2009 PORT EVERGLADES MASTER/VISION PLAN

OCTOBER 2009

APPENDIX C

AIRSPACE OBSTRUCTION ANALYSES OF PROPOSED PORT CRANES AND VESSELS
PREPARED BY JACOBS CONSULTANCY

PRESENTED BY

AECOM




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June 5, 2009

Mr. James McCluskie
Director of Planning
Broward County Aviation Department
100 Aviation Blvd.
Fort Lauderdale, FL 33315

Re: Airspace Obstruction Analyses of Proposed Port Cranes and Vessels

Dear Mr. McCluskie:

This is the final letter report on the airspace obstruction analyses of proposed Port cranes and vessels.

INTRODUCTION

On behalf of the Broward County Aviation Department (BCAD), Jacobs Consultancy (JC) has performed airspace obstruction analyses of the proposed expanded crane and vessel areas at the seaport cargo facility operated by Port Everglades (the Port) that is directly east of Fort Lauderdale-Hollywood International Airport (the Airport, or FLL). The purpose of this Study is to assess maximum feasible object heights that would not cause adverse effects to Airport operations.

The portions of seaport cargo facility under consideration in this study are very close to the Airport's runway endpoints, ranging from approximately 4,000 feet (0.65 nautical miles) to 10,000 feet (1.65 nautical miles), and lie directly along runway centerline extended and to both sides (see Figures 1 and 2). In terms of flight time, an aircraft travelling at 180 knots (nautical miles per hour) covers 4,000 feet in about 13 seconds. Because of proximity to the Airport and alignment with its runways, tall objects such as cranes and vessels in the seaport cargo facility can potentially have a direct and substantial influence on aircraft operations.

This Study is an update to a similar study conducted in 2006 by JC, when the Port was in earlier stages of a master plan effort. That study described the three general types of airspace protection criteria, recommended maintaining of existing heights of cranes for obstruction and hazard considerations, and recommended further coordination of air service considerations in more detail when the final version of the runway configuration was to be approved at the conclusion of the Environmental Impact Study (EIS) process.

The factors considered in this Study that are different the 2006 Study are: (1) the airfield configuration proposed in the EIS has been finalized and issued a Record of Decision (ROD) by the FAA; (2) the 2006 Study investigated taller crane heights at existing locations,

while this Study investigates several new crane and vessel locations; and (3) a more comprehensive list of airspace protection criteria is being applied.

Mobile cranes at Berths 30-32, and cargo ship, viewed from Airport, May 2009

In addition, to assess certain criteria and cross-check FAA and airline assumptions, publicly available obstacle databases were acquired, and obstacle point locations were plotted in CAD and GIS. These databases include the National Oceanic and Atmospheric Administration (NOAA) Airport Obstruction Chart (AOC) / Aeronautical Data Sheets (ADS), which are the products of single comprehensive airport site surveys that are undertaken approximately every 5-10 years (the most recent FLL survey was in 1999); and the Federal Aviation Administration (FAA) National Aeronautical Charting Office (NACO) Digital Obstacle File (DOF), a database that is comprised of occasional single-object surveys, field reports, and FAA notifications and approvals for proposed and actual construction. Neither database is 100% accurate. When combined, they represent the database that the FAA and airlines generally design to, unless better information is available, and/or certain errors or omissions are brought to their attention.

AIRSPACE PROTECTION CRITERIA

The Federal Aviation Administration (FAA) defines three general types of airspace protection criteria: obstruction, hazard, and air service. The following paragraphs briefly summarize the criteria, and indicate how they were considered and depicted in the Study.

1. **Obstruction Criteria:** Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace,* is the overall federal regulation defining basic airspace protection criteria, roles and responsibilities. FAR §77.13 defines notification standards, the heights for which a project proponent is required to file FAA Form 7460-1, *Notice of Proposed Construction or Alteration,* to initiate the FAA's obstruction evaluation / airport airspace analysis (OE/AAA) process. FAR §77.23 defines five types of obstruction standards, the heights for which an object at any given location is classified as an "obstruction to air navigation". An object which is classified as an obstruction is presumed to be a hazard until further aeronautical study by the FAA verifies its hazard status. If determined not to constitute a hazard, the object can be allowable as long as it complies with FAA's obstruction marking and lighting criteria, among other requirements.

   Within close proximity to an airport, the type of obstruction criteria most often found to be lowest, and therefore governing, are "civil airport imaginary surfaces", a set of three-dimensional geometric shapes based on the airport's runway system and circling areas. The FAR Part 77 civil airport imaginary surfaces are shown in Figures 3 and 4. Objects that exceed the elevations of these surfaces will be classified as obstructions; those found not to exceed hazard standards may be allowable subject to marking and lighting criteria, among other requirements.

   Of note, exceeding the height of surfaces protecting specific instrument procedures (TERPS surfaces) is also an obstruction criterion. There occasionally are cases where TERPS surfaces are lower than FAR Part 77 surfaces; therefore, it is not always a safe assumption that keeping an object below FAR Part 77 surfaces will guarantee that it is not an obstruction.

2. **Hazard Criteria.** After finding an object would be an obstruction, if the proponent is unwilling to lower the proposal to a height not exceeding obstruction standards, the FAA conducts further aeronautical study to assess whether the proposal would create a "significant adverse effect" to a "substantial amount of air traffic", which indicates hazard status. Hazard status could be indicated for many reasons, including effects to navigation aids (NAVAIDS), radar, control tower sightlines, air traffic procedures, but it is most commonly indicated when a proposal would exceed the elevation of obstacle clearance surfaces (OCSs) protecting specific instrument flight procedures, as defined in FAA Order 8260.3, the *US Standard for Terminal Instrument Procedures (TERPS).*

In order to inform maximum feasible structure heights for the study area, JC developed mapping of the lowest types of TERPS OCSs covering the study area. This was accomplished by researching all of the instrument procedures overflying the study area, assessing the heights of their OCSs, and mapping those that potentially could contribute to the composite map of lowest surfaces. In addition to the instrument flight rules (IFR) obstacle departure procedure (ODP) OCSs as identified in the 2006 Study (see Figures 5 and 6), the Runway 27R localizer-only (LOC) final approach OCS was found to have an elevation of 170 feet above mean sea level (AMSL), that is lowest for certain portions of the study area (see Figure 7). Figure 8 includes an estimated, hypothetical LOC final approach OCS for the proposed configuration of Runway 27L; its height at 190 feet AMSL assumes FAA procedure designers will take into account an augmented obstruction database including the vessels that occasionally traverse the waterway today with an air draft of 180 feet AMSL.

3. **Air Service Criteria.** The FAA requires all air carriers to develop emergency flight procedures for one engine inoperative (OEI) conditions, in which the aircraft experiences total loss of power to one engine during a takeoff procedure, after the aircraft has passed the point on the runway where emergency braking could be safely initiated. Loss of power could be due to a variety of factors including mechanical failures, and bird strikes. OEI procedures are designed by each individual airline's flight operations engineering staff, following FAA design guidelines and using airframe and jet engine manufacturers' performance guidelines, to develop simple flight procedures a distressed pilot can follow to guide the disabled aircraft to a safe landing. OEI procedures must be developed for each runway heading at each airport an air carrier serves, and will vary by aircraft type depending on weight and balance calculations including payload, fuel, and range.

   Because aircraft climb performance is compromised with one engine inoperative, OEI climb flight paths are generally lower than all-engine flight paths, and therefore the surfaces protecting them are lower. OEI surfaces are referenced under the "air service" criteria heading because the available flight corridor for OEI procedures dictates the weight and balance calculations for specific combinations of aircraft and range; and loss of OEI airspace protection can mean an airline will no longer be able to fly direct to a certain destination with a certain aircraft.

   To develop the most reliable type of OEI surface mapping, it is preferable to poll existing and potential air carriers serving an airport, and document each OEI procedure to map the most demanding one(s). Given time and budget constraints of this Study, generic OEI protection was mapped assuming two common OEI obstacle accountability areas (OAAs or "splays"), and applying the flattest slope available for each one given existing documented obstacles (see Figures 9 - 12).

MAXIMUM FEASIBLE HEIGHT ASSESSMENTS

It is assumed that the Port, in desiring maximum feasible object heights throughout the study area, will propose objects that exceed obstruction criteria, and will mark and light the obstructions per FAA guidance. Therefore, the composite map of maximum feasible object heights throughout the study area is a combination of hazard and air service criteria surfaces (see Figures 15 and 16). The recommended maximum feasible object heights are as follows, moving from north to south:

1. **Berths 26 and 27: maximum height of 195 feet above mean sea level (AMSL).** Critical limiting factor is the Runway 9L IFR standard ODP OCS. This factor was identified in the 2006 Study.

2. **Berths 28 and 29: maximum height of 170 feet AMSL.** Critical limiting factor is the Runway 27R LOC final approach OCS. This factor was not identified in the 2006 Study. Berth 29 is also within the Runway 9L OAA for OEI emergency departure procedures as defined by the International Civil Aviation Organization (ICAO). It is possible that one or more airline OEI procedures could be more limiting than 170 feet AMSL, but this could only be verified by polling the airlines.

3. **Berth 30 / Expanded Turning Notch: maximum height of 135 feet AMSL.** Critical limiting factor is the Runway 9L IFR standard ODP OCS. This factor was identified in the 2006 Study. This area and the adjoining part of Intercoastal Waterway that leads to it are within the OEI OAAs as defined by both ICAO, and the FAA Advisory Circular 120-91. It is possible that one or more airline OEI procedures could be more limiting than 135 feet AMSL, but this could only be verified by polling the airlines.

4. **Berth 31: 190 feet AMSL.** Critical limiting factor is the Runway 9R IFR standard ODP OCS. This factor was identified in the 2006 Study. **See Note 1 below.**

5. **Berth 32 and 33 including southwards expansion: maximum height of 165 to 180 feet AMSL.** Critical limiting factor is future Runway 9R OEI procedures. This is an incremental expansion of the existing crane envelope (160 feet AMSL), directly along the runway centerline extended, and closer to the Airport. OEI procedures that would accommodate the existing crane envelope would be able to accommodate an expanded envelope at a slightly lesser height. **See Note 1 below.**

Note 1: The aeronautical surfaces depicted in this report for proposed Runway 9R-27L assume the Runway 27L endpoint would be at an elevation of 45.4 feet AMSL, per various studies and the EIS. This elevation was due to the fact that there will be a large bridge structure and earthwork fill area to allow the runway and parallel taxiway to ramp from field level, up and over the Florida East Coast Railroad (FECRR) and U.S. Route 1. Over the past few weeks (late May 2009), preliminary engineering studies have suggested a less deep

bridge structure may be feasible to span the FECRR and US-1. A shallower structure and overall lower and flatter earthwork fill area would represent significant cost and time savings for the construction project, and would be less restrictive to aircraft operations throughout the useful life of the runway. The runway endpoint could be approximately 5 feet lower (approximately 40 feet AMSL), pending outcome of more detailed engineering studies and runway profile development. Lowering the runway endpoint would have a negative effect on airspace obstruction clearances, however, since all aeronautical surfaces based on the Runway 27L endpoint would be approximately 5 feet lower than currently depicted.

CONCLUSIONS AND RECOMMENDATIONS

The "ceiling" representing maximum feasible structure heights calculated throughout the study area is comprised of several aeronautical factors, including OCSs for several published instrument flight procedures, and protection for airline emergency procedures. The tallest available heights, not surprisingly, were found furthest from runway centerline extended: Berths 26 and 27, and to a limited extent, Berth 31 at the location between centerlines. These are the only locations where the Port's desired crane height of 190 feet AMSL could be accommodated without significant adverse effects to aircraft operations. (However, 185 feet AMSL might be the limit at Berth 31, pending final design of the runway profile). Because the height limit varies along some of the segments of mobile crane track, Jacobs Consultancy recommends careful consideration of potential crane heights at the extremes of mobility.

Jacobs Consultancy recommends sharing this Report not only with the Port for crane and vessel planning purposes, but also with the FAA and existing and potential air carriers serving FLL, to augment awareness and initiate a dialogue regarding obstacle database, crane, and vessel issues.

* * * * *

Please call me at (650) 375-5339 or email me at byron.thurber@jacobs.consultancy.com if you have any further questions regarding this matter.

Respectfully submitted,

JACOBS CONSULTANCY

Byron Thurber
Principal Consultant

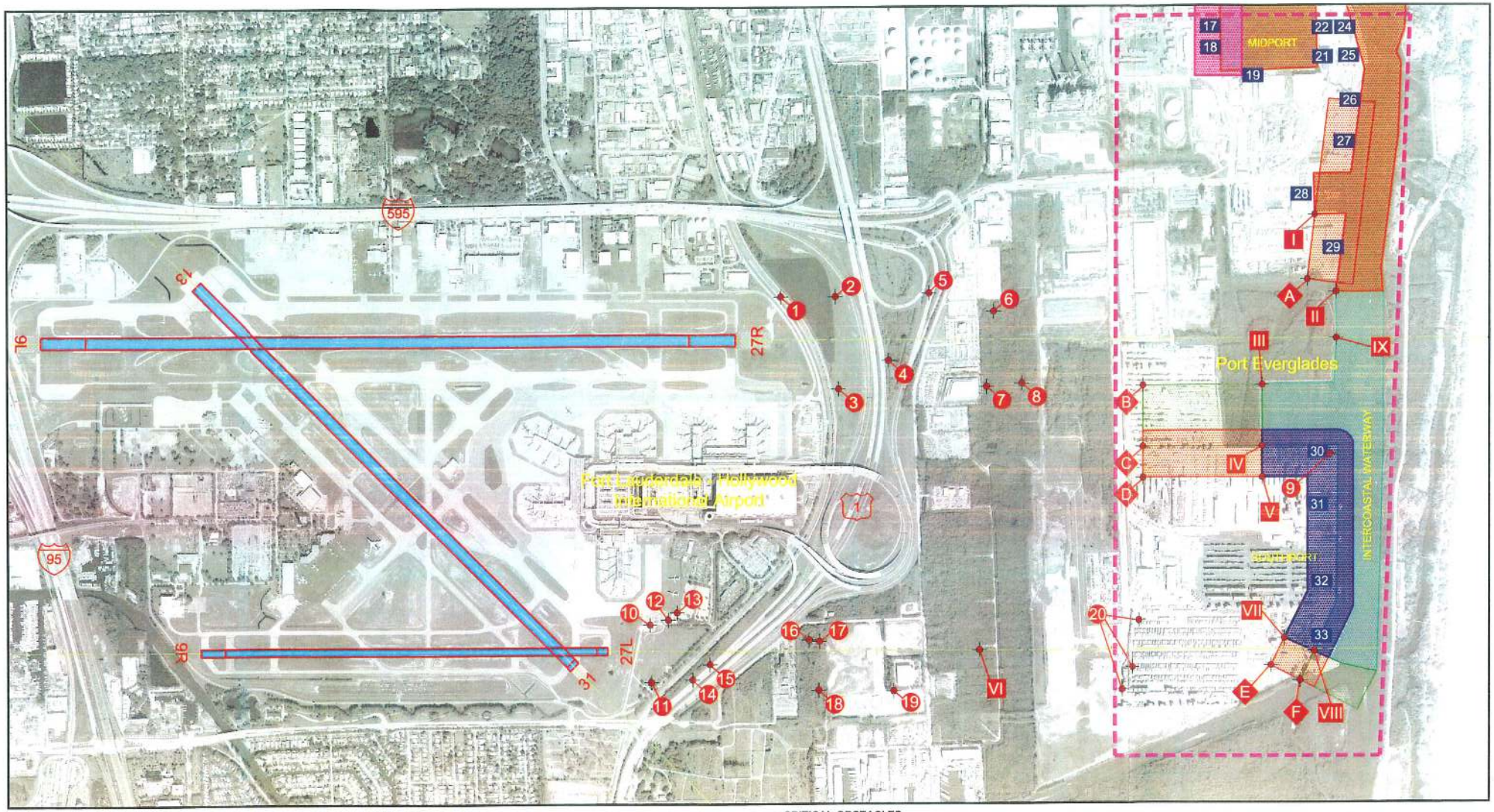
CC: Mr. Bill Dunlay, Mr. Greg Detmer, Ms. Sonia Saraf, Mr. Scott Tumolo

Table 1
CRITICAL OBSTACLES
Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderdale-Hollywood International Airport

			Obstacle Number	Description	Geographic coordinates NAD83		Top of structure elevation, feet AMSL, NAVD88	
					Latitude (N)	Longitude (W)		
Existing	Obstacle Databases	NOAA 1999 Airport obstruction chart	1	Railroad vehicle clearance	26-04-41.87	80-08-14.36	30'	
			2	Obstacle light on light pole	26-04-41.80	80-08-6.65	47'	
			3	Obstacle light on light pole	26-04-30.09	80-08-6.27	46'	
			4	Tree	26-04-33.63	80-07-59.17	59'	
			5	Light pole	26-04-42.13	80-07-53.40	66'	
			6	Tree	26-04-39.77	80-07-44.24	76'	
			7	Tree	26-04-30.23	80-07-45.32	67'	
			8	Transmission tower	25-04-30.62	80-07-40.32	70'	
			9	Obstacle light on mobile crane	26-04-21.23	80-06-56.39	159'	
			10	Light pole	26-04-00.44	80-08-33.29	41'	
			11	Tree	26-03-53.19	80-08-33.10	70'	
			12	Tree	26-04-01.03	80-08-30.67	44'	
			15	Obstacle light on light pole	26-03-55.39	80-08-24.78	48'	
		NOAA 2007 LPV survey	13	Light Pole	26-04-01.19	80-08-29.43	63'	
			14	Light Pole	26-03-53.41	80-08-27.28	47'	
			16	Tree	26-03-58.33	80-08-10.72	62'	
			17	Tree	26-03-58.14	80-08-09.19	70'	
			18	Tree	26-03-51.94	80-08-09.41	66'	
			19	Tree	26-03-51.74	80-07-58.76	90'	
		NACO Digital Obstacle File	20	High mast lighting	26-04-00.38	80-07-23.76	114'	
			20	High mast lighting	26-03-54.46	80-07-24.79	112'	
			20	High mast lighting	26-03-51.61	80-07-26.39	112'	
		Other likely critical obstacles not on databases	I	Cruise ship vehicle clearance	26-04-51.61	80-06-58.34	200'	estimated height
			II	Cruise ship vehicle clearance	26-04-41.83	80-06-55.34	200'	
			III	Cargo ship vehicle clearance	26-04-30.09	80-07-06.02	180'	
			IV	Cargo ship vehicle clearance	26-04-22.34	80-07-06.08	180'	
			V	Mobile crane envelope	26-04-18.41	80-07-06.11	160'	
			VI	Transmission tower	26-03-56.88	80-07-46.58	70'	
			VII	Mobile crane envelope	26-03-58.01	80-07-03.08	160'	
			VIII	Cargo ship vehicle clearance	26-03-56.28	80-06-58.87	180'	
			IX	Cargo ship vehicle clearance	26-04-35.94	80-06-55.36	180'	
Proposed		Proposed critical obstacles	A	Mobile crane envelope	26-04-43.45	80-06-59.47	170'	recommended max. height
			B	Cargo ship vehicle clearance	26-04-39.73	81-04-03.79	135'	
			C	Cargo ship vehicle clearance	26-04-22.45	80-07-22.97	135'	
			D	Mobile crane envelope	26-04-18.51	80-07-23.00	135'	
			E	Mobile crane envelope	26-03-54.56	80-07-05.03	165'	
			F	Cargo ship vehicle clearance	26-03-52.63	80-07-00.91	175'	

Abbreviations:

NAD83 - North American Datum of 1983
NAVD88 - North American Vertical Datum of 1988
AMSL - Above Mean Sea Level
NACO - National Aeronautical Charting Office
NOAA - National Oceanic and Atmospheric Administration
LPV - Localizer Performance with Vertical guidance



AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline

SEAPORT

- Study area
- 25 Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 1
STUDY AREA IN RELATION TO AIRPORT EXISTING AIRFIELD CONFIGURATION
Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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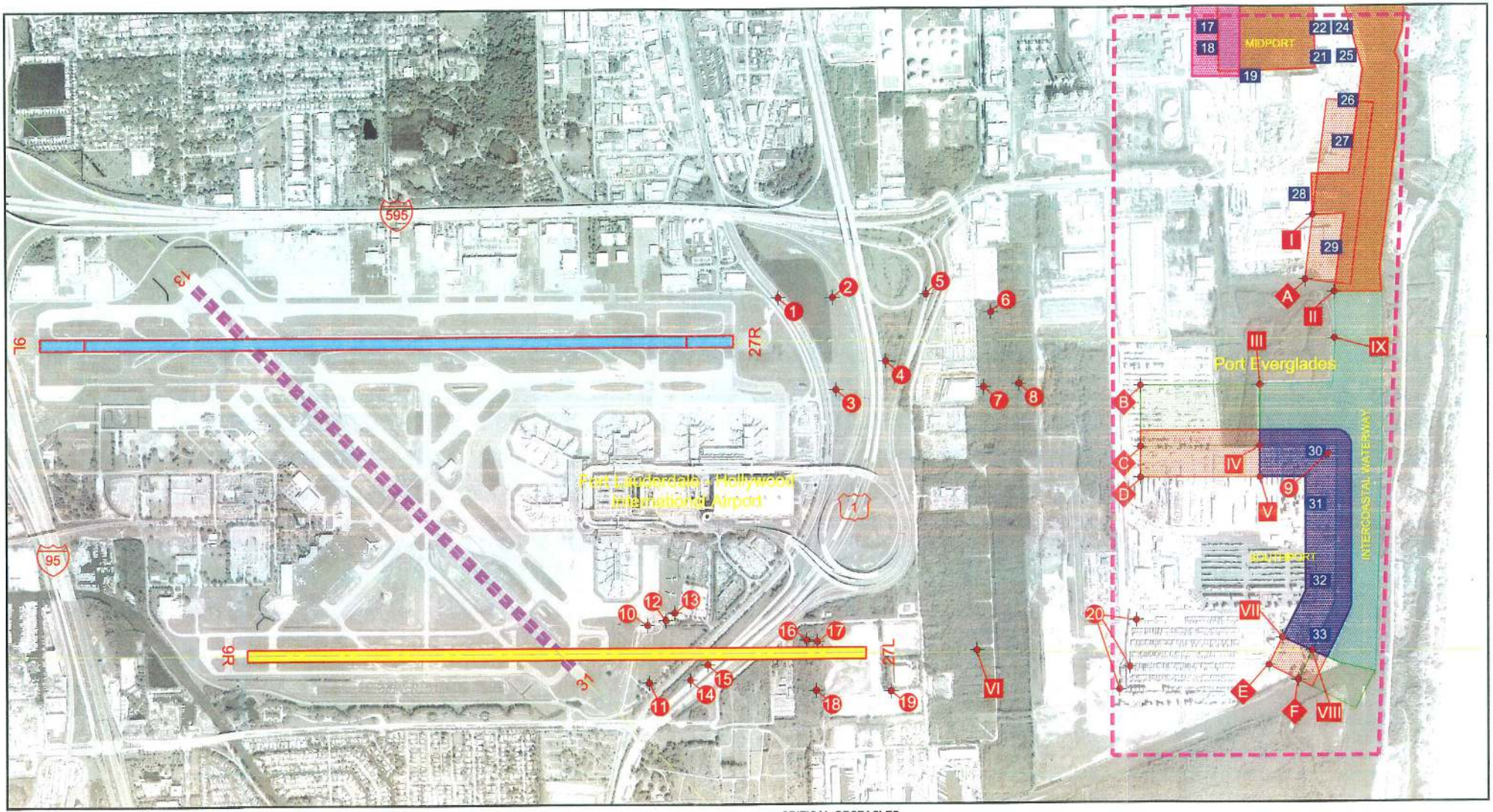
Airport Management Consulting



AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline

SEAPORT

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- Proposed cargo ships vessel area

CRITICAL OBSTACLES

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- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 2

STUDY AREA IN RELATION TO AIRPORT PROPOSED AIRFIELD DEVELOPMENT

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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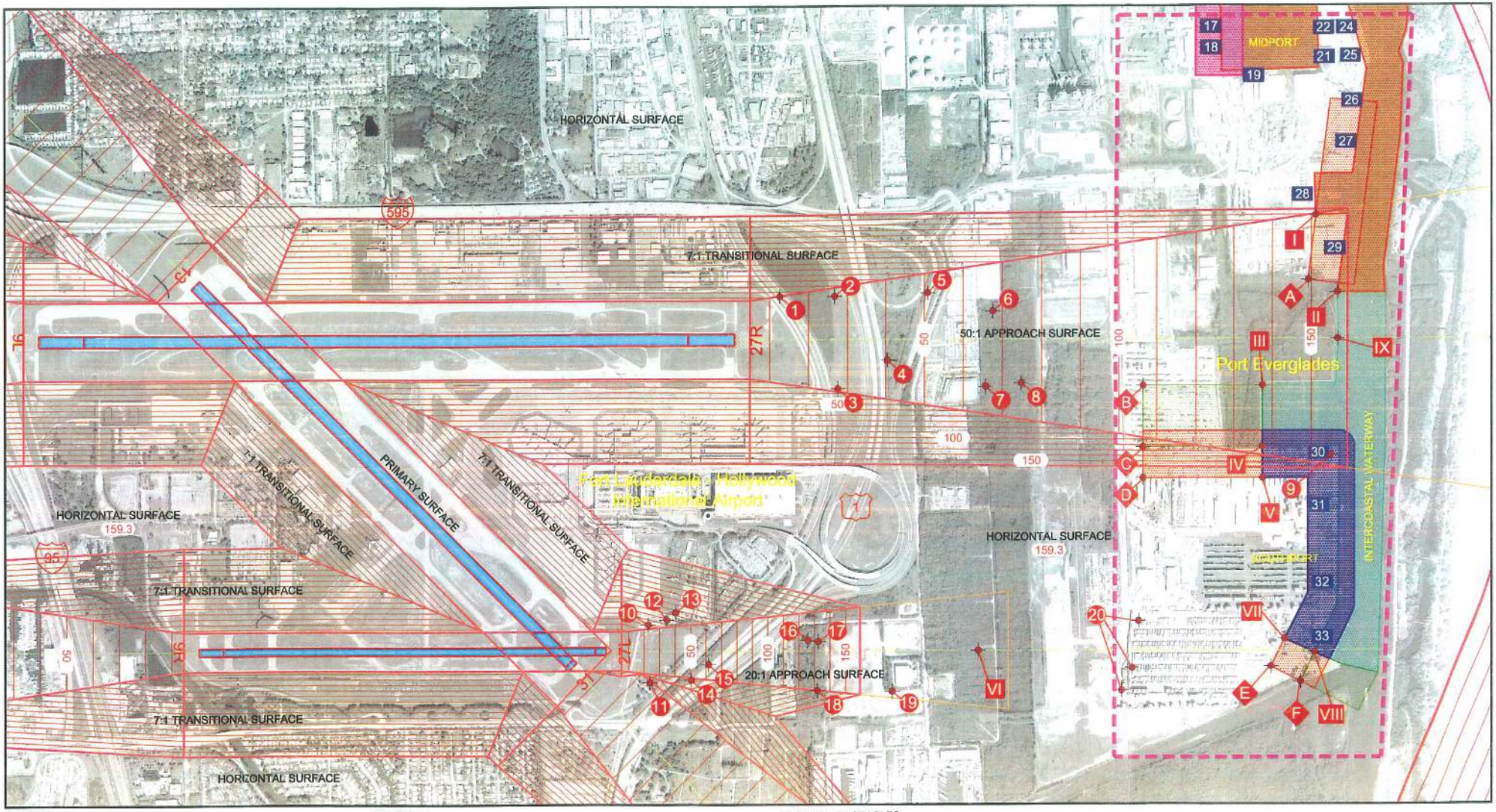

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- FAR Part 77 surface
- 150 — Elevation contour of above-named surface, feet AMSL

SEAPORT

- Study area
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- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # — Obstacles in databases (See Table 1)
- # — Other likely critical obstacles
- # — Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 3

FAR PART 77 SURFACES OVER STUDY AREA EXISTING AIRFIELD CONFIGURATION

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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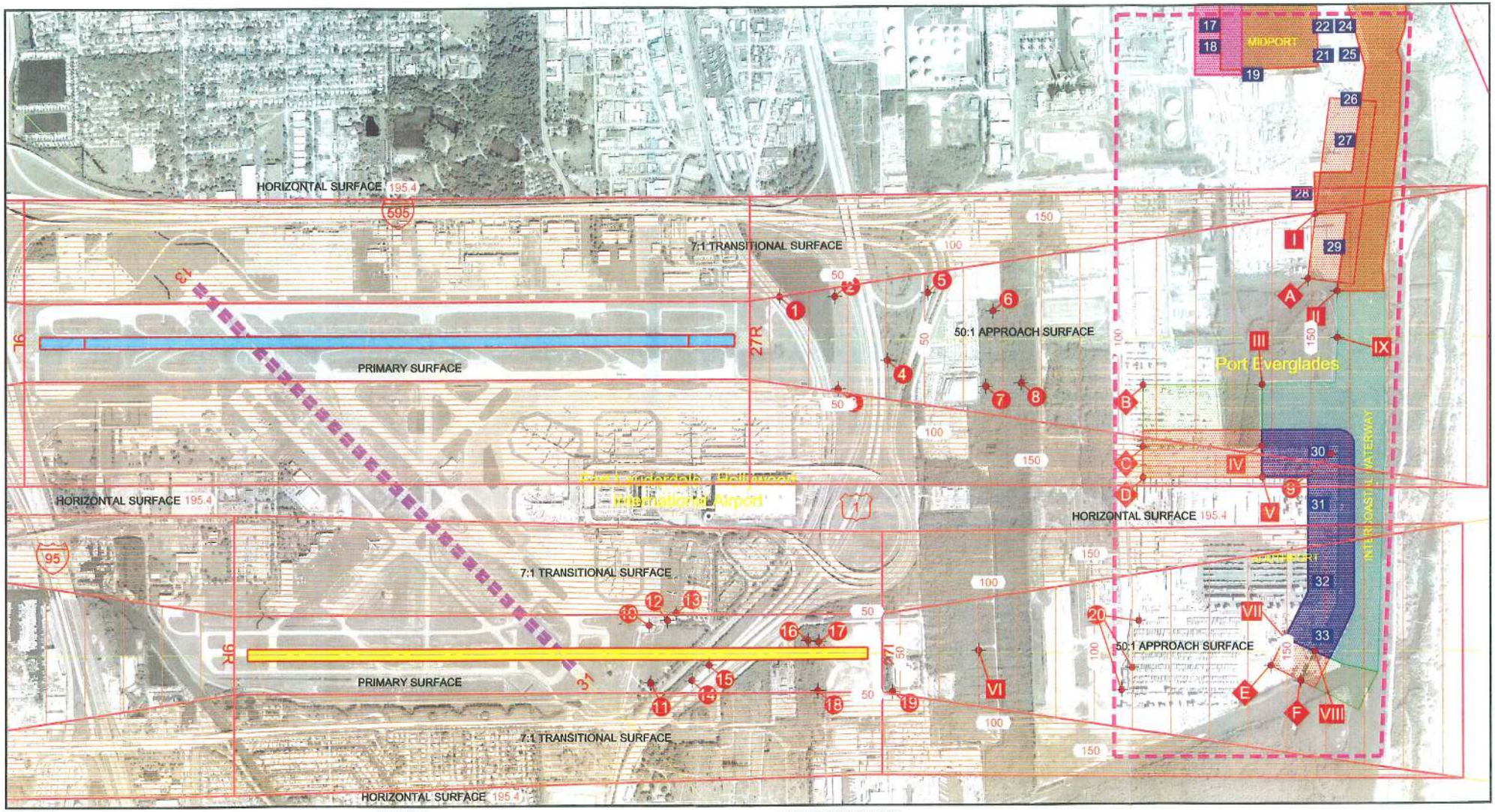

Figure 4

FAR PART 77 SURFACES OVER STUDY AREA PROPOSED AIRFIELD DEVELOPMENT

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
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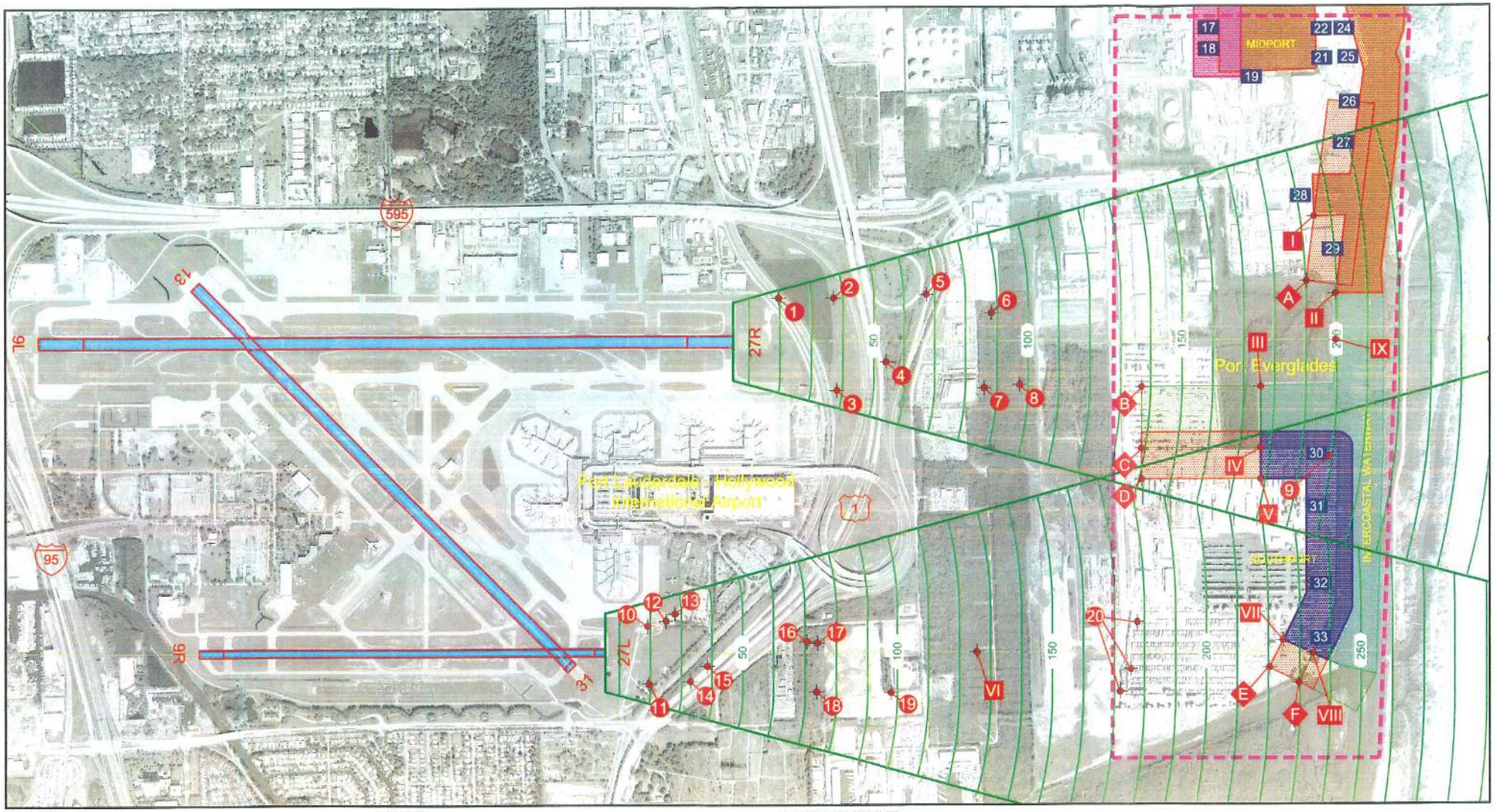

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- IFR departure obstacle clearance surface (TERPS)
- 150 — Elevation contour of above-named surface, feet AMSL

Note: where overlap occurs, contours are for lowest surface.

SEAPORT

- Study area
- 25 Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 5

CRITICAL TERPS DEPARTURE SURFACES OVER STUDY AREA EXISTING AIRFIELD CONFIGURATION

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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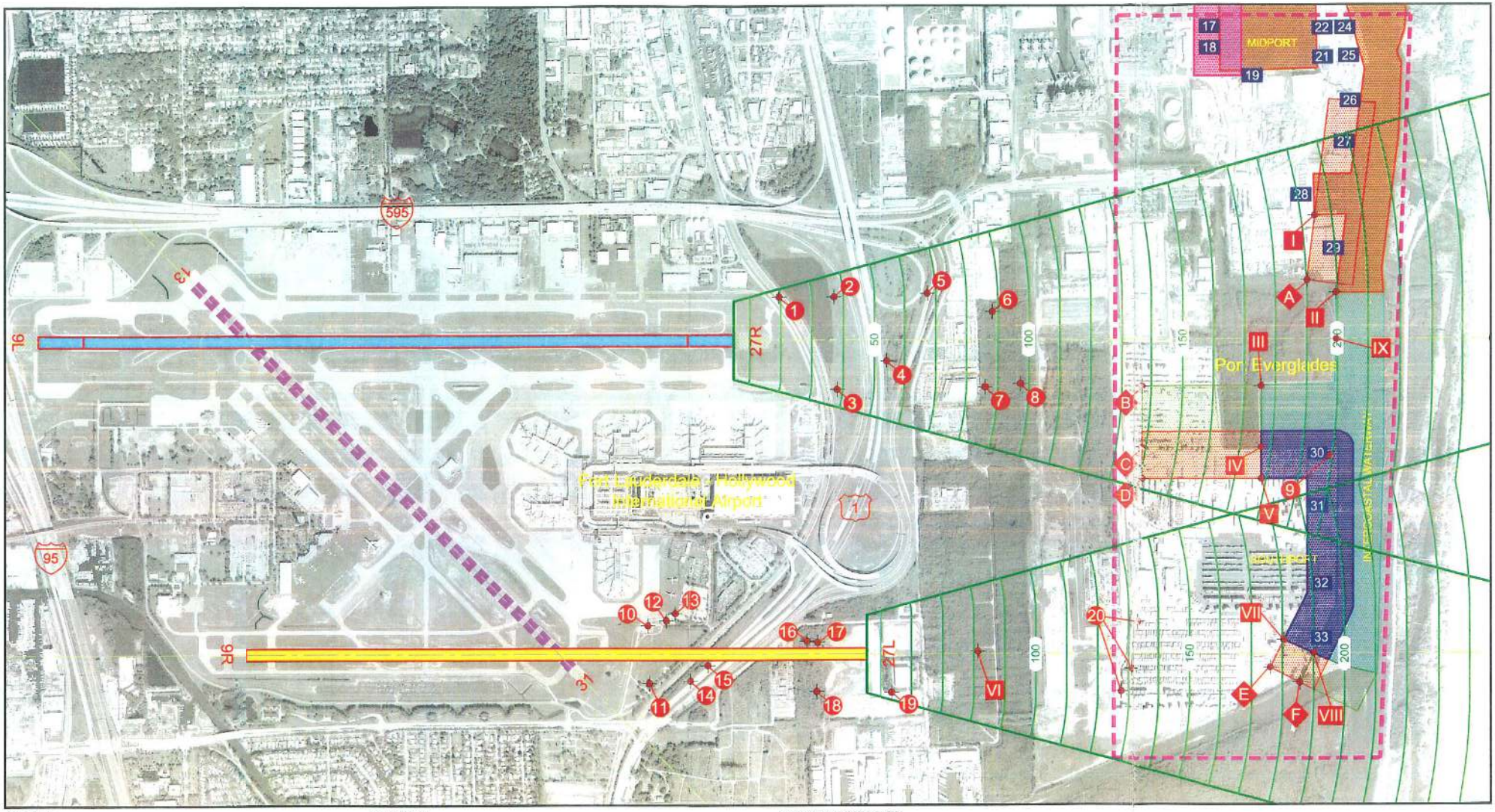

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CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 6

CRITICAL TERPS DEPARTURE SURFACES OVER STUDY AREA PROPOSED AIRFIELD DEVELOPMENT

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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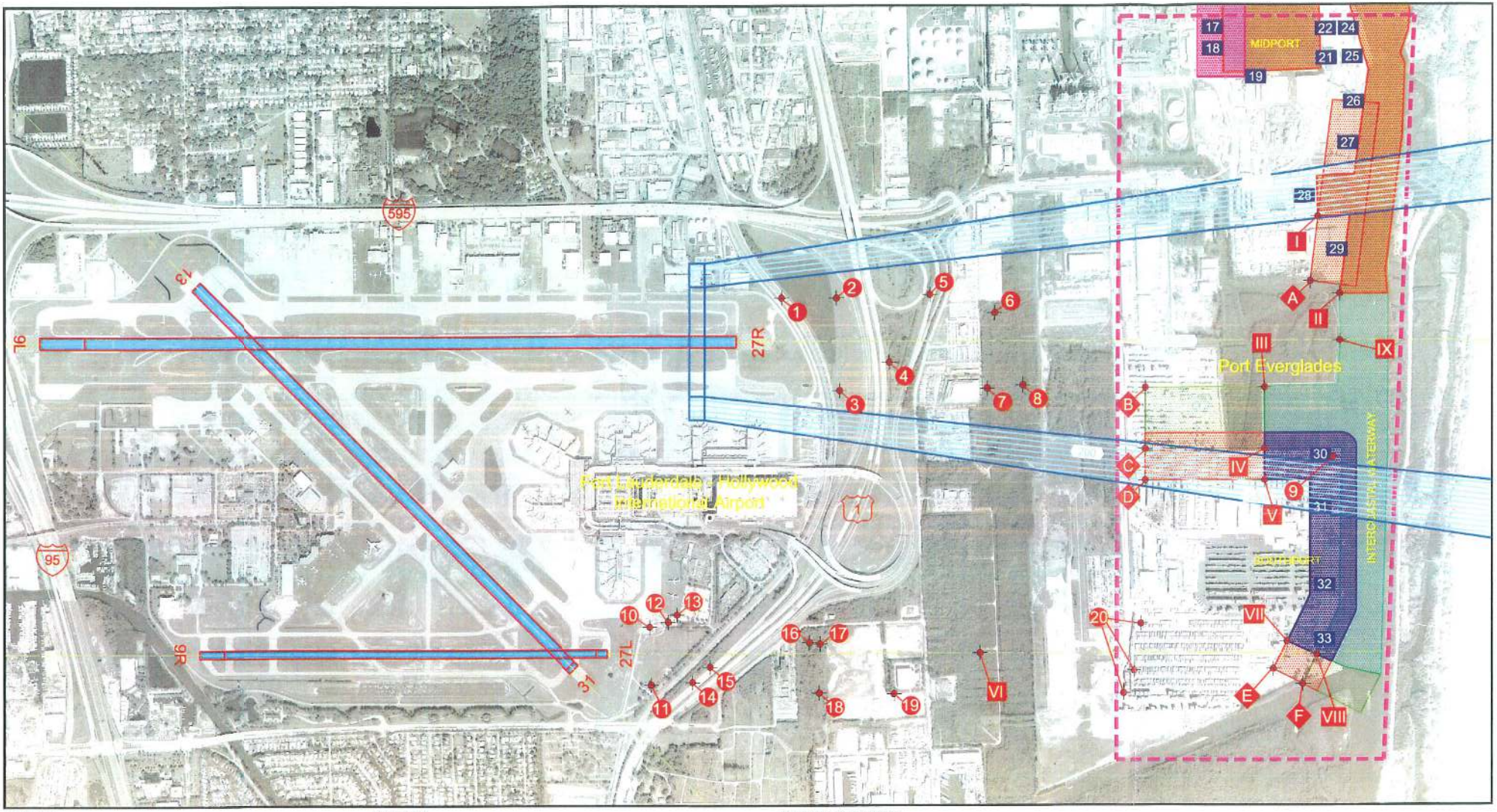

AIRPORT

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- Decommissioned runway
- Extended runway centerline
- LOC clearance surface
- Elevation contour of above-named surface, feet AMSL

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- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 7

CRITICAL LOC SURFACES OVER STUDY AREA EXISTING AIRFIELD CONFIGURATION

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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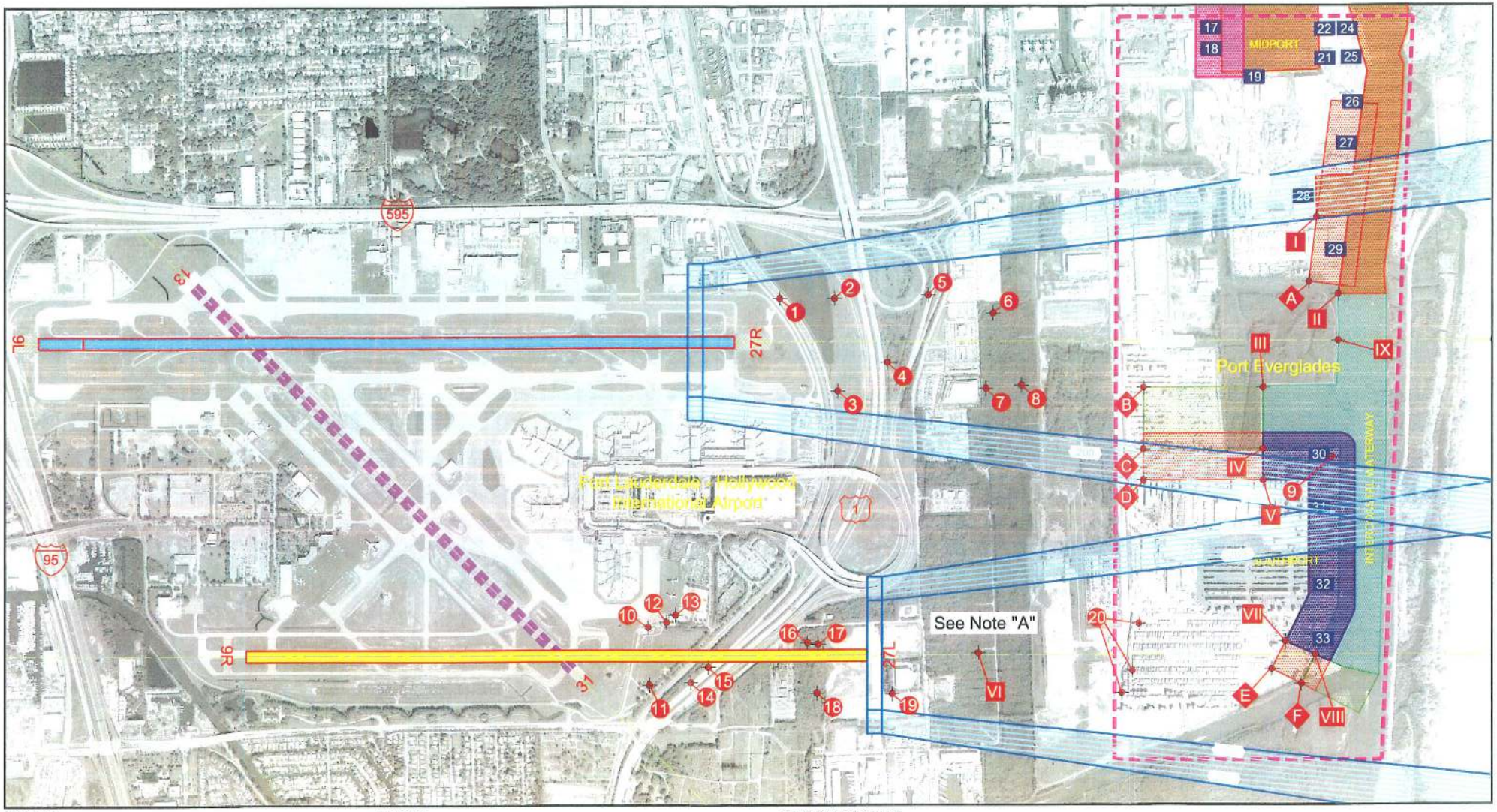

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- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

NOTE "A": Assumes similar procedure will be developed for proposed runway

Figure 8

CRITICAL LOC SURFACES OVER STUDY AREA PROPOSED CONDITIONS

Airspace Obstruction Study
Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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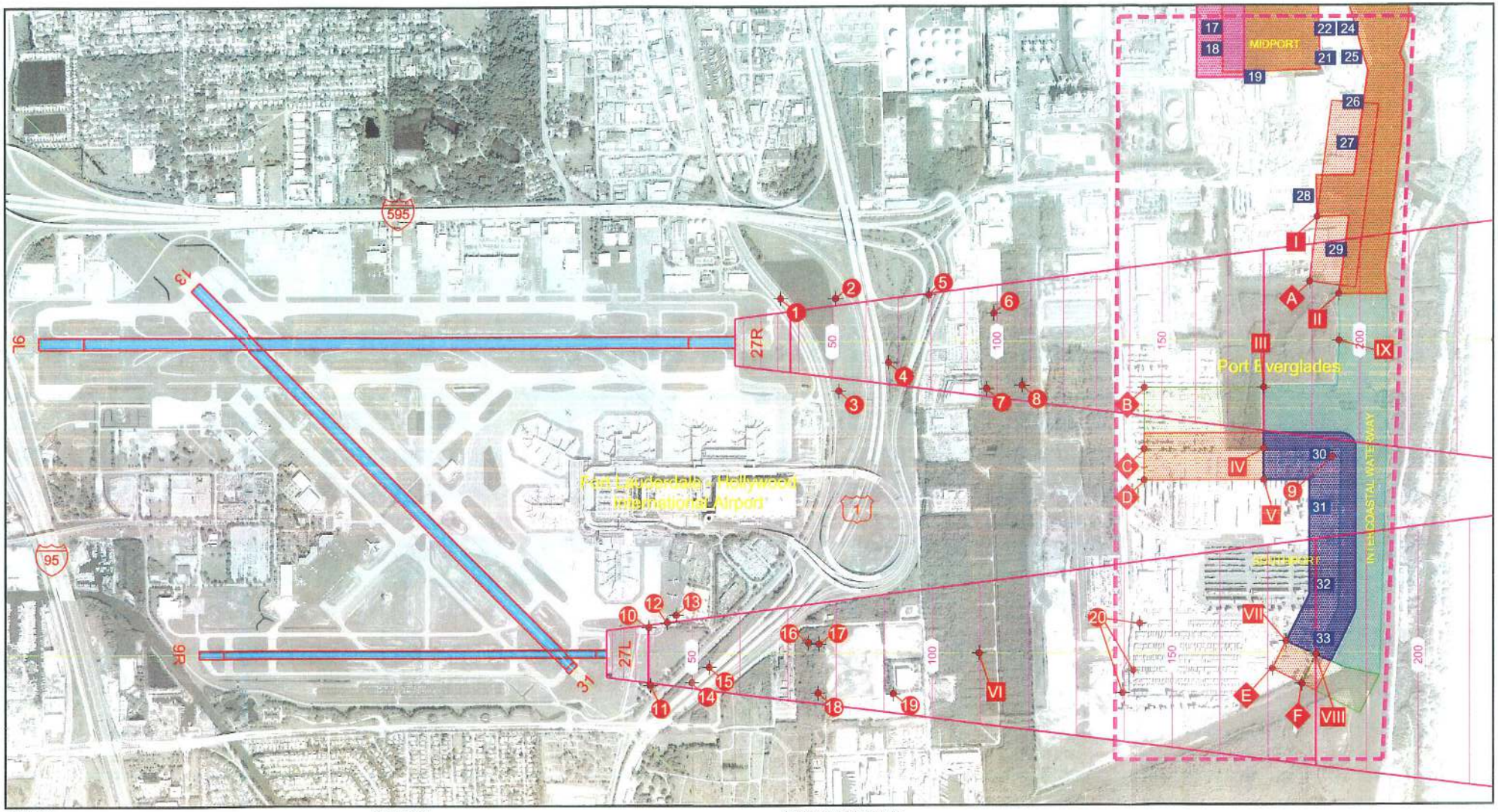

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- ICAO one-engine inoperative (OEI) surface
- 200 Elevation contour of above-named surface, feet AMSL

SEAPORT

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- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 9

ICAO ONE ENGINE INOPERATIVE (OEI) SURFACE OVER STUDY AREA EXISTING AIRFIELD CONFIGURATION

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Port Everglades Cranes and Vessels
Fort Lauderale-Hollywood International Airport
June 2009

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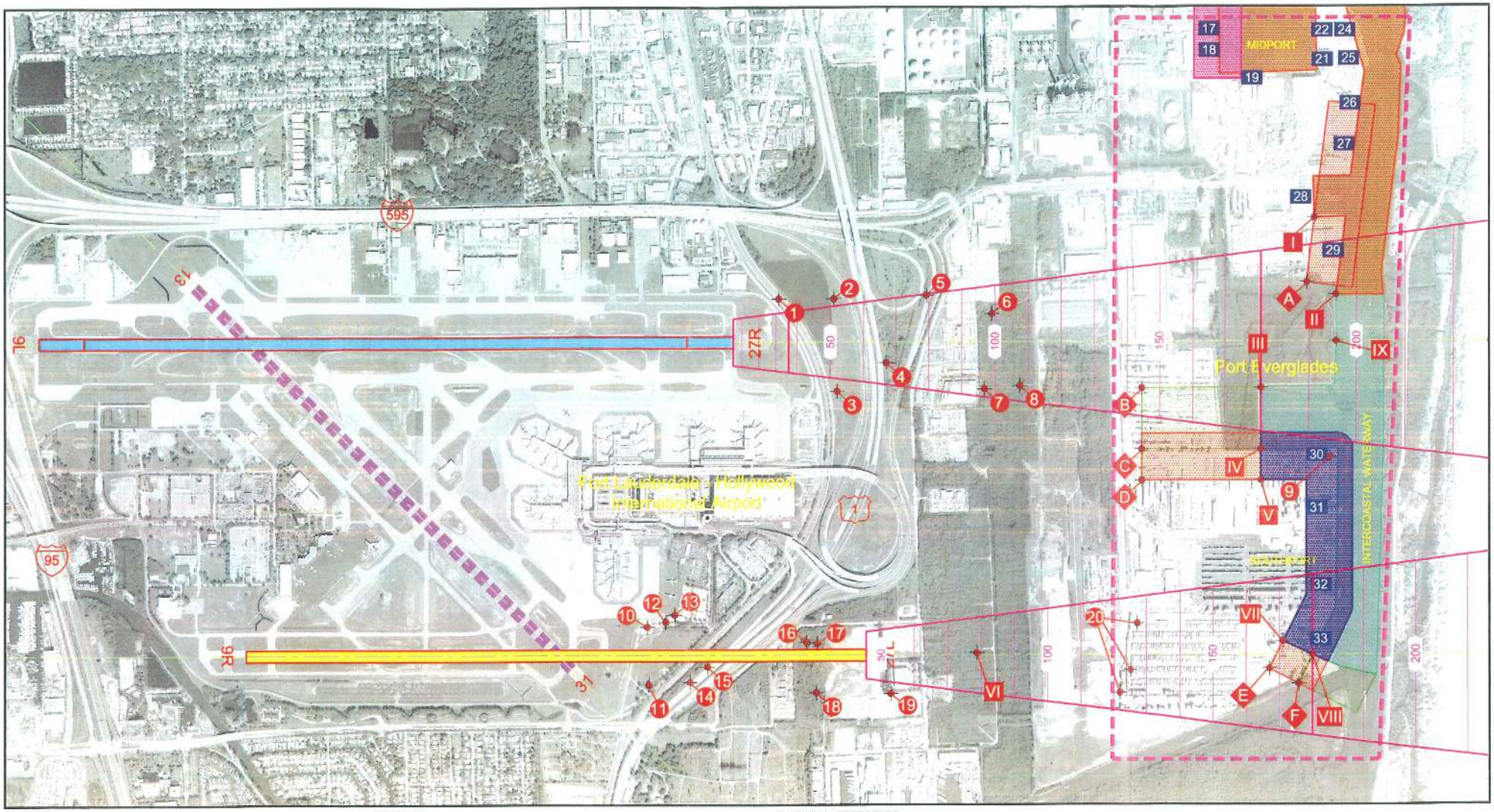

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- ICAO one-engine inoperative (OEI) surface
- 200 — Elevation contour of above-named surface, feet AMSL

SEAPORT

- Study area
- 25 Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NOTE: OEI surface slopes and elevations based on flattest slope available clearing existing obstacles. Individual airline-developed OEI procedures may vary.

NORTH

0 600' 1200' 2400'

Figure 10

ICAO ONE ENGINE INOPERATIVE (OEI) SURFACE OVER STUDY AREA PROPOSED CONDITIONS

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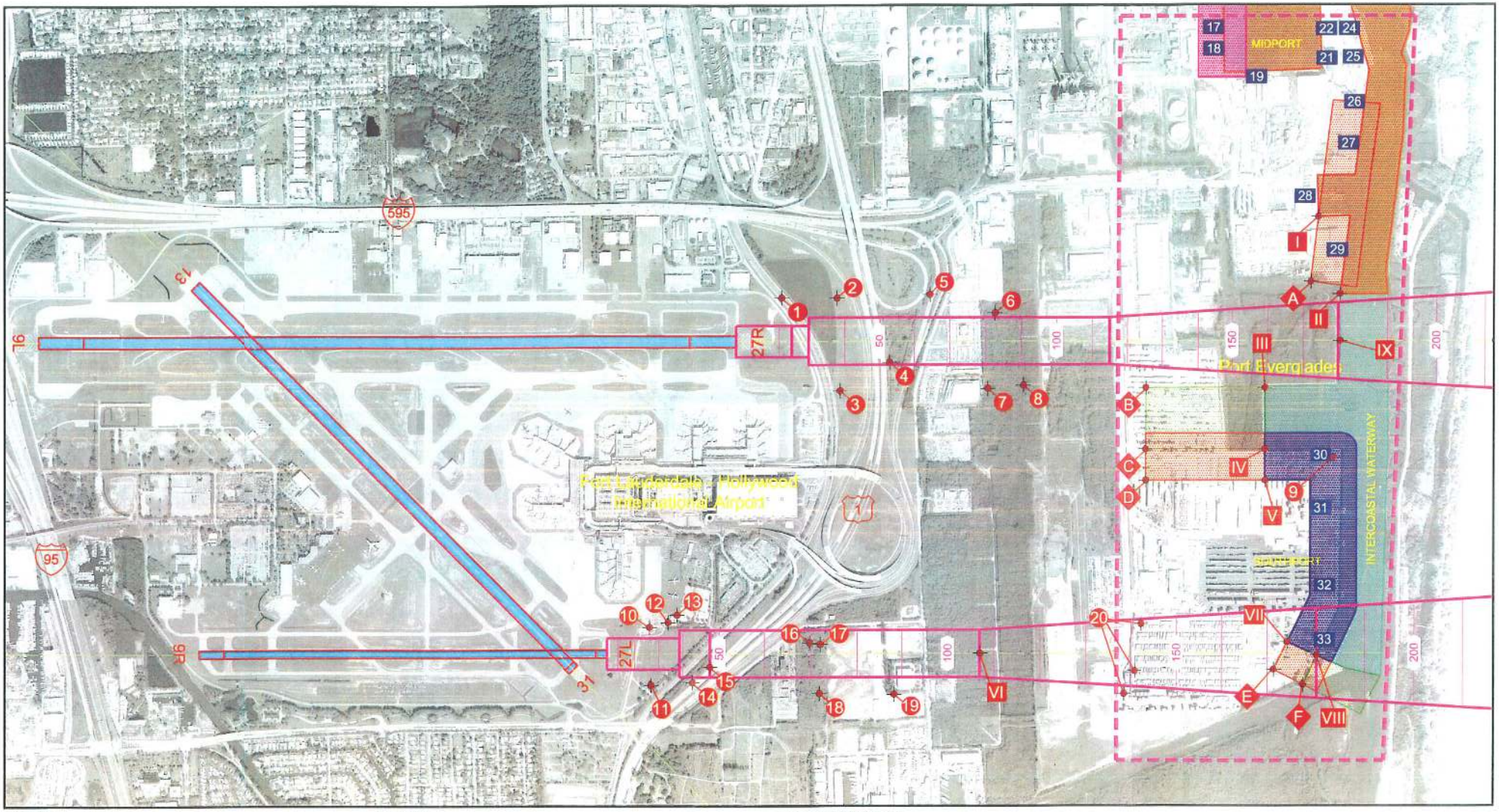

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- AC 120-19 one-engine inoperative (OEI) surface
- 200 — Elevation contour of above-named surface, feet AMSL

SEAPORT

- Study area
- 25 Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 11

AC 120-19 ONE ENGINE INOPERATIVE (OEI) SURFACE OVER STUDY AREA EXISTING AIRFIELD CONFIGURATION

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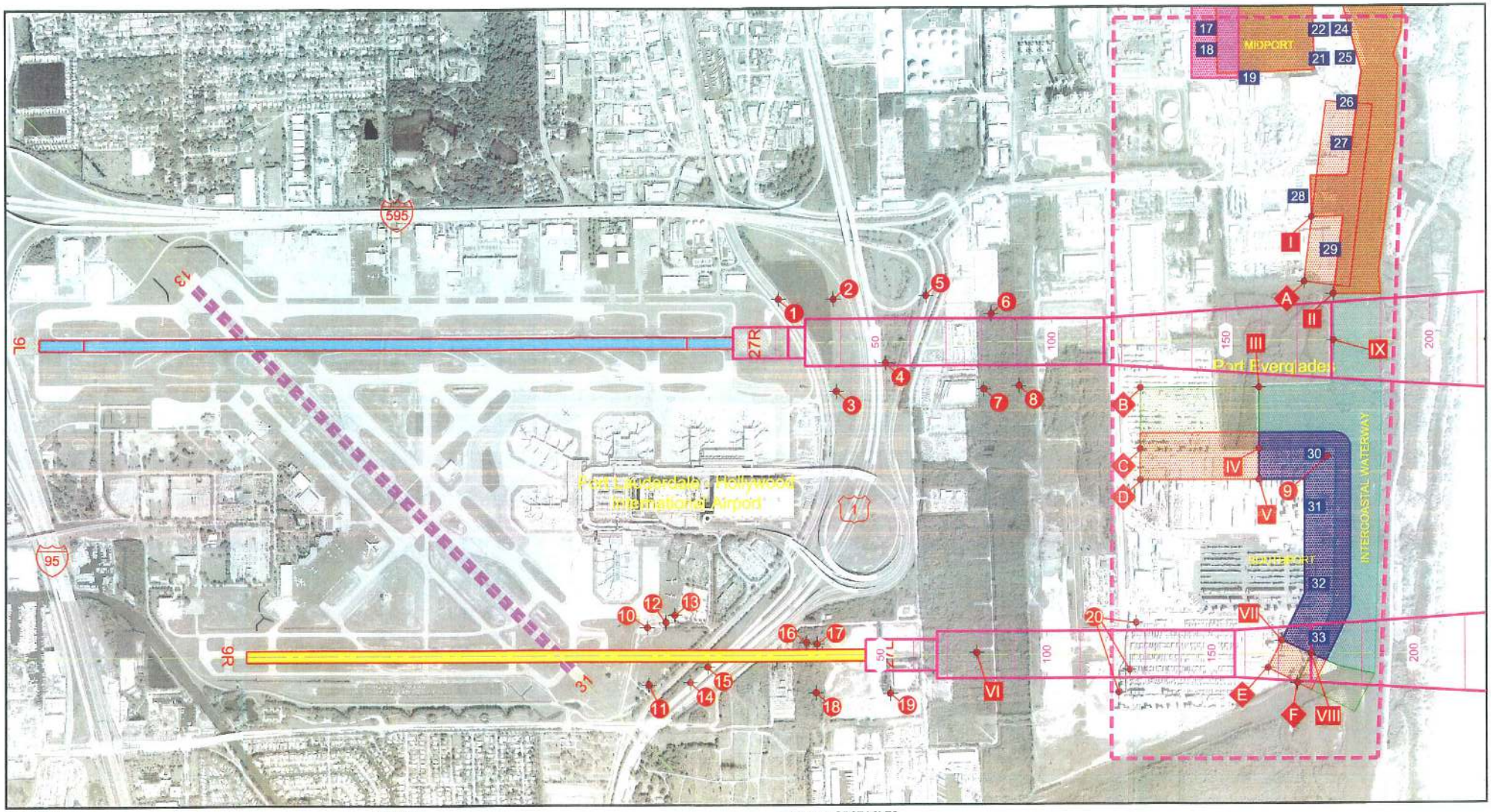

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- AC 120-19 one-engine inoperative (OEI) surface
- 200 — Elevation contour of above-named surface, feet AMSL

SEAPORT

- Study area
- 25 — Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # — Obstacles in databases (See Table 1)
- # — Other likely critical obstacles
- # — Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 12

AC 120-19 ONE ENGINE INOPERATIVE (OEI) SURFACE OVER STUDY AREA PROPOSED CONDITIONS

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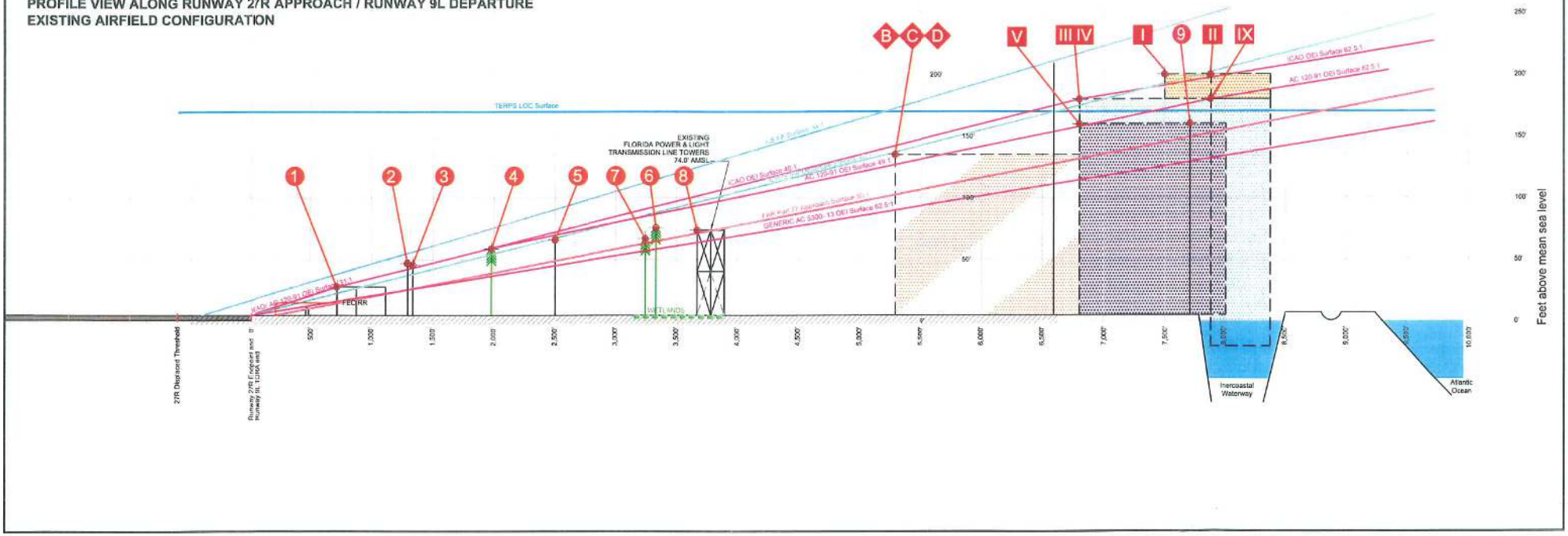
PROFILE VIEW ALONG RUNWAY 27R APPROACH / RUNWAY 9L DEPARTURE
EXISTING AIRFIELD CONFIGURATION



SEAPORT

- Existing crane envelope of operation approximately 180 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

0 400' 800' 1600'

WITH 10x VERTICAL EXAGGERATION

Figure 13

PROFILE VIEW
RUNWAY 27R APPROACH/ RUNWAY 9L DEPARTURE
EXISTING AIRFIELD CONFIGURATION

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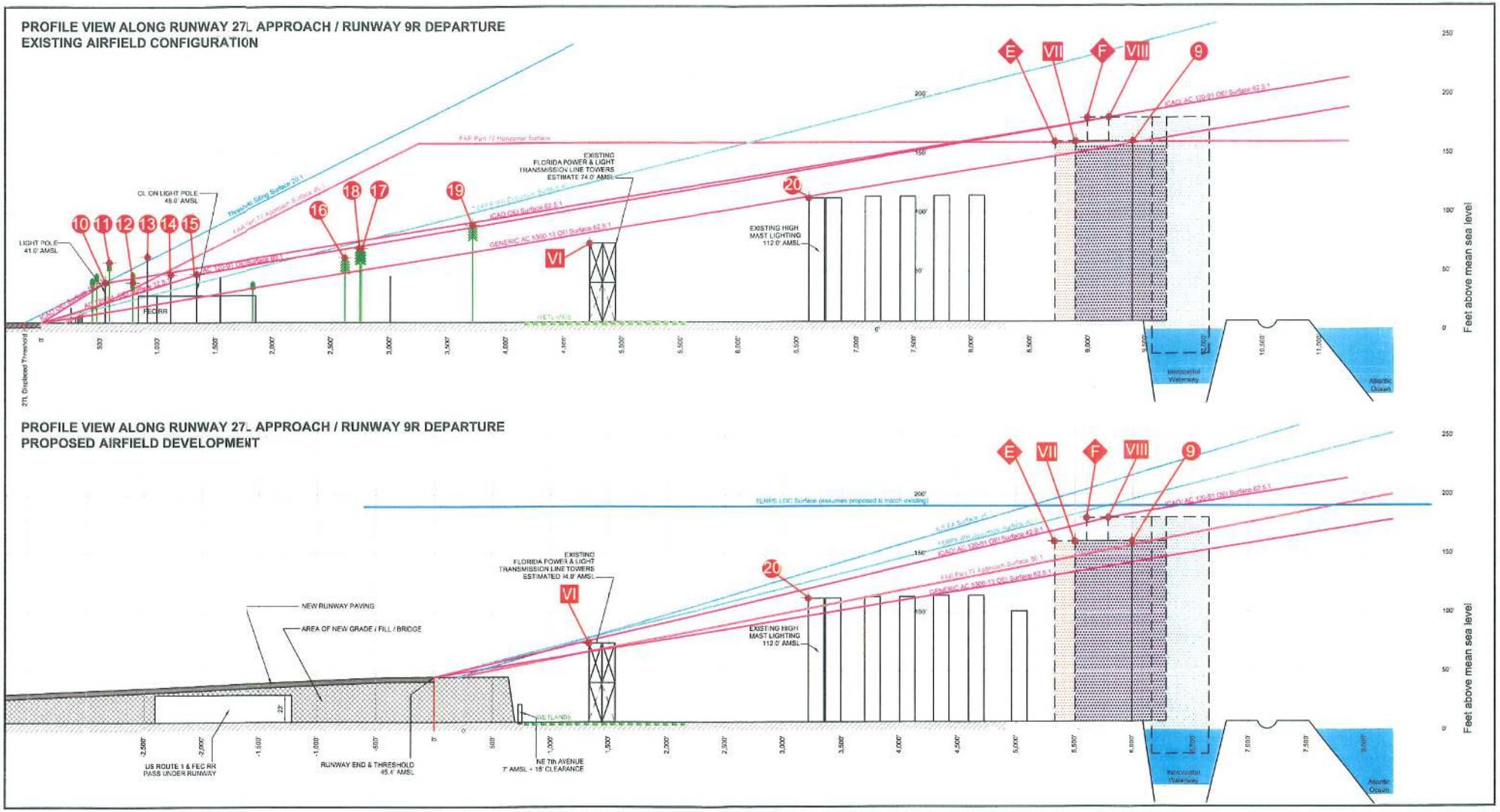

SEAPORT

- Existing crane envelope of operation approximately 180 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # Obstacles in databases (See Table 1)
- # Other likely critical obstacles
- # Proposed critical obstacles

0 400' 800' 1600'

WITH 10x VERTICAL EXAGGERATION

Figure 14

PROFILE VIEW
RUNWAY 27L APPROACH / RUNWAY 9R DEPARTURE
EXISTING AND PROPOSED CONDITIONS

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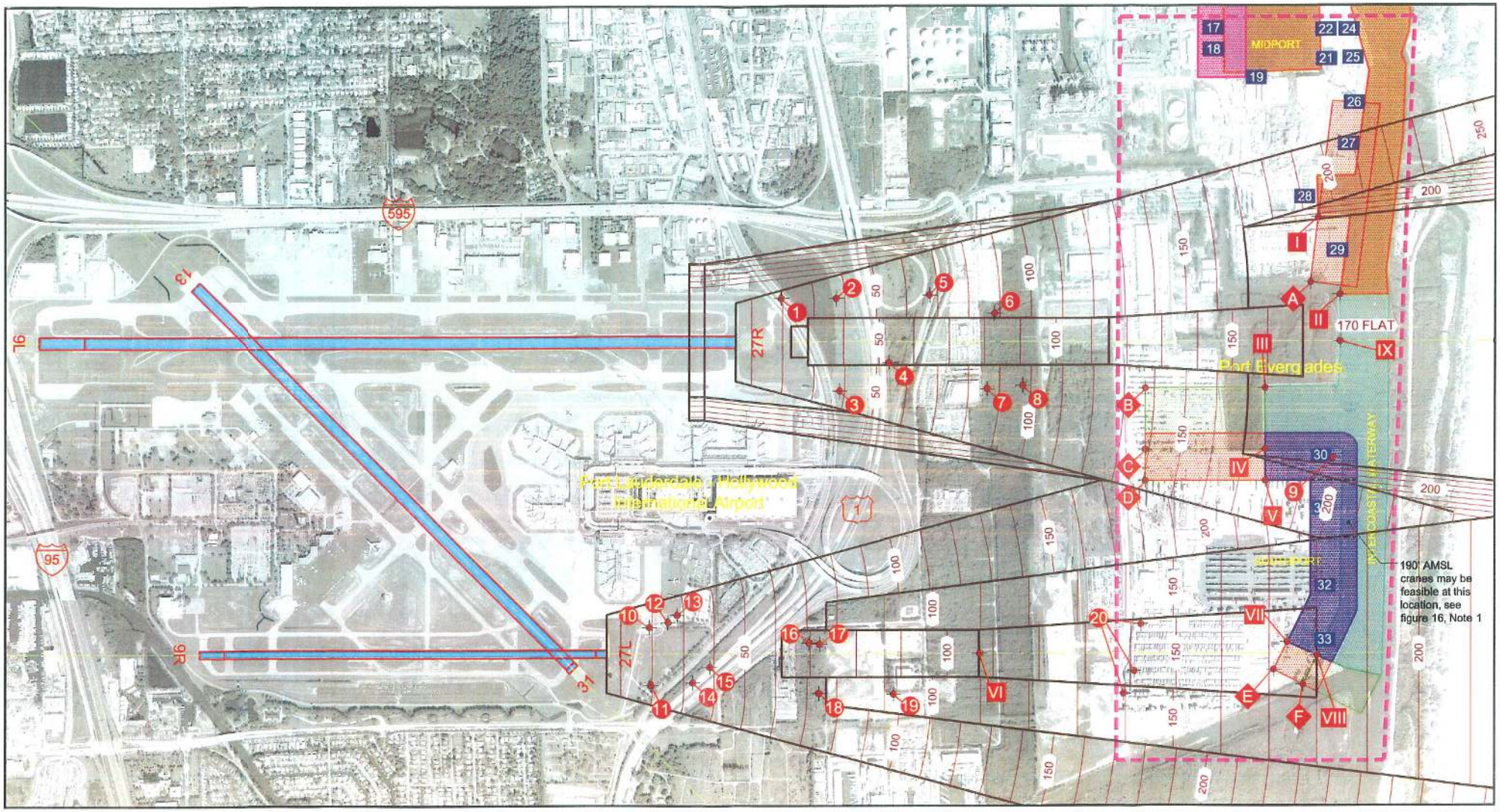

AIRPORT

- Existing runway
- Proposed Extended South Runway (9R-27L) from EIS team, Alternative B1b
- Decommissioned runway
- Extended runway centerline
- Lowest composite surface
- 200 — Elevation contour of above-named surface, feet AMSL

SEAPORT

- Study area
- 25 — Berth number
- Existing crane envelope of operation approximately 160 feet AMSL
- Existing crane envelope of operation approximately 280 feet AMSL
- Existing cargo ships vessel area up to 55m (180 feet) above waterline
- Existing cruise ships vessel area up to 62m (200 feet) above waterline
- Proposed crane envelope of operation
- Proposed cargo ships vessel area

CRITICAL OBSTACLES

- # — Obstacles in databases (See Table 1)
- # — Other likely critical obstacles
- # — Proposed critical obstacles

NORTH

0 600' 1200' 2400'

Figure 15
LOWEST COMPOSITE SURFACE OVER STUDY AREA EXISTING CONDITIONS
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Fort Lauderale-Hollywood International Airport
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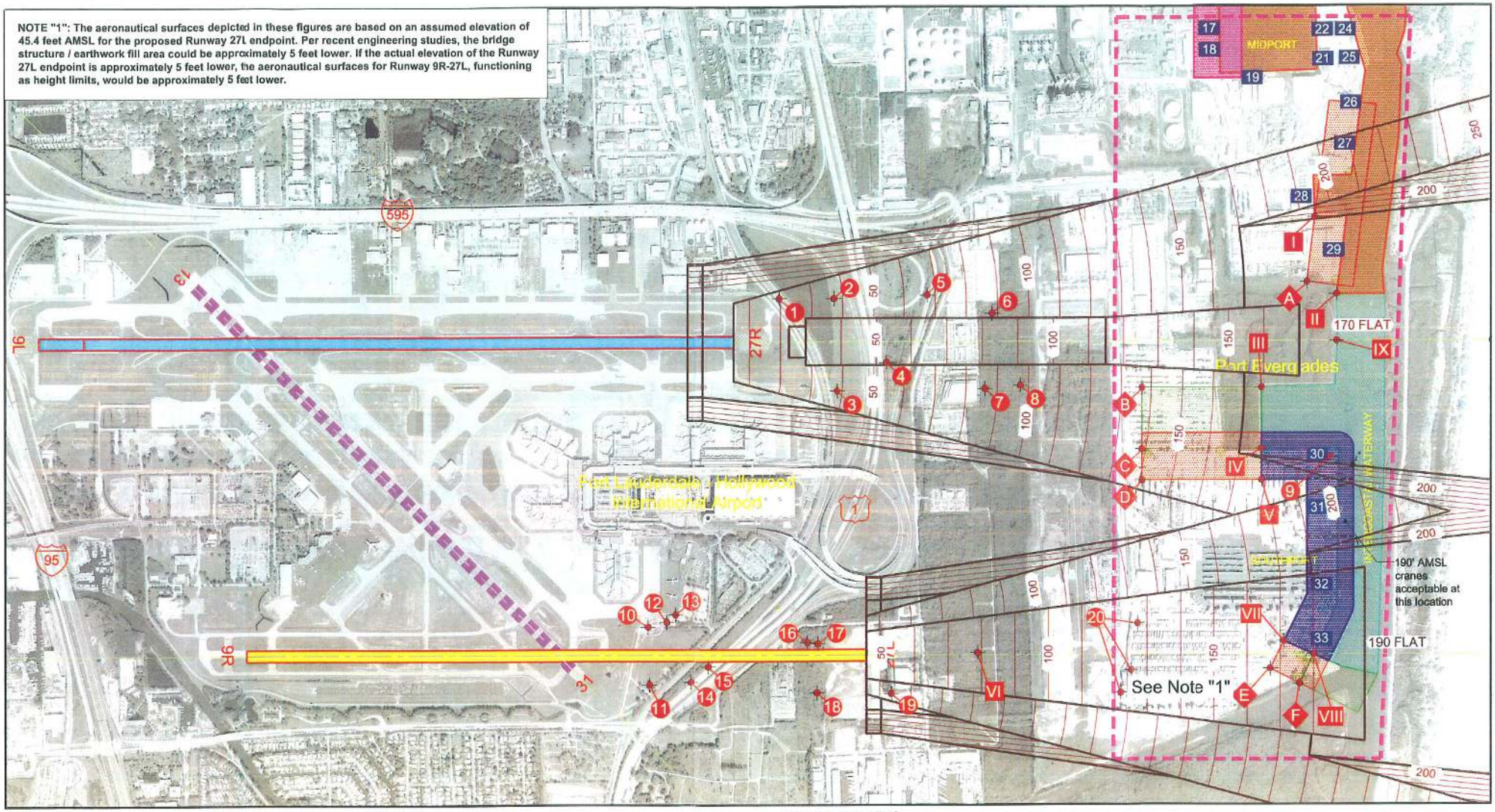

Figure 16
LOWEST COMPOSITE SURFACE OVER STUDY AREA PROPOSED CONDITIONS
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