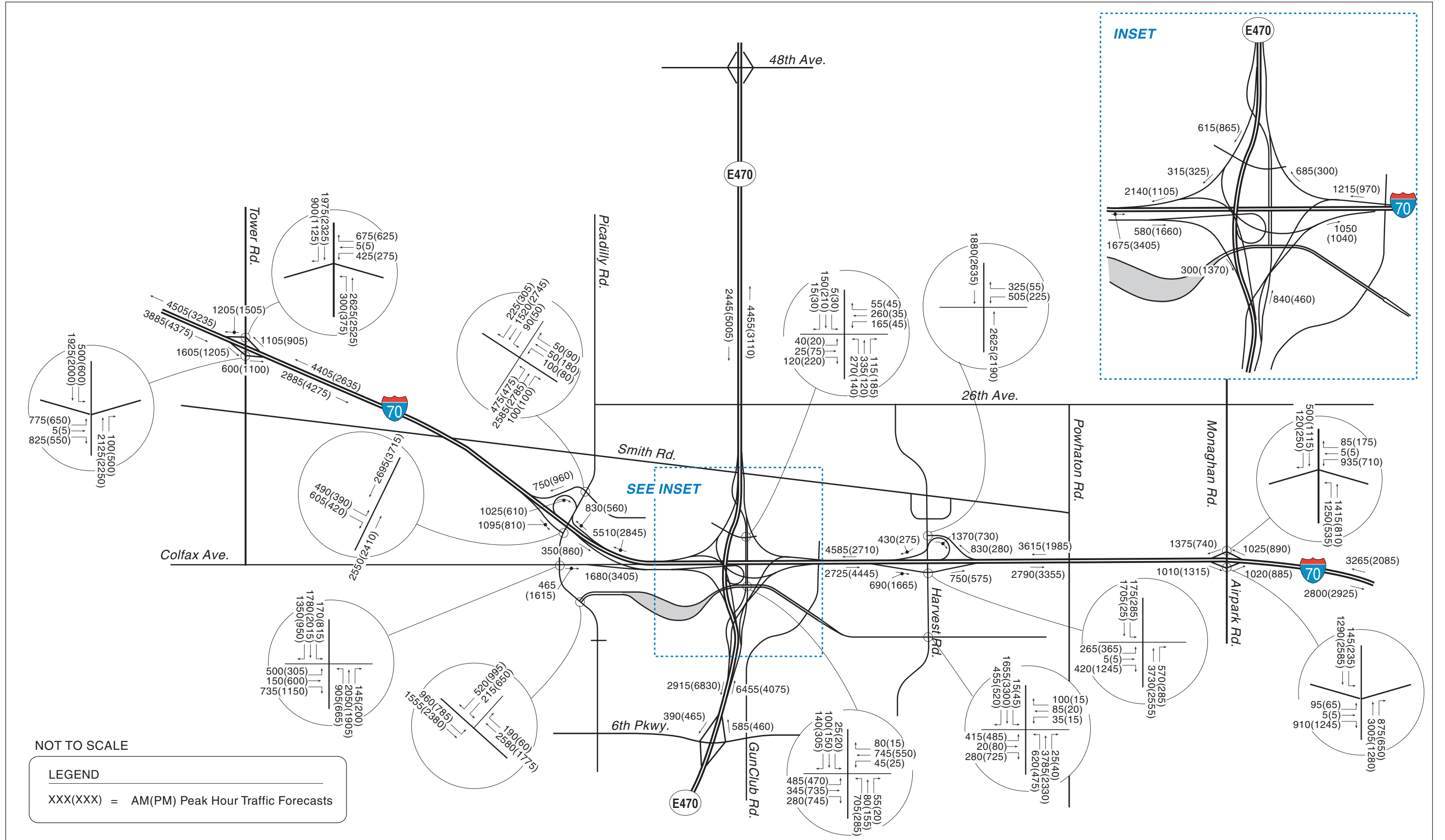


Figure 2-14
Proposed Action - Year 2030 Peak Hour Traffic Forecasts

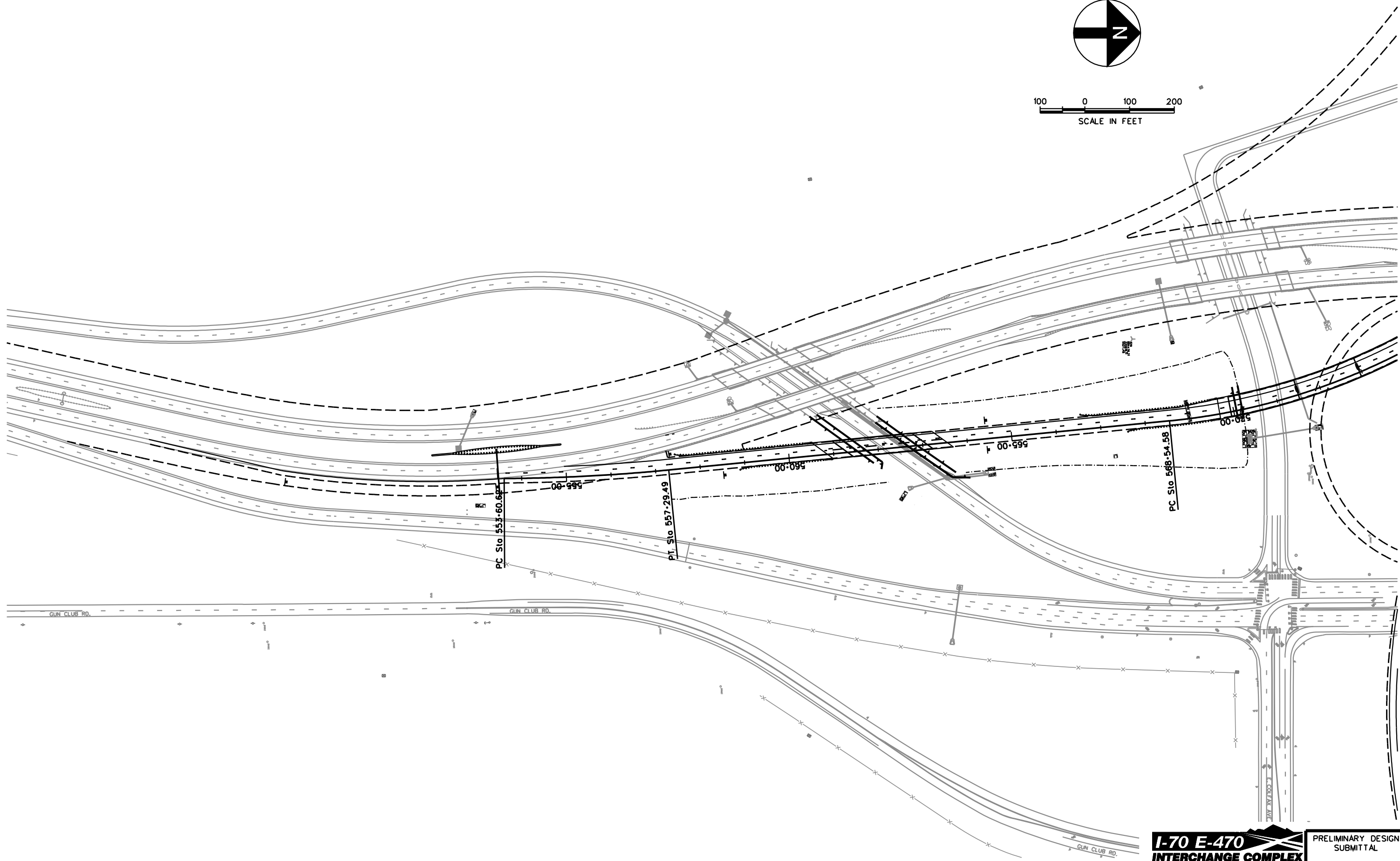


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RAMP H PLAN VIEW
1 OF 3

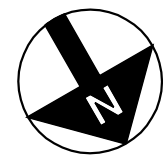
I-70 E-470
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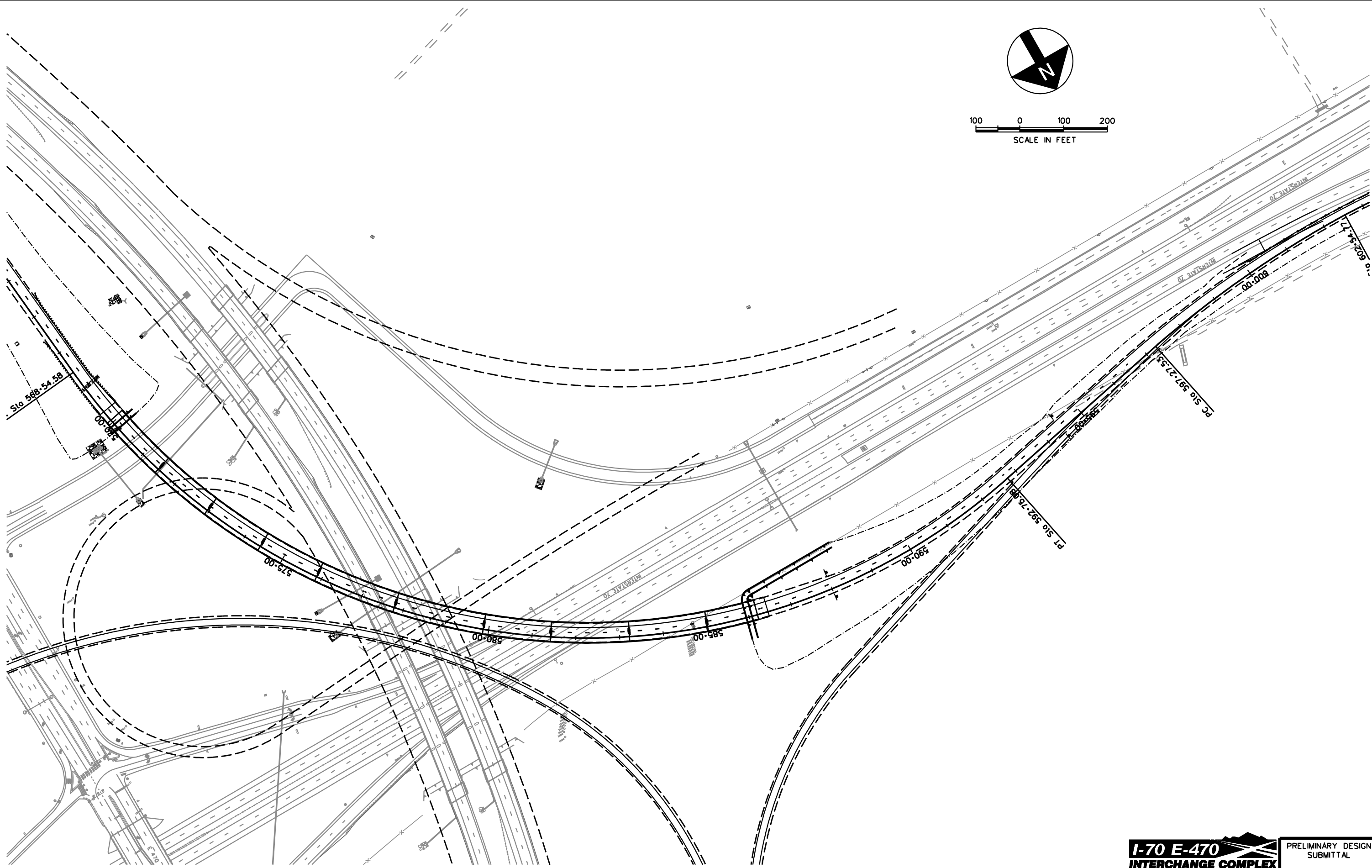
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2 OF 3

I-70 E-470
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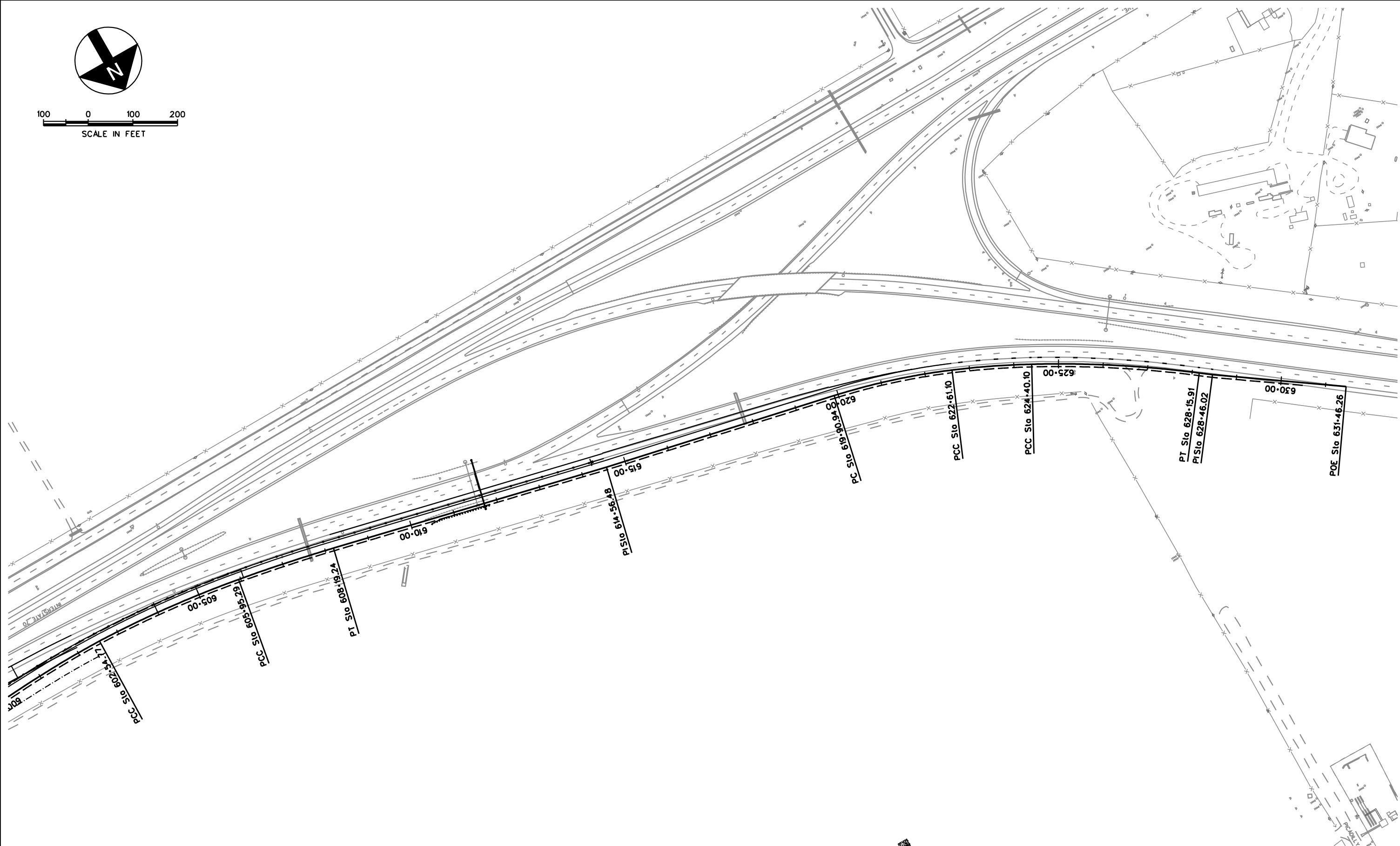
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PLOT DATE: 10/25/2005



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3 OF 3

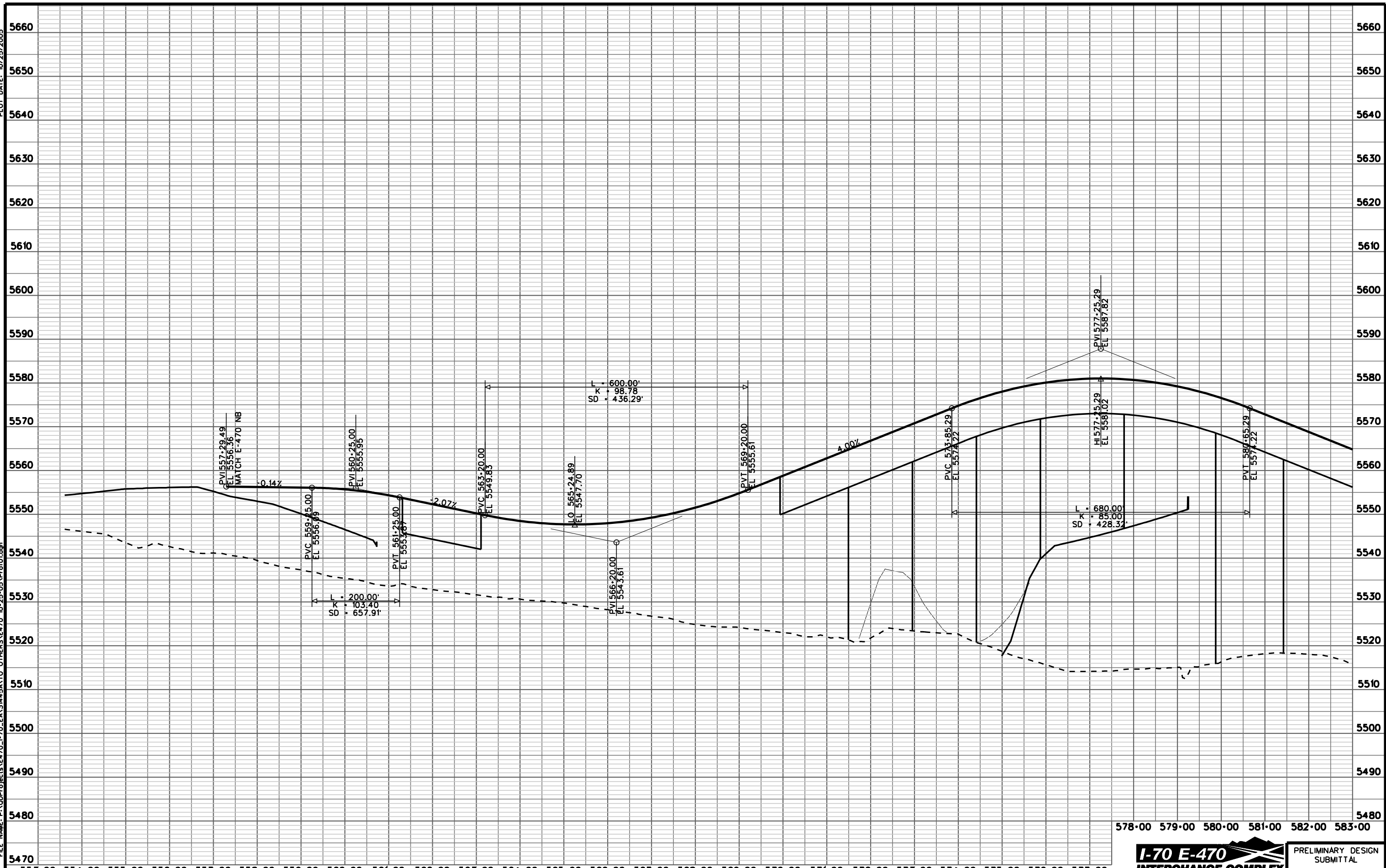
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ISSUE DATE: OCTOBER 25, 2005

PLOT DATE: 10/25/2005

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1 OF 2

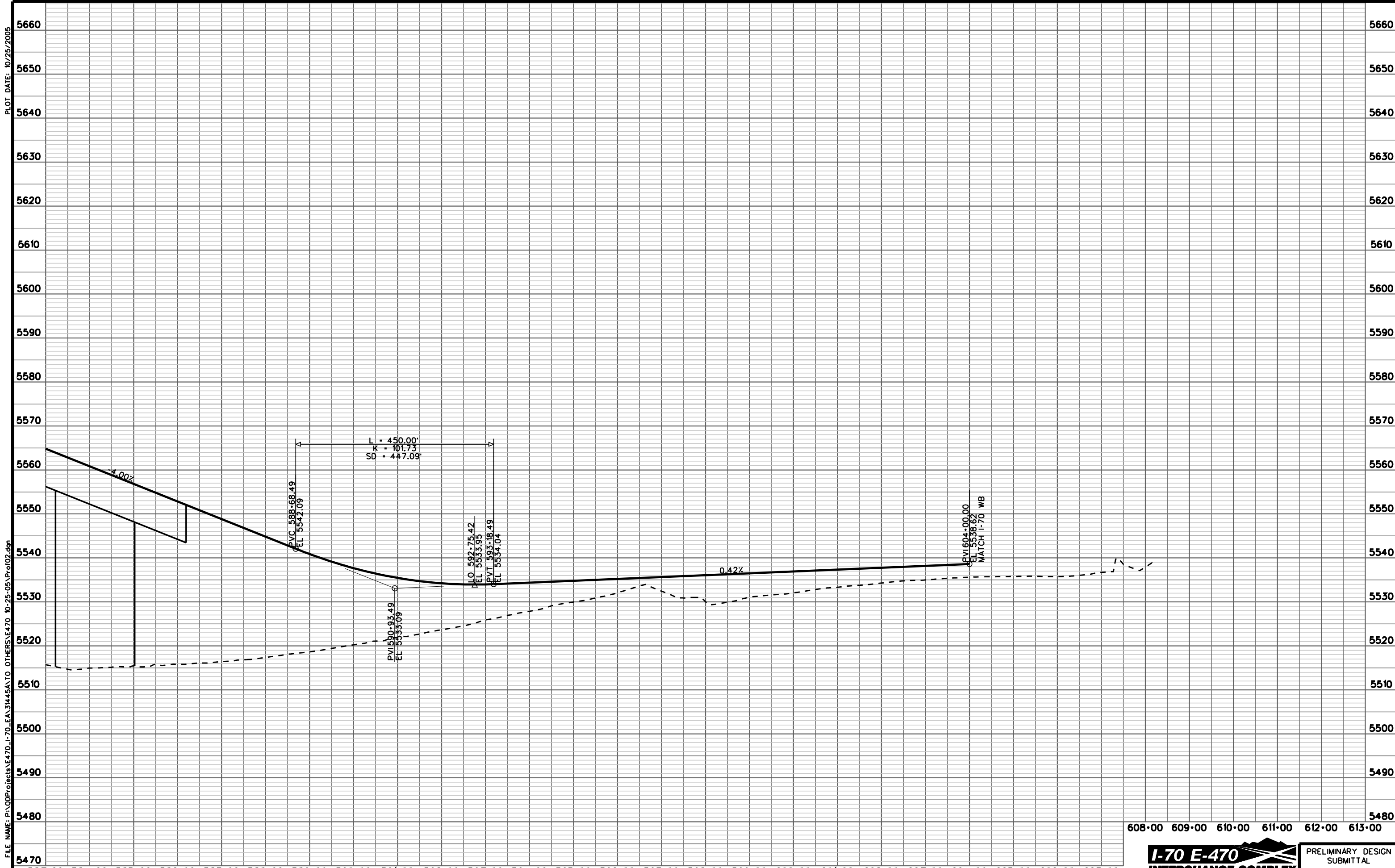
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RAMP H PROFILE
2 OF 2

CONTRACT NO. 04B501
SHEET NUMBER PRD02

APPENDIX C

**STAMINA 2.0 INPUT AND OUTPUT FILES
ON CD-ROM**