

GBAS/LAAS Cat-I Siting Order Background, and Application to Newark Liberty International Airport.

Presented to: Chinese Delegation Participants
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Federal Aviation
Administration



Presentation Overview

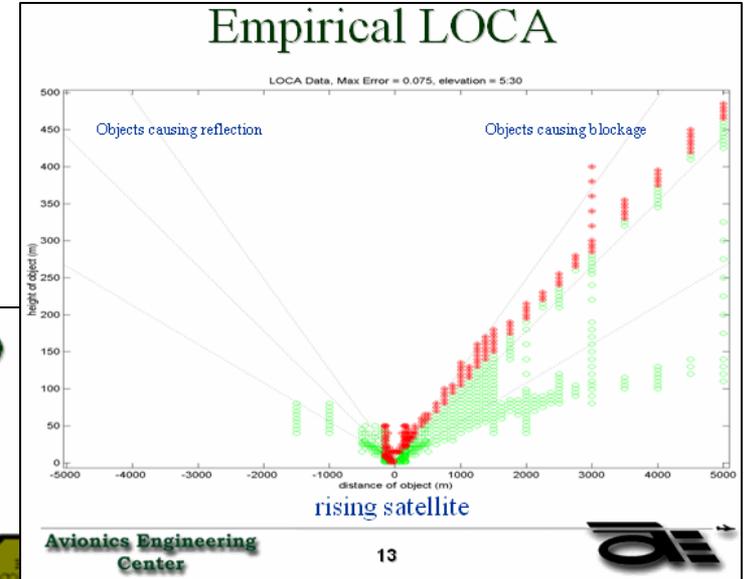
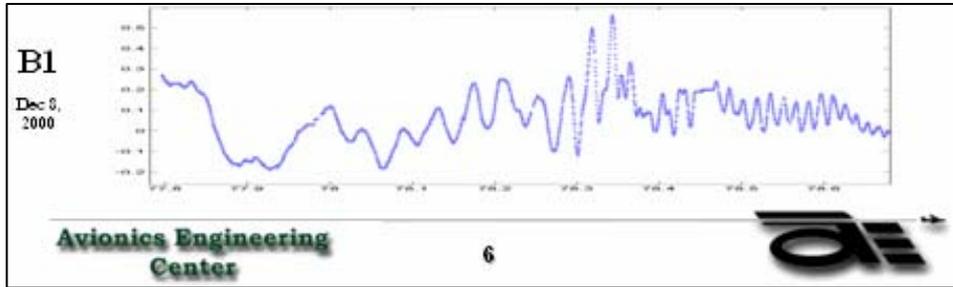
- **LAAS Siting Background**
 - Siting Working Group.
 - LAAS Object Consideration Areas (LOCAs) and Models.
 - LAAS Model Validation.
 - LAAS Siting Handbook.
- **LAAS Siting Evolution**
 - Incorporation of updated capabilities and hardware testing.
 - Critical Areas vs Selective Masking.
 - Knowledge gained from the LAAS HMI working group.
 - Draft LAAS Order Creation June/2009
- **LAAS Siting Efforts and Key Factors**
 - Project Newark “Siting Plan” evaluation and example
 - Some important tangibles for LAAS siting

LAAS Siting Work Background - SWG

- **LAAS Siting Working Group (SWG)**
 - The SWG was a multi-organizational, multi-year effort, to identify and validate/verify LAAS specific siting criteria.
- **The SWG roster consisted of (Legacy Org Names);**
 - ASR-100 (Spectrum)
 - AAS-100 (Airport Engineering Division)
 - AND-710 (PO Navigation Systems Acquisition)
 - AND-720 (PO Navigation Systems Implementation)
 - ANI-90 (NAS Implementation)
 - AOP-21 (NAS In-service Management)
 - AVN-230 (Flight Inspection)
 - Ohio University
 - Oakland University
 - ACT-360 (Technical Center – LAAS Group)



Model and LOCA Development – OU SWG 1/02



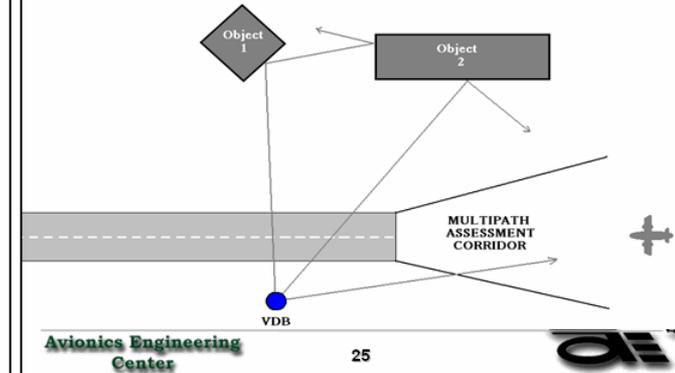
Single Dominant Object Scenario



Avionics Engineering Center

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- VDB Clear Area will consist of cleared “corridors,” since multipath interference is not limited by time-delay



Model Validation and LOCA Testing

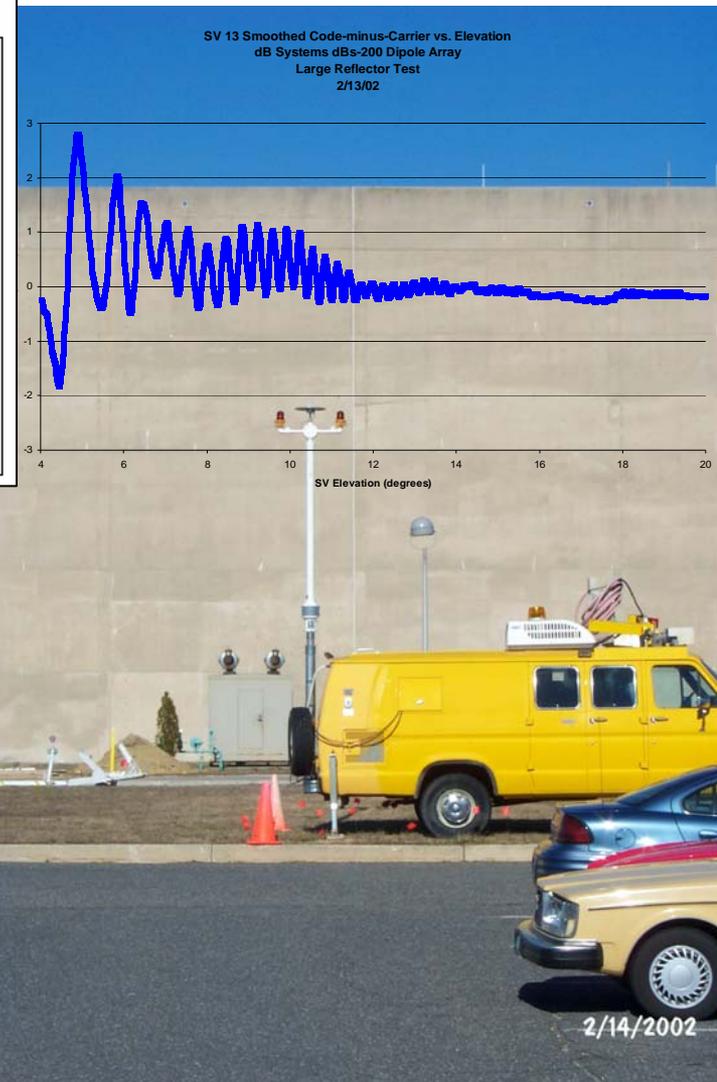
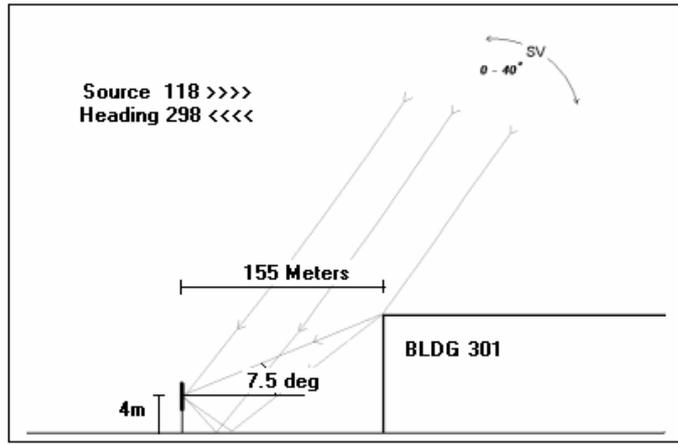


Federal Aviation Administration
LAAS GROUND FACILITY SITING
TEST PROGRAM

LGF Object Clearance Area (LOCA)
TEST CASE #4
Initial Provisional Model Validation Study

RRA - LOCA Model Validation Test Plan
(LOCA Penetration Case)
May 30, 2002
Author: Carmen Tedeschi

DIAGRAM 2.2



The FAA LAAS Siting Handbook 8/05

- The LAAS Ground Facility Siting Handbook was the venue chosen to document LAAS Siting knowledge in the absence of a Siting Order.

Local Area Augmentation System Ground Facility

SITING Handbook

Draft 2.0



August 2005

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

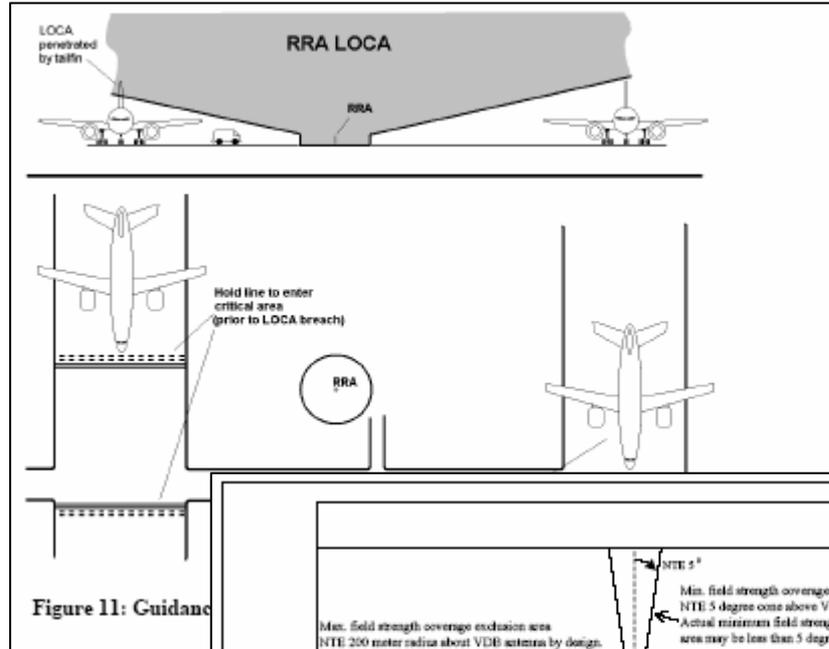


Figure 11: Guidance

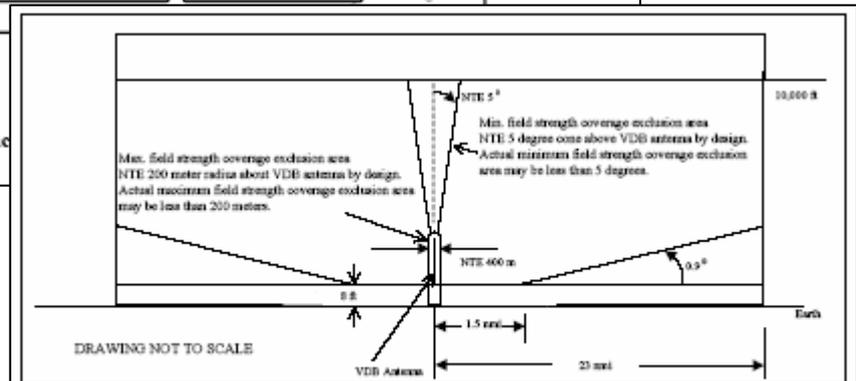


Figure C.3 VDB Coverage Volume



LAAS Siting Evolution and Efforts

- The LGF Siting Handbook needed updating and refinements
 - Incorporation of updated capabilities, and hardware testing.
 - Critical Areas vs Selective Masking.
 - BAE vs IMLA (DGPS Sensors / RRAs)
 - The RRA LOCA section was based on the IMLA.
 - New testing conducted for the BAE (Field/Chamber)
 - Incorporation of knowledge gained from the LAAS HMI working group, and other testing.
 - Despite Siting flexibility of a LGF, many “Key Factors” for successful LGF Siting are still required.
 - The Siting Order would include “Key Factors” up front.
 - The HI SLS-4000 Siting Plan had yet to be tested.



Draft LAAS Siting Order Creation June/2009

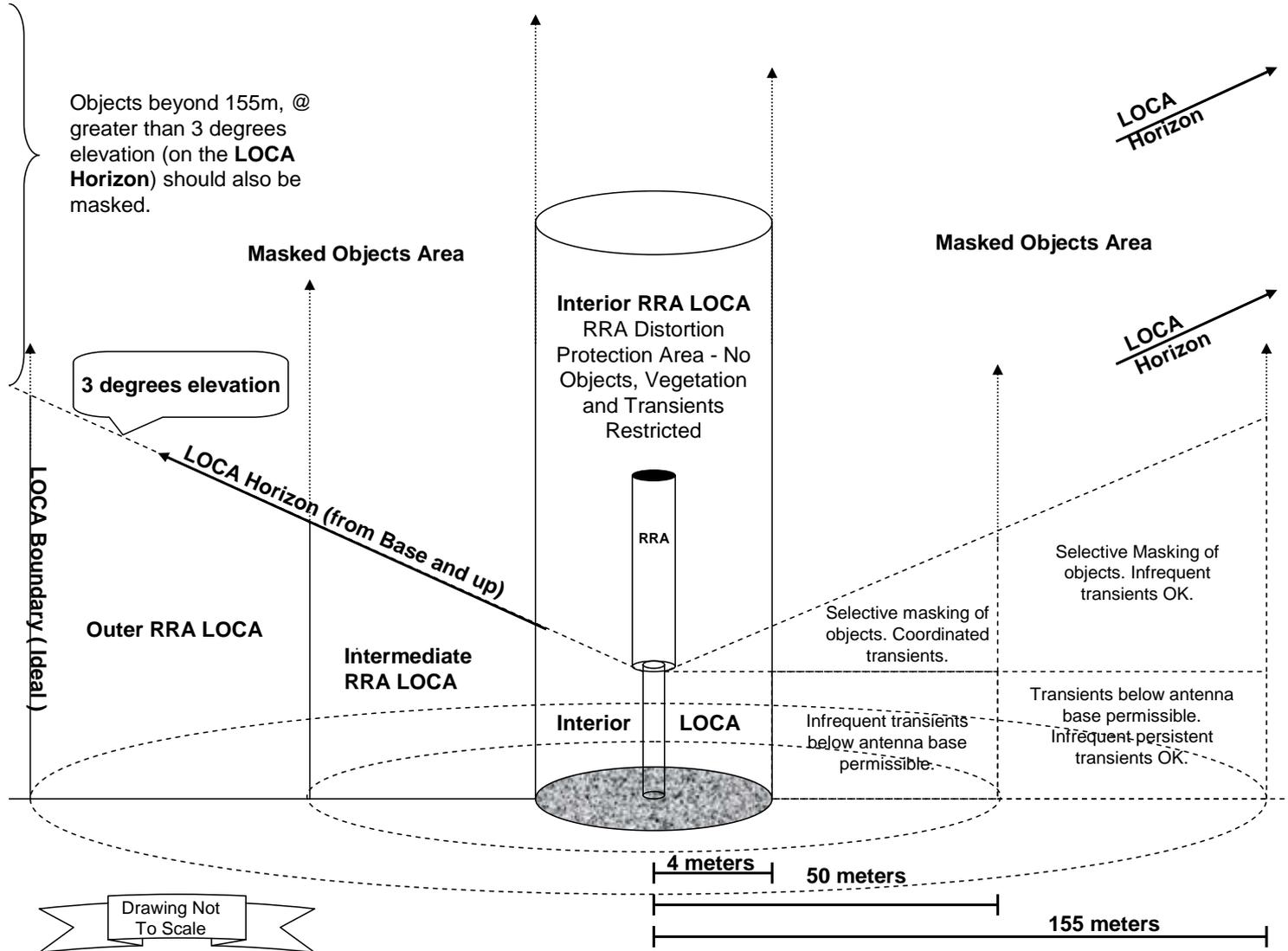
- **FAA Approvers requested an FAA Siting Order for Non-Fed GBAS**
 - Airports (AAS-100) was the primary organization that needed an the order to clarify Airports responsibilities.
- **Work to create a LAAS Category I (CAT I) Siting Order begins ~ in Spring '09.**
 - The Order will aid players involved now, and will be used for future adaptation for CAT II/III.
 - Handbook content extracted and updated (i.e., LOCA dissection)
 - Utilized ILS Siting Order as a template.
 - Draft Order in review – 1st draft Spring 2009

Siting Order Content and Application

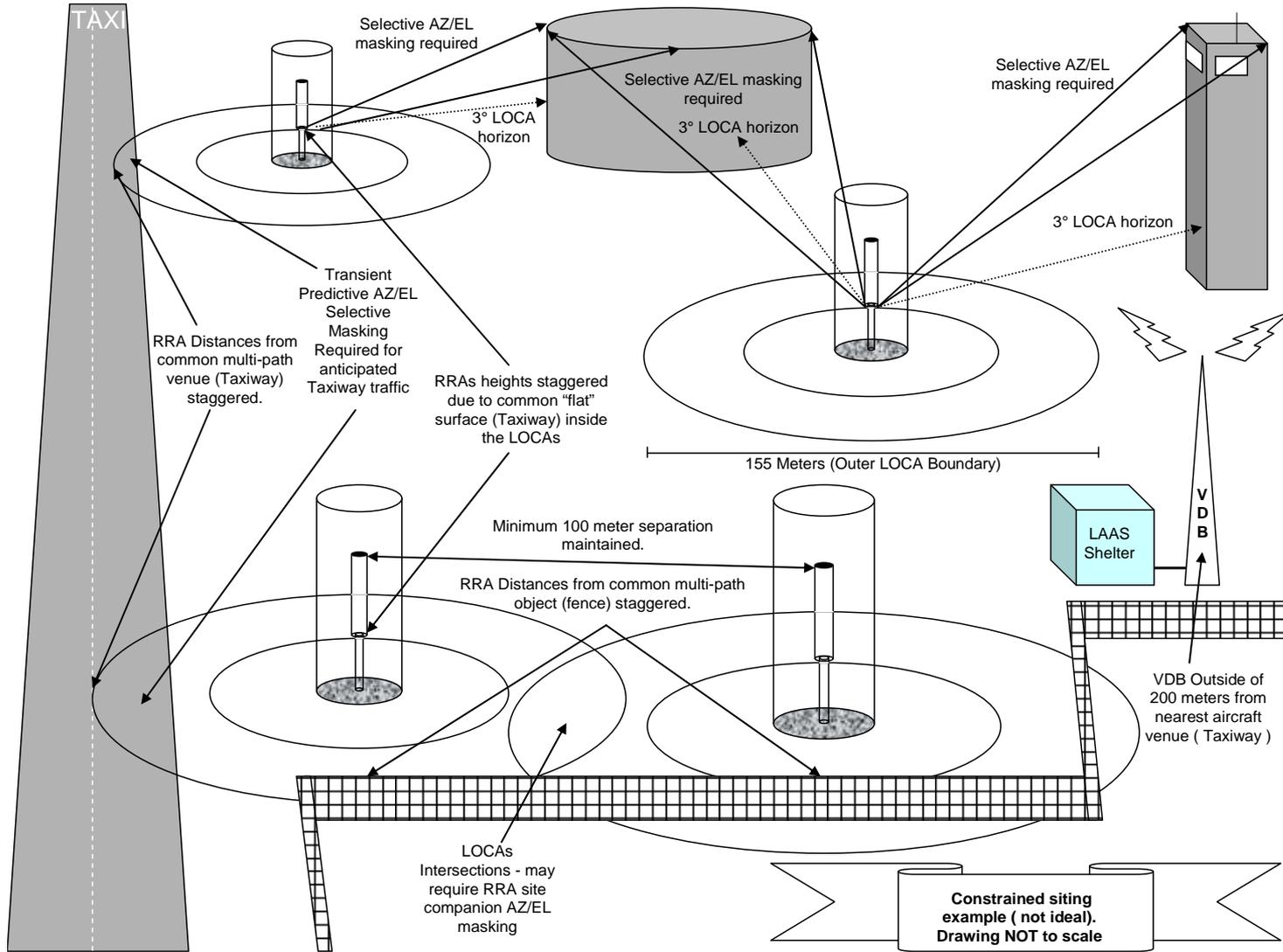
- **Some Key Factors, and Considerations.**
 - LAAS is not fixed by function, but....
 - Installed in an AOA / Security Area
 - VDBA < 3 nm radius from Desired Serviced Thresholds
 - RRA Centroid < 6 km from Decision Height Points
 - VDBA > 200* m from any Operational Aircraft Venues (*NTE)
 - No 3 RRAs can be collinear
 - RRA common object distance staggering, and PC height staggering (max 4m AGL)
 - VDBA Safety Area, and LOS to DHs
 - RRA separation > 100 meters
 - RRA and VDB LOCAs are well defined
 - Obstruction, and Keep Out Zones (Part 77, etc.)
 - Performance Evaluation, Site Selection Trade Offs



Remember the RRA LOCA when conceiving a layout



Interaction of LOCA and Airport

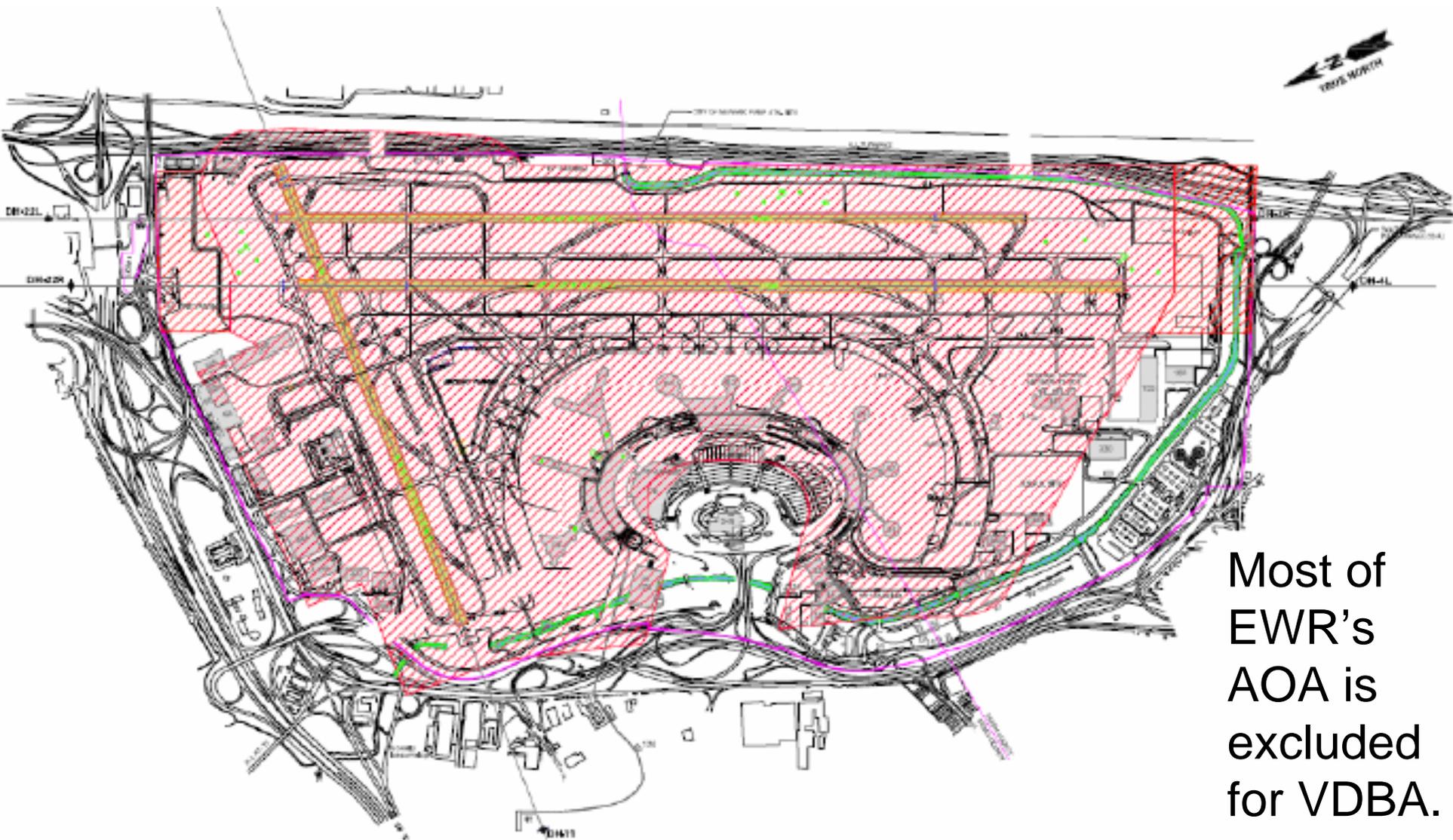


Project Newark (EWR) Siting Example

- Satisfy 3 nm (VDBA) to Thresholds, and 6 km (RRAs) to DHs

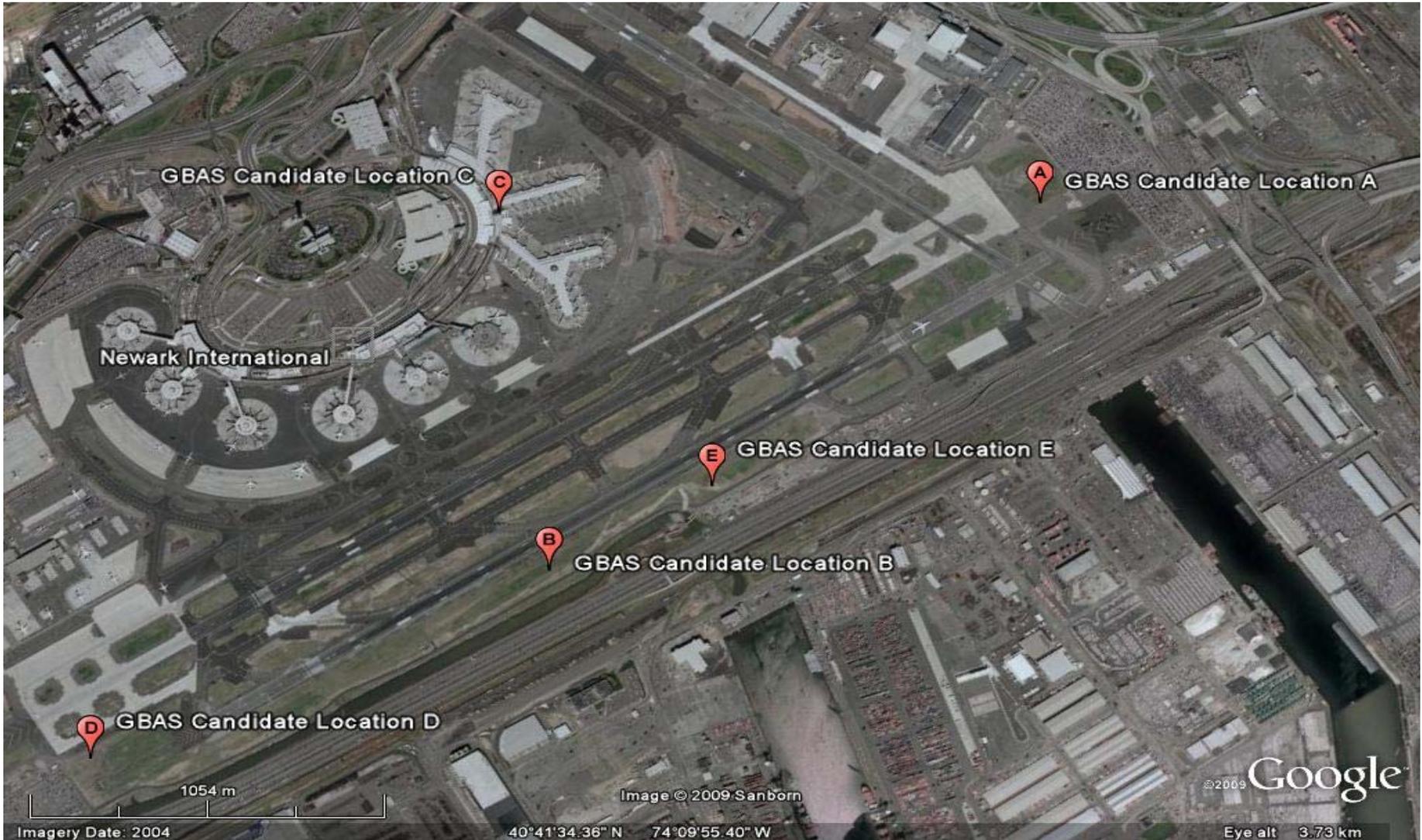


Satisfy VDBA > 200 (Max) meters from aircraft.



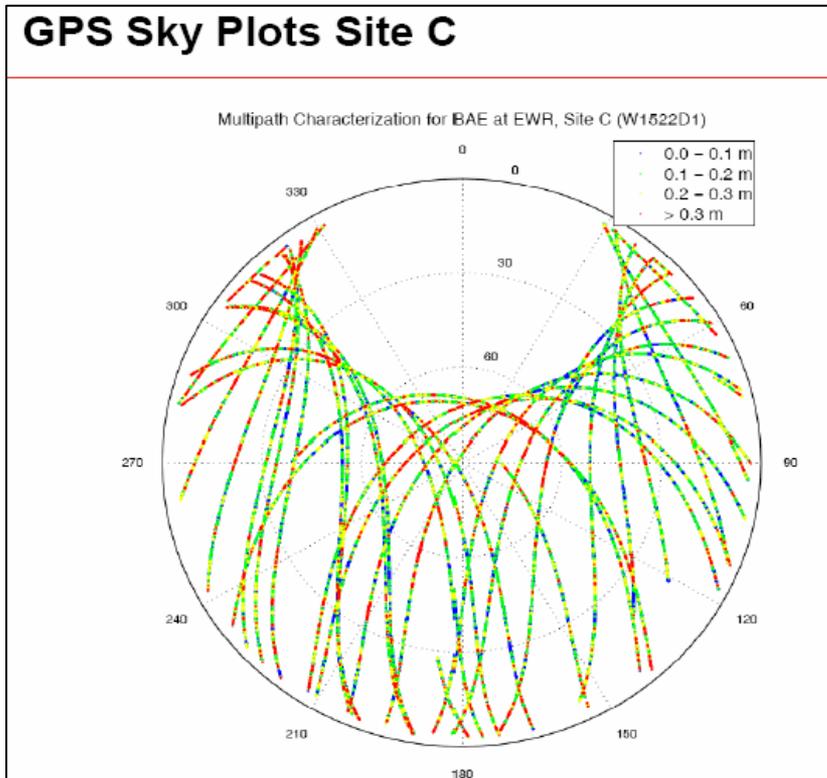
Most of EWR's AOA is excluded for VDBA.

Identify Several Sites for Performance Evaluation



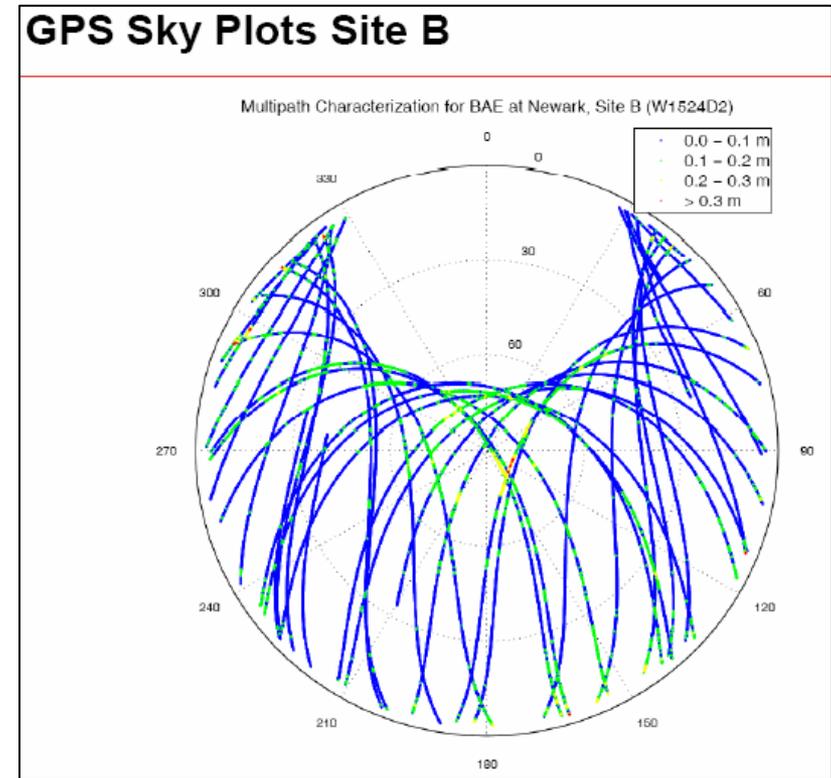
Perform Data Collection and Evaluate Candidate Site(s) w/ Tradeoffs

GPS Sky Plots Site C



- EWR “Site C” was convenient for infrastructure, but performance was dismal.

GPS Sky Plots Site B



- EWR “Site B” performed well, but is in a tight “trafficy” area with construction restrictions.

Perform VDB Placement – “LOS Study”

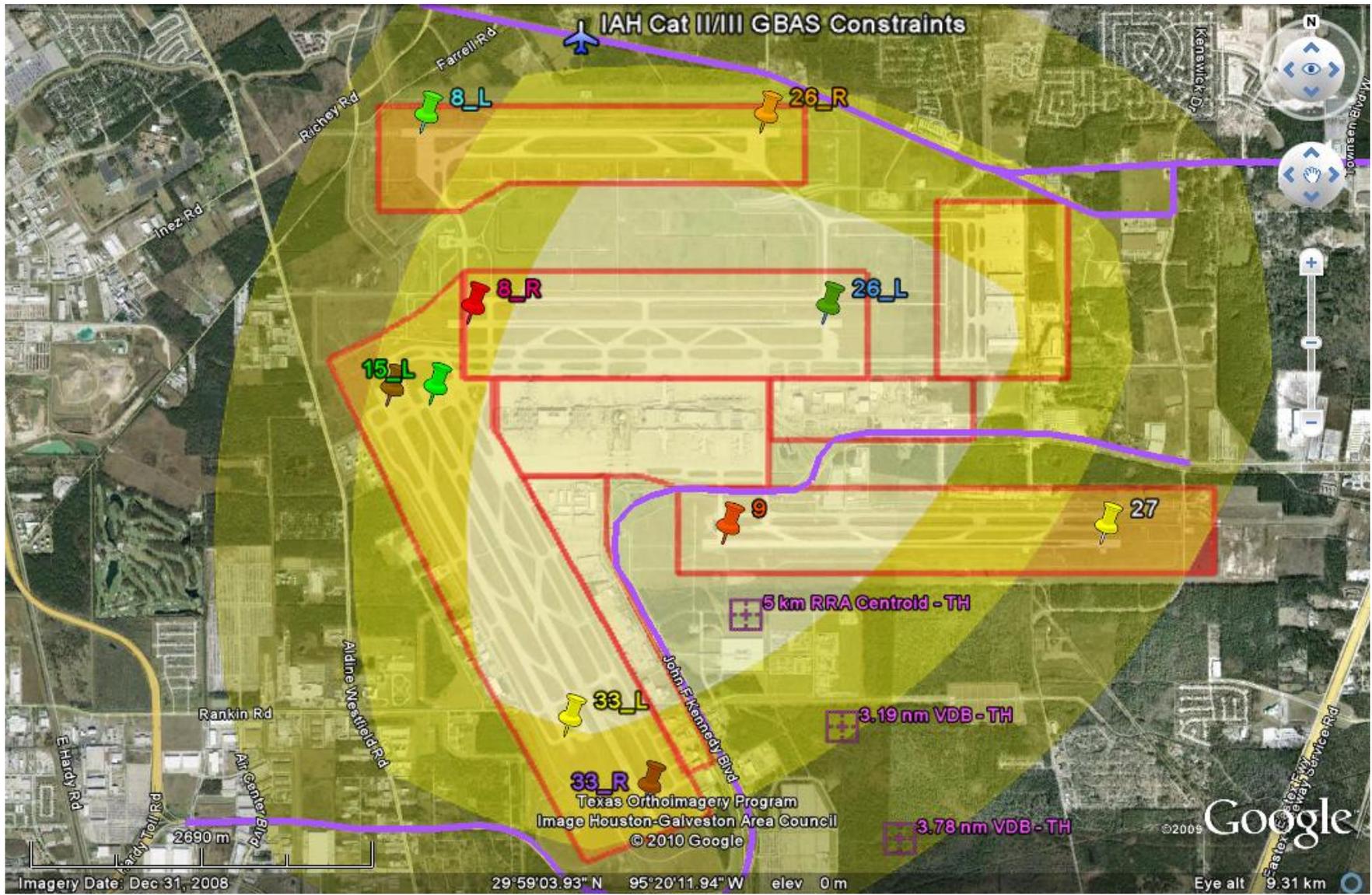


The Winner, “Site E”



- Proved to be the least restrictive while satisfying all the “must-dos” in the Siting Order
- The VDBA site was not welcome in the green zone because of the 200 meter requirement (Max).
- Survey work on “Site E” began on 7/30/09.

IAH Category II/III (Proposed) GBAS Constraints



Future Work

- **Incorporate FAA feedback into the Draft Siting Order, and prepare for publication.**
- **Continue to evaluate siting of the non-fed systems.**
- **Provide technical expertise in future LAAS Siting work and technical evolutions.**
 - Pre-comissioning Flight Checks
 - Local Monitoring
 - Updating Requirements

Question or Comments

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