Hartsfield-Jackson Development Program

Focus on the Future

Taxiway Solutions to Improve Capacity

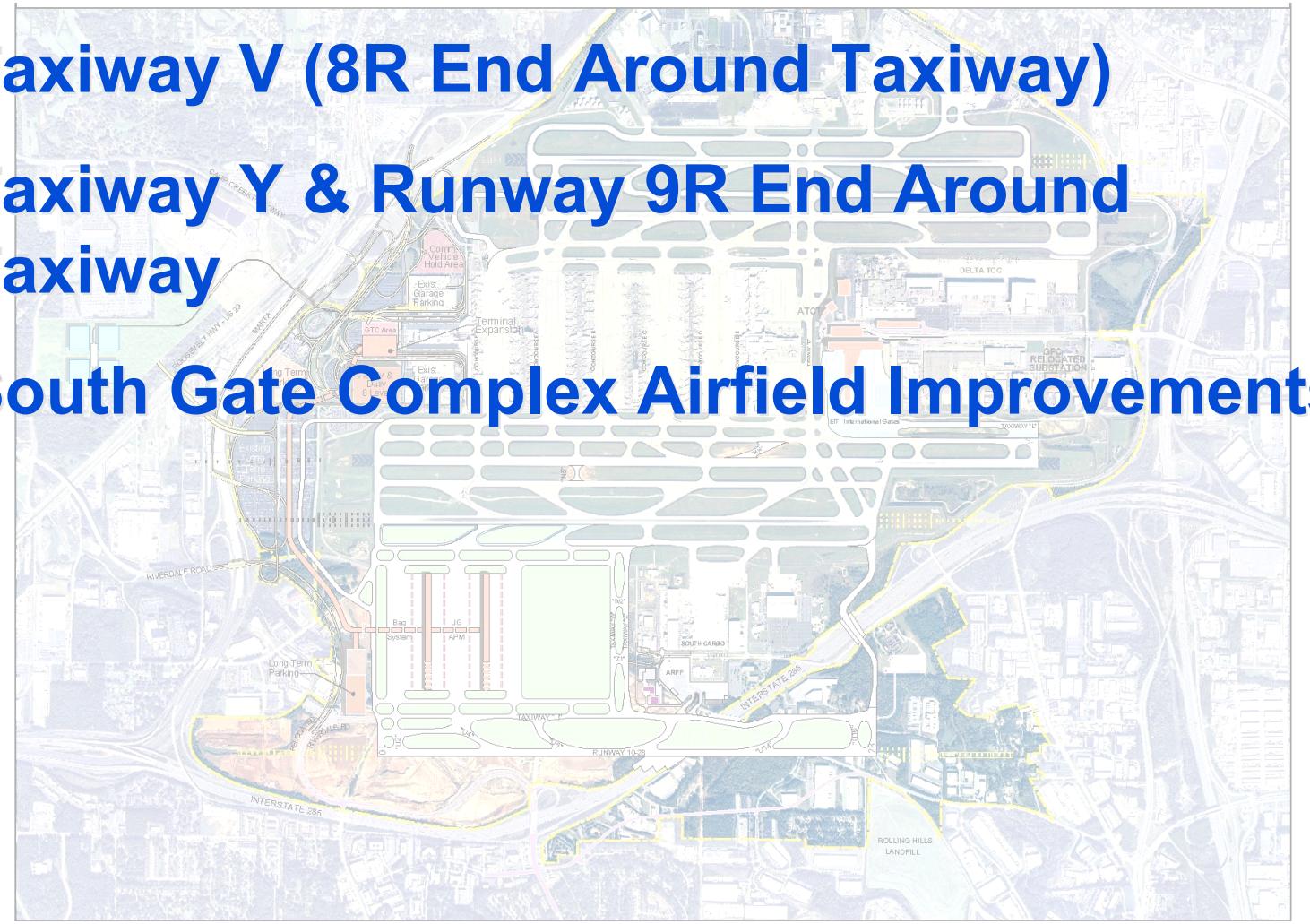
and Lessons Learned

9/12/06

City of Atlanta-Department of Aviation

AGENDA

- Taxiway V (8R End Around Taxiway)
- Taxiway Y & Runway 9R End Around Taxiway
- South Gate Complex Airfield Improvements



Taxiway V (Runway 8R-26L) Overview

Key Goals:

- Designed as part of the ATL Master Plan to reduce Runway 26L departure delay.
- Reduce congestion on Taxiways E & F at the entrance to Ramp 1 during East Flow operations.
- Facilitate the reduction in the number of runway crossings on Runway 8R/26L over the projected growth of the airport.

Issues Encountered in Approval Process

- **Initial meeting between ATL Staff and FAA's Airport Obstruction Standards Committee resulted in the following:**
  - Θ **Justification for departure from a long-standing "normal" practice of not overflying free-flowing taxiing aircraft.**
  - Θ **Human factors considerations.**
  - Θ **How the 40:1 departure surface penetrations would be mitigated.**
  - Θ **How many aircraft may be allowed in the Runway Protection Zone without fully understanding the surface risk transference issues.**
- **ATL continued the design effort on an "at risk" basis to maintain the schedule for implementation. The decision to proceed "at risk" was based on the belief that FAA would ultimately approve the project.**

Resolutions to Issues

- ATL Staff supplied examples of 13 airports that had taxiways that encroached on the end of the runway or the RPZ.
- Taxiway Use restrictions were based on TERPS.
- MITRE CAASD did research on the risk of an aircraft in the RPZ and concluded that the risk was acceptable based on the proposed use of the Taxiway.
- Delta Air Lines provided use of their flight simulators and several flight crews to test the Human Factors issues. FAA prepared a series of test and observed how the crews reacted to aircraft on the taxiway under several conditions (weather, engine out, low visibility, day/night).

Taxiway V - Usage/Limitations

Approved by AOSC

Runway and Operation Affected	West Flow Operation
26R Arrivals	Runway 26R arrivals land, taxi westbound on "B" and continue onto End-Around, taxiing to Taxiway E, Taxiway F, or entrance to Ramp 1 North.
26L Departures	Runway 26L departures continue to depart over aircraft taxiing on End-Around in conditions above 300-foot ceiling and one-mile visibility (300-1).

Needs AOSC Approval

Runway and Operation Affected	East Operation
8L Arrivals	Runway 8L arrivals continue to land on 8L in all weather conditions, even with aircraft on 8R End-Around queued to depart 8R.
8L Arrivals Sidestepping to 8R	8L arrivals electing to sidestep in visual, daytime conditions are protected by 20:1. Instrument sidestep procedure to 8R would not be protected with aircraft on 8R End-Around. 8R approach light plane would not be protected from aircraft on End-Around.
8R Departures	Aircraft would be able to queue on the Taxiway, providing an opportunity to queue 8R departures on the End-Around and "E" and "F".
8R Arrivals	No aircraft permitted on End-Around when ILS or localizer approaches are conducted to 8R.

- **West Flow Summary:**
  - **All passenger airline arrivals (with the exception of Design Group V aircraft) landing on Runway 26R use end around taxiway to access the Central Passenger Terminal Complex during Visual Meteorological Conditions.**
  - **Use of the taxiway during Instrument Meteorological Conditions would be limited to ceiling and visibilities greater than 300' AGL and 1 mile visibility, due to aircraft tail penetrations of the RW 26L TERPS 40:1 Departure Surface.**

- **East Flow Summary:**
  - **Runway 8L arrival operations are not impacted.**
  - **Instrument approaches to Runway 8R not permitted when taxiway is in use.**
  - **Visual approaches to Runway 8R are permitted.**
  - **Runway 8R departures may be queued on taxiway as long as there are no instrument approaches being conducted to Runway 8R.**

Outstanding Issues for Taxiway V

- Approval for the unrestricted use of arrival aircraft landing over the top of aircraft on an End Around Taxiway.

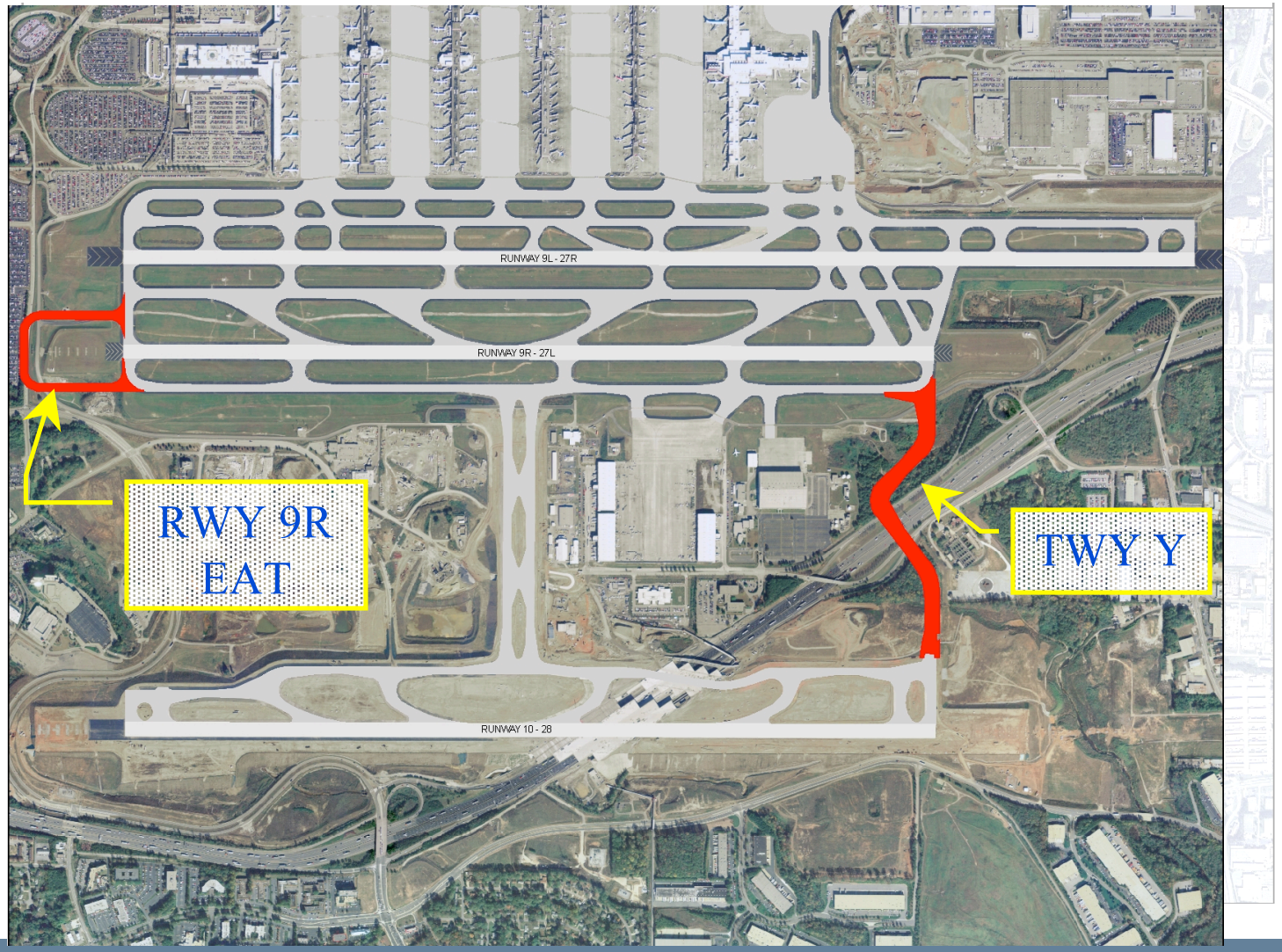
Benefit/Cost Analysis

- Total cost (including soft costs) to construct the proposed taxiway is approximately $42.0 million.
- Included annual maintenance costs for the taxiway plus maintenance cost for new roadways.
- Annual aircraft taxi and delay time savings associated with the Taxiway V estimated to be approximately $27.1 million per year. Delta Air Lines TAAM modeling effort estimated the savings to be roughly $50.0 million per year.
- Total accrued costs and accrued benefits were discounted at an annual rate of 7% per FAA guidelines. Resulted in a B/C ratio of 6.8

Video of Simulated RWY 26L Departures

Video of Simulated RWY 8R Arrivals

Taxiway Y & Runway 9R End Around Taxiway



Background on Taxiway Y & 9R EAT

- **Both projects were proposed in the Airport Master Plan and included in the Development Program.**
  - Taxiway Y became a geometric/cost issue for the airport as GDOT required it accommodate expansion of the Interstate.
  - 9R EAT became a geometric/cost issue for the Airport as it severely impacted a major exit roadway and long term parking. Benefits were also questioned.
- **Local FAA (ADO & Air Traffic) became concerned that Runway 10/28 would not achieve the benefits that originally justified its expense.**
  - Time to taxi to Runway 28 would be to difficult to judge and result in increased delays for Runway 27R departures.
  - Aircraft exiting Runway 10 at the second high speed would have to back taxi down Taxiway SG and have head to head conflicts with trailing aircraft using the first high speed.
  - Aircraft taxiing to the gate areas would have to cross Runway 27R which would increase delays and decrease the arrival rate for Runway 27R .

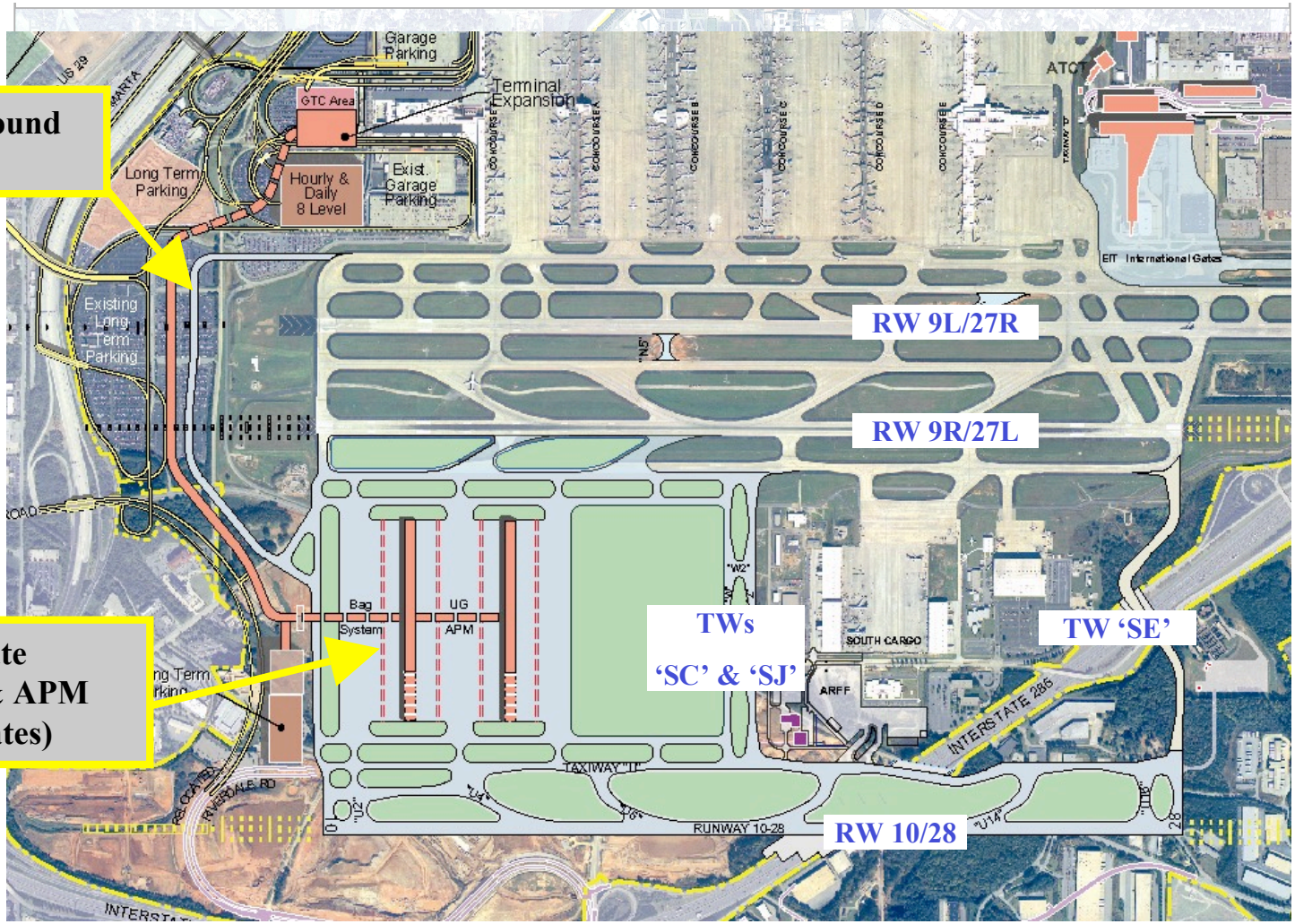
Resolution to FAA Concerns

- **An Airfield Simulation Working Group was formed to analyze FAA concerns.**
  - **MITRE CAASD**
  - **FAA Runway Safety Office**
  - **FAA Airports District Office**
  - **FAA Southern Region (Airports)**
  - **FAA Flight Standards**
  - **FAA Air Traffic – A80 (Combined Tower and TRACON)**
  - **Hartsfield-Jackson International Airport Planning Staff**
  - **Hartsfield-Jackson Development Program Project Mangers**
  - **Delta Air Lines – Operations Command Center**

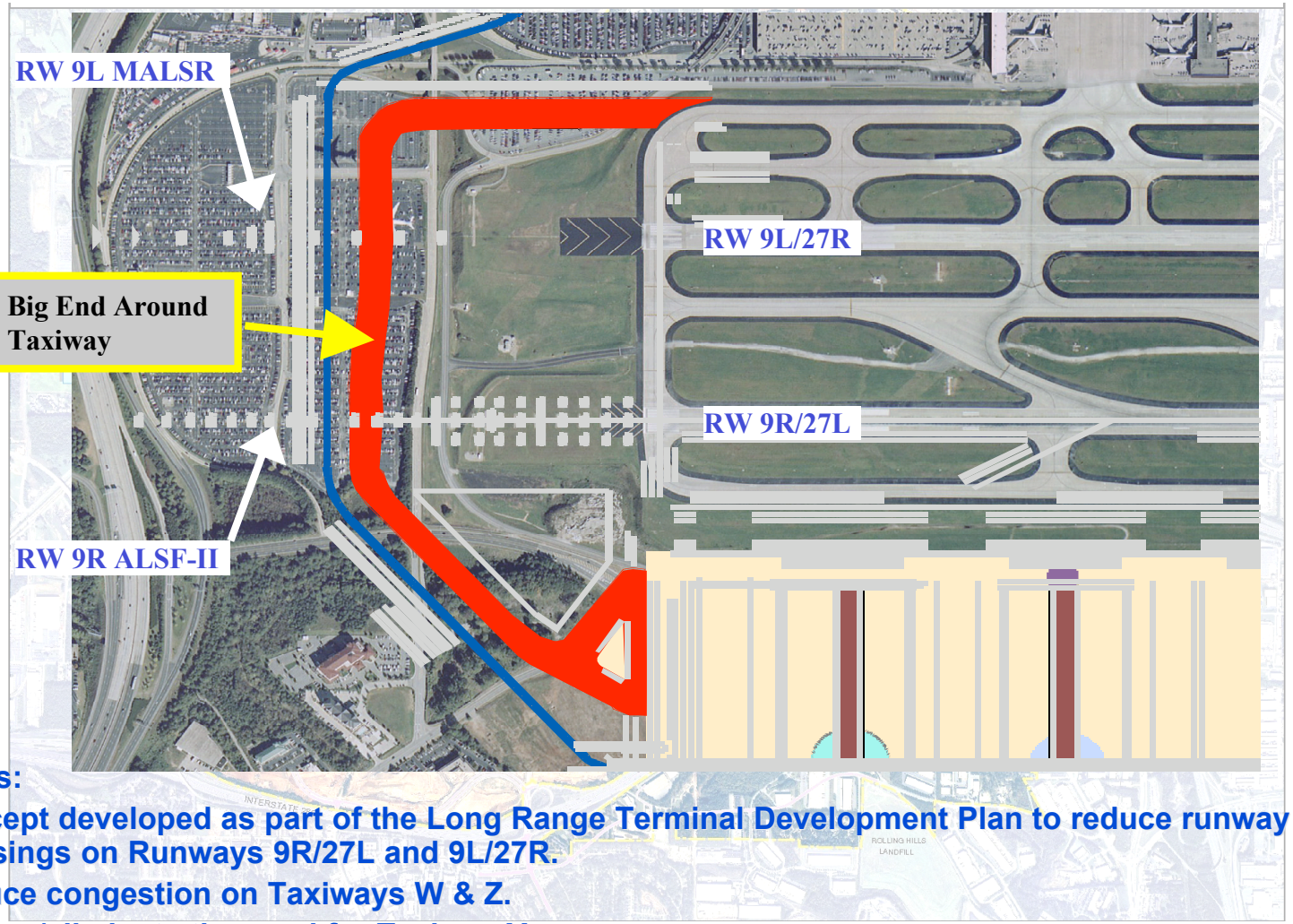
Results of Airfield Simulation Working Group

- Taxiway Y provided marginal benefits in taxi times. Benefits were insufficient to offset the cost of building the taxiway.
- Runway 10 Head to head movements were minimal and did not appear to impact operational efficiency.
- Flow rates on Runway 27R were not negatively impacted by the lack of the Runway 9L End Around Taxiway.
- While delays for aircraft crossing Runway 27R, these aircraft had an increased unimpeded taxi time and incurred more delay in trying to cross Runway 27L. The overall result was an increase in taxi times.

2010/2015 (112 MAP/121 MAP)
Ultimate Gate Development



Big End Around Taxiway Concept Overview



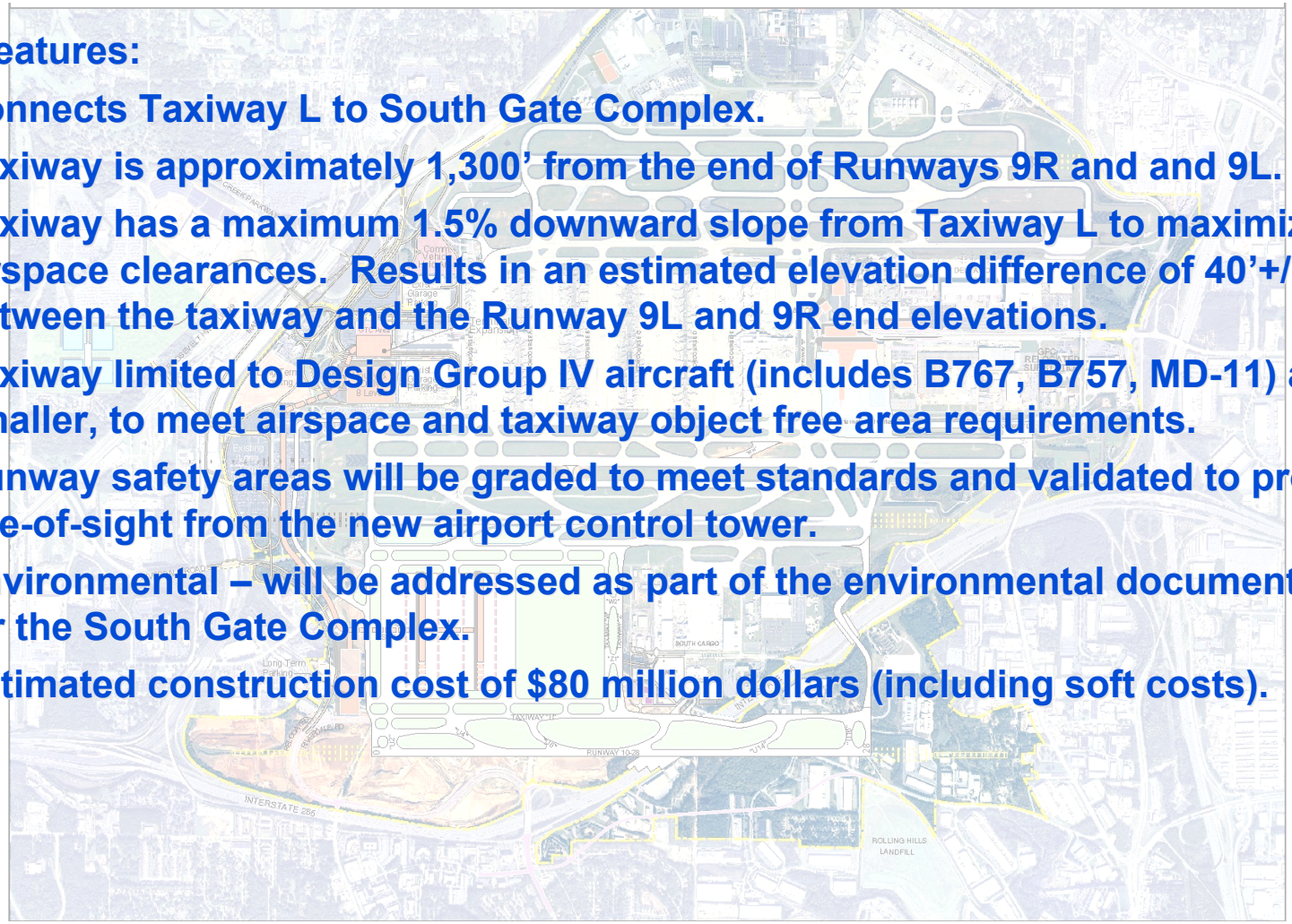
Key Goals:

- Concept developed as part of the Long Range Terminal Development Plan to reduce runway crossings on Runways 9R/27L and 9L/27R.
- Reduce congestion on Taxiways W & Z.
- Reduce/eliminate the need for Taxiway Y.

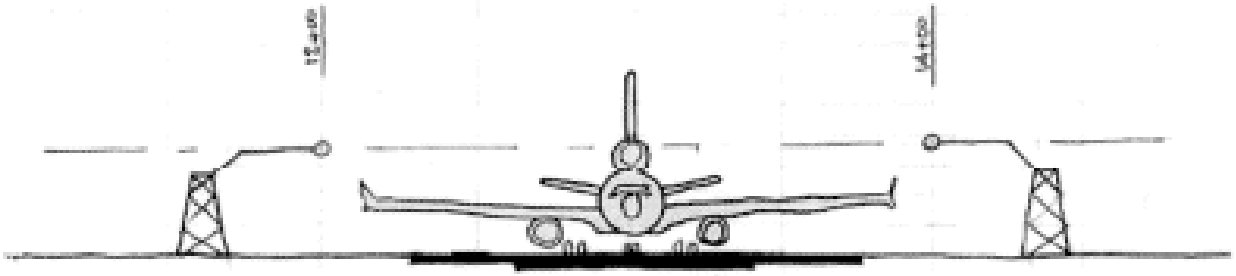
Big End Around Concept Overview - (Continued)

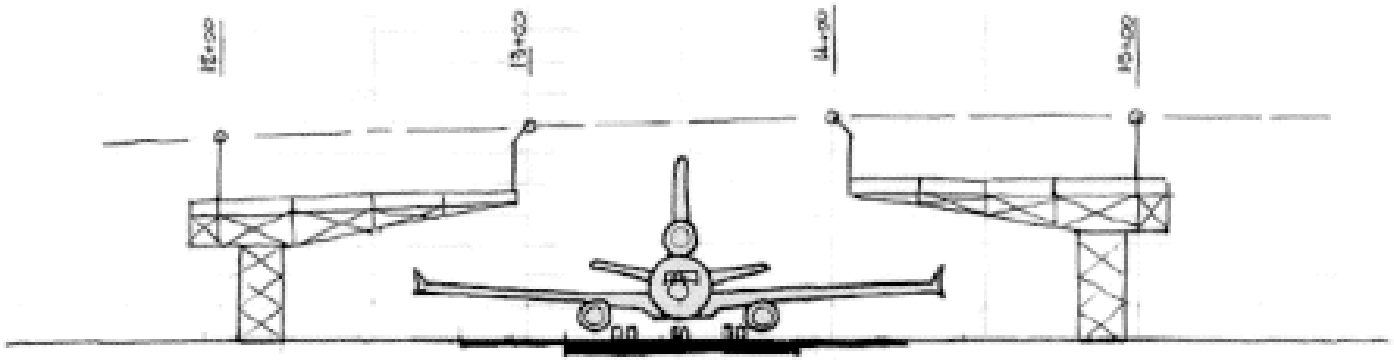
Key Features:

- Connects Taxiway L to South Gate Complex.
- Taxiway is approximately 1,300' from the end of Runways 9R and and 9L.
- Taxiway has a maximum 1.5% downward slope from Taxiway L to maximize airspace clearances. Results in an estimated elevation difference of 40'+/- between the taxiway and the Runway 9L and 9R end elevations.
- Taxiway limited to Design Group IV aircraft (includes B767, B757, MD-11) and smaller, to meet airspace and taxiway object free area requirements.
- Runway safety areas will be graded to meet standards and validated to provide line-of-sight from the new airport control tower.
- Environmental – will be addressed as part of the environmental documentation for the South Gate Complex.
- Estimated construction cost of $80 million dollars (including soft costs).

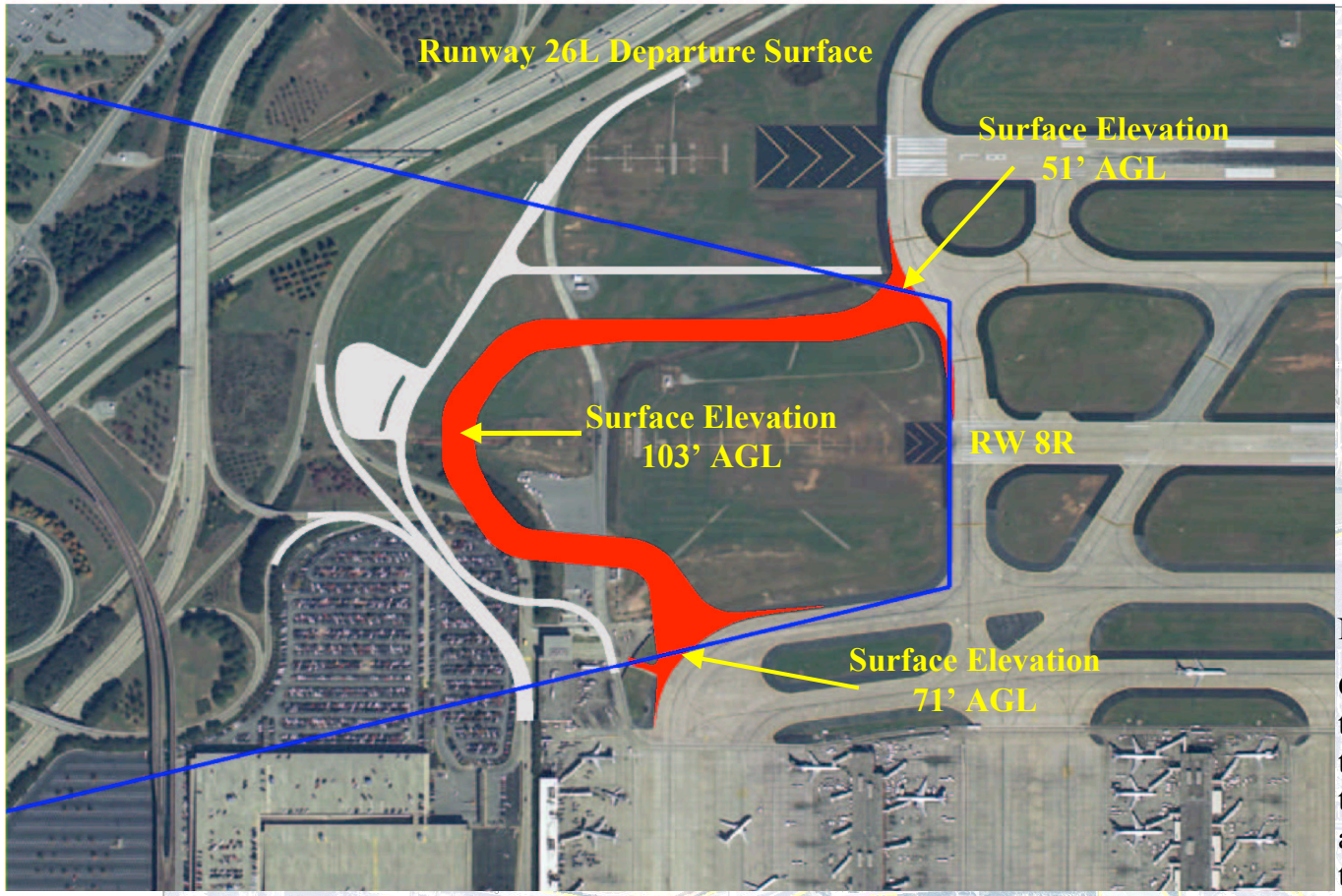


Object Free Area – Modification To Standard





Airport Obstruction Criteria –
(TERPS Departure Surface for Runway 26L)

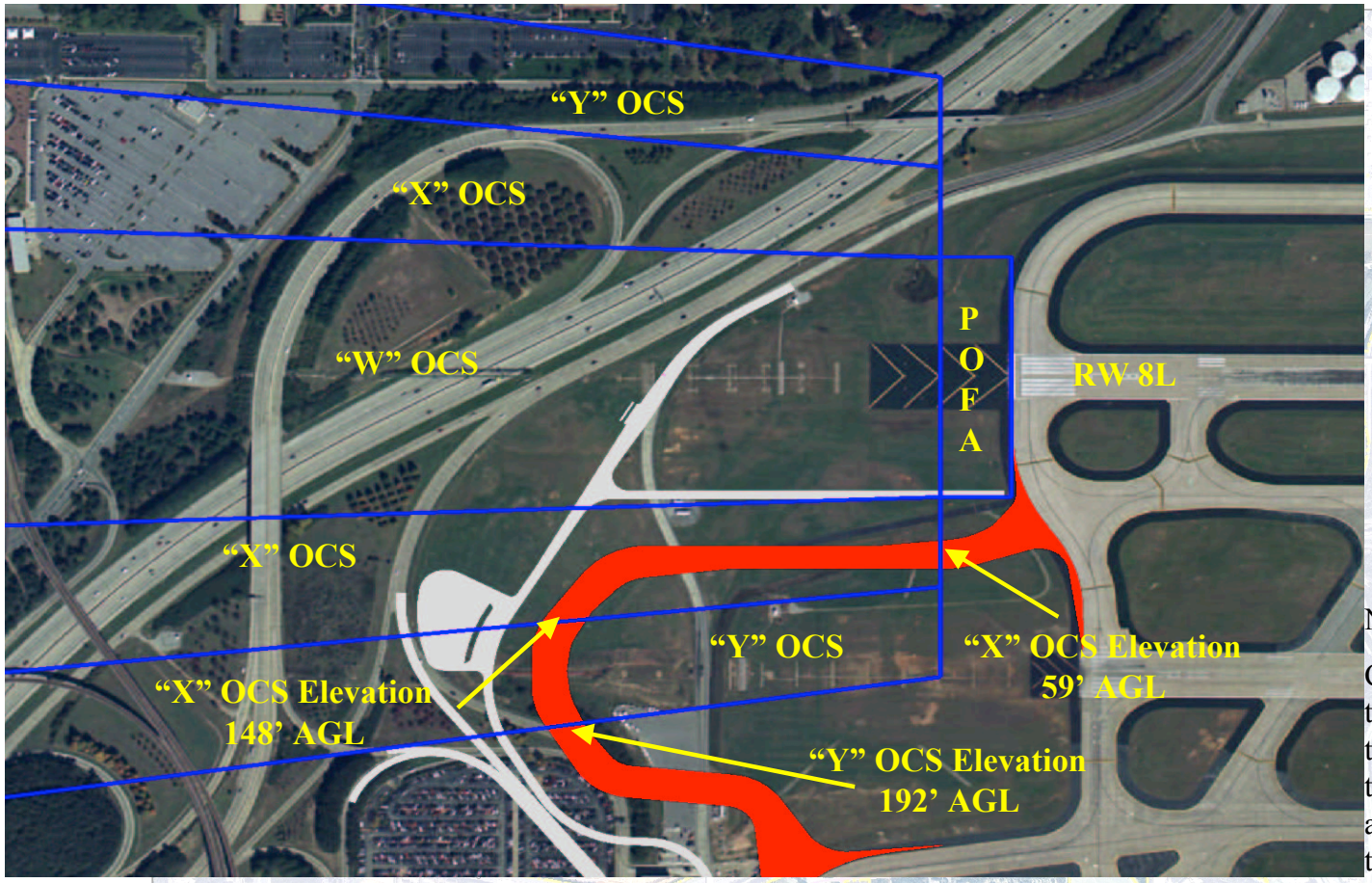


Note:

Clearances noted on the drawing represent the difference between the criterion surface and the ground level at that point.

- **Group IV aircraft using the proposed taxiway will penetrate the Runway 26L TERPS 40:1 departure surface at the intersection of Taxiway B and Taxiway H.**

Airport Obstruction Criteria –
(POFA & W,X, & Y Surfaces for Runway 8L)

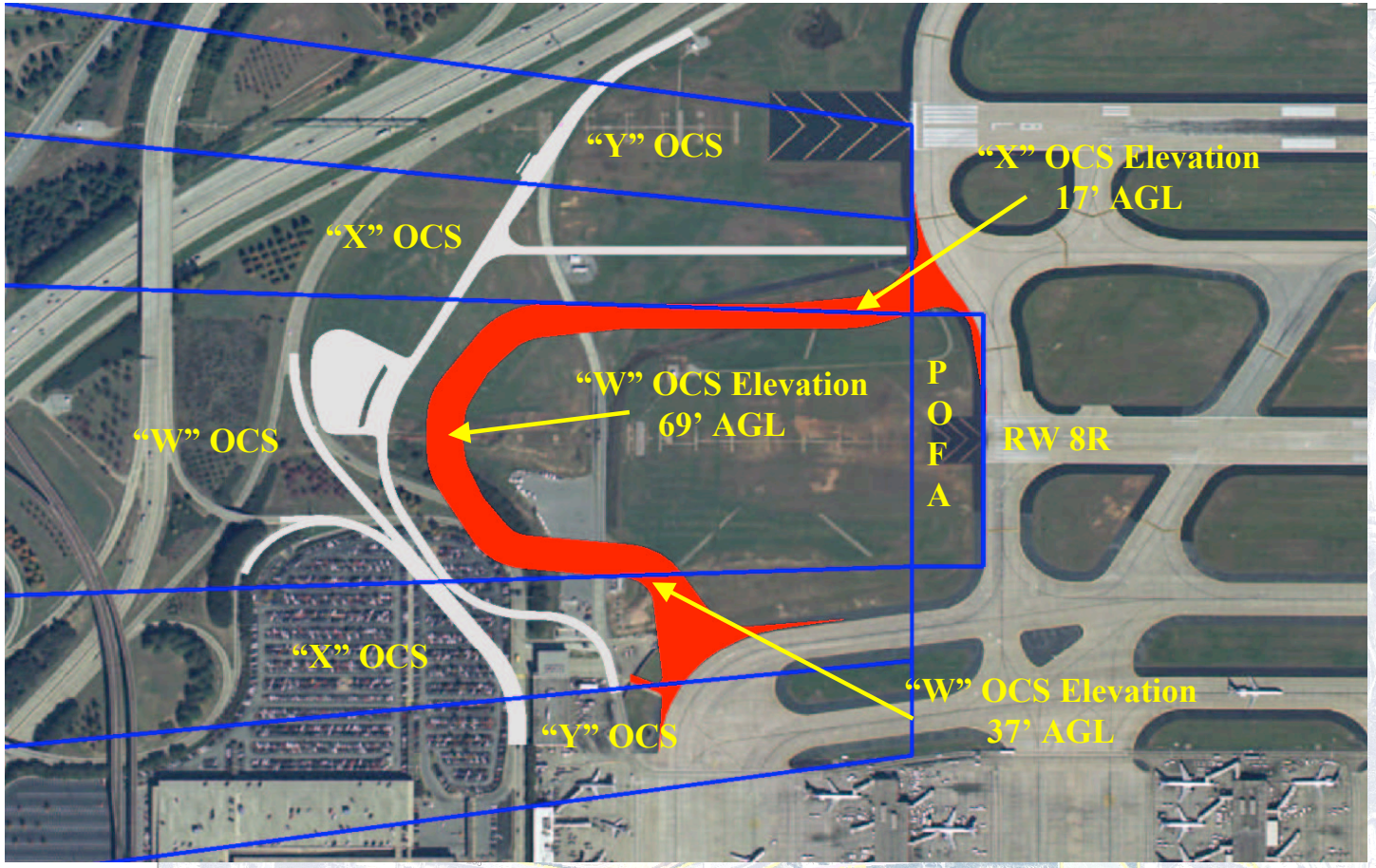


Note:

Clearances noted on the drawing represent the difference between the criterion surface and the ground level at that point.

- **Group IV aircraft using the proposed taxiway will be clear of the Runway 8L POFA, 'W', 'X', and 'Y' surfaces.**

Airport Obstruction Criteria –
(POFA & W, X, & Y Surface for Runway 8R)

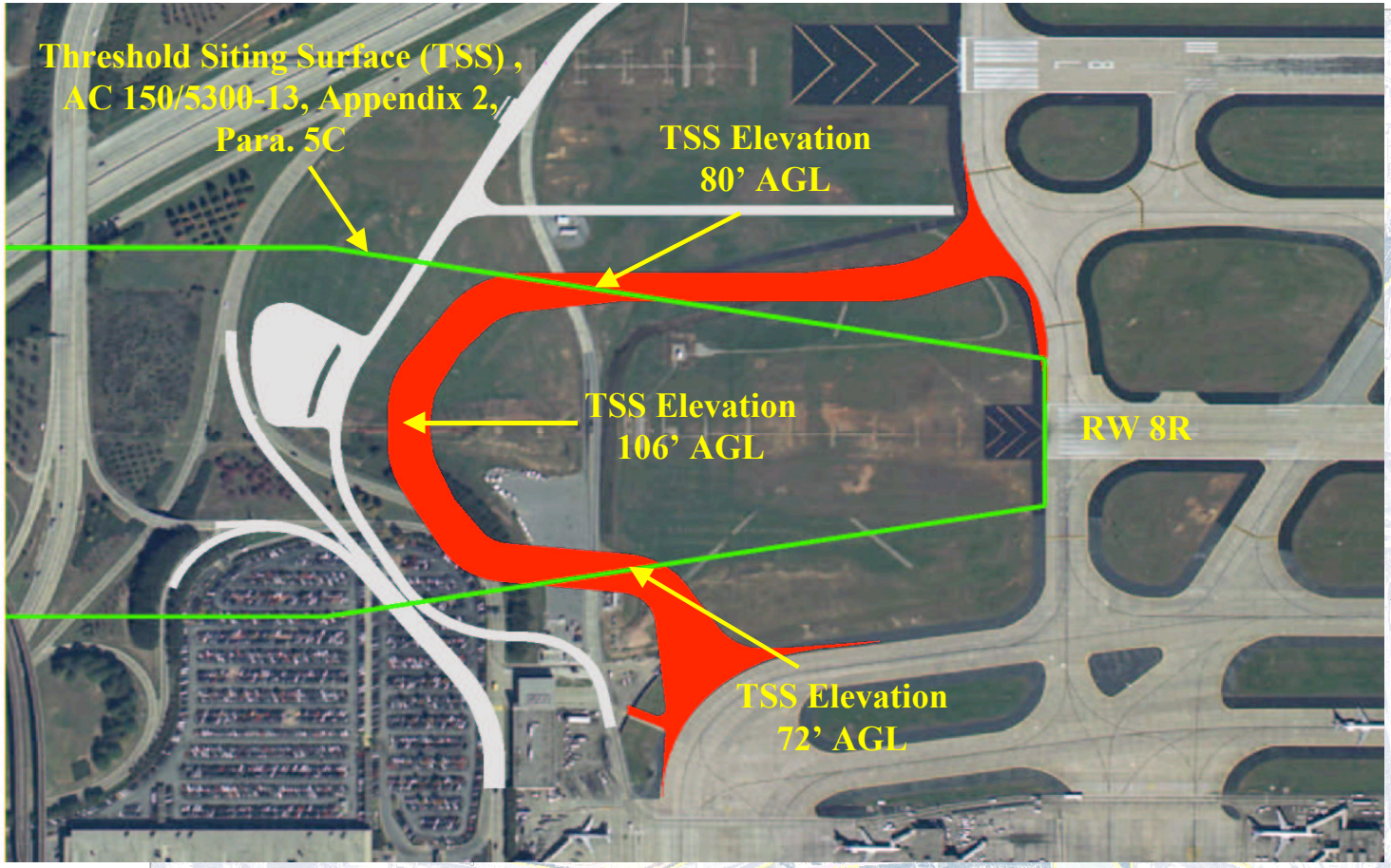


Note:

Clearances noted on the drawing represent the difference between the criterion surface and the ground level at that point.

- **Insufficient Clearance at the edges of the 'W' surface would prohibit use of the taxi while instrument approaches are being conducted to Runway 8R.**

Airport Obstruction Criteria –
(Threshold Siting Criteria for Runway 8R)



Note:

Clearances noted on the drawing represent the difference between the criterion surface and the ground level at that point.

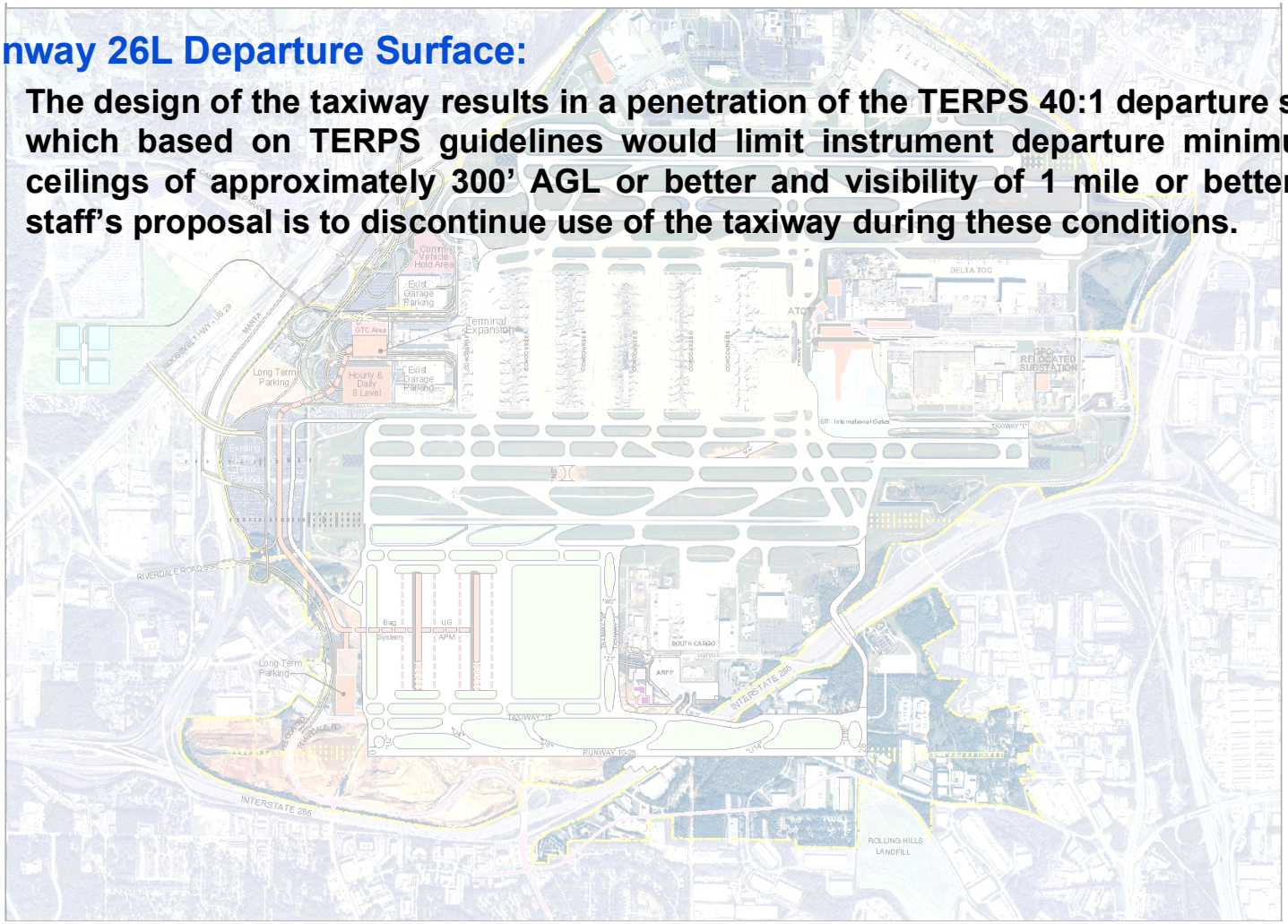
- **The Threshold Siting Surface for runway ends expected to serve large aircraft (visual day/night) would clear the tail of any Group IV aircraft on the proposed taxiway.**

Airport Obstruction Criteria –
(Results of DOA Analysis – East Flow)

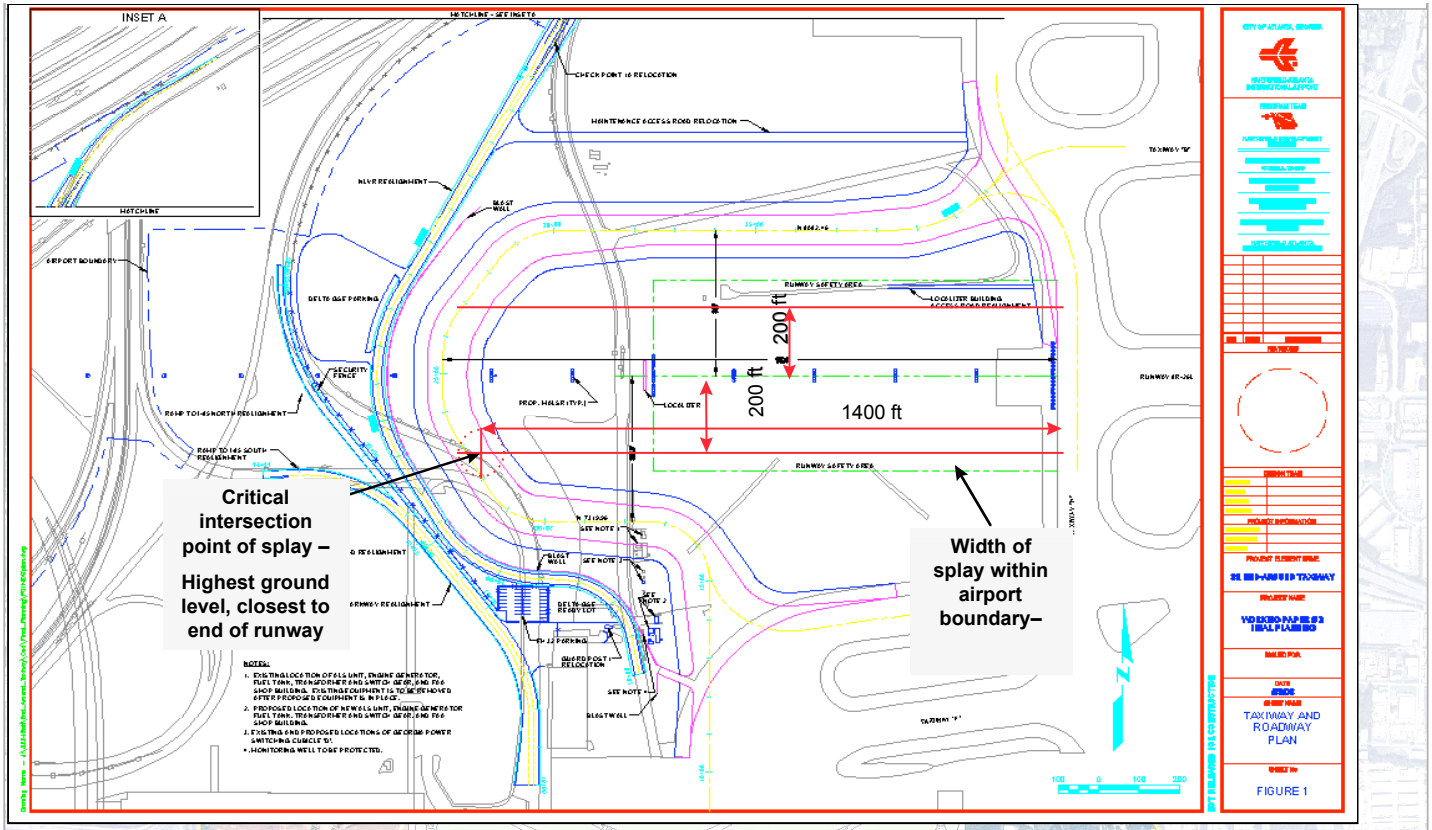
- **Runway 8L Category III Approach:**
  - The design of the taxiway does not result in aircraft tails or fuselages penetrating the POFA; however, wings will pass through the POFA. Based on DRAFT TIL 03-040, wingtips passing through the POFA will not impact minimums.
  - The proposed taxiway alignment will not penetrate or pass through the 'W" surface.
  - Taxiway passes under the 'X' and 'Y' surfaces for Runway 8L at a point that provides approximately 59' feet and 148' of clearance (difference between surface elevation and taxiway elevation), respectively. The most critical of these limits the use of the proposed taxiway to aircraft with tail heights less than 59 feet. Based on current aircraft design groups as defined in AC 150/5300-13, Change 7, this should allow all Group IV aircraft (B767, MD-11 and smaller) to use the proposed taxiway without impacting minimums on Runway 8L.
- **Runway 8R Category I Approach & Visual Approach:**
  - Most aircraft will penetrate either the POFA, 'W', or 'X' surfaces when using the taxiway for departure on Runway 8R. These penetrations make instrument approaches to Runway 8R unusable when aircraft are on the taxiway; however, Runway 8R is only used for instrument arrival operations when Runway 8L is closed or the landing aircraft has declared an emergency (usually these are visual approaches).
  - Using the Threshold Siting criteria from AC 150/5300-13, Appendix 2 paragraph 5C, indicates that visual approaches could be made to the runway while aircraft are on the taxiway.

Airport Obstruction Criteria –
(Results of DOA Analysis – West Flow)

- **Runway 26L Departure Surface:**
  - The design of the taxiway results in a penetration of the TERPS 40:1 departure surface, which based on TERPS guidelines would limit instrument departure minimums to ceilings of approximately 300' AGL or better and visibility of 1 mile or better. ATL staff's proposal is to discontinue use of the taxiway during these conditions.

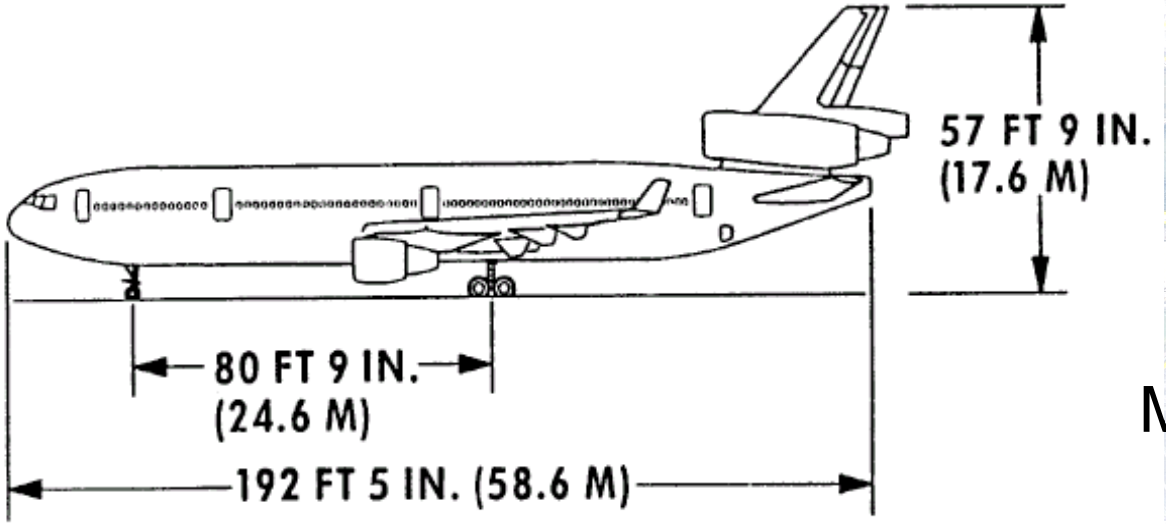


Airline Obstruction Criteria –
(Results of DAL Analysis)



- The critical intersection point of the engine out splay and end around taxiway is located a distance and elevation of 1400 ft and 997 ft MSL, respectively
- This meets the maximum obstacle height restriction of 1056 ft MSL, should an MD-11 be present on the taxiway

Airline Obstruction Criteria –
(Assumptions used by DAL and other Airlines)

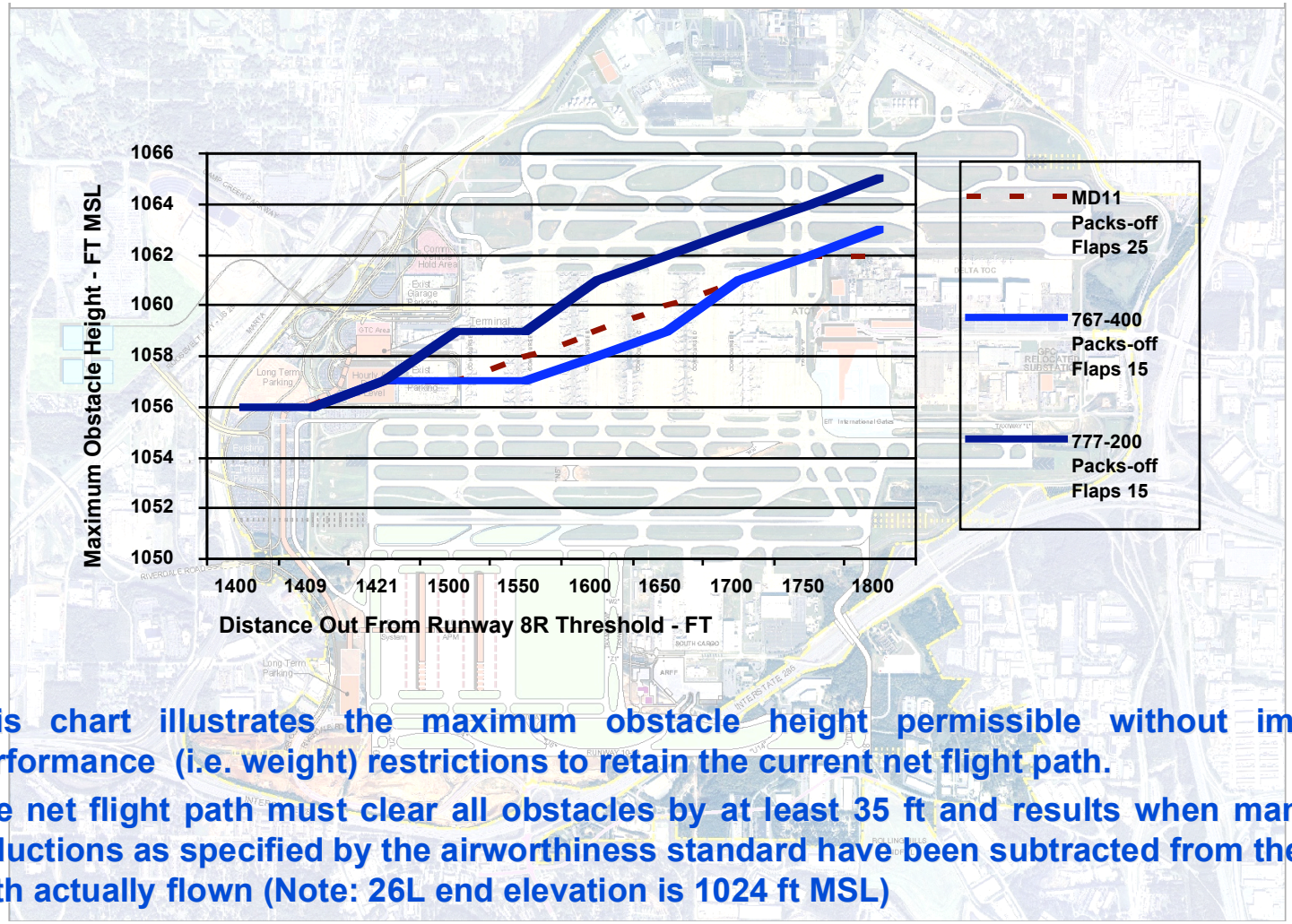


58.7 FT
Maximum

Note: Ground to tail height of 58'7" includes variation for strut and tire inflation as well as loading variations.

- Current obstacles and elevations as identified on Atlanta Obstacle Clearance (OC) 26 chart, published March 2000
- Tallest Design Group IV aircraft, MD-11, placed at most critical position on end around taxiway

Airline Obstruction Criteria –
(DAL Analysis)



- This chart illustrates the maximum obstacle height permissible without imposing performance (i.e. weight) restrictions to retain the current net flight path.
- The net flight path must clear all obstacles by at least 35 ft and results when mandatory reductions as specified by the airworthiness standard have been subtracted from the gross path actually flown (Note: 26L end elevation is 1024 ft MSL)