

The Impact of Towing Aircraft from Runway Exit to Gates at LAX

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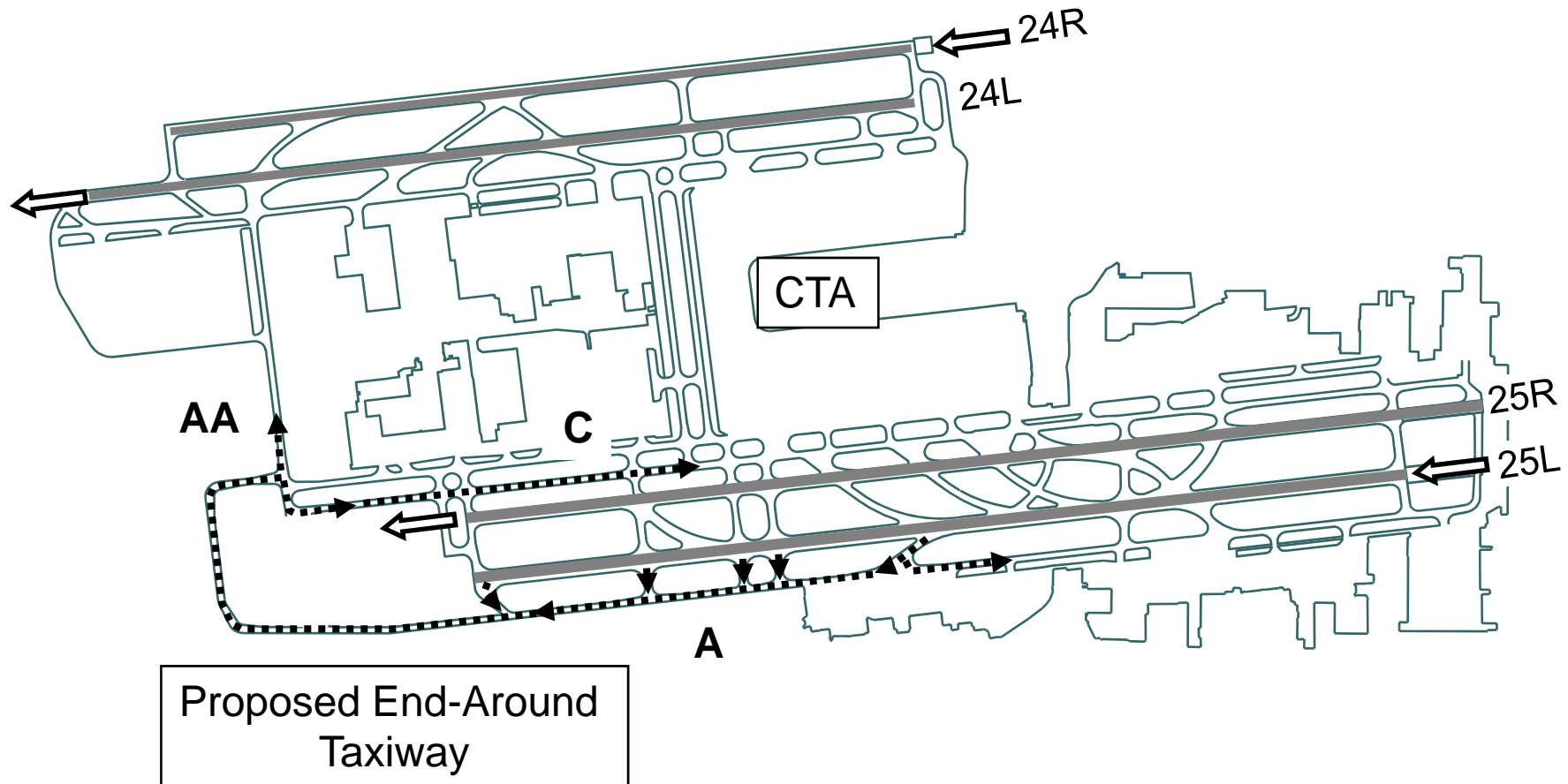
Background

- Los Angeles World Airports studied a variety of ways to minimize or eliminate runway incursions at LAX
- Two alternatives that were studied for the South Airfield were A4 and B1B
 - Alternative A4 added an end-around taxiway
 - Alternative B1B moved Runway 7R-25L south ~55 ft and added a center taxiway between Runways 7R-25L & 7L-25R
- Environmental impact
 - Alternative A4 increased taxi noise in El Segundo
 - Alternative B1B shifted noise to the south, further into the City of El Segundo

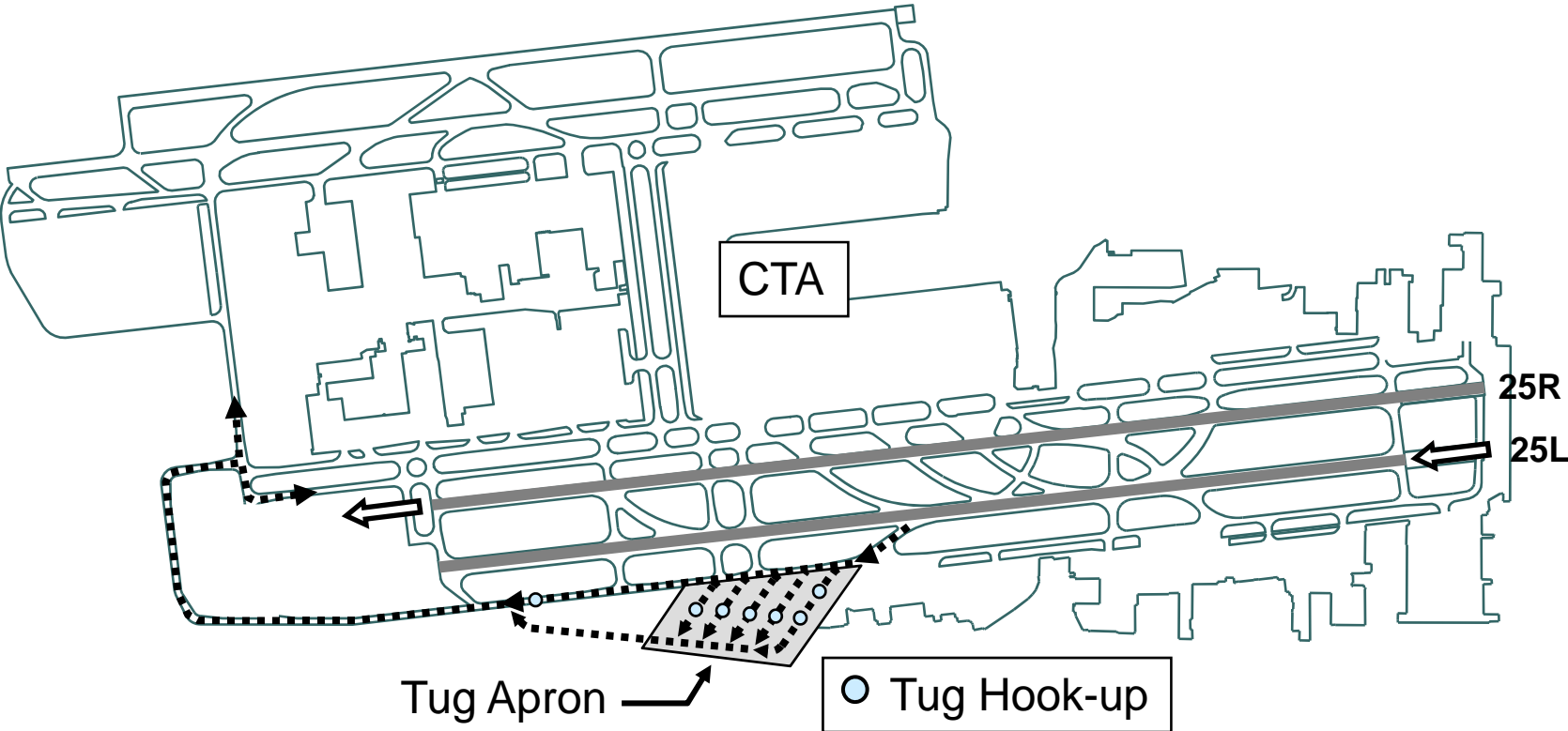
Objective

- Investigate the use of tractor tugs to tow most aircraft from 25L runway exits to their final destination on the airfield as a means to mitigate the increased noise affecting the City of El Segundo caused by the end-around taxiway.

Proposed A4 Alternative



A4 Airfield with tug apron



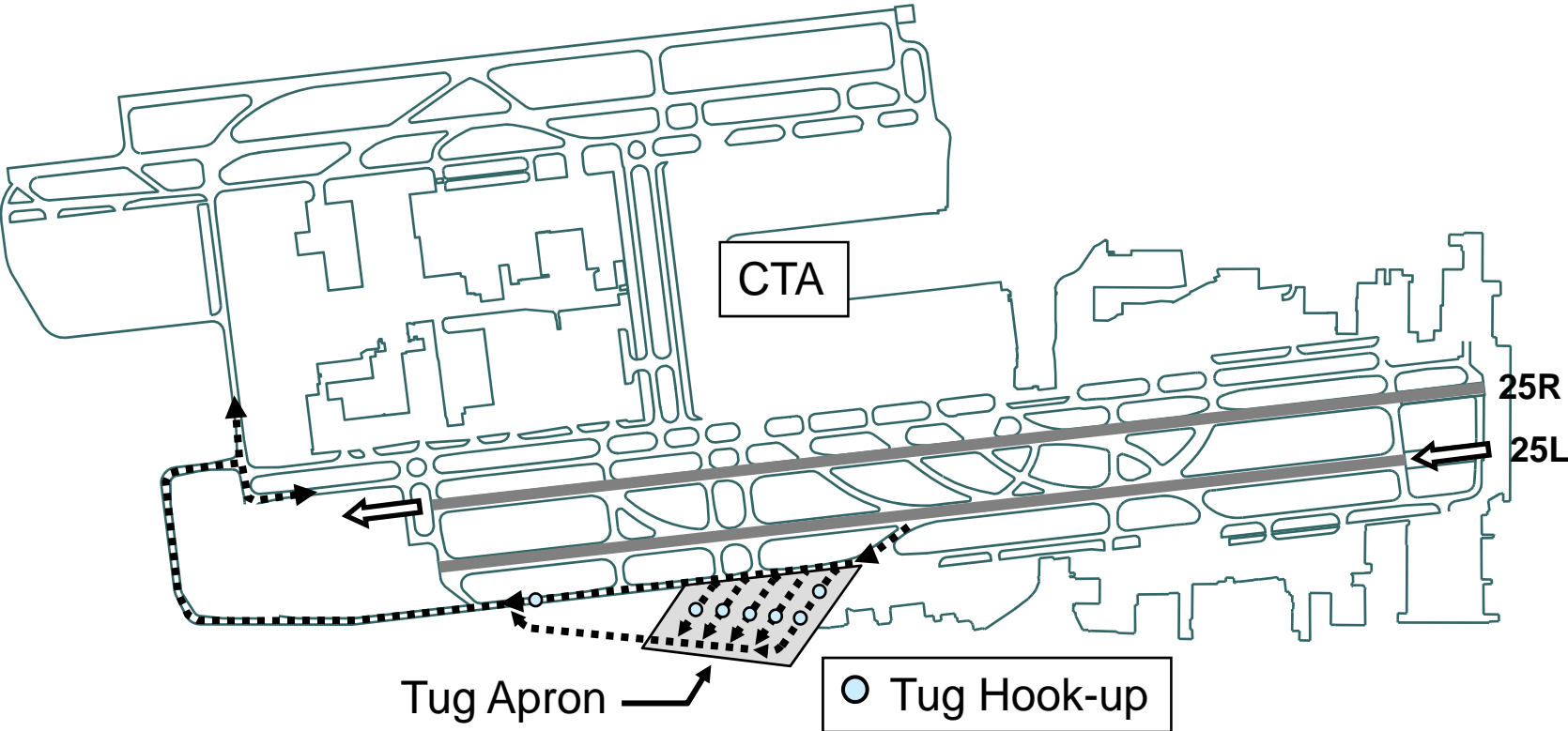
Analysis assumptions

- Engines off during tugging
- Only jet-powered aircraft are tugged
- Three minutes of low load engine operations prior to shutdown
- Tug hook-up can occur with aircraft engines running
- Two minutes required to connect tug
- Diesel, towbarless tugs
- 13 knot towing speed vs. 17 knot taxi speed

Analysis assumptions (con't)

- Five lanes on tug apron
 - Four lanes with capacity for a single wide-body aircraft
 - One lane with capacity for one wide-body and one smaller aircraft
- One potential tug hook-up location on Taxiway A
- West plan during VFR weather
- 2005 demand schedule
- End-around taxiway located outside of Runway Protection Zone (RPZ)

A4 Airfield with tug apron

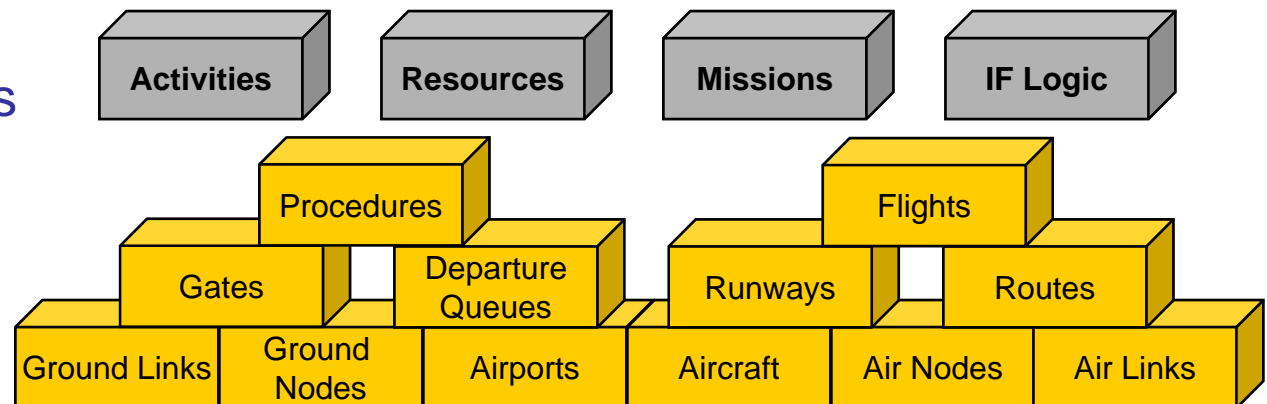


Simulation tool

- Simmod *PRO!* used for simulation
- Rules-based derivative of the FAA's airport and airspace simulation model, SIMMOD
- Look-ahead capabilities
 - Ground or airspace congestion
 - Current level of air or ground delay
 - Departure queue length
 - Gate occupancy

Simmod *PRO!*
Rules-based Objects

SIMMOD
Modeling Objects

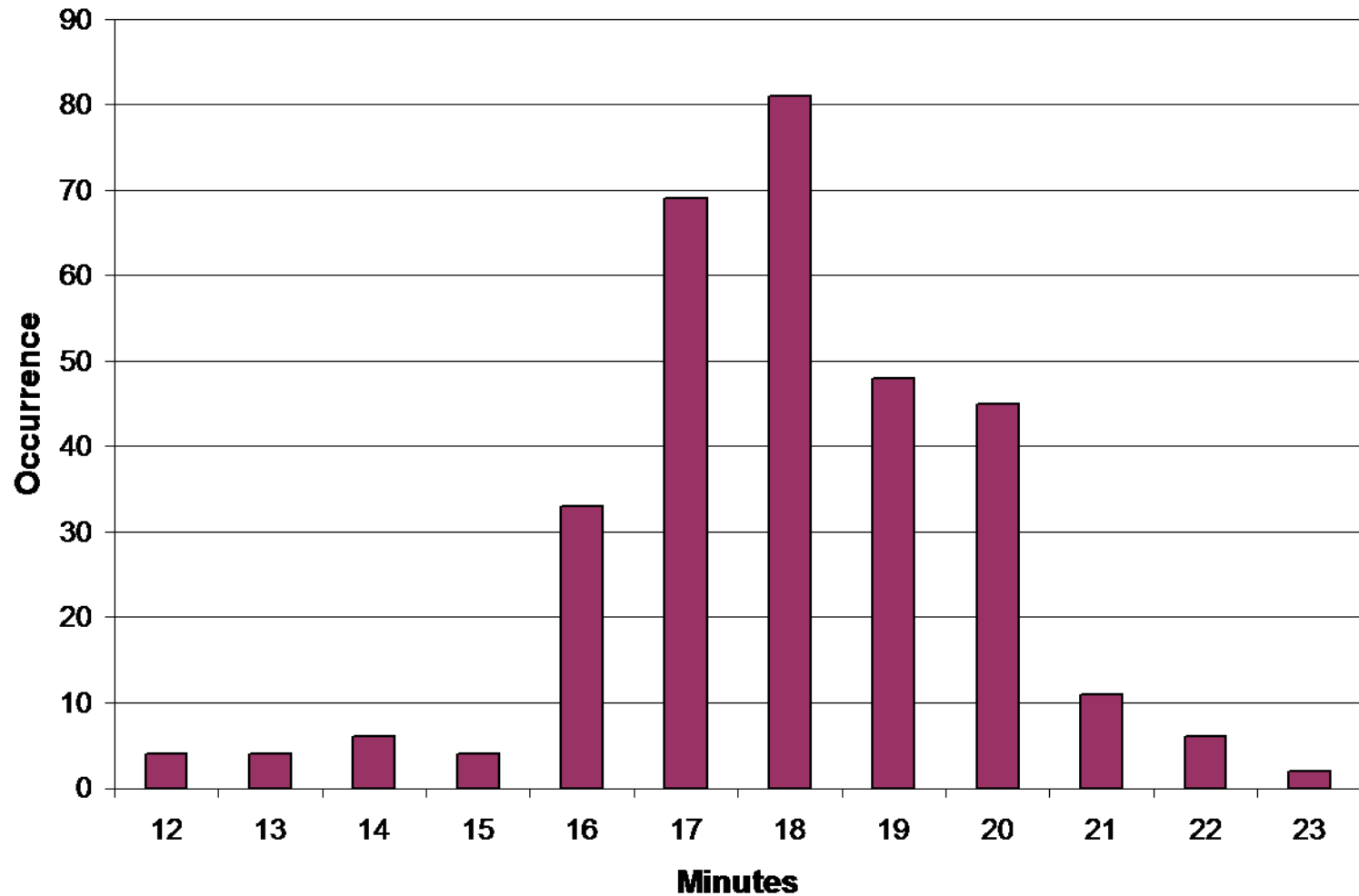


Runway utilization

- 29% of arrivals towed
- 64% of 25L arrivals towed

Runway	Arrivals	Towed
24L	87	-
24R	511	-
25L	489	313
25R	2	-
Total	1,089	313

Distribution of tow times



25L Arrivals taxi and delay times

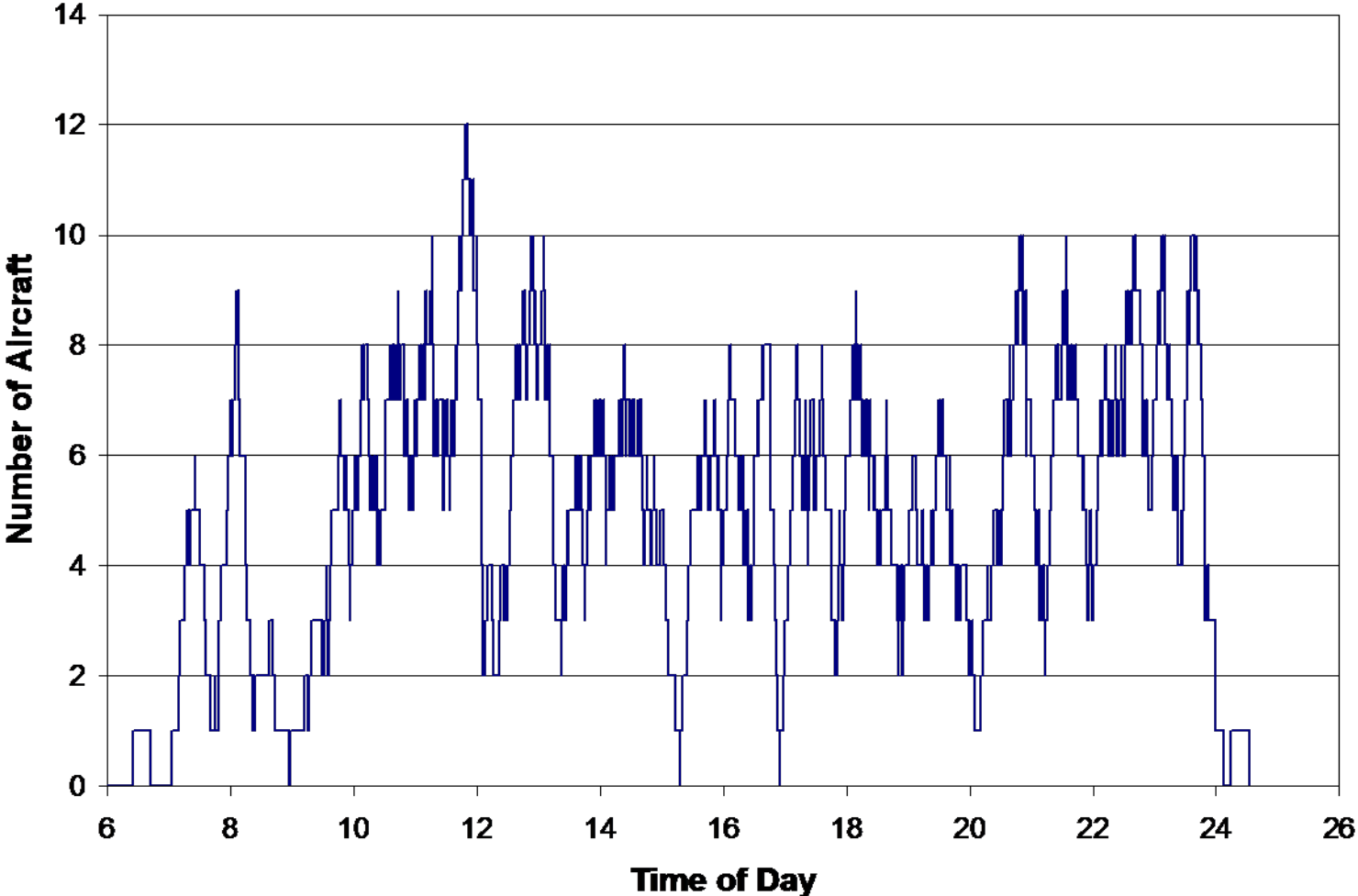
Alternative	Travel Time	Delay
End-around	10.0 min	0.2 min
End-around with Tugs	15.8 min	1.6 min

Tug alternative taxi and delay times

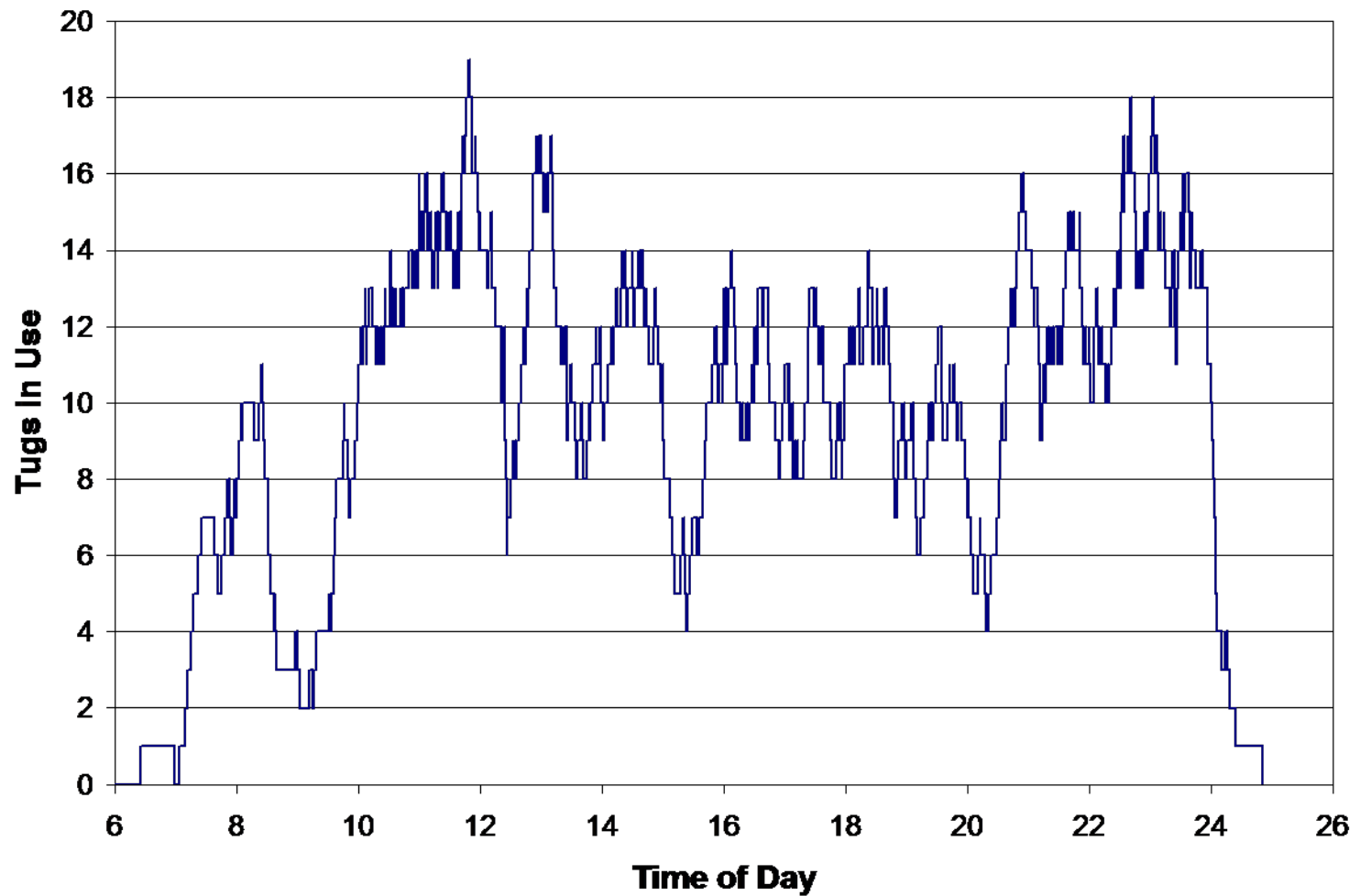
Aircraft Type	Travel Time	Delay	Aircraft
25L taxiing arrivals	8.8 min	0.5 min	176
25L towed arrivals	19.1 min	2.2 min	313

- 25L taxiing arrivals (GA and turboprop) typically utilize gates that are closer than towed aircraft
- Two minutes of tug connect time included in towed arrivals delay statistic

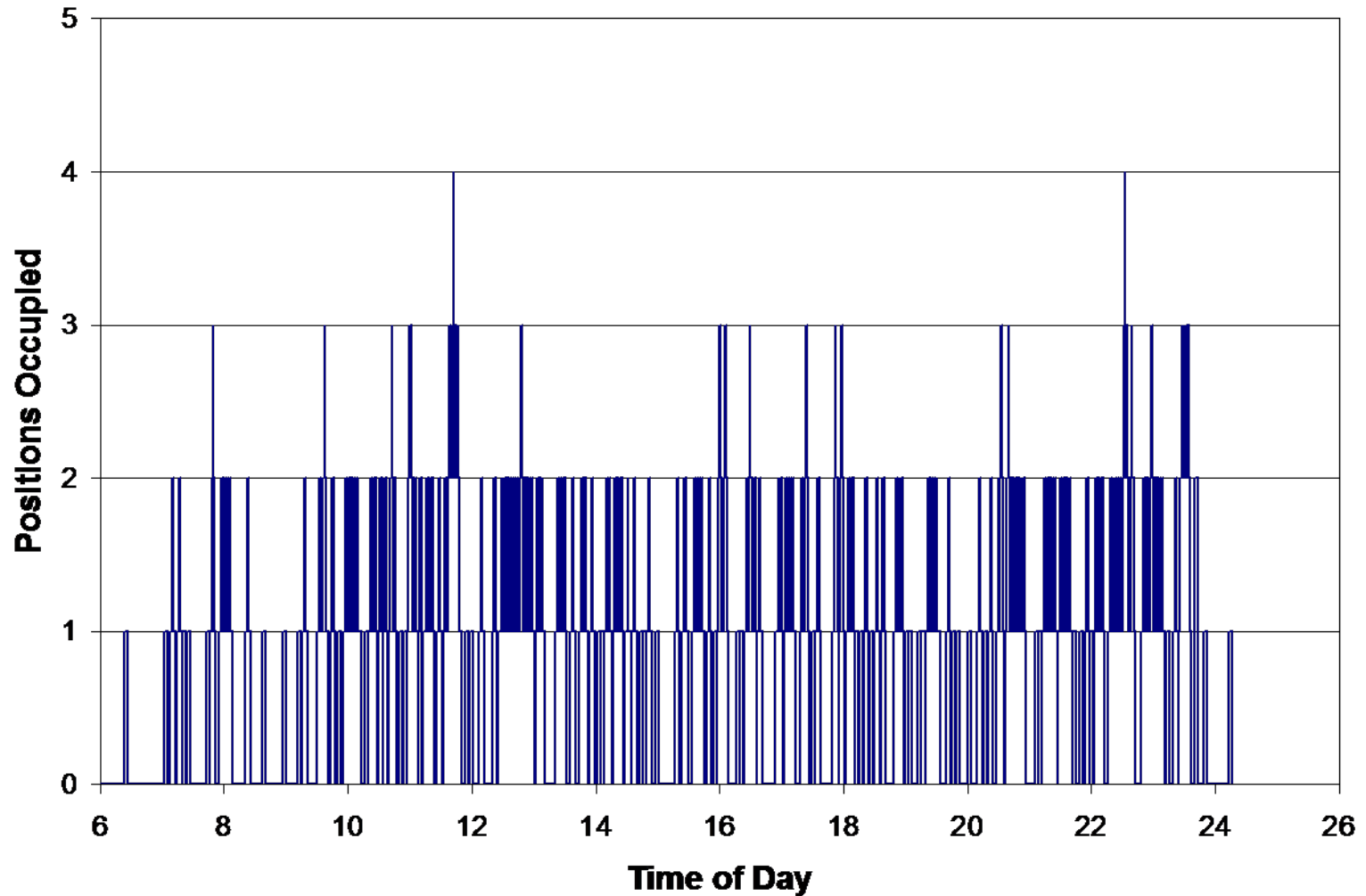
Aircraft under tow



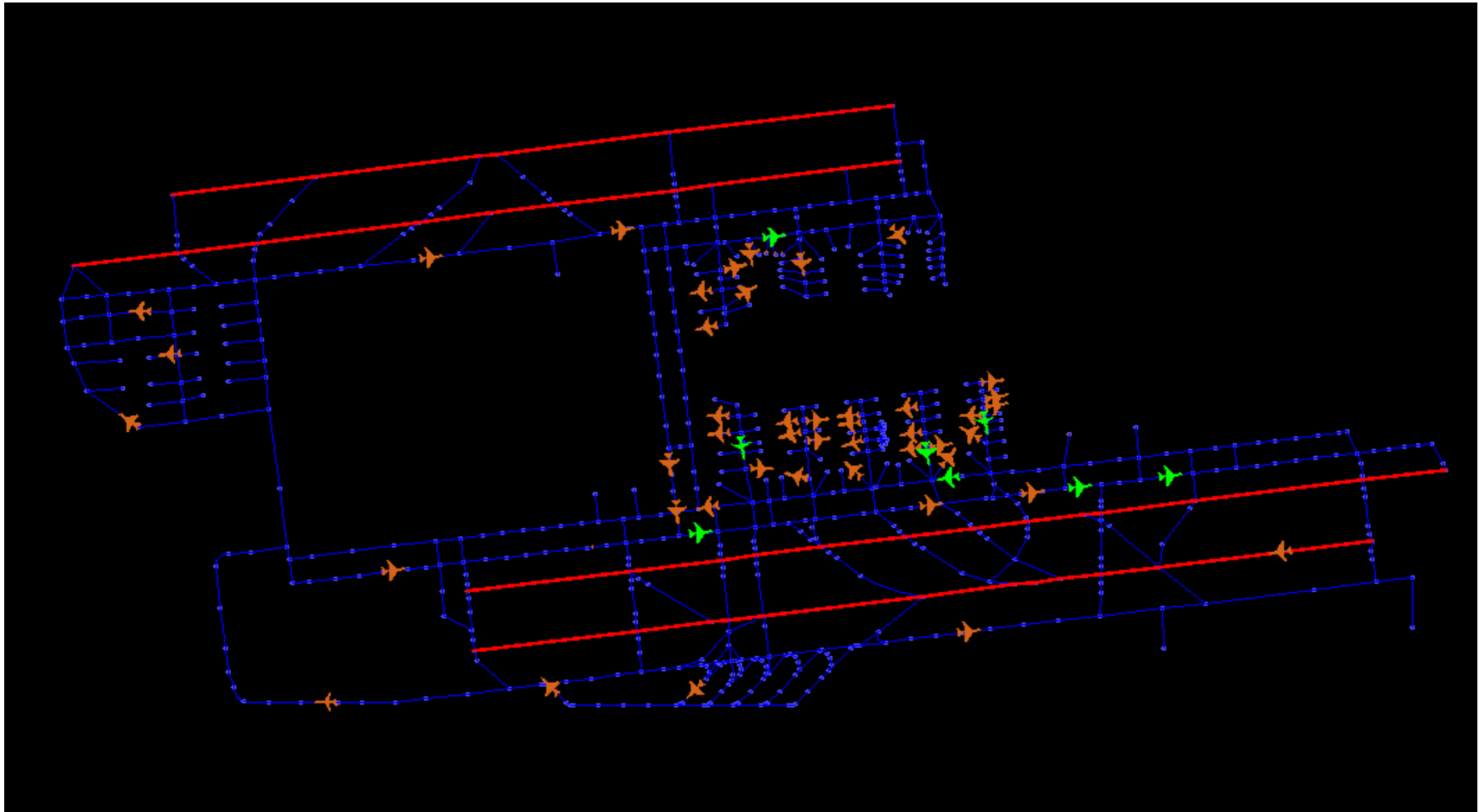
Tug utilization



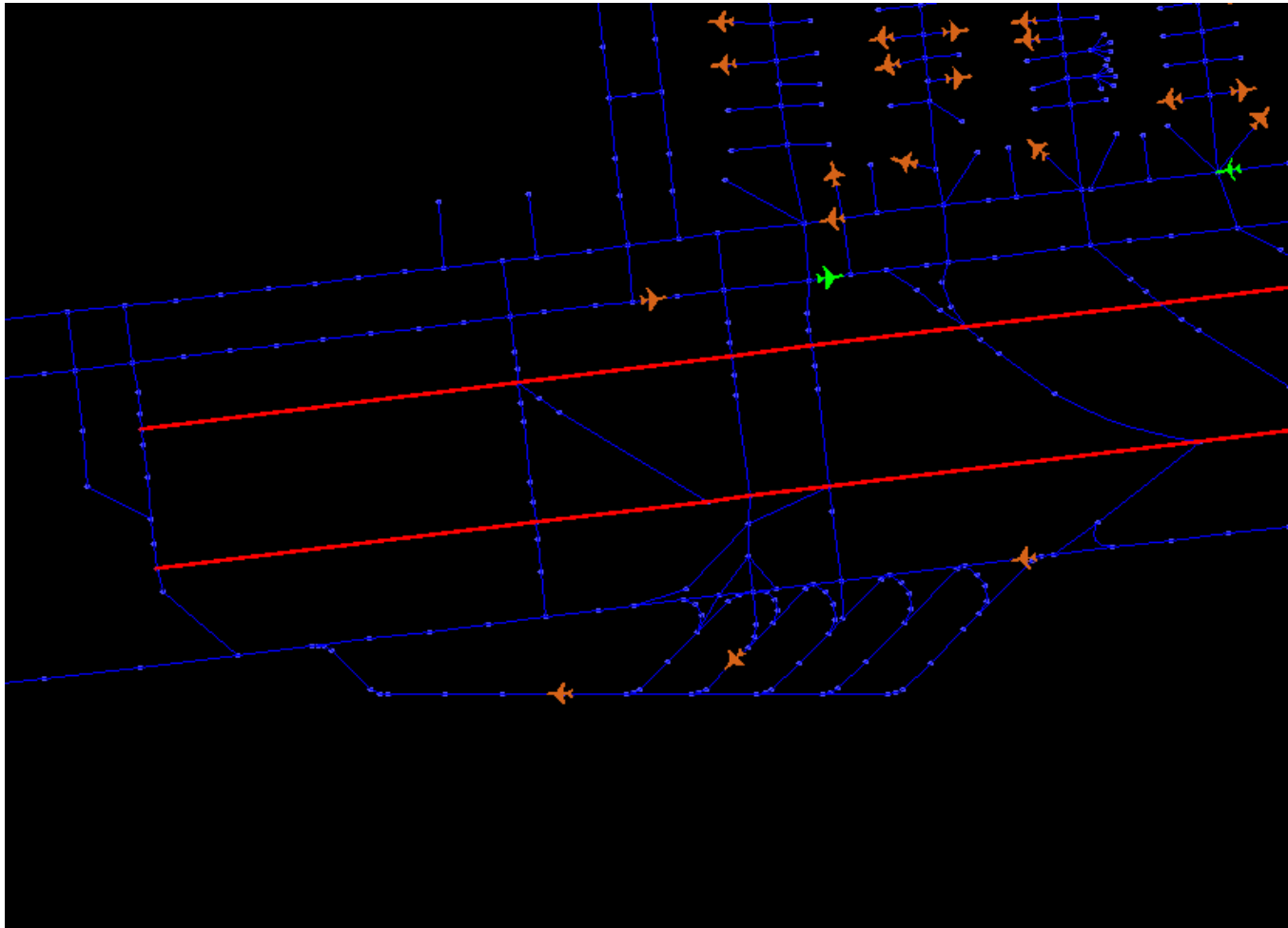
Ramp utilization



Animation of results



Animation of results



Noise results

- Sound Exposure Level (SEL)
 - Represents the cumulative noise the surrounding area receives over the entire study day as if it had occurred within a period of one second
 - Does not weight noise by time of day
 - Does not average noise over 24-hour period
 - Results indicate a higher decibel level than will ever actually be heard at a given location
- Auxiliary power unit (APU) and diesel tug operation noise not included in results

Conclusions

- Use of tugs did not produced the desired reduction in noise impact on the City of El Segundo
- Travel times for towed aircraft significantly increased due to slower tug speeds
- Delay times increased for non-towed aircraft due to the speed differential between towed and non-towed aircraft