

C-470 Corridor Coalition Traffic Modeling

Concept of Operations

draft

white paper

prepared for

Douglas County

prepared by

Cambridge Systematics, Inc.

in association with

Wilson & Company

INTRODUCTION

White Paper Purpose

The purpose of document is to identify the assumptions and approach for toll price setting for Segment 1 of C-470 in Douglas County. In order to have the most accurate revenue and traffic performance predictions, the CS team will require input on how the facility will be operated. It is recognized that the system operations may change, however it is important that the assumptions going into the current modeling effort are understood and agreed upon by the operating agency. It is assumed that the operating agency will be the High Performance Transportation Enterprise (HPTE) and all toll setting parameters and assumptions need to be approved by the HPTE office.

The goal of this white paper is to provide sufficient direction so that Toll and Revenue (T&R) estimates and operational analysis can be prepared. The outline of this paper is as follows:

- Project Overview
- Ingress/Egress Concept
- Toll Zone Concept
- Toll Price Setting
- Summary

Project Overview

The purpose of this project is to expand the capacity and increase mobility along approximately 14 miles of C-470 from I-25 to Kipling Boulevard (Douglas County) by the construction of one to two Express Toll Lanes in each direction. The project will include the reconstruction of all lanes in order to accommodate the two additional lanes in the center of the freeway. Access to and from the new express toll lanes will be limited and controlled through the use of tolling equipment. The project limits are shown in Figure 1.

Figure 1 Study Area



Key features of the Project and proposed operation is as follows:

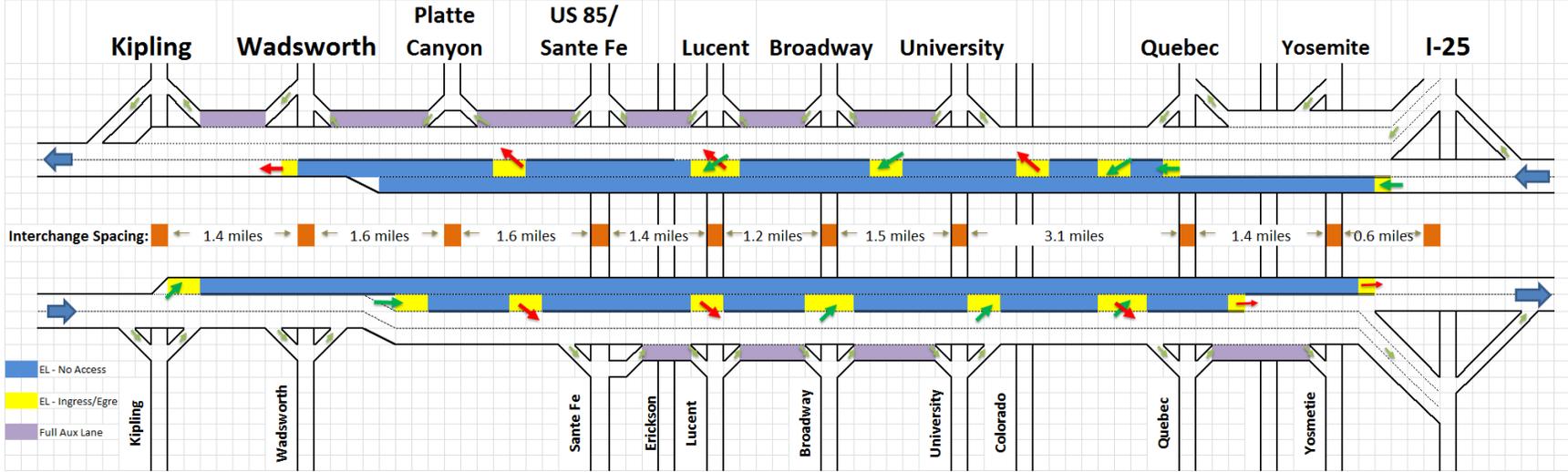
- **Vehicle Exemptions.** All vehicles will be tolled except registered vanpools. There will be no other vehicle exemptions.
- **Toll Collection.** Tolls will be collected through automatic transponders; photo tolling is yet to be determined.
- **Toll Price Setting.** Tolls will be fixed variable. Toll price values will be determined in advance and will vary in real time based on different levels of congestion.
- **Hours of Operation.** The system will be in operation 24 hours per day, 7 days per week.

INGRESS/EGRESS CONCEPT

A design concept plan has been developed by The Working Group (TWG) of the C-470 Coalition and Wilson and Company. This plan, and the assumptions that went into its development, are contained in a separate white paper. It is possible that the physical locations and type of design of the ingress and/or egress may change during the course of the traffic modeling and analysis effort. For the purposes of this toll price setting white paper, the concept plan is fixed.

Figure 2 presents the selected concept plan. Two express toll lanes in each direction will operate on the inside of the roadway and will be separated from the general purpose lanes with a set of painted, solid, double-white lines. Drivers will enter and exit the express toll lanes at designated locations. There will be eight total ingress/egress locations for westbound C-470 and eight total ingress/egress locations for eastbound C-470.

Figure 2 Ingress/Egress Design Concept Plan (6-7-2013)



TOLL ZONE CONCEPT

A toll zoning strategy must be selected in order to manage the volume of traffic and the tolls being paid. During project meetings, different toll zoning concepts were presented and discussed among the Traffic Subcommittee. These included one-zone (one price for the entire facility), two-zone and three-zone strategies. Based on consensus reached during the project meetings, a two-zone system was selected for use in the modeling phase of this project. The following sections explain how the two-zone concept would function.

The two-zone scenario contains two toll zones that compensates users who travel shorter distances. For example, a user who travels on eastbound C-470 from point M to point 10 will pay a lower toll than the user who opts to travel from point N to point 10 (see Figure 3).

Figure 3 Two-Zone Concept

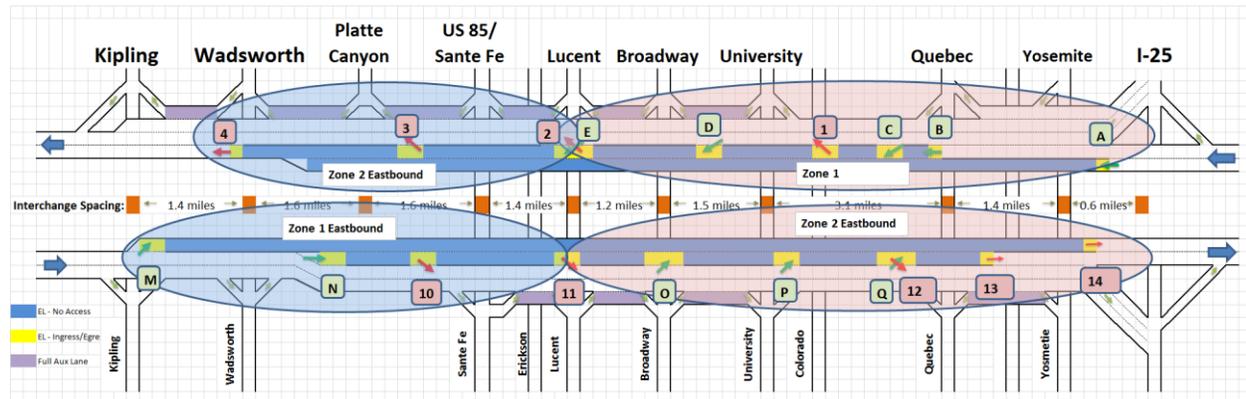


Table 1 shows an example of the toll rate for the different types of movements allowed, assuming a rate of \$1.50 per zone. Users who travel from Zone 1 to Zone 2 will pay \$3.00 based on this hypothetical example.

Table 1 Toll Price Paid Example, Eastbound

Zones & Toll Price	Ingress Locations	Egress Locations				
		Zone 1		Zone 2		
		10	11	12	13	14
Zone 1 \$1.50 ¹	M	\$1.50	\$1.50	\$3.00	\$3.00	\$3.00
	N	\$1.50	\$1.50	\$3.00	\$3.00	\$3.00
Zone 2 \$1.50 ¹	O			\$1.50	\$1.50	\$1.50
	P			\$1.50	\$1.50	\$1.50
	Q				\$1.50	\$1.50

¹ Toll price(s) are to be determined; these prices are for illustration purposes only.

The ultimate Time of Day toll pricing will include a schedule of toll prices by time of day. Table 2 is a sample table that will be a product of this study.

Table 2 Sample Layout of Proposed Toll Rates

Zone #	Description of Zone	Time of Day Prices ²				
		7am-10am	10am-2pm	2pm-4pm	4pm-7pm	7pm-7am
Eastbound						
Zone 1	Kipling to Lucent	\$1.00	\$0.50	\$0.50	\$1.00	\$0.50
Zone 2	Lucent to I-25	\$2.50	\$0.50	\$0.50	\$1.50	\$0.50
Westbound						
Zone 1	I-25 to Lucent	\$1.50	\$0.50	\$0.50	\$2.50	\$0.50
Zone 2	Lucent to Kipling	\$0.50	\$0.50	\$0.50	\$1.25	\$0.50

²Price setting schedule and prices are to be determined; these prices are for illustration purposes only.

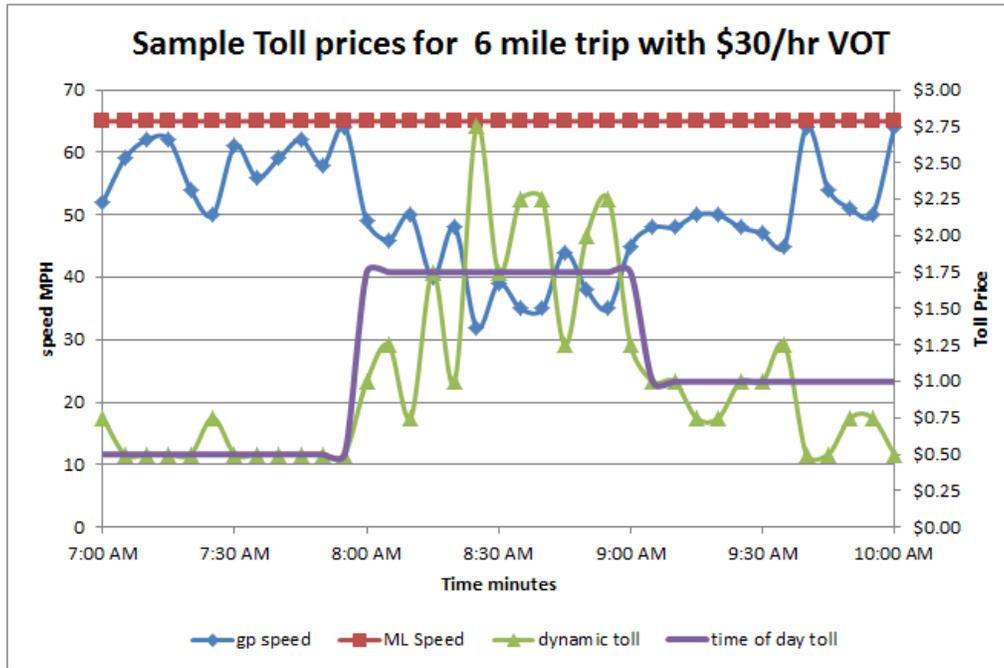
TOLL PRICE SETTING

It is assumed that Time of Day pricing will be implemented on this project. Toll prices under this approach are established by time of day and day of week based on historical congestion trends. Typically, the highest toll rate is paid during the peak hours on weekdays. Pricing schemes are generally adjusted every few months based on hourly volumes, congestion levels and performance in the express and general purpose lanes. The express lanes are proposed to operate 24 hours per day, seven days per week.

Toll Rate Setting

CS will use a VISSIM micro-simulation model as a first step to help develop prices for the fixed variable scheme. The approach involves running the model with a dynamic toll-setting algorithm. The algorithm will adjust the prices every five minutes based on levels of performance in the express lanes. After the model runs have been completed, the five-minute dynamic prices will be plotted on a chart and the fixed variable schedule will be determined. Figure 4 presents an example of this type of chart.

Figure 4 Fixed Variable Toll Price Setting Example



SUMMARY

Table 3 was developed to facilitate decision-making between HPTE and TWG. The following assumptions need to be confirmed before moving forward with modeling the design concept.

Table 3 Toll setting criteria

Item No.	Description	TWG/CS Recommendation	HPTE Direction
1	Minimum Toll	\$.50	
2	Maximum Toll	-	
3	Toll Surcharge for license plate entry	-	
4	Vehicle Exemptions	None ³	
5	Type of Pricing:	Time of Day ⁴	
6	Smallest Pricing increment	1 hour	
7	Rate lock	Price for vehicle locked in at entry	
8	Toll Zones	2 zones	
9	Price Setting	CS to run models to determine price setting	
10	Pricing objectives/targets	Speed = 45 mph Volume = 1,800 vphpl Density =	
11	Hours/Days of Operation	24/7 ⁴	
12	?		
13	?		

³ State Law will dictate vehicles exempt from tolling.

⁴ Parameters established by TWG.