3 ALTERNATIVES

The purpose of the Proposed Action, as described in Chapter 2, *Purpose and Need*, is the implementation of optimized standard arrival and departure instrument procedures, serving air traffic flows into and out of airports in the Houston Metroplex. Implementation of the Proposed Action would (1) improve operational efficiency through use of PBN procedures, (2) increase flight path predictability, and (3) decrease required pilot-controller voice communication.

This chapter describes the alternatives analyzed by the FAA for the Houston OAPM project. The FAA conducted the analysis in accordance with the CEQ regulations and FAA Order 1050.1E.

3.1 Identification and Evaluation of Potential Alternatives

The Houston OAPM Study Team and Design & Implementation (D&I) Team each identified and evaluated potential alternatives to individual procedures. Collectively, the final set of proposed changes to instrument flight procedures (IFPs),[49] as detailed in Section 3.1.2, became the Proposed Action. The following sections summarize this process.

3.1.1 Houston OAPM Study Team

Chapter 1, *Background*, includes a brief description of the Houston OAPM Study Team. The Study Team convened in May 2011 to define operational issues in the Houston Metroplex and identify potential corresponding solutions. Work by the Study Team served to guide later detailed design efforts and inform FAA decision-making processes related to these efforts. During three sets of outreach meetings, the Study Team obtained input from ATC experts, airspace users, and industry representatives. These meetings helped identify existing operational challenges, enhancement opportunities, and evaluation metrics. Initially, 105 issues were identified, after which similar issues were grouped to determine potential solution sets.

The Study Team identified several potential modifications to the arrival/departure procedures that addressed issues identified in the outreach meetings. The team recommended new or changed arrival and departure procedures that meet the need for the project, as described in Section 2.1 .

The Study Team rejected or modified several of the initial proposals because they would not address the need for the project or would adversely affect existing operations. The team also worked closely with environmental specialists to consider whether any of the proposed solutions might create an environmental impact and to develop mitigation alternatives as necessary. Considerations included reviewing level flight segments and flight profiles. During a descent or climb profile, level flight segments are less efficient.

[49] IFPs include conventional ground-based and PBN procedures, through all phases of flight (i.e., departures, arrivals, and approaches).

Therefore, the team emphasized optimization of aircraft climb and descent profiles for the various procedures. When proposing PBN procedures or airspace modifications, the Study Team also considered the Alabama-Coushatta Tribe of Texas Reservation, as well as resources protected under Section 4(f) of the Department of Transportation (DOT) Act[50] (including the Big Thicket National Preserve, the Sam Houston National Forest, and the Anahuac and Trinity River National Wildlife Refuges). The result of the initial screening by the Study Team indicated minimal potential for significant environmental impacts on these lands.

The Study Team recommendations became the basis for the initial set of alternatives evaluated by the D&I Team. (See Appendix E for the record of this process.)

3.1.2 Houston OAPM Design and Implementation Team

The Houston OAPM Design and Implementation (D&I) Team, comprised of FAA and industry personnel, convened in January 2012 to review the procedures recommended by the Study Team. The D&I Team adopted, refined, rejected, and added to the proposal elements recommended by the Study Team. The D&I Team engaged airspace users and environmental specialists regularly for feedback throughout their deliberations.

The D&I Team carefully considered the Study Team recommendations. In some instances, design concerns or other issues precluded the development of procedures as originally envisioned by the Study Team. As the D&I Team analyzed changes to individual procedures, and their associated interactions between procedures, it elected not to carry some changes forward because they did not meet FAA design or safety criteria, and/or the purpose and need of this project. This evaluation was an iterative process, as modifying one procedure had potential to affect one or more other procedures.

Also during this iterative process, the D&I Team considered various environmental factors based on use and location of routes. The following are some examples of consideration of environmental factors by the D&I Team during the development process:

- Modification of initial Study Team recommendations that would have increased runway use on IAH Runway 26R. With the modification, arrival use of Runways 26L, 26R, and 27 would not be expected to change
- Change of the initial design of a proposed airway to direct aircraft away from Big Thicket National Preserve

[50] Section 4(f) of the DOT Act, codified at *United States Code*, Title 49, sec. 303(c), provides protection for "publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site)."

- Revision of proposed departure procedures for IAH Runways 15L/R to minimize changes in noise exposure

The Study Team recommended use of procedural deconfliction[51] where practical. The D&I Team looked at each procedure individually and considered the benefits both gained and lost due to the use of procedural deconfliction in developing PBN procedures. When an operational advantage seemed likely, the D&I team employed procedural deconfliction. In some cases, though, burdens imposed on airspace users would have outweighed the operational advantage of procedural deconfliction. For example, where two routes intersect at the same altitude, procedural deconfliction would require one aircraft to take a less efficient routing or altitude in order to maintain adequate separation. Existing and anticipated air traffic levels, however, may not warrant imposing these burdens upon users. In these cases, the D&I Team determined that tactical separation[52] of aircraft on an as-needed basis was a more effective option.

In addition to standard design considerations (e.g., aircraft performance capabilities, airfield layout and runway geometry, and locations of satellite airports), other factors specific to the Houston Metroplex also influenced the design (see Appendix F, *Houston OAPM Design and Implementation Team Documents*). Two such considerations included the proximity of the two primary airports in the region, IAH and HOU, and the presence and location of Special Use Airspace (SUA) for military operations. The D&I Team also accounted for additional operational factors, including preferred runways during fluctuating wind conditions.[53]

Throughout the course of its deliberations, the D&I Team made numerous modifications and improvements to the Study Team's recommendations. For discussions of each proposed procedure, specific functional issues, comparisons to existing procedures, and various constraints identified during analysis, see Appendix F.

3.2 Alternatives Considered

This section provides descriptions of the alternatives analyzed in detail in this EA – the No Action Alternative and the Proposed Action.

3.2.1 No Action Alternative

There are currently 34 published SIDs and STARs in the Houston Metroplex, serving the Houston OAPM Airports.

- Four (4) RNAV SIDs
- Eleven (11) RNAV STARs
- Twelve (12) conventional (i.e., non-RNAV) SIDs[54]

[51] The Study Team referred to "procedural deconfliction" as "procedural separation."
[52] "Tactical separation" is the separation of aircraft by ATC instruction via radio-voice communication.
[53] Aircraft generally land and take-off into the wind. This allows an aircraft to operate at a slower speed relative to the ground.
[54] The terms "non-RNAV" and "conventional" are used interchangeably in this document.

- Seven (7) conventional STARs

Under the No Action Alternative, the FAA would maintain the existing arrival and departure procedures in the Houston Metroplex. However, it would include expected future actions that are independent of the Houston OAPM process. The existing conventional and RNAV arrival and departure procedures would remain as is, subject to minor, periodic reviews and revisions in response to changes in the operational environment. The No Action Alternative would not implement the specific procedures designed as part of the Houston OAPM (as detailed in Appendix F).

3.2.2 Proposed Action

The Study Team recommended 22 new or changed SIDs and STARs. The D&I Team reviewed the Study Team recommendations and developed the Proposed Action, which consists of the following:

- Establish twenty (20) new RNAV SIDs and twenty (20) new RNAV STARs;
- Establish five (5) new conventional STARs and modify four (4) existing conventional STARs;
- Establish four (4) new RNP Authorization Required (AR)[55] approaches and modify two (2) RNP AR approaches for IAH (two [2] new and one [1] modified per each flow);
- Modify six (6) existing Instrument Landing System (ILS)[56] approaches by adding RNAV ILS transitions;[57]
- Cancel nineteen (19) existing procedures.

The Proposed Action would not affect eleven (11) of the existing SIDs, which would be retained. The Proposed Action would (1) improve operational efficiency through use of new PBN procedures, (2) increase flight path predictability, and (3) decrease required pilot-controller voice communication. Table 11, in Section 3.4 , lists the individual procedures and their relationship to the purpose and need. In some cases, PBN routes that mirror the existing flight paths over the ground would replace standard routings achieved currently through radar vectoring.[58] This would typically result in shorter and more predictable routes as compared to current published routes. The new PBN

[55] Required Navigation Performance (RNP) is a method of aircraft navigation that utilizes modern flight computers, GPS, and innovative new procedures to fly precisely predetermined paths loaded into aircraft computers. A RNP "Authorization Required" (AR) procedure is a type of Standard Instrument Approach Procedure (SIAP) that offers the most benefit to users by allowing for predetermined, precise, curved flight paths that can reduce flight distances, conserve fuel, and preserve the environment. These procedures require specific aircraft functionality and pilot crew training. For more information, see Appendix D.
[56] An Instrument Landing System (ILS) is a ground-based navigation system that provides lateral and vertical course guidance, to facilitate landings during adverse weather conditions. (FAA, *Pilot/Controller Glossary*, July 26, 2012.)
[57] An "RNAV ILS Transition" connects the end of the RNAV STAR procedure to an ILS final approach course, from where the aircraft completes a normal ILS approach procedure to the landing runway.
[58] For more information, see Appendix D.

procedures would also provide vertical navigation, allowing the aircraft to descend from cruise altitude into the airport area with reduced pilot-controller communications and fewer inefficient level flight segments. Additionally, modifications to routes that interact with the adjacent Fort Worth ARTCC (ZFW) would improve integration with ZFW procedures. Finally, certain procedures would change in order to better align routes and profiles for international flights to Mexico and South America. Appendix F provides detail on the proposed alterations, deletions, or additions to each procedure associated with the Proposed Action. The target date for publication of the Houston Metroplex optimized procedures is December 12, 2013.[59]

Implementation of the Proposed Action would not require any ground disturbance or development of facilities, nor would it require local or state action. The Proposed Action consists only of procedural changes intended to improve operational efficiency, increase flight path predictability, and reduce required controller-pilot voice communication. Therefore, it would not increase the number of aircraft operations within southeast Texas airspace when compared to the No Action Alternative.

3.3 Comparison of the No Action Alternative and the Proposed Action

This section describes the similarities and differences between the Proposed Action and the No Action Alternative, as shown in Table 1 through Table 10 in the discussion of the Houston OAPM Airports. Figure 5 depicts the air traffic flows into and out of the Houston metropolitan area. Figure 6 through Figure 13 present generalized depictions of the current instrument procedures and an annualized representation of flight activity (on the left), and proposed new or modified procedures (on the right), in the discussion of each airport.[60] Appendix F provides additional details on the existing and proposed procedures.

3.3.1 Similarities

Arrivals in both the Proposed Action and No Action Alternative would transfer from ZHU ARTCC airspace to I90 TRACON airspace over the following "corner-posts,"[61] illustrated in Figure 5:

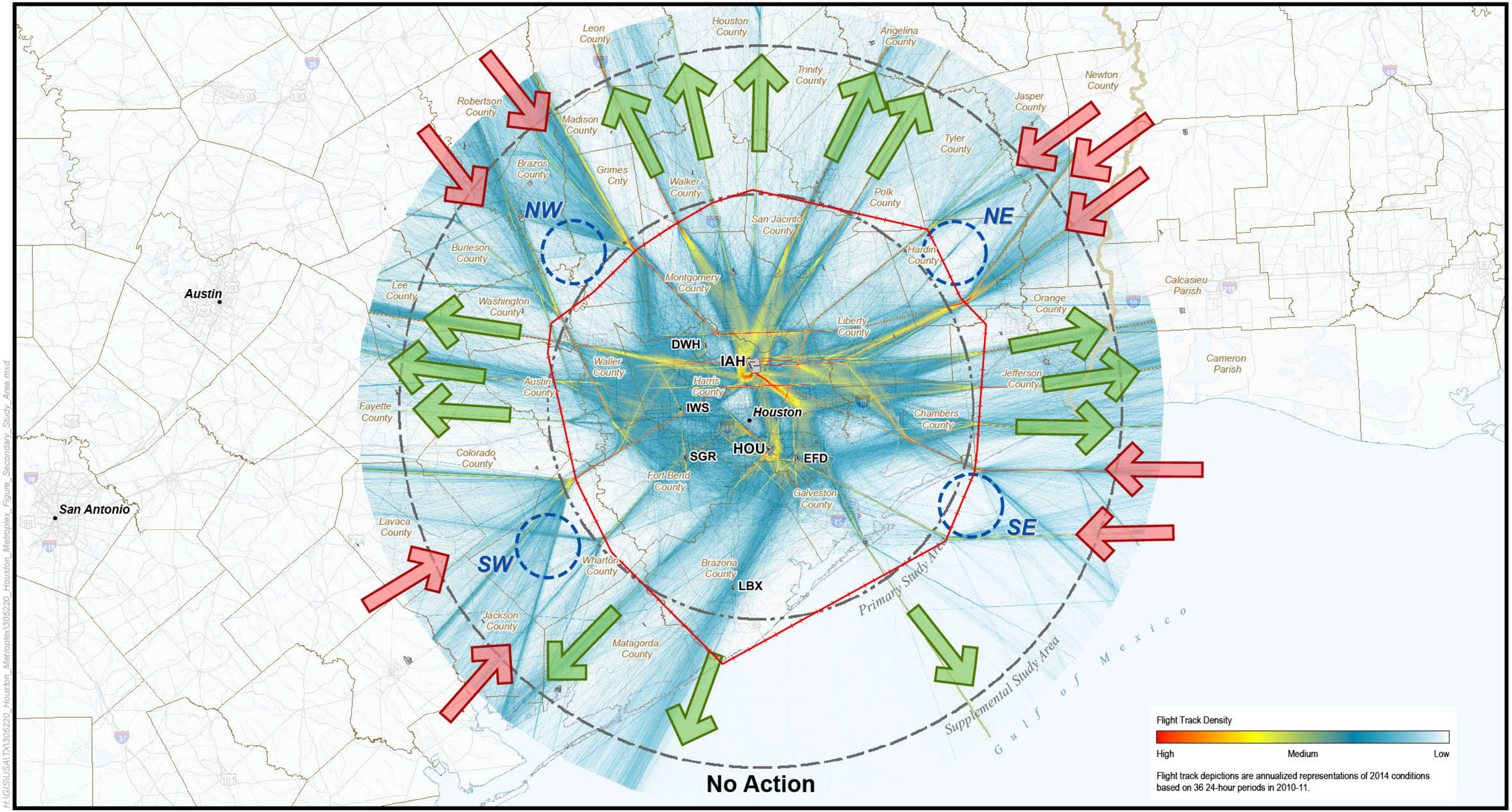
- Northeast approximately over Hardin County
- Southeast over the Gulf of Mexico, south of Chambers County
- Southwest over Wharton County
- Northwest in an area over Brazos, Grimes and Washington Counties

[59] Federal Infrastructure Projects Dashboard, "NextGen Infrastructure Initiative – Houston Metroplex (OAPM)": http://permits.performance.gov/permits/implementation.
[60] For additional information on the representation of flight activity, see Section 4.1.1 and Appendix G.2, Section 4.9.
[61] Corner-post configuration refers to an arrangement of air traffic pathways in a terminal area that brings incoming flights over points (i.e., fixes) at four corners of the traffic area, while outbound flights depart between the fixes, thus minimizing conflicts between arriving and departing air traffic.

Departures in both alternatives would continue to transfer from I90 TRACON airspace to ZHU ARTCC airspace between the “corner-posts” or to the north, east, south, or west over the following locations:

- North in an area over Walker, San Jacinto and Polk Counties
- East over Jefferson County
- South over Brazoria, Galveston and Matagorda Counties
- West over Austin County and the southern portion of Washington County

The Proposed Action would not affect how many aircraft land on each runway.



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North

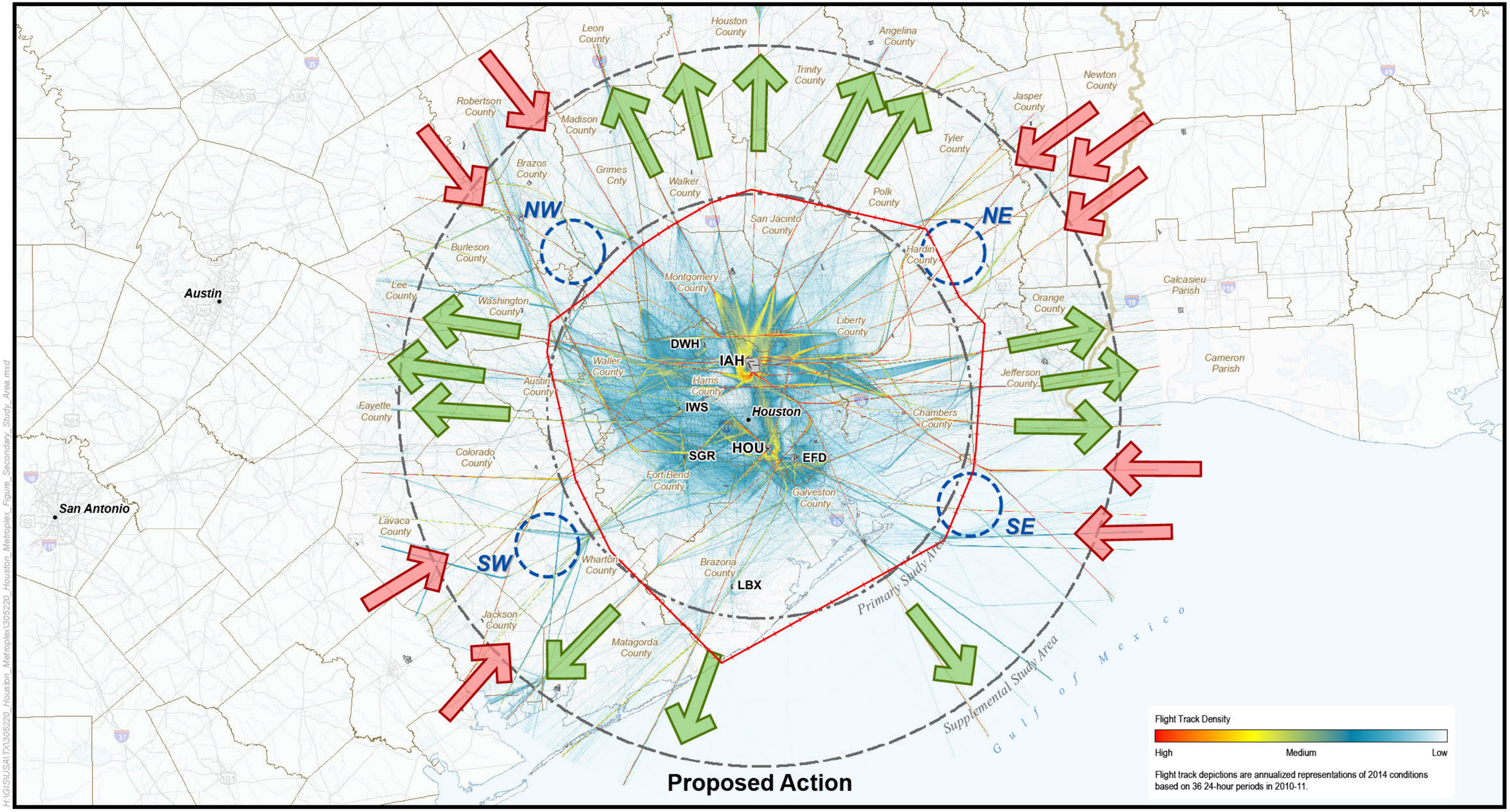
0 20 40 Nautical Miles

- Primary Study Area
- Secondary Study Area
- TRACON Boundary
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Secondary Roads
- Water
- River/Stream
- Arrival Corridor
- Departure Corridor
- Corner Post

Corner Posts and Arrival and Departure Flight Routes

Figure 5
Sheet 1 of 2

Houston OAPM EA



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North

0 20 40 Nautical Miles

- Primary Study Area
- Secondary Study Area
- TRACON Boundary
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Secondary Roads
- Water
- River/Stream
- Arrival Corridor
- Departure Corridor
- Corner Post

Corner Posts and Arrival and Departure Flight Routes

Figure 5
Sheet 2 of 2

Houston OAPM EA

3.3.2 Differences

In ZHU ARTCC airspace, the Proposed Action procedures would align better with current flight paths of aircraft that are radar vectored onto more direct routes into and out of IAH and HOU. Under the Proposed Action, this would allow aircraft operators to plan for a more direct route, increasing flight path predictability and reducing pilot-controller voice communications. In contrast to the Proposed Action, the existing published procedures (i.e., No Action Alternative) are less direct and/or require a more frequent occurrence of pilot-controller radio communication to radar vector the aircraft along a more efficient flight path when conditions permit. The Proposed Action arrival procedures include OPDs, as opposed to current flight profiles that sometimes employ a stair-stepped, alternating sequence of level-offs and descending flight segments.

The current STARs are not flow-specific[62] and do not include OPDs. Therefore, they result in level flight segments when control of aircraft transfers from ZHU ARTCC to I90 TRACON. Current procedures include inefficiently designed and under-utilized dual STARs[63] on some corner-posts that are seldom utilized due to inefficient design. The Proposed Action would implement flow-specific STARs that incorporate OPDs, thereby minimizing level flight segments during transfer of control from ZHU ARTCC to I90 TRACON. The Proposed Action would also redesign dual STARs to improve efficiency and utilization.

The current SIDs are not optimized for unrestricted climbs and are not procedurally deconflicted from STARs. Therefore, they result in level flight segments and inefficient vertical profiles. Additionally, current SIDs restrict aircraft to a longer departure path than necessary before transitioning to requested routes. Under the Proposed Action, the FAA would implement new or modified SIDs for maximum efficiency, allowing unrestricted climbs when possible, thereby minimizing level flight segments. The proposed SIDs would also be shorter, thereby allowing earlier transitions to requested routes. Additionally, while existing RNAV SIDs currently rely upon manual instructions from air traffic control after take-off (e.g., radar vectoring), the Proposed Action would implement some RNAV SIDs that would provide pre-defined and automated guidance immediately after take-off (i.e., RNAV off-the-ground).[64]

Currently there are two RNP AR approach procedures in the Metroplex, serving IAH Runways 8R and 27. As mentioned in Section 3.1.2, under the Proposed Action, the two existing RNP AR approaches would be modified and four additional RNP AR approaches serving the balance of the east/west runways at IAH would be developed (Runways 8L/26R, 26L, and 9). In addition, RNAV transitions to ILS approaches (i.e., RNAV ILS transitions) would occur at IAH (6) and HOU (1). Implementation of these

[62] "Flow" refers to the direction in which aircraft take-off and land at a particular airport. Aircraft generally take-off and land into the wind. However, other factors (e.g., nearby airports, construction) can also affect flow.
[63] "Dual STARs" refers to the presence of a second, generally parallel, STAR over a corner-post to the same airport.
[64] "RNAV off-the-ground" refers to procedures developed for specific runways that allow aircraft immediately after take-off to use navigational course guidance from the onboard Flight Management System (FMS) rather than conventional ground-based navigation aids or radar vectors by ATC.

procedures would improve lateral flight path accuracy (i.e., the extent to which the aircraft flight track matches the published procedure), increasing predictability.

The following sections provide tabular and graphical comparisons of the existing No Action procedures and the Proposed Action procedures for the Houston OAPM Airports. Table 1 through Table 10 show the various procedures for the Proposed Action and No Action Alternative. Figure 6 through Figure 13 present generalized depictions of the current instrument procedures and an annualized representation of flight activity (on the left), and proposed new or modified procedures (on the right) in the discussion of each airport.[65] Note that many of the figures consist of multiple pages labeled as "Sheet 1 of 2" and "Sheet 2 of 2." Appendix F provides additional details on the existing and proposed procedures.

3.3.2.1 IAH Arrivals

Table 1 lists the Proposed Action IAH arrival procedure(s) that would replace or supplement the respective No Action procedures. In addition, it identifies the associated corner-post, applicable aircraft types, and any specific noteworthy comments.

Table 1 IAH Arrival Procedures Modifications

Flow	Existing Procedure	New Procedure	Corner Post	Aircraft Types[66]	Comments
West	WOLDE	GILLL	SE	Jets/All Turbo-Props	Applicable to Runways 26L, 26R and 27[67]
East	WOLDE	BRSKT	SE	Jets/All Turbo-Props	Applicable to Runways 8L, 8R and 9
All	KABOY	BOOZZ	SE	Jets/All Turbo-Props	Applicable to all Runways; Severe Weather Avoidance Procedure (SWAP)[68] route when assigned by Air Traffic Control
All	GILCO		SE	Jets/Turbo-Props	Retained/Modified conventional STAR for non-RNAV equipped arrivals
West	HAMMU	TEJAS	SW	Jets/High-Performance Turbo-Props	Applicable to Runways 26L, 26R and 27
East	HAMMU	HTOWN	SW	Jets/High-Performance Turbo-Props	Applicable to Runways 8L, 8R and 9
All	CARNE	CARNE	SW	Jets/Turbo-Props/Pistons	Revised CARNE conventional STAR to align with proposed TEJAS RNAV STAR; for non-RNAV equipped arrivals
West	BAZBL	DRLLR	NW	Jets/All Turbo-Props	Applicable to Runways 26L, 26R and 27

[65] Flight track depictions on Figures 6 through 13 are annualized representations of 2014 conditions, based on 36 24-hour periods in 2010-11.
[66] These procedures would apply to various classifications of aircraft, including jet, high-performance turbo-prop (capable of greater than 280 knots), and other propeller aircraft.
[67] Runways are identified based on their magnetic direction. For example, a runway oriented on an east-west axis, having a magnetic heading of 090^0 and 270^0 would be identified as Runway 9/27. This single runway would be identified as Runway 9 when taking off or landing eastbound, and Runway 27 when taking off or landing westbound. Parallel runways have a letter appended to the number indicating "left" or "right" or "center" (e.g., 26R). The runways at IAH and HOU are depicted in Figures 3 and 4 in Section 1.1.
[68] Severe Weather Avoidance Plan (SWAP) – A route only assigned by ATC during adverse weather conditions.

Flow	Existing Procedure	New Procedure	Corner Post	Aircraft Types[66]	Comments
East	BAZBL	GUSHR	NW	Jets/All Turbo-Props	Applicable to Runways 8L, 8R and 9
West	AGGEE	MSCOT	NW	Jets/High-Performance Turbo-Props	Applicable to Runways 26L, 26R and 27 Generally traffic from El Paso, Llano, and Austin
East	AGGEE	TTORO	NW	Jets/High-Performance Turbo-Props	Applicable to Runways 8L, 8R and 9 Generally traffic from El Paso, Llano, and Austin
All	RIICE		NW	Jets/Turbo-Props/Pistons	Retained/Modified conventional STAR for non-RNAV equipped arrivals
West	TXMEX	DOOBI	NE	Jets/High-Performance Turbo-Props	Primary Runway 26L
East	TXMEX	SKNRD	NE	Jets/High-Performance Turbo-Props	Primary Runway 8L
West	DAS	WHACK	NE	Jets/High-Performance Turbo-Props	Primary Runway 26R with options for Runways 26L and 27
East	DAS	TWSTD	NE	Jets/High-Performance Turbo-Props	Primary Runway 8L
All		OHIIO	NE	Jets/Turbo-Props/Pistons	New conventional STAR for non-RNAV equipped arrivals
Source: Houston OAPM D&I Team (see Appendix F)					

Figure 6 presents IAH arrivals during west flow and Figure 7 presents IAH arrivals during east flow. Both figures provide a comparison of the No Action and the Proposed Action IAH arrival procedures within the SSA for the respective operations.

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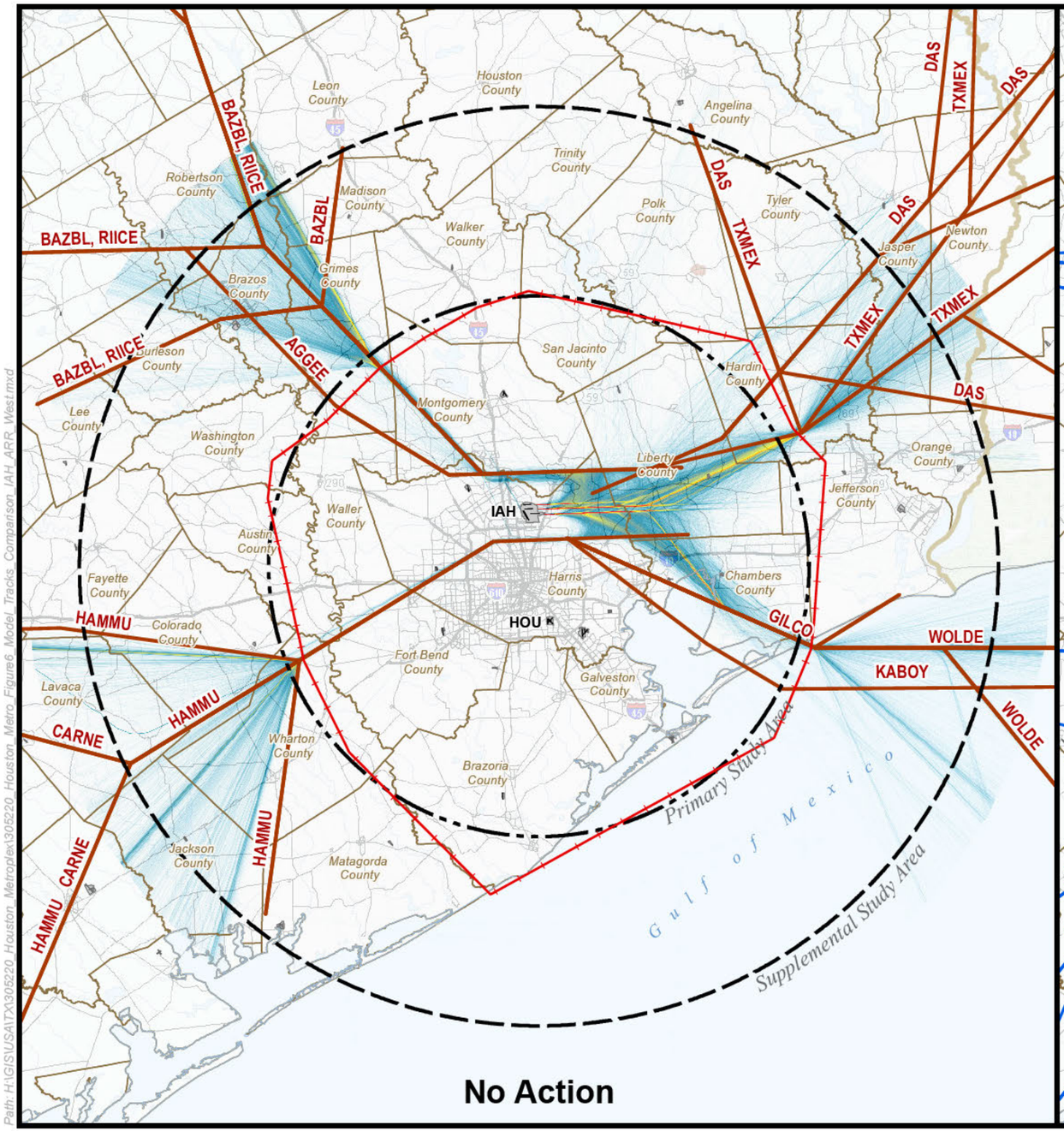

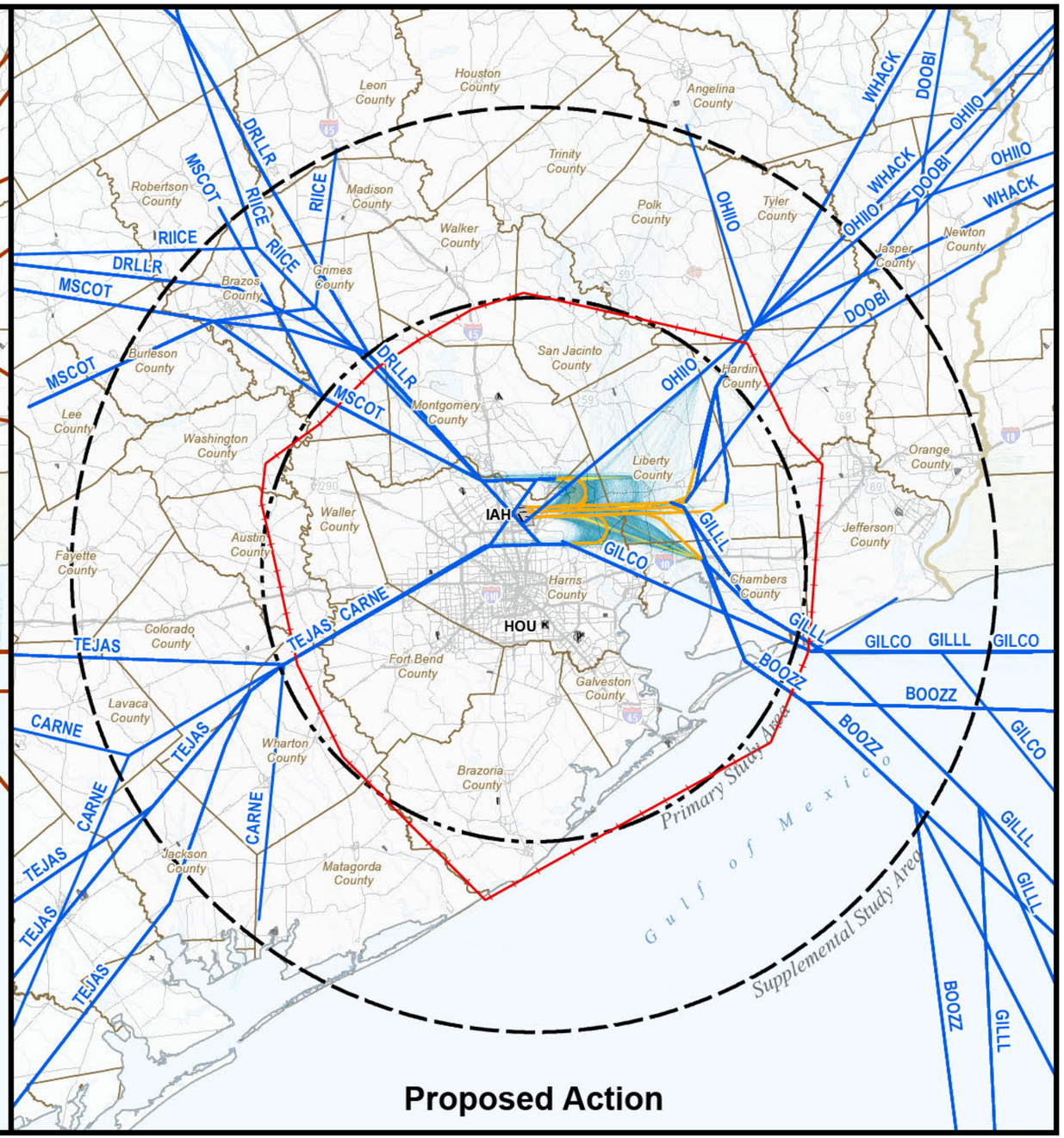

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North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation

- Proposed Procedure
- No Action Procedure
- Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

IAH Arrivals during West Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 6
Sheet 1 of 2

Houston OAPM EA

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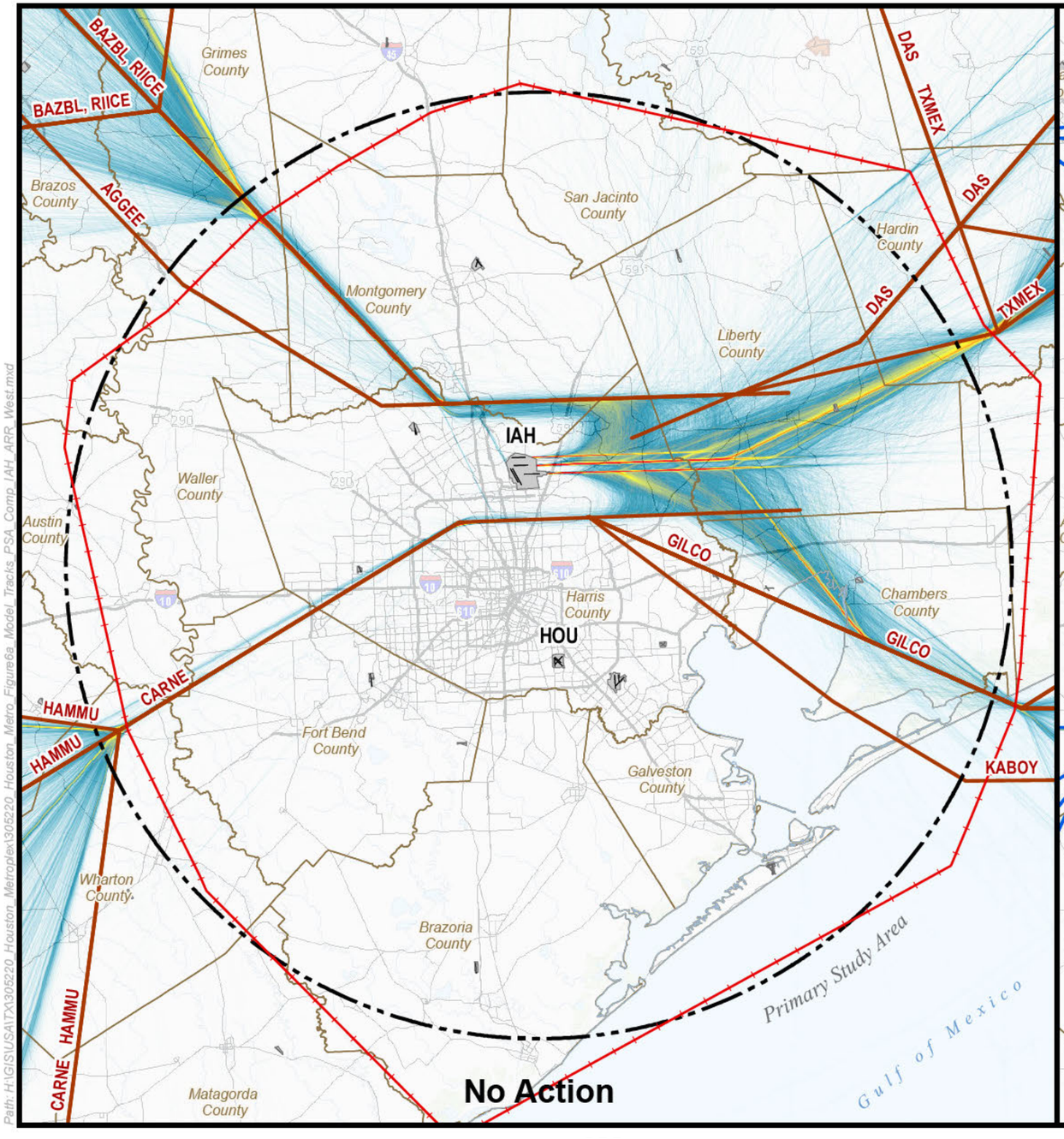

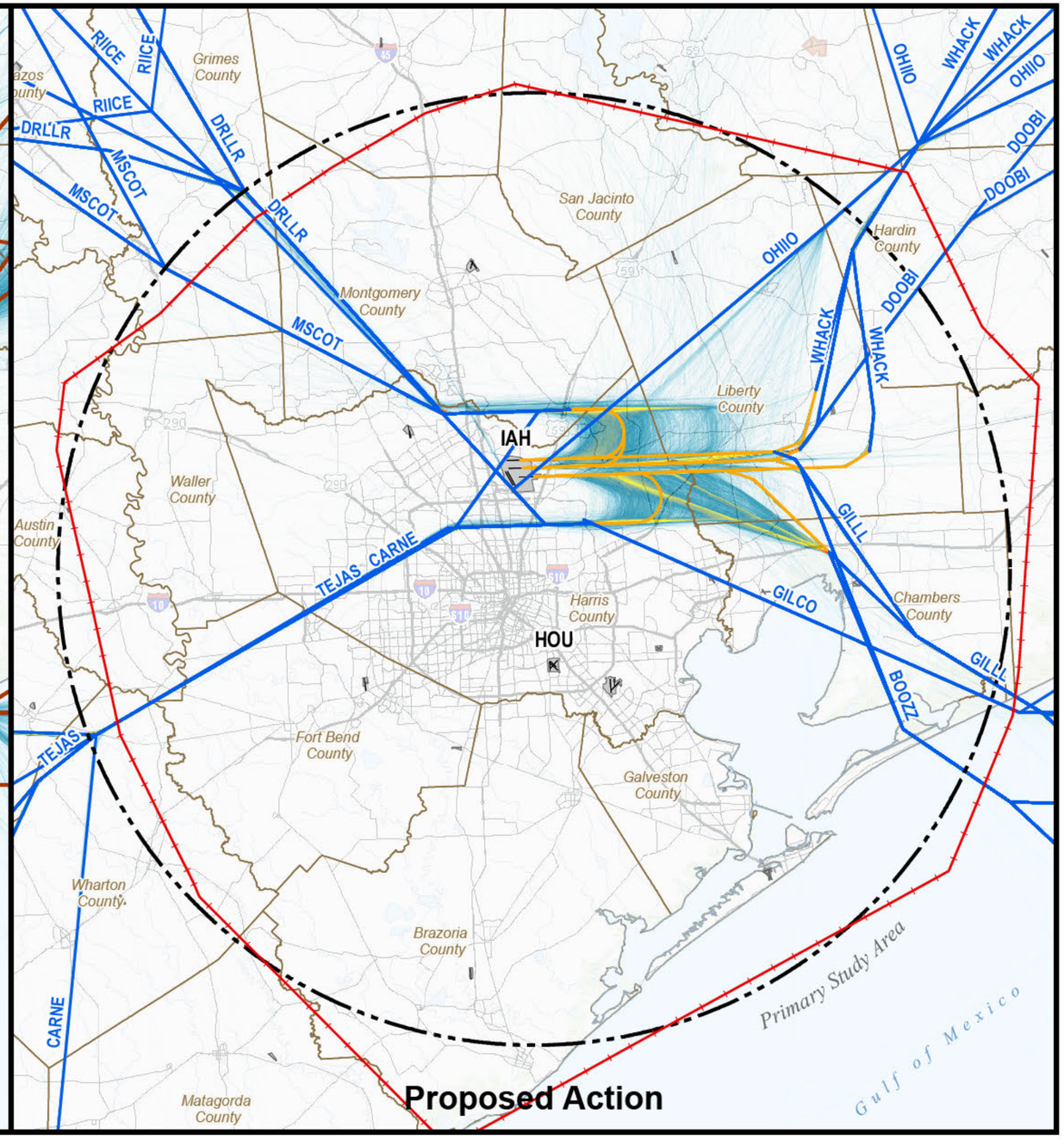

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Primary Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure
Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 10 20 Nautical Miles

IAH Arrivals during West Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 6
Sheet 2 of 2

Houston OAPM EA

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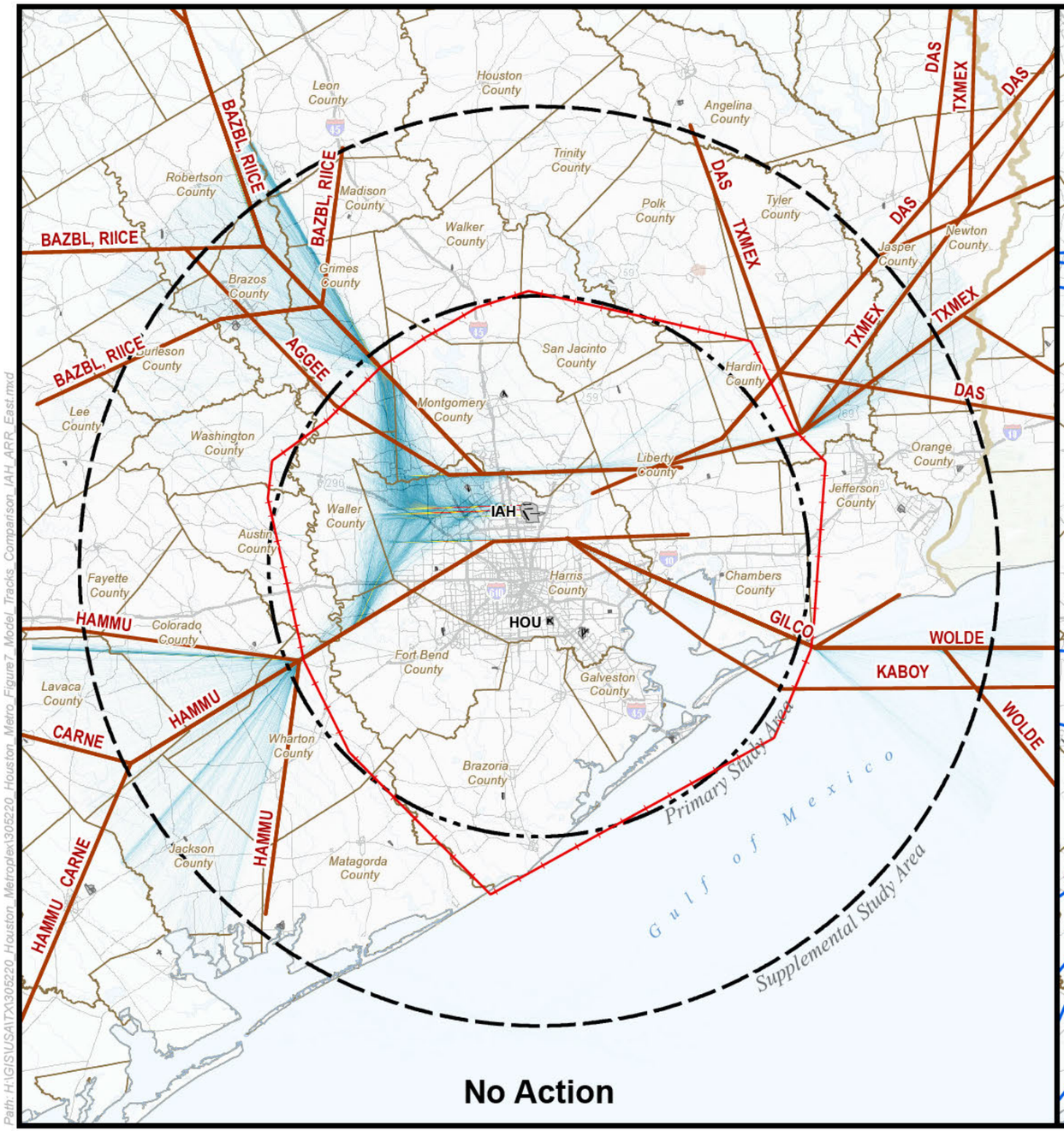
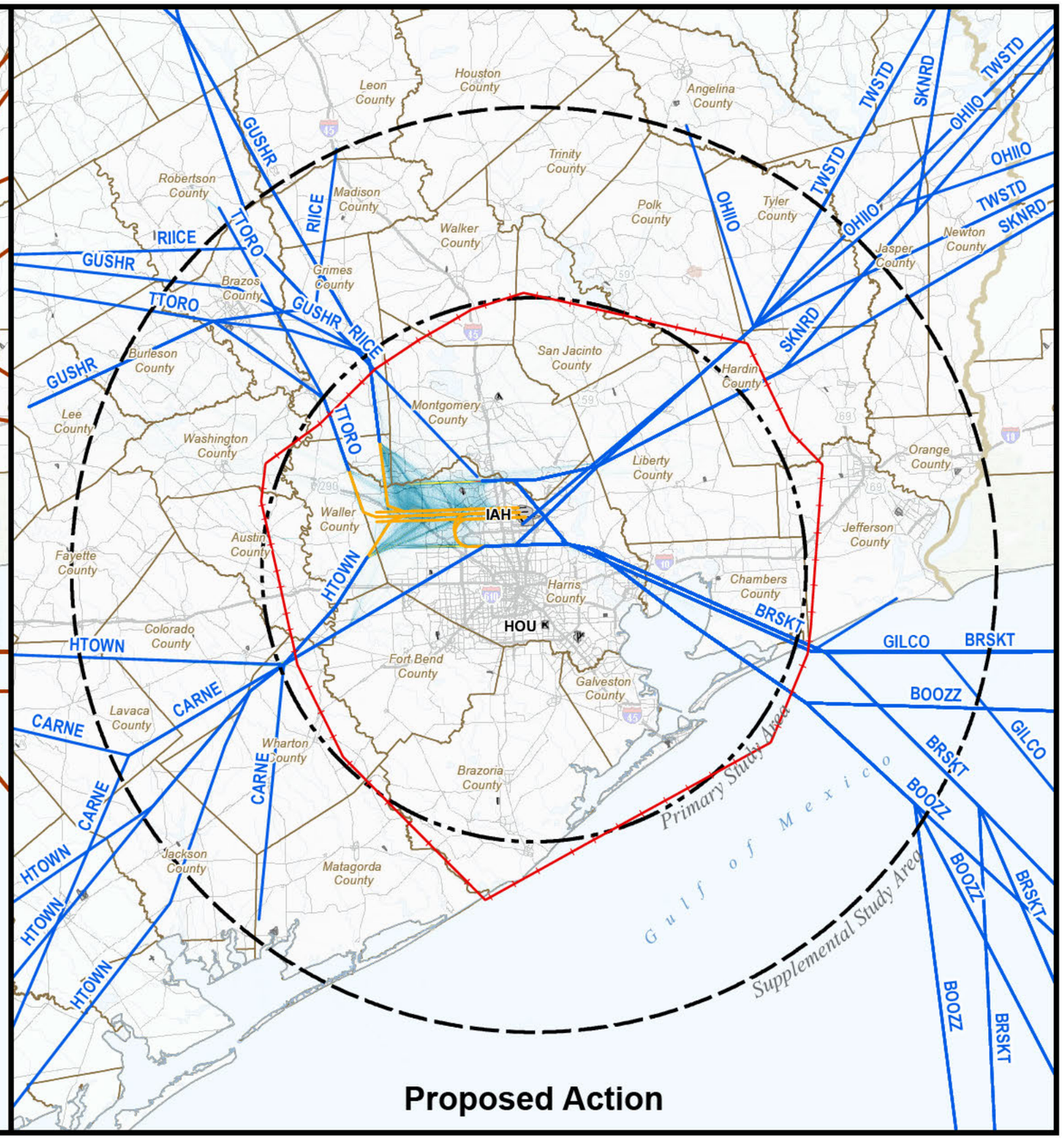


No Action



Proposed Action

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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation

- Proposed Procedure
- No Action Procedure
- Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

IAH Arrivals during East Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 7
Sheet 1 of 2

Houston OAPM EA

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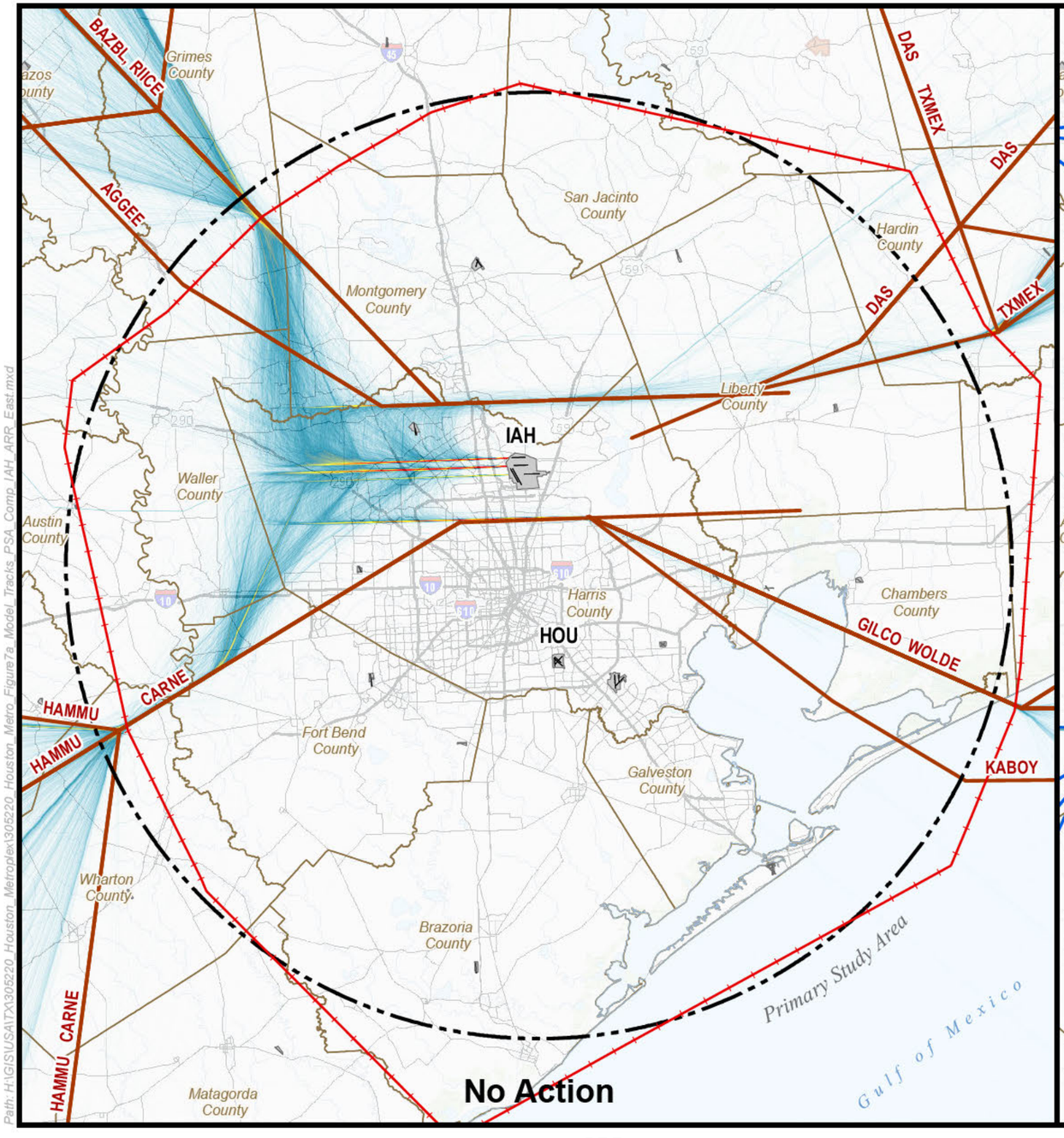

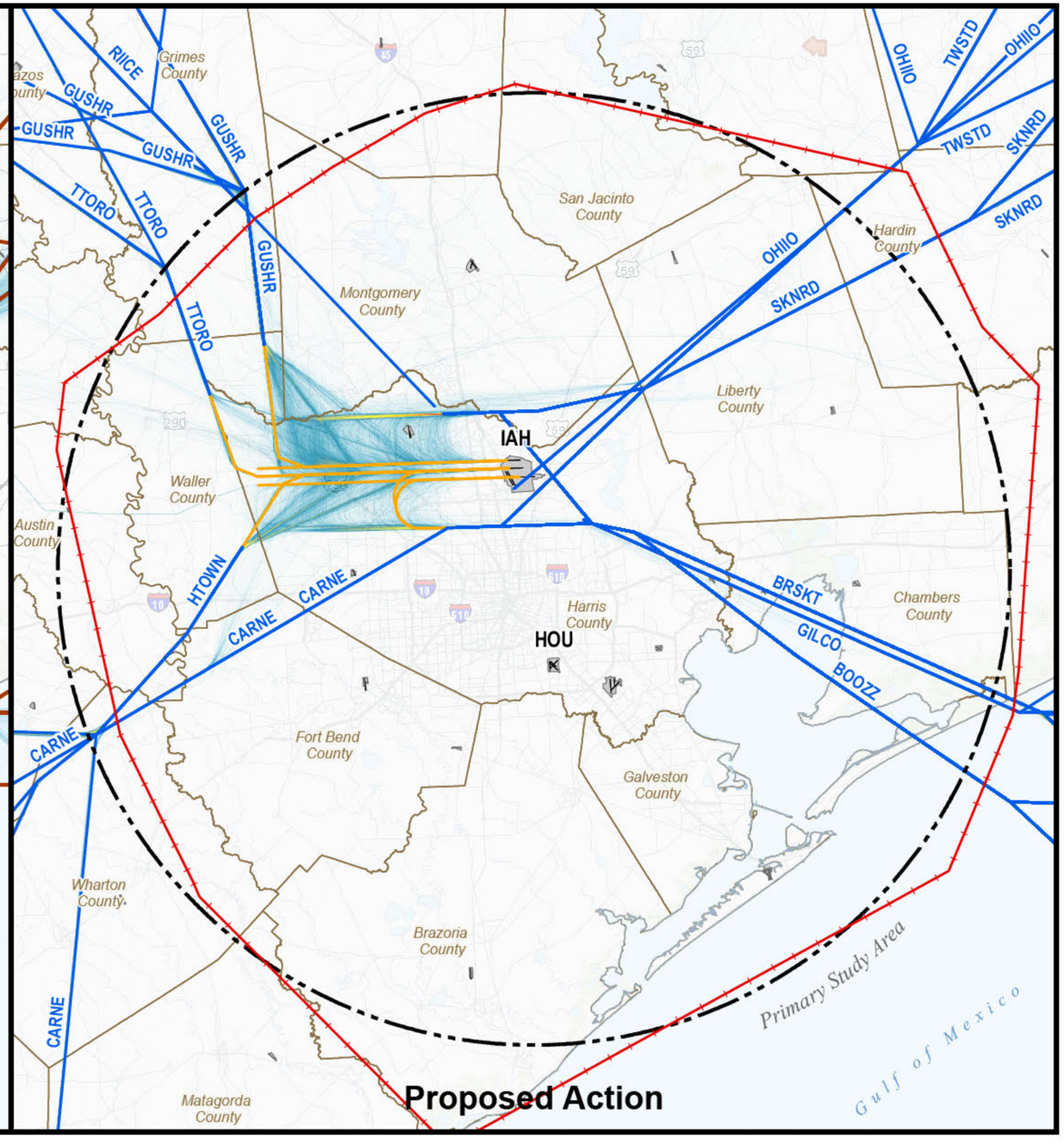

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Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated);

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure
Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 10 20 Nautical Miles

IAH Arrivals during East Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 7
Sheet 2 of 2

Houston OAPM EA

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3.3.2.2 IAH RNAV ILS Transitions

Table 2 lists the proposed RNAV transitions to the respective ILS for IAH, also illustrated in Figure 6 and Figure 7. ATC would issue these transitions to aircraft based on direction of flow and the landing runway assigned, as shown in the table.

Table 2 IAH Proposed RNAV ILS Transitions

Flow	Runway	RNAV STAR	Corner Post	Aircraft Types[69]	Comments*
East	8L	GUSHR	NW	Jets/Turbo-Props	RNAV-equipped aircraft
East	8R	TTORO	NW	Jets/Turbo-Props	RNAV-equipped aircraft
East	8R	HTOWN	SW	Jets/Turbo-Props	RNAV-equipped aircraft
West	26L/27	GILLL/BOOZZ	SE	Jets/Turbo-Props	RNAV-equipped aircraft
West	26L	DOOBI	NE	Jets/Turbo-Props	RNAV-equipped aircraft
West	26L/26R/27	WHACK	NE	Jets/Turbo-Props	RNAV-equipped aircraft
*Note: .All RNAV ILS transitions would be ATC-assigned only In other words, the use of an RNAV ILS Transition is solely at the discretion of ATC. Source: Houston OAPM D&I Team (see Appendix F)					

3.3.2.3 IAH Required Navigation Performance (RNP) Authorization Required (AR) Approaches

Table 3 lists the proposed RNP AR approaches to the three parallel runways – 8L/26R, 8R/26L, and 9/27. Only properly equipped jets and turbo-props with authorized aircrews would fly these approaches. For each runway, the RNP AR final approach course[70] would coincide with the ILS final approach course. The table identifies the specific flow and runway, the proposed RNAV STAR feeding the procedure, and the arrival direction. Figure 6 and Figure 7 show the RNP AR approaches as they connect to the appropriate RNAV STARs.

Table 3 IAH RNP AR Approaches

Flow	Runway	RNAV STAR	Corner Post	Arrival Direction
East	8L	GUSHR	NW	Short-side[1]
East	8R	TTORO	NW	Short-side
		HTOWN	SW	Short-side
		BRSKT, BOOZZ	SE	Long-side[2]
East	9	BRSKT, BOOZZ	SE	Long-side
		TWSTD, SKNRD	NE	Long-side
West	26L	DRLLR, MSCOT	NW	Long-side
		DOOBI, WHACK	NE	Short-side
		GILLL, BOOZZ	SE	Short-side

[69] These procedures would apply to various classifications of aircraft, include jet, high-performance turbo-prop (capable of greater than 280 knots), and other propeller aircraft.
[70] The final approach course is the segment of the procedure that begins when the procedure track aligns with the runway (i.e., the extended runway centerline), continuing to the runway.

Flow	Runway	RNAV STAR	Corner Post	Arrival Direction
West	26R	DRLLR, MSCOT	NW	Long-side
		WHACK	NE	Short-side
		TEJAS	SW	Long-side
West	27	DRLLR, MSCOT	NW	Long-side
		WHACK	NE	Short-side
		GILLL, BOOZZ	SE	Short-side
		TEJAS	SW	Long-side

Notes:

1. "Short-side" refers to a circumstance when a STAR ties into the final approach course of a SIAP, continuing directly to the landing runway without requiring a course reversal (e.g., aircraft arriving on a STAR from the northwest or southwest side of the Metroplex, with west to east landing operations at IAH on Runways 8L/R or 9).
2. "Long-side" refers to a circumstance when a STAR ties into the final approach course of a SIAP after a course reversal to a landing runway on the opposite side of the airfield (e.g., aircraft arriving on a STAR from the northwest or southwest, with east to west landing operations at IAH on Runways 26L/R or 27).
3. All proposed RNP AR approaches would be ATC-assigned only. In other words, the use of an RNAV ILS Transition is solely at the discretion of ATC.

Source: Houston OAPM D&I Team (see Appendix F)

3.3.2.4 IAH Departures

Table 4 lists the Proposed Action IAH departure procedure(s) that would replace or supplement the respective No Action procedures.

Table 4 IAH Departure Procedures Modifications

Flow	Existing Procedure	New Procedure	Boundary Side	Comments
West	LAKE CHARLES /GUSTI/SABINE PASS	MMUGS	E	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be issued a heading to fly; LAKE CHARLES retained as a conventional, non-RNAV route
East	LAKE CHARLES /GUSTI/SABINE PASS	GUMBY	E	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be issued a heading to fly; LAKE CHARLES retained as a conventional, non-RNAV route
All	SCHOLES	FLYZA	S	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be issued a heading to fly
All	TRUAX/PALACIOS	RITAA	S	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be radar vectored to a fix on the RNAV SID; based on proposed procedural changes with Mexico. TRUAX and PALACIOS retained as conventional, non-RNAV routes
All	BOWFN		S	RNAV-equipped aircraft; retained for use during weather events
West	INDUSTRY/JUNCTION /WAILN	BNDTO	W	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be radar vectored to a fix on the RNAV SID; INDUSTRY and JUNCTION retained as conventional, non-RNAV routes
East	INDUSTRY/JUNCTION /WAILN	PITZZ	W	Includes RNAV off-the-ground for Runways 15L/15R; departures for all other runways would be radar vectored to a fix on the RNAV SID. INDUSTRY and JUNCTION retained as conventional, non-RNAV routes

Flow	Existing Procedure	New Procedure	Boundary Side	Comments
All	LEONA	STYCK	N	RNAV-equipped aircraft; departures from all runways would be radar vectored a fix on the RNAV SID. LEONA retained as a conventional, non-RNAV route
All	CRIED	DREMR	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a fix on the RNAV SID; prior to North Texas OAPM[1] implementation, aircraft would fly DREMR to DAL; after expected North Texas implementation, they would fly DREMR to DFW, with CRIED retained as a conventional, non-RNAV route
All	GIFFA	WYLSN	N	RNAV-equipped aircraft; departures from all runways to radar vectored to a fix on the RNAV SID; prior to North Texas OAPM implementation, aircraft would fly GIFFA transition to DFW; after expected North Texas implementation, they would fly MAJKK transition to DAL, with GIFFA retained as a conventional, non-RNAV route
All	LUFKIN	INDIE	N	RNAV-equipped aircraft; departures from all runways to radar vectored to a fix on the RNAV SID; LUFKIN retained as a conventional, non-RNAV route
All	ALEXANDRIA	STRYA	N	RNAV-equipped aircraft; departures from all runways to radar vectored to a fix on the RNAV SID
All	EL DORADO	LURIC	N	RNAV-equipped aircraft; departures from all runways to radar vectored to a fix on the RNAV SID; EL DORADO retained as a conventional, non-RNAV route

Source: Houston OAPM D&I Team (see Appendix F)
Note:
1. Similar to the Houston OAPM, the North Texas OAPM project would optimize air traffic operations in the Dallas – Fort Worth area.

Figure 8 presents IAH departures during west flow and Figure 9 presents IAH departures during west flow. Both figures provide a comparison of the No Action and the Proposed Action IAH departure procedures within the SSA for the respective operations.

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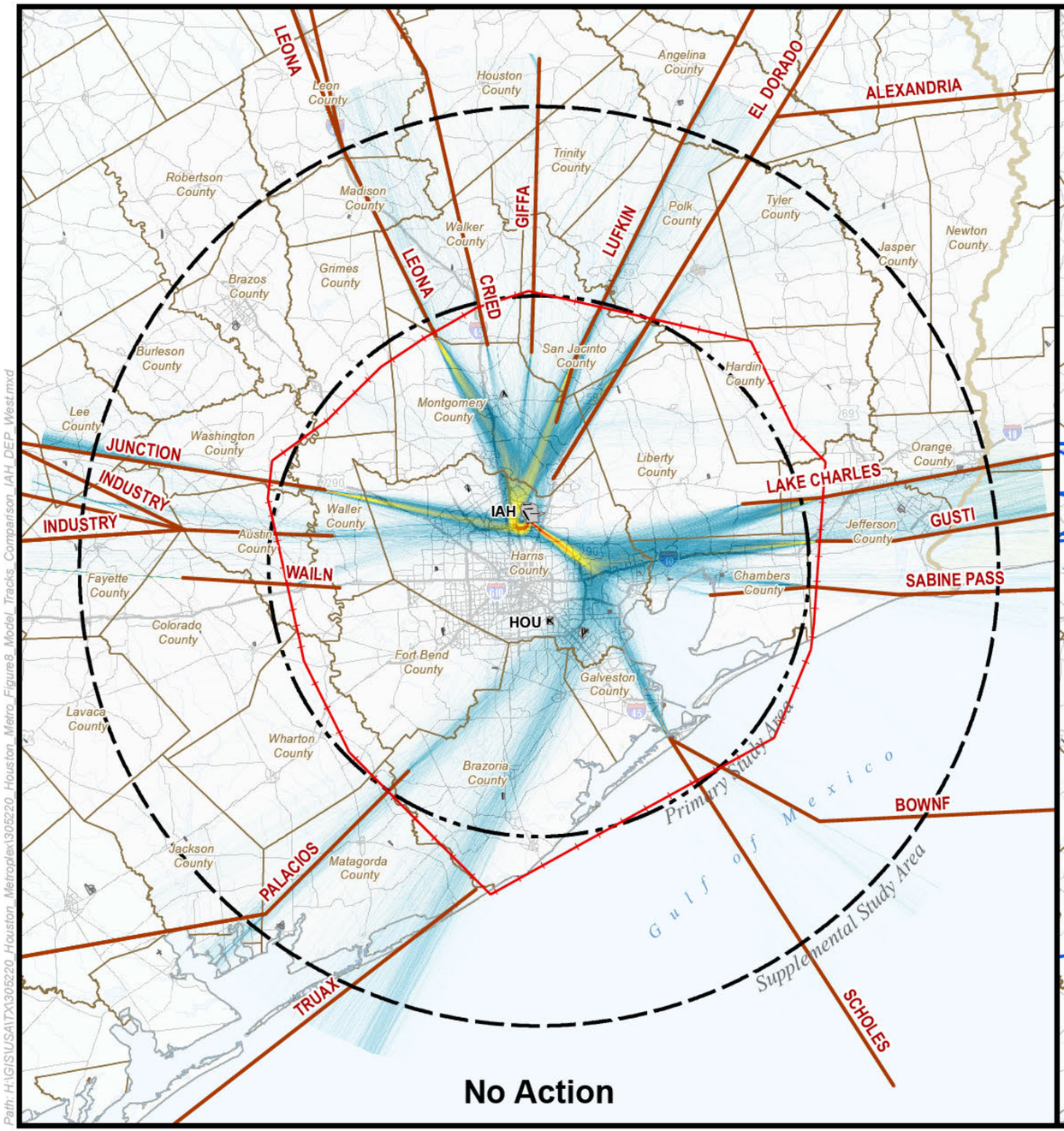

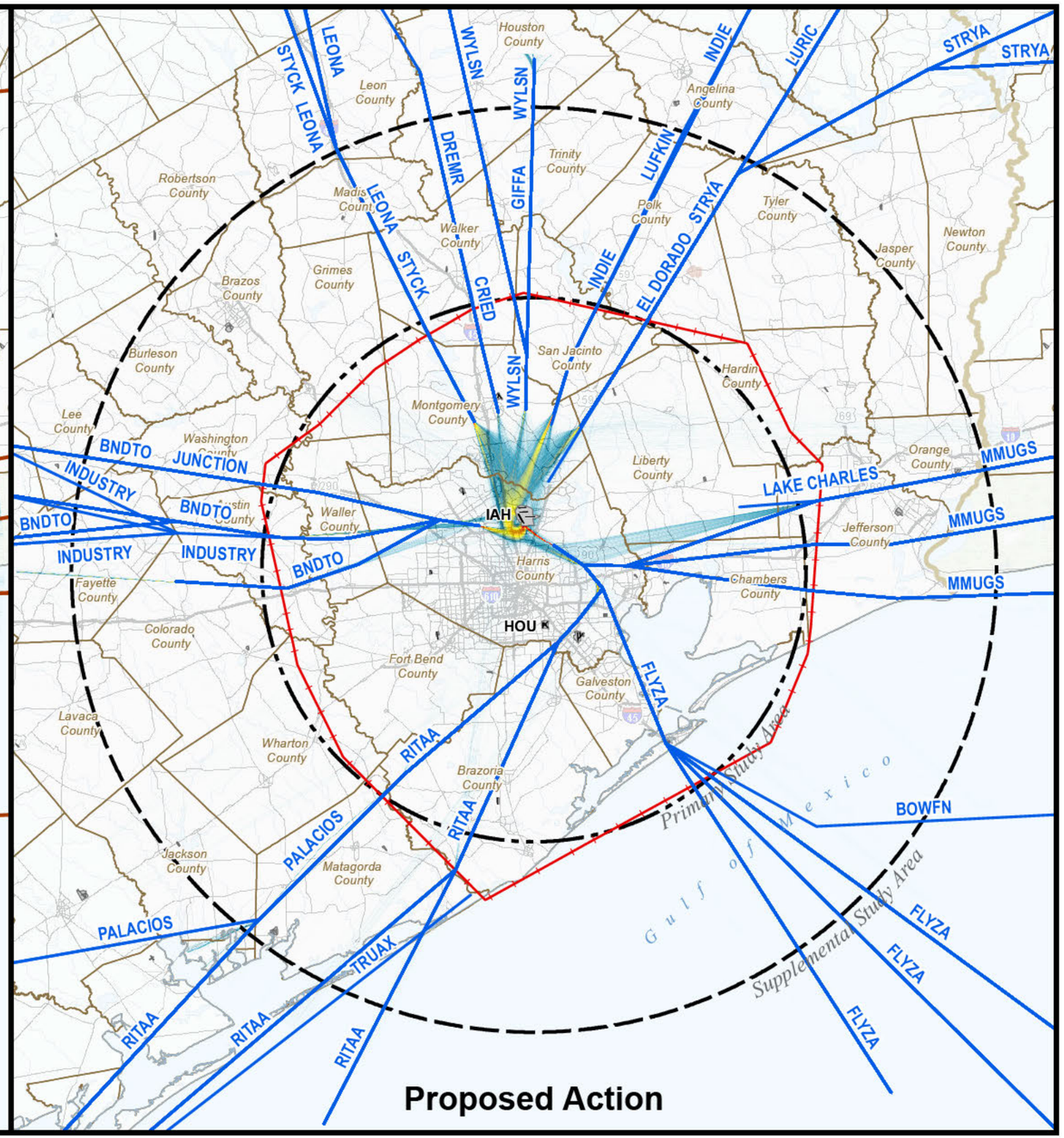

Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated)

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area
Supplemental Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 20 40 Nautical Miles

IAH Departures during West (Comparison of Proposed Action and No Action Alternatives)

Figure 8
Sheet 1 of 2

Houston OAPM EA

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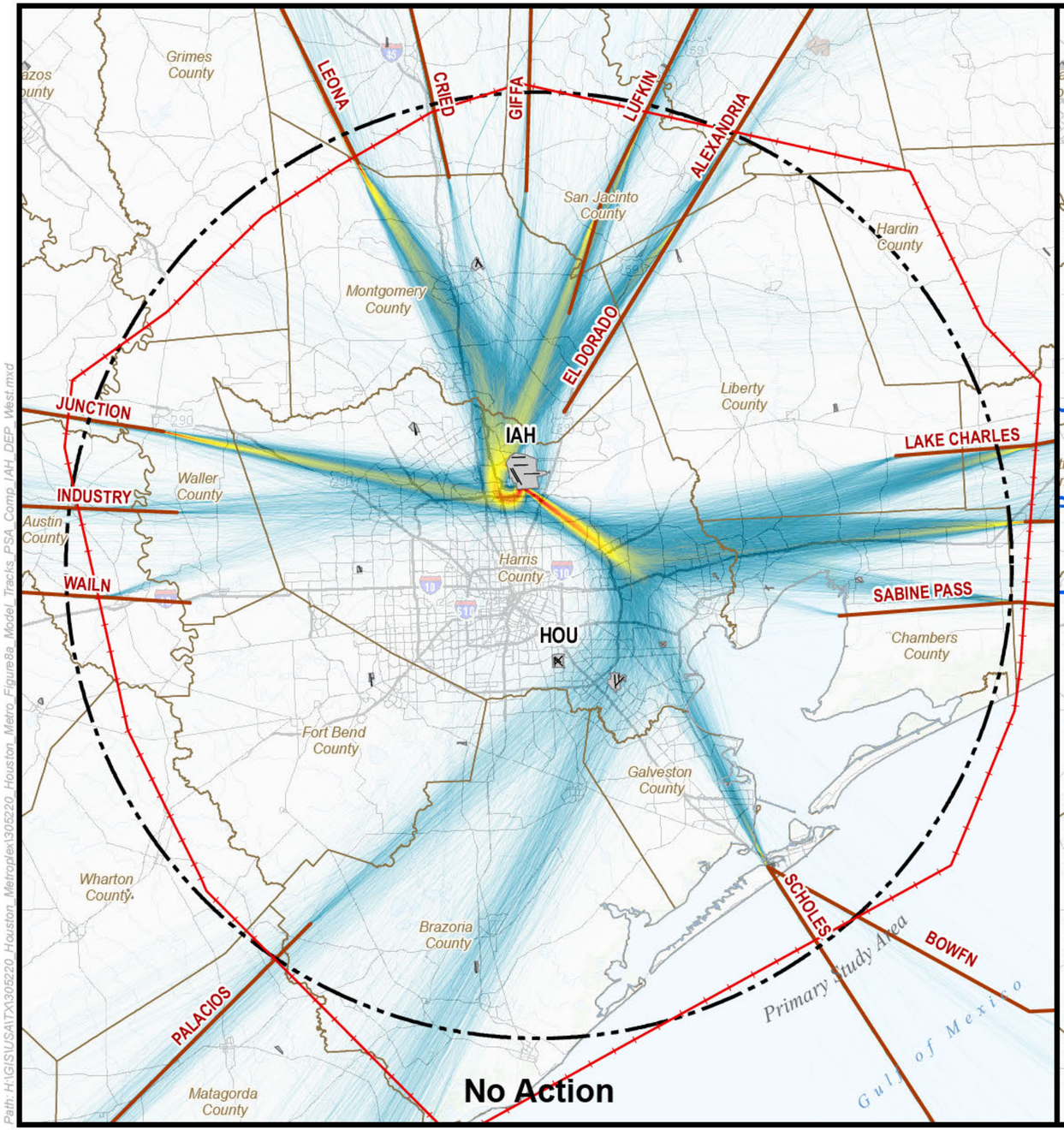

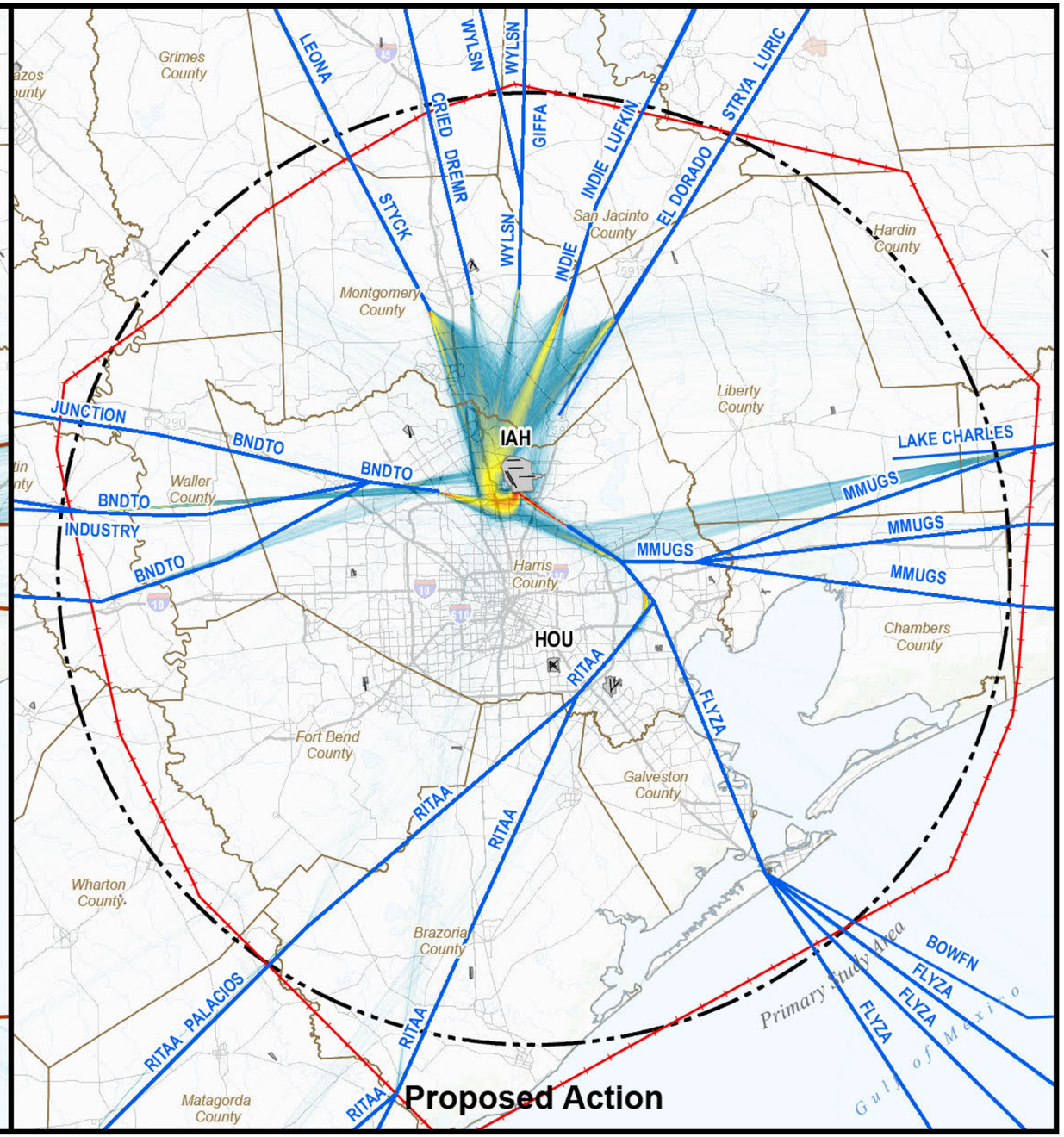

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Primary Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 10 20 Nautical Miles

IAH Departures during West (Comparison of Proposed Action and No Action Alternatives)

Figure 8
Sheet 2 of 2

Houston OAPM EA

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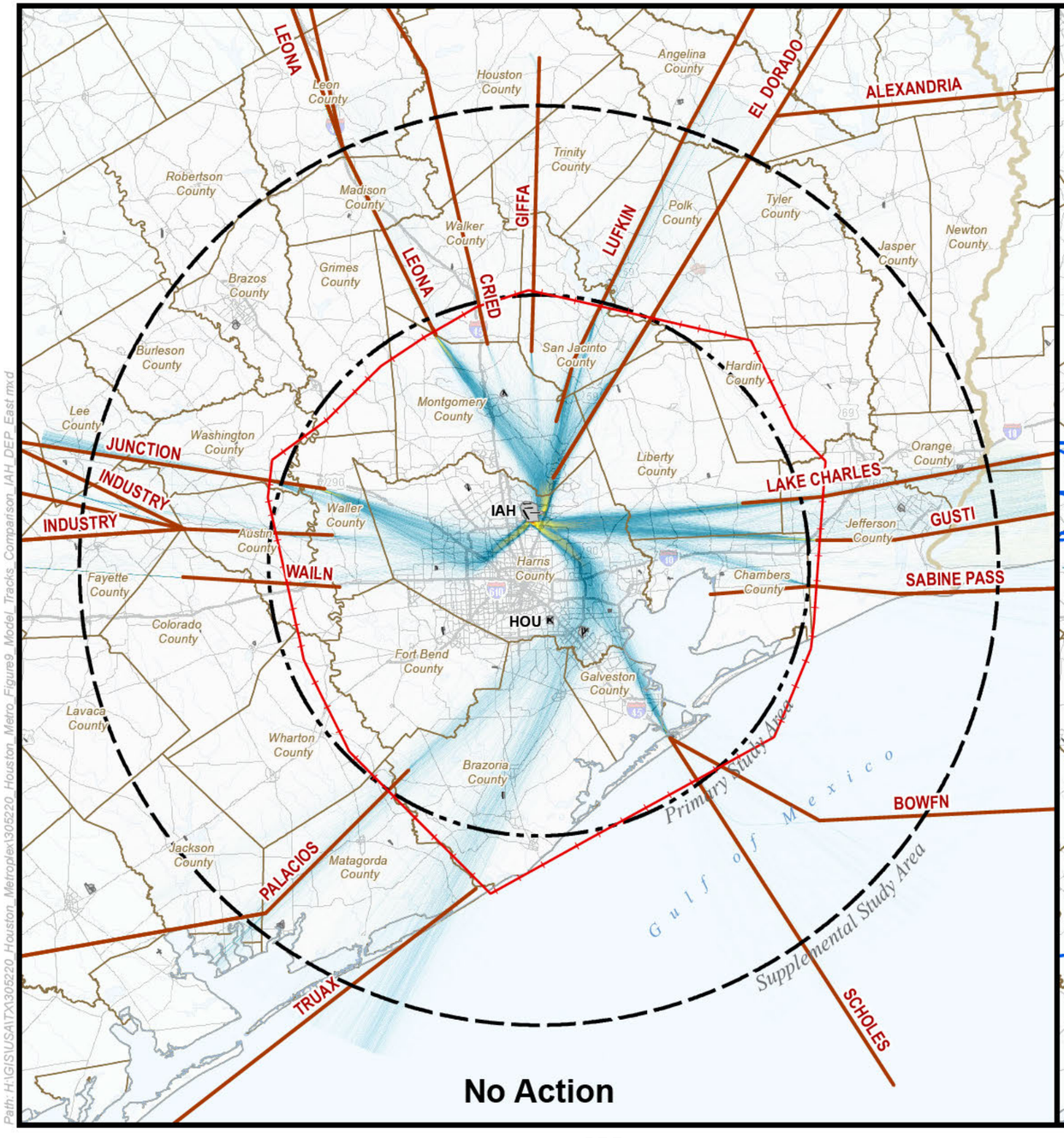
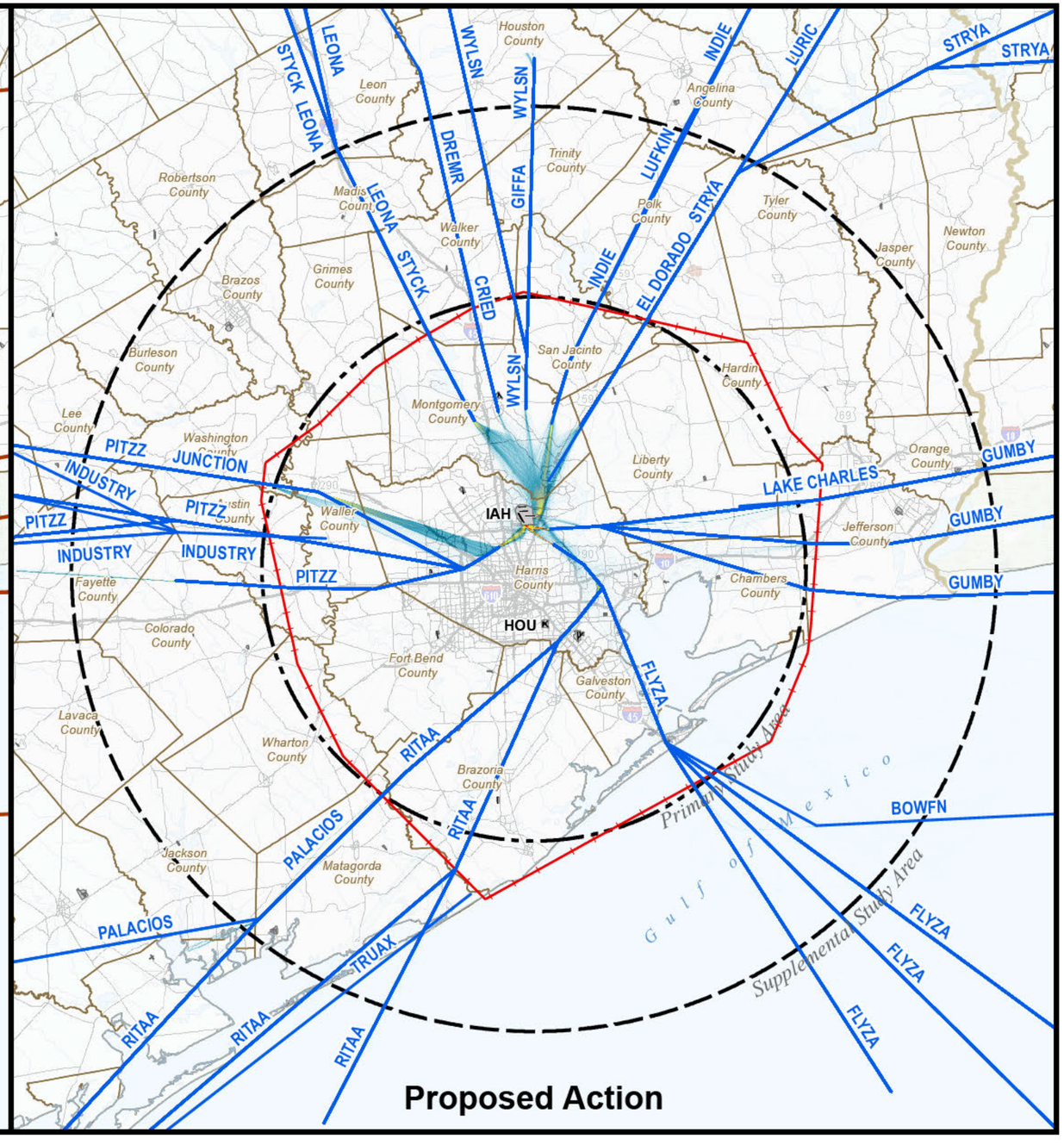


No Action



Proposed Action

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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation

- Proposed Procedure
- No Action Procedure

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

IAH Departures during East Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 9
Sheet 1 of 2

Houston OAPM EA

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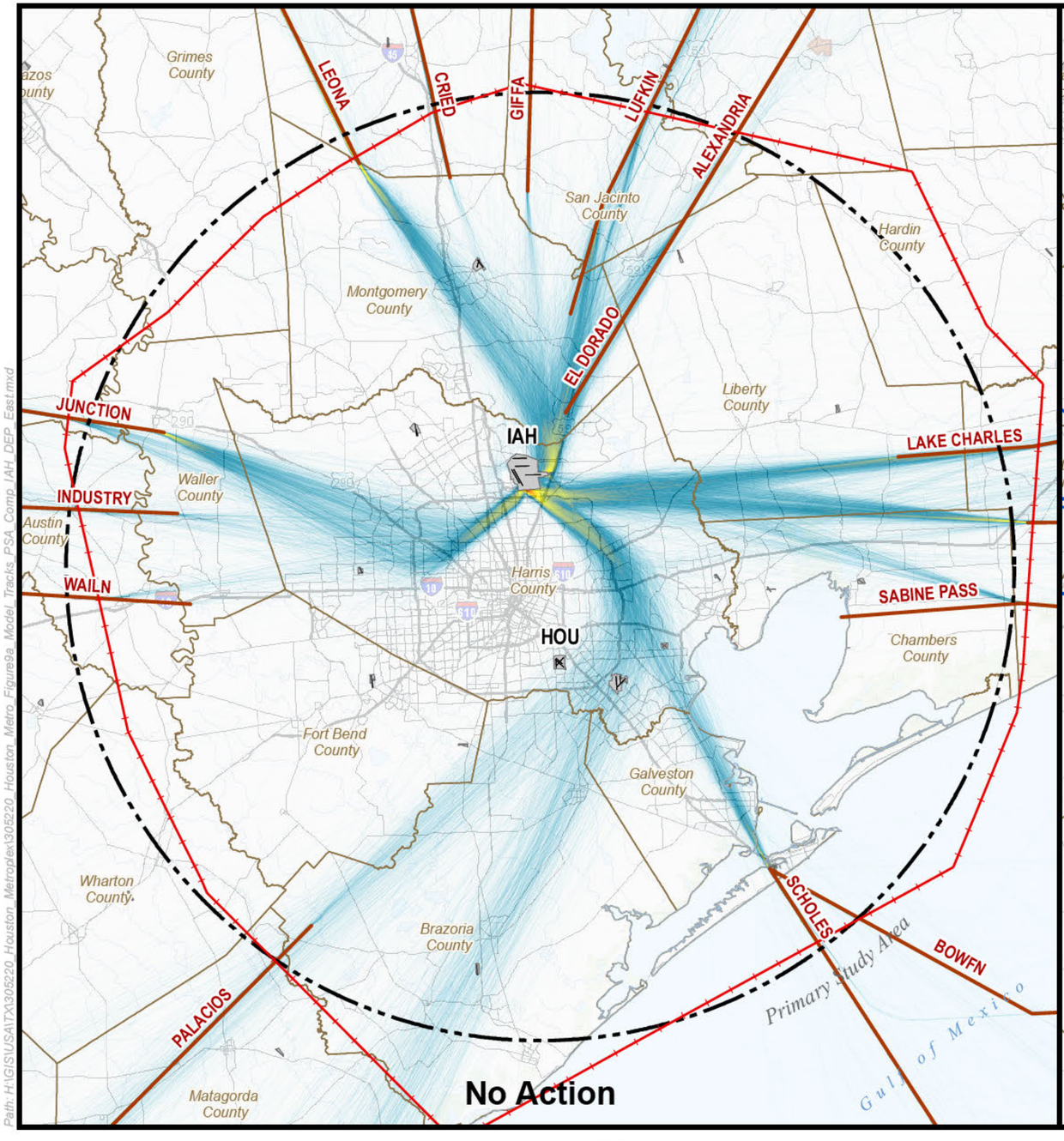

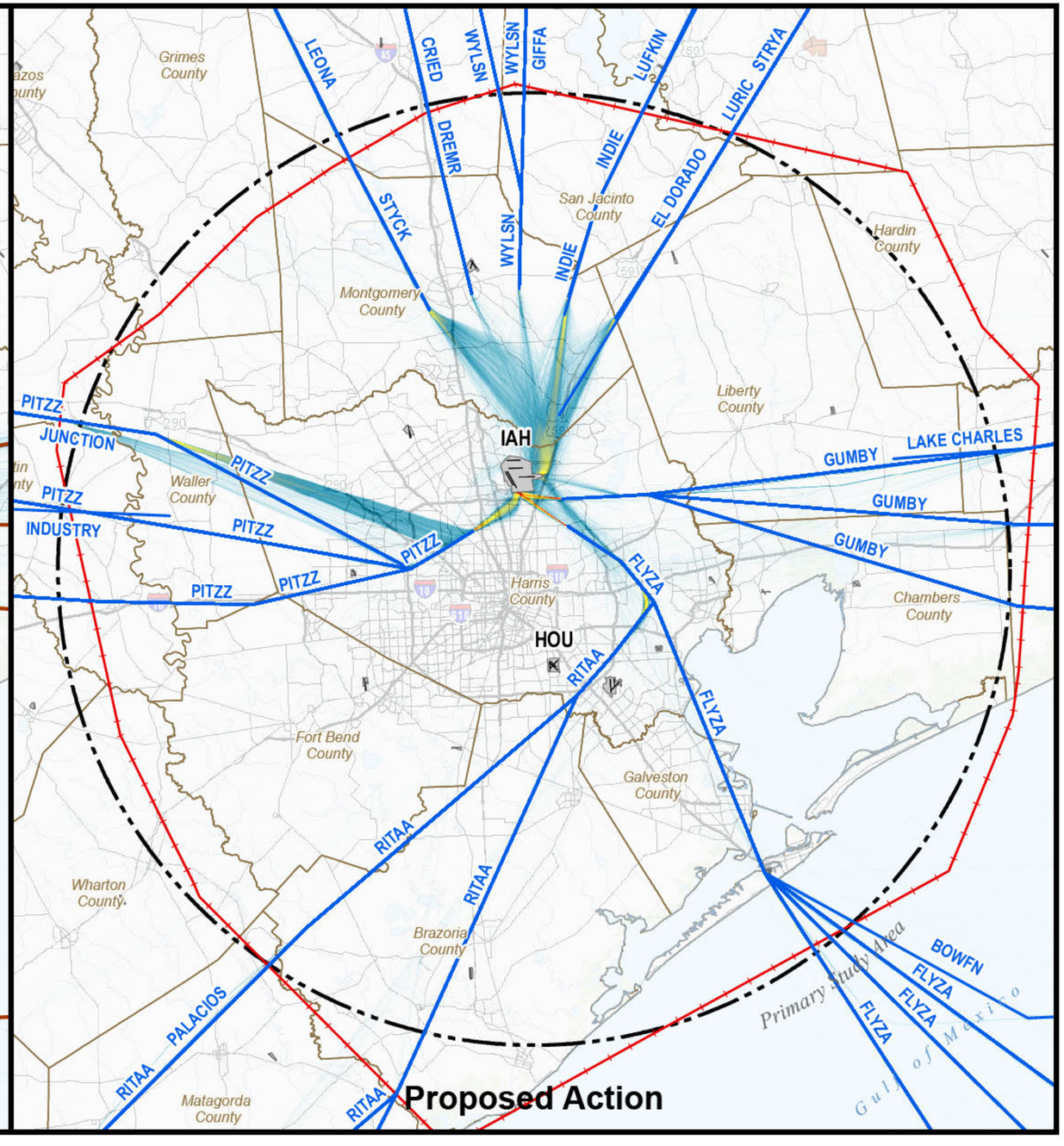

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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 10 20 Nautical Miles

IAH Departures during East Flow (Comparison of Proposed Action and No Action Alternatives)

Figure 9
Sheet 2 of 2

Houston OAPM EA

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3.3.2.5 HOU Arrivals

Table 5 lists the Proposed Action HOU arrival procedure(s) that would replace or supplement the respective No Action procedures.

Table 5 HOU Arrival Procedures Modifications

Flow	Existing Procedure	New Procedure	Corner-Post	Aircraft Types	Comments
All	COLUMBIA	TKNIQ	SE	Turbo-Props	RNAV-equipped aircraft; primary route for turboprop aircraft landing at HOU; used by jets landing at HOU when Severe Weather Avoidance Procedures initiated for BOOZZ to IAH
Runway 4 or 12L/R	COLUMBIA	BAYYY	SE	Jets	RNAV-equipped aircraft; BAYYY closely follows path of BOOZZ; jets redirected to TKNIQ when BOOZZ used by IAH
Runway 22 or 30L/R	COLUMBIA	PUCKS	SE	Jets	RNAV-equipped aircraft; PUCKS closely follows path of BOOZZ; jets redirected to TQNIK when BOOZZ used by IAH
All	STROS	BELLR	SW	Jets/High-Performance Turbo-Props	RNAV-equipped aircraft
All	ROYOH	TCHDN	SW	Jets/Turbo-Props/Pistons	Revised conventional STAR to align with BELLR RNAV STAR; for non-RNAV-equipped aircraft
All	COACH	KIDDZ	NW	Jets	RNAV-equipped aircraft
All	BLUBL		NW	Turbo-Props/Pistons	Retained/Modified conventional STAR for non-RNAV-equipped aircraft
All		TAKKL	NW	Jets	Conventional STAR for non-RNAV-equipped aircraft
All	ROKIT	WAPPL	NE	Jets/High-Performance Turbo-Props	RNAV-equipped aircraft
All		CESAN	NE	Turbo-Props/Pistons	RNAV-equipped aircraft
All		HUDZY	NE	Jets/Turbo-Props	Conventional STAR for non-RNAV-equipped aircraft
Source: Houston OAPM D&I Team (see Appendix F)					

Figure 10 compares the No Action and the Proposed Action HOU arrival procedures within the SSA.

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No Action

Proposed Action

Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated)

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation

- Proposed Procedure
- No Action Procedure
- Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density

Low Medium High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

HOU Arrivals (Comparison of Proposed Action and No Action Alternatives)

Figure 10
Sheet 1 of 2

Houston OAPM EA

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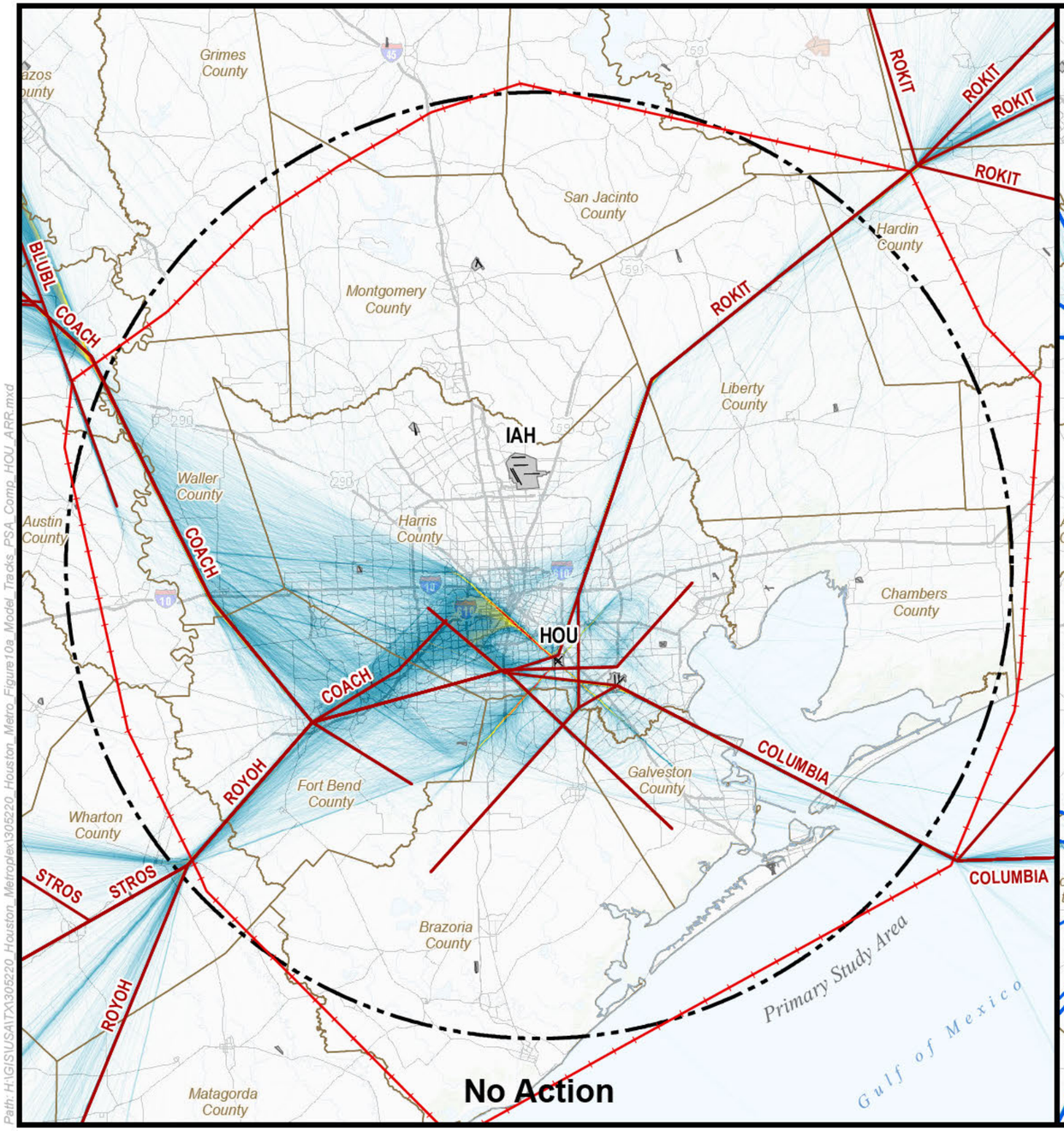

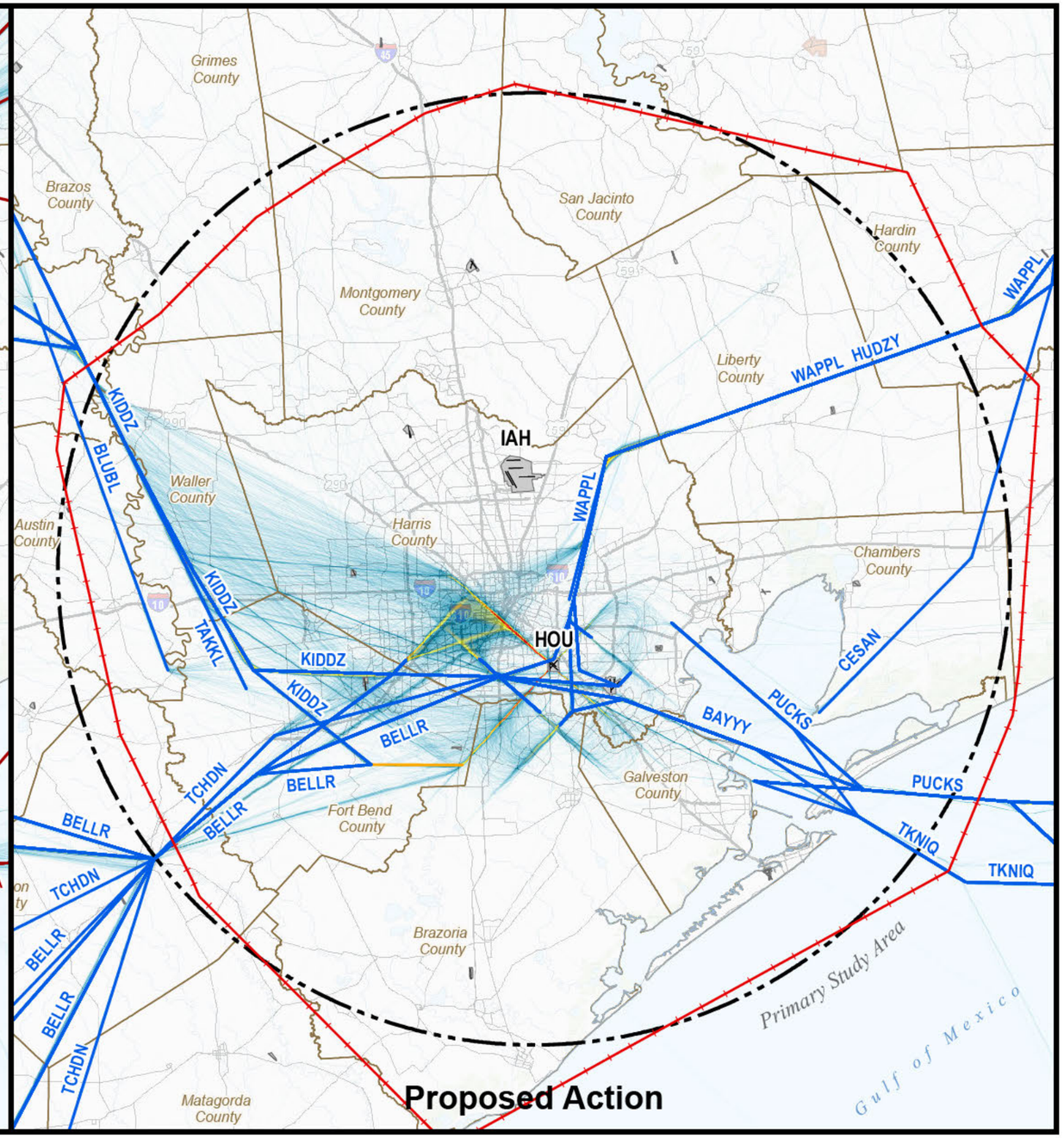

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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area

Core I90 TRACON Boundary

County/Parish Boundary

Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure

No Action Procedure

Proposed RNP AR Approaches and RNAV Transitions (RNP AR and ILS)

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North

0 10 20 Nautical Miles

HOU Arrivals (Comparison of Proposed Action and No Action Alternatives)

Figure 10
Sheet 2 of 2

Houston OAPM EA

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3.3.2.6 HOU RNAV ILS Transition

Table 6 lists and Figure 10 illustrates the proposed RNAV transition to the ILS for HOU. This transition is only applicable to Runway 4, as shown in the table.

Table 6 HOU Proposed RNAV ILS Transitions

Runway	RNAV STAR	Corner-Post	Aircraft Types[71]	Comments*
4	KIDDZ	NW	Jets/Turbo-Props	RNAV-equipped aircraft
	BELLR	SW		
*Note: The use of an RNAV ILS Transition is solely at the discretion of ATC. In other words, the use of an RNAV ILS Transition is solely at the discretion of ATC. Source: Houston OAPM D&I Team (see Appendix F)				

3.3.2.7 HOU Departures

Table 7 lists the Proposed Action HOU departure procedures that would replace or supplement the respective No Action procedure(s).

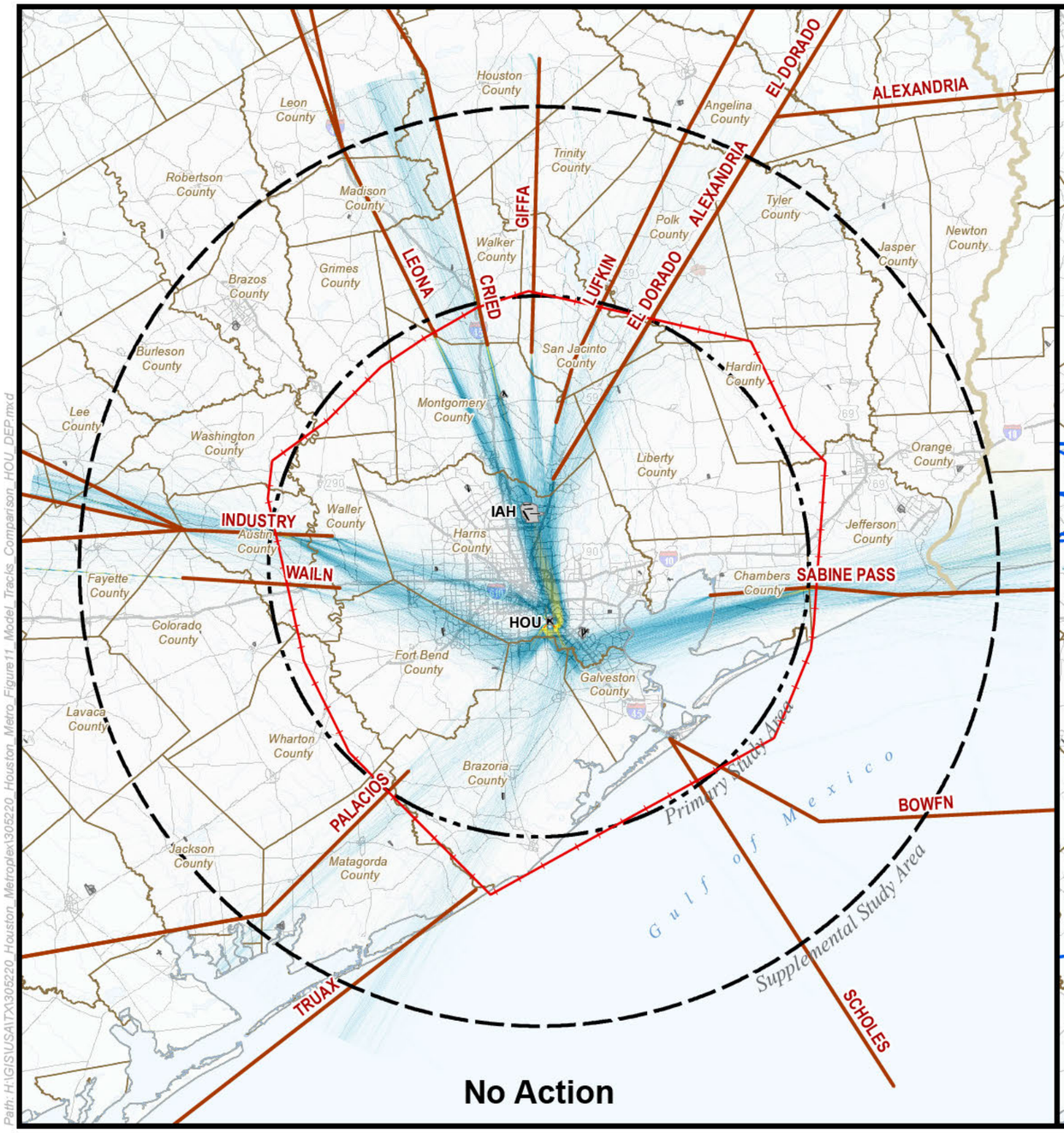
Table 7 HOU Departure Procedures Modifications

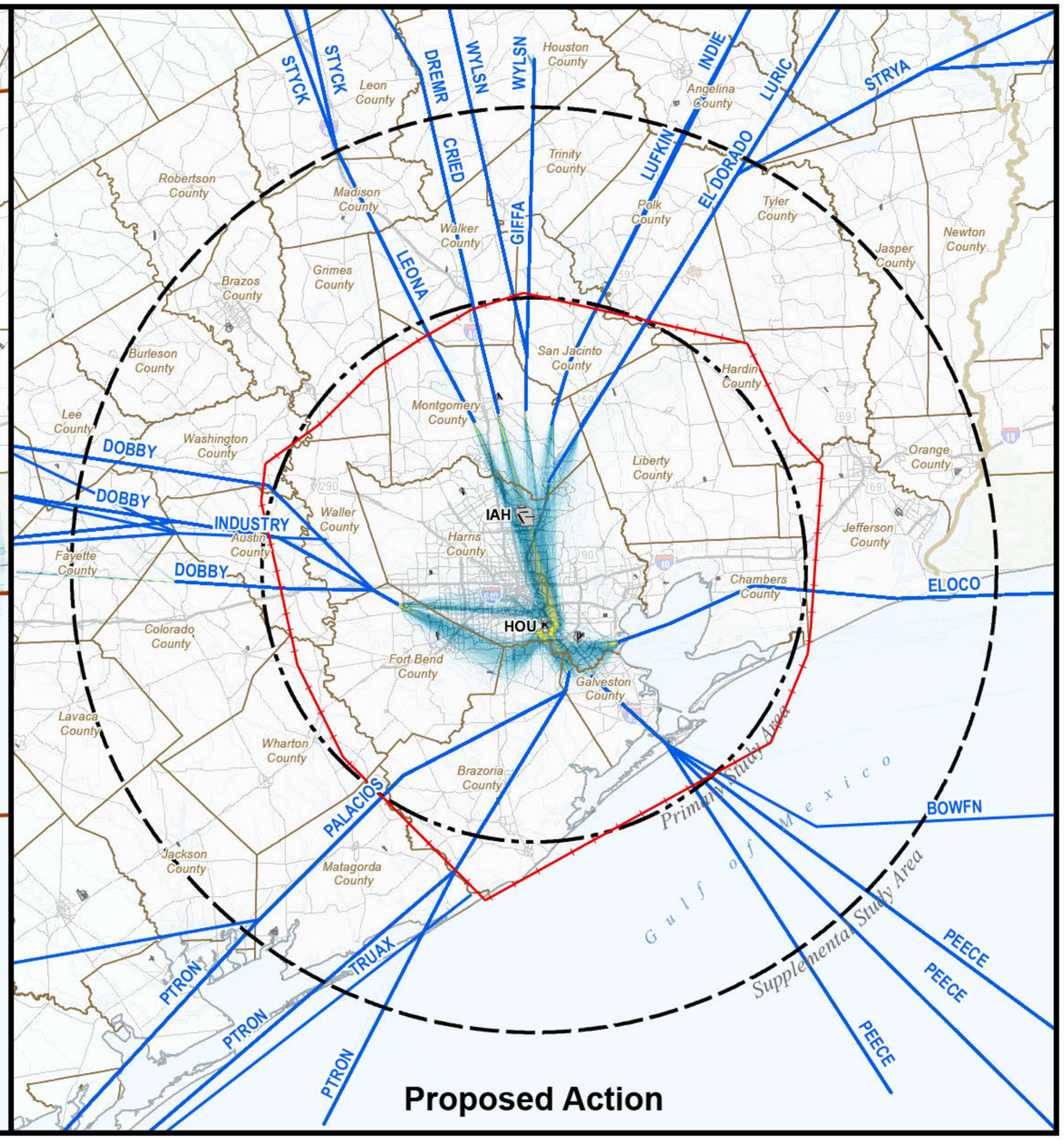
Flow	Existing Procedure	New Procedure	Boundary Side	Comments
All	SABINE PASS	ELOCO	E	RNAV aircraft issued radar vectors to ELOCO
All	SCHOLES	PEECE	S	RNAV aircraft issued radar vectors to PEECE; aligned with proposed Gulf of Mexico Required Navigation Performance routes
All	TRUAX/PALACIOS	PTRON	S	RNAV aircraft issued radar vectors; en route transitions based on proposed procedural changes with Mexico; TRUAX and PALACIOS retained as conventional, non-RNAV routes
All	BOWFN		S	RNAV-equipped aircraft; retained for use during weather events
All	INDUSTRY /WAILN	DOBBY	W	RNAV aircraft issued radar vectors; INDUSTRY retained as conventional, non-RNAV route
All	LEONA	STYCK	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a point; LEONA retained as conventional, non-RNAV route
All	CRIED	DREMR	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a point; prior to North Texas OAPM implementation, aircraft would fly DREMR to DAL; after expected North Texas implementation, they would fly DREMR to DFW, with CRIED retained as conventional, non-RNAV route
All	GIFFA	WYLSN	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a point; prior to North Texas OAPM implementation, aircraft would fly GIFFA transition to DFW; after expected North Texas implementation would fly MAJKK transition to DAL; GIFFA retained as conventional, non-RNAV route
All	LUFKIN	INDIE	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a point; LUFKIN retained as conventional, non-RNAV route
All	ALEXANDRIA	STRYA	N	RNAV-equipped aircraft; departures from all runways would be radar

[71] These procedures would apply to various classifications of aircraft, include jet, high-performance turbo-prop (capable of greater than 280 knots), and other propeller aircraft.

Flow	Existing Procedure	New Procedure	Boundary Side	Comments
				vectored to a point
All	EL DORADO	LURIC	N	RNAV-equipped aircraft; departures from all runways would be radar vectored to a point; EL DORADO retained as conventional, non-RNAV route
Source: Houston OAPM D&I Team (see Appendix F)				

Figure 11 compares the No Action and the Proposed Action HOU departure procedures within the SSA.





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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

Primary Study Area

Supplemental Study Area

Core I90 TRACON Boundary

County/Parish Boundary

Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure

No Action Procedure

Flight Track Density

Low Medium High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

HOU Departures (Comparison of Proposed Action and No Action Alternatives)

Figure 11
Sheet 1 of 2

Houston OAPM EA

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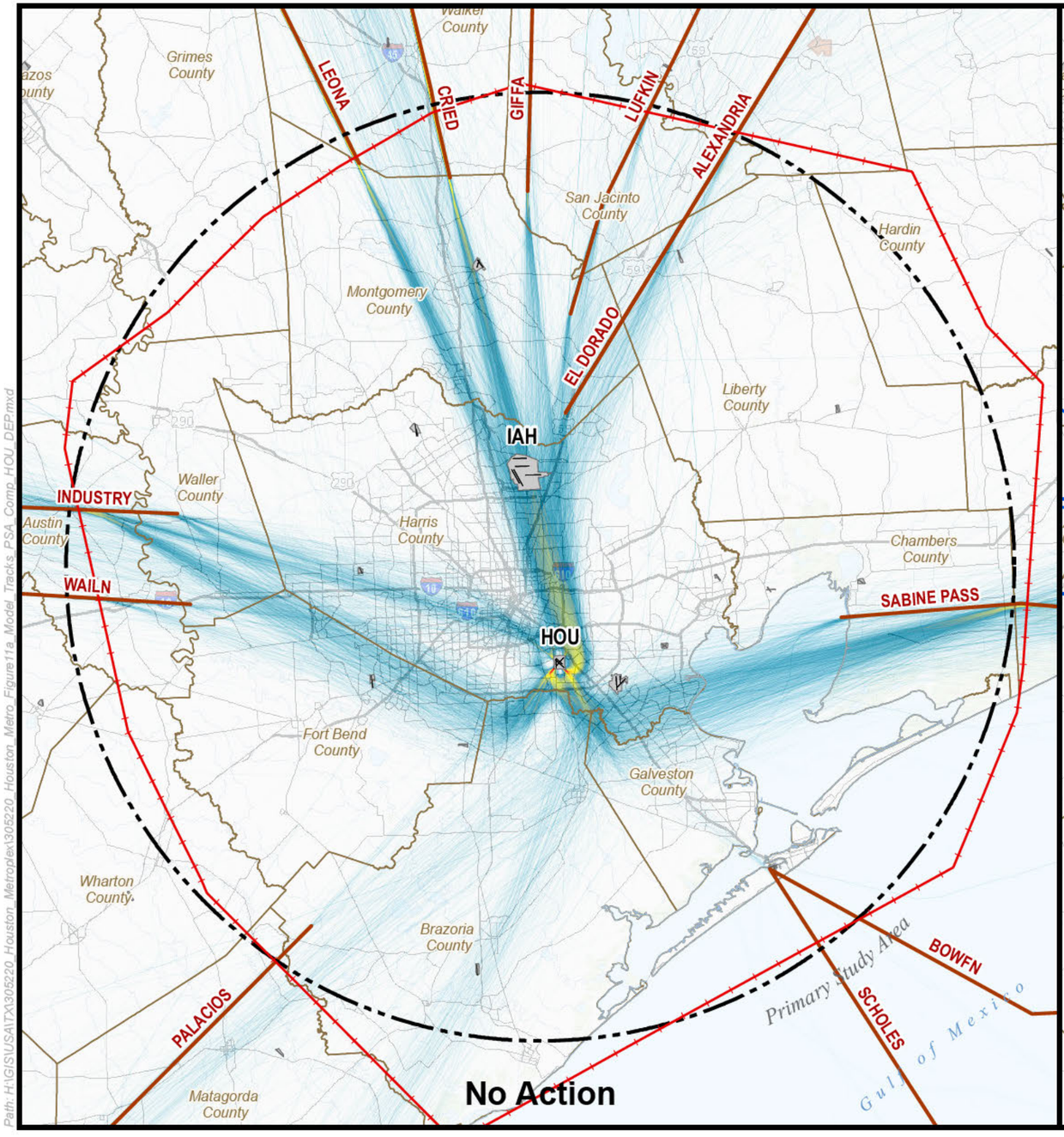

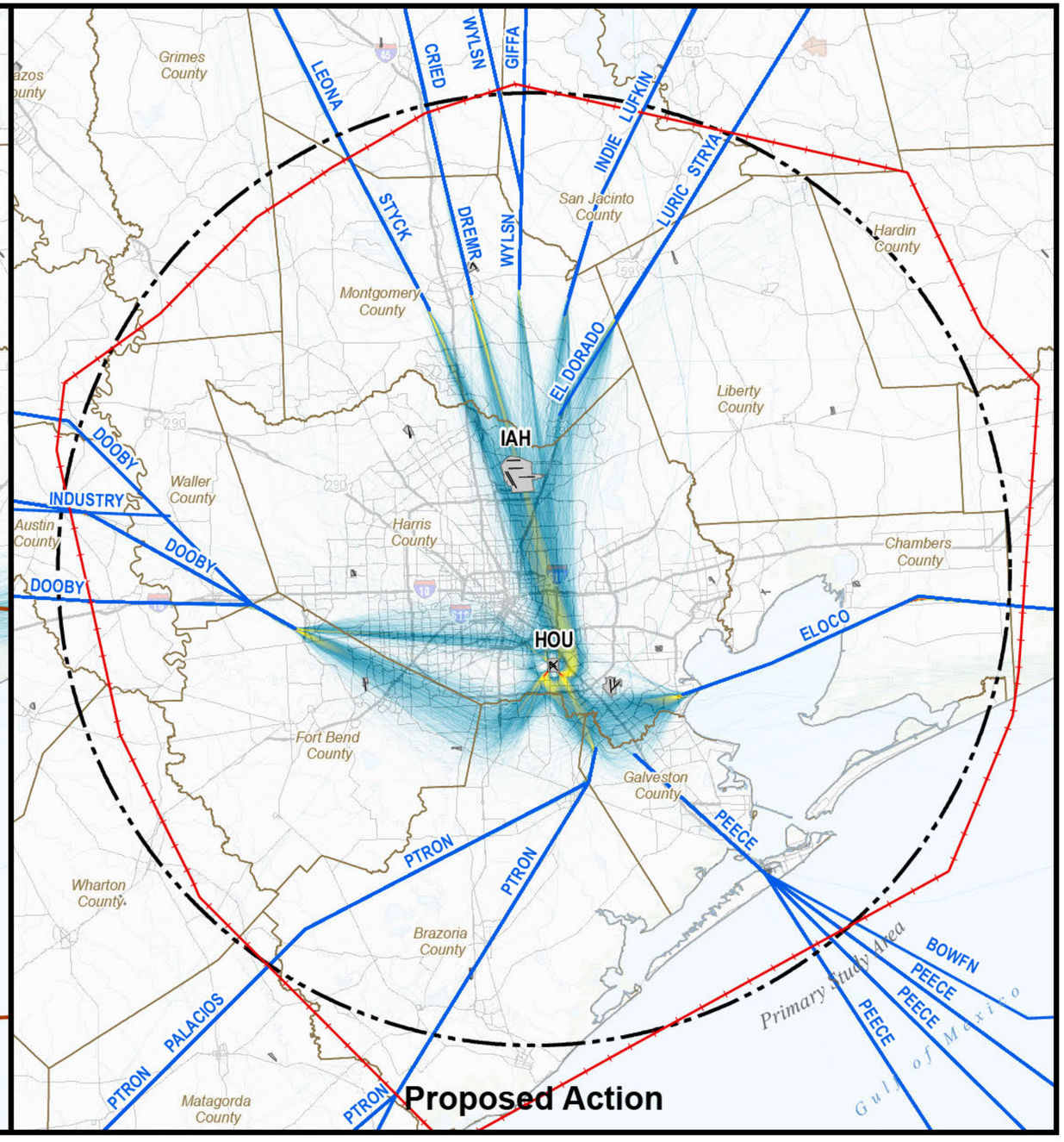

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Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated)

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area
Supplemental Study Area
Core I90 TRACON Boundary
County/Parish Boundary
Alabama-Coushatta Tribe of Texas Reservation

Proposed Procedure
No Action Procedure

Flight Track Density
Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

North
0 10 20 Nautical Miles

HOU Departures (Comparison of Proposed Action and No Action Alternatives)

Figure 11
Sheet 2 of 2

Houston OAPM EA

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3.3.2.8 Satellite Airport Operations

Chapter 1 identified 15 satellite airports within the PSA where the Proposed Action would change SIDs and/or STARs. The D&I Team grouped these airports geographically as either North or South in reference to Jet Route J2, which approximates Interstate Highway 10 (I-10) in the PSA. Table 8 lists the satellite airports by this grouping, followed by Table 9 and Table 10, which list the existing and proposed new arrivals and departures, respectively. Figure 12 and Figure 13 show representations of the satellite airport arrivals and departures, respectively.

Table 8 Satellite Geographical Location in Reference to I-10

Airport ID	South of I-10 Airport Name	Airport ID	North of I-10 Airport Name
AXH	Houston Southwest	CXO	Lone Star Executive
EFD	Ellington Field	DWH	David Wayne Hooks Memorial
GLS	Scholes International at Galveston	EYQ	Weiser Air Park
HPY	Baytown		
IWS	West Houston		
LBX	Texas Gulf Coast Regional		
LVJ	Pearland Regional		
SGR	Sugar Land Regional		
TME	Houston Executive		
T00	Chambers County		
T41	La Porte Municipal		
54T	RWJ Airpark		
Source: Houston OAPM D&I Team (see Appendix F)			

Table 9 Satellite Arrival Procedures Modifications

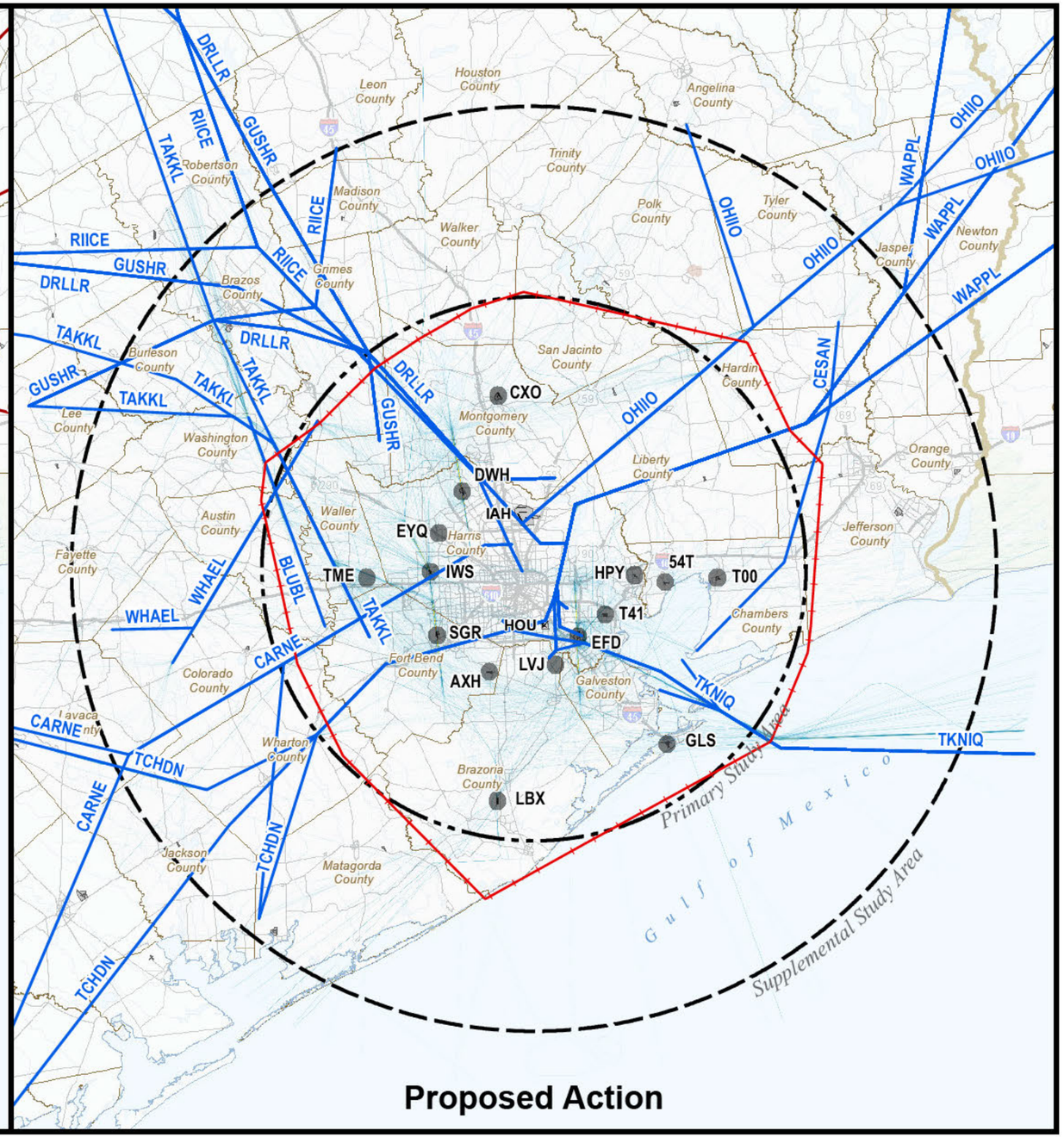
Flow	Existing Procedure	New Procedure	Satellite Airports	Aircraft Types	Comments
All	CARNE		CXO, DWH	Jets/Turbo-Props/Pistons	Retained/Modified for non-RNAV-equipped aircraft; IAH west flow only
All	RIICE		North	Jets/Turbo-Props/Pistons	Retained/Modified conventional STAR for non-RNAV equipped aircraft
All		WHAEL	CXO, DWH	Jets/Turbo-Props/Pistons	Non-RNAV-equipped aircraft
All		OHIIO	North	Jets/Turbo-Props/Pistons	Non-RNAV-equipped aircraft
East		GUSHR	North	Jets/Turbo-Props/Pistons	RNAV-equipped aircraft
West		DRLLR	North	Jets/Turbo-Props/Pistons	RNAV-equipped aircraft
All	BLUBL		AXH, HPY, IWS, LVJ, SGR, TME, T00, T41, 54T	Turbo-Props/Pistons	Retained/Modified for RNAV and non-RNAV-equipped aircraft

Flow	Existing Procedure	New Procedure	Satellite Airports	Aircraft Types	Comments
All	ROYOH	TCHDN	South	Jets/Turbo-Props/Pistons	Revised conventional STAR to align with BELLR RNAV STAR; for non-RNAV-equipped aircraft
All	ROKIT	WAPPL	South	Jets/High Performance Turbo-Props	RNAV-equipped aircraft
All		CESAN	South	Turbo-Props/Pistons	RNAV-equipped aircraft
All		TAKKL	EFD, GLS, and LBX	Jets/Turbo-Props/Pistons	Non-RNAV-equipped aircraft
All		TKNIQ	EFD,GLS, HPY, IWS, LVJ, LBX, SGR, TME, T00, T41, 54T	Jets/Turbo-Props/Pistons	RNAV-equipped aircraft
Source: Houston OAPM D&I Team (see Appendix F)					

Table 10 Satellite Airport Departure Procedures Modifications

Flow	Existing Procedure	New Procedure	North or South satellite	Comments
All	CRIED	DREMR	Both	RNAV-equipped aircraft; CRIED retained for Non-RNAV-equipped aircraft
All	EL DORADO	LURIC	Both	RNAV-equipped aircraft; EL DORADO retained for Non-RNAV-equipped aircraft
All	GIFFA	WYLSN	Both	RNAV-equipped aircraft; GIFFA retained for Non-RNAV-equipped aircraft
All	LEONA	STYCK	Both	RNAV-equipped aircraft; LEONA retained for Non-RNAV-equipped aircraft
All	LUFKIN	INDIE	Both	RNAV-equipped aircraft; LUFKIN retained for Non-RNAV-equipped aircraft
All	ALEXANDRIA	STRYA	Both	RNAV-equipped aircraft
All	INDUSTRY/JUNCTION/WAILN	BORRN	Both	RNAV-equipped aircraft; INDUSTRY and JUNCTION retained for Non-RNAV-equipped aircraft
All	TRUAX/PALACIOS	KARRR	Both	RNAV-equipped aircraft; TRUAX and PALACIOS retained for Non-RNAV-equipped aircraft
All	LAKE CHARLES/GUSTI/ SABINE PASS	MMALT	Both	RNAV-equipped aircraft; LAKE CHARLES retained for Non-RNAV-equipped aircraft
All	BOWFN		Both	RNAV-equipped aircraft; retained for use during weather events.
All		WATFO	Both	RNAV-equipped aircraft
Source: Houston OAPM D&I Team (see Appendix F)				

No Action



Proposed Action

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Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated)

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation

- Proposed Procedure
- No Action Procedure
- Satellite Airports

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

Satellite Airport Arrivals (Comparison of Proposed Action and No Action Alternatives)

Figure 12

Houston OAPM EA

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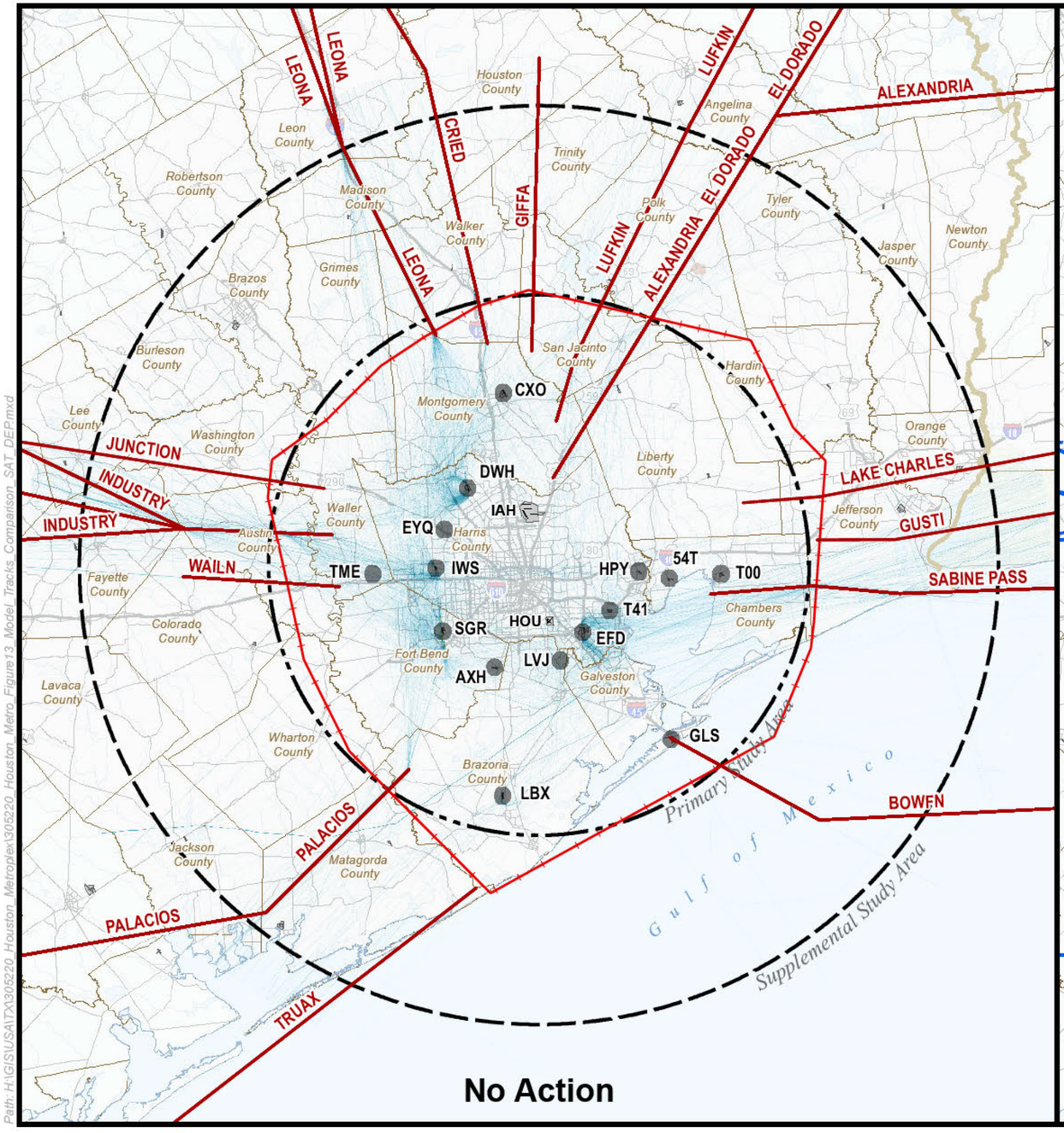
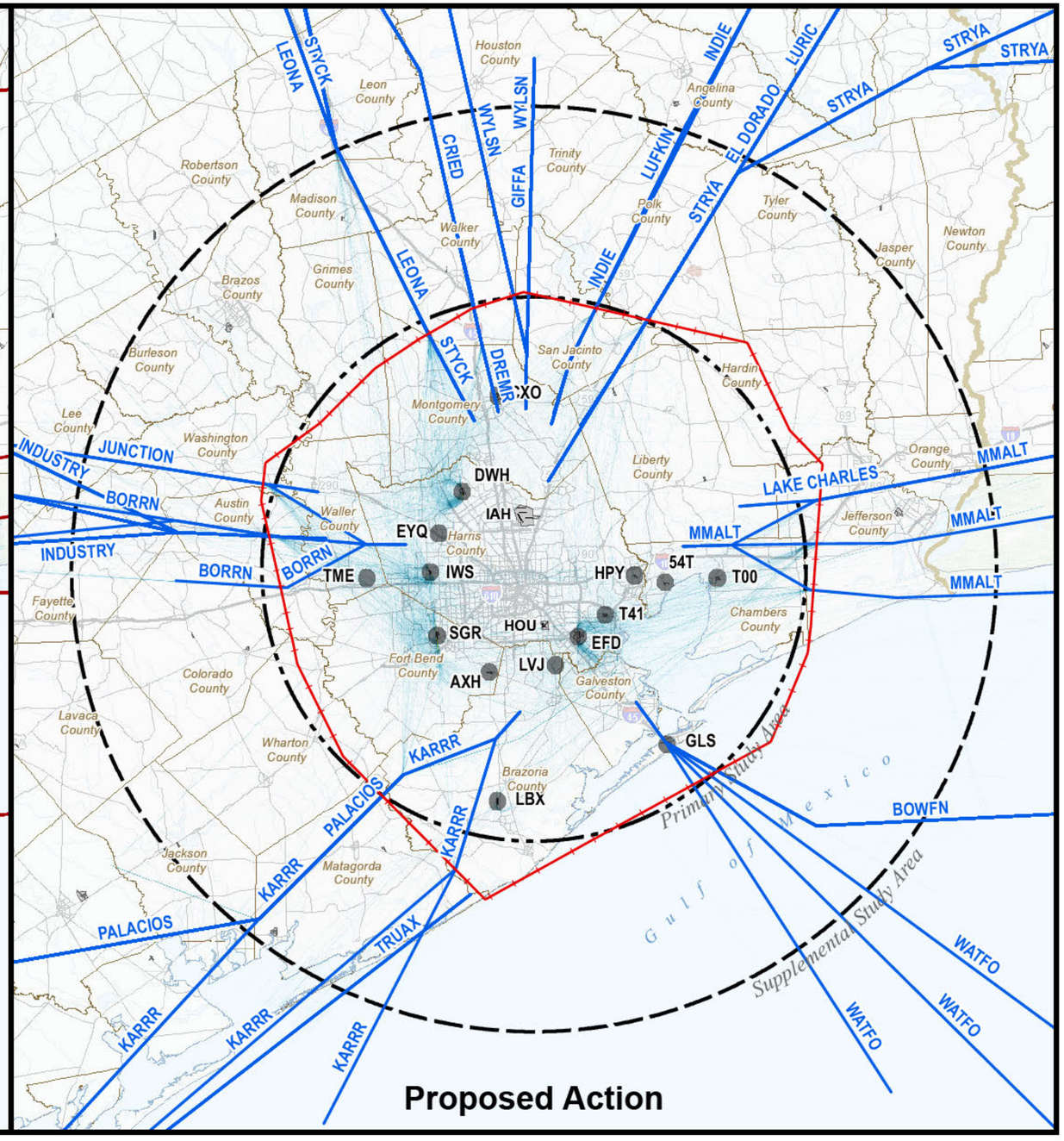


No Action



Proposed Action

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Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Nautical Miles

- Primary Study Area
- Supplemental Study Area
- Core I90 TRACON Boundary
- County/Parish Boundary
- Alabama-Coushatta Tribe of Texas Reservation
- Proposed Procedure
- No Action Procedure
- Satellite Airports

Flight Track Density

Low — Medium — High

Flight track depictions are annualized representations of 2014 conditions based on 36 24-hour periods in 2010-11.

Satellite Airport Departures (Comparison of Proposed Action and No Action Alternatives)

Figure 13

Houston OAPM EA

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3.4 Identification of the Preferred Alternative

Of the two alternatives carried forward for detailed analysis, only the Proposed Action would meet the Purpose and Need, as stated in Chapter 2. Therefore, the Proposed Action is the Preferred Alternative.

The No Action Alternative does not meet the Purpose and Need and, therefore, existing air traffic inefficiencies would remain and the Houston Metroplex would not fully realize the benefits of PBN procedures. Although the No Action Alternative would not meet the Purpose and Need, this EA carries it forward, as required by CEQ regulations, to establish a benchmark against which decision makers can compare the magnitude of the environmental effects of undertaking the Proposed Action.

Table 11 relates the Proposed Action to the Purpose and Need by presenting all individual procedures that would comprise the Proposed Action, including procedures that would be retained, modified, or cancelled from the No Action Alternative.

Table 11 Relation of All Proposed Changes in Instrument Procedures to Purpose & Need Criteria

Procedure Name	Action	Boundary Side	Improves Efficiency	Flight Path Predictability & Flexibility	Reduces Pilot-Controller Communication
RNAV SIDs					
ELOCO	New	E	Y	Y	Y
GUMBY	New	E	Y	Y	Y
MMALT	New	E	Y	Y	Y
MMUGS	New	E	Y	Y	Y
WATFO	New	E	Y	Y	Y
GUSTI	Cancel	E	-	-	-
SABINE PASS	Cancel	E	-	-	-
DREMR	New	N	Y	Y	No Change
INDIE	New	N	Y	Y	No Change
LURIC	New	N	Y	Y	No Change
STRYA	New	N	Y	Y	Y
STYCK	New	N	Y	Y	No Change
WYLSN	New	N	Y	Y	No Change
BOWFN	Retain	S	No Change	No Change	No Change
FLYZA	New	S	Y	Y	Y
KARRR	New	S	Y	Y	Y
PEECE	New	S	Y	Y	Y
PTRON	New	S	Y	Y	Y
RITAA	New	S	Y	Y	Y
BNDTO	New	W	Y	Y	Y
BORRN	New	W	Y	Y	Y
DOBBY	New	W	Y	Y	Y
PITZZ	New	W	Y	Y	Y

Procedure Name	Action	Boundary Side	Improves Efficiency	Flight Path Predictability & Flexibility	Reduces Pilot-Controller Communication
WAILN	Cancel	W	-	-	-
Conventional (non-RNAV) SIDs					
LAKE CHARLES	Retain	E	No Change	No Change	No Change
CRIED	Retain	N	No Change	No Change	No Change
EL DORADO	Retain	N	No Change	No Change	No Change
GIFFA	Retain	N	No Change	No Change	No Change
LEONA	Retain	N	No Change	No Change	No Change
LUFKIN	Retain	N	No Change	No Change	No Change
ALEXANDRIA	Cancel	N	-	-	-
PALACIOS	Retain	S	No Change	No Change	No Change
TRUAX	Retain	S	No Change	No Change	No Change
SCHOLES	Cancel	S	-	-	-
INDUSTRY	Retain	W	No Change	No Change	No Change
JUNCTION	Retain	W	No Change	No Change	No Change
RNAV STARs					
CESAN	New	NE	Y	Y	No Change
DOOBI	New	NE	Y	Y	Y
SKNRD	New	NE	Y	Y	Y
TWSTD	New	NE	Y	Y	Y
WAPPL	New	NE	Y	Y	Y
WHACK	New	NE	Y	Y	Y
ROKIT	Cancel	NE	-	-	-
TXMEX	Cancel	NE	-	-	-
DRLLR	New	NW	Y	Y	Y
GUSHR	New	NW	Y	Y	Y
KIDDZ	New	NW	Y	Y	Y
MSCOT	New	NW	Y	Y	Y
TTORO	New	NW	Y	Y	Y
AGEEE	Cancel	NW	-	-	-
BAZBL	Cancel	NW	-	-	-
COACH	Cancel	NW	-	-	-
BAYYY	New	SE	Y	Y	Y
BOOZZ	New	SE	Y	Y	Y
BRSKT	New	SE	Y	Y	Y
GILLL	New	SE	Y	Y	Y
PUCKS	New	SE	Y	Y	Y
TQNIK	New	SE	Y	Y	Y
CLMBA	Cancel	SE	-	-	-
KABOY	Cancel	SE	-	-	-
WOLDE	Cancel	SE	-	-	-
BELLR	New	SW	Y	Y	Y

Procedure Name	Action	Boundary Side	Improves Efficiency	Flight Path Predictability & Flexibility	Reduces Pilot-Controller Communication
HTOWN	New	SW	Y	Y	Y
TEJAS	New	SW	Y	Y	Y
DYNMO	Cancel	SW	-	-	-
HAMMU	Cancel	SW	-	-	-
STROS	Cancel	SW	-	-	-
Conventional (non-RNAV) STARs					
HUDZY	New	NE	Y	Y	No Change
OHIIO	New	NE	Y	Y	No Change
DAS	Cancel	NE	-	-	-
TAKKL	New	NW	Y	Y	No Change
BLUBL	Modify	NW	No Change	No Change	No Change
RIICE	Modify	NW	No Change	No Change	No Change
TEXNN	Cancel	NW	-	-	-
GILCO	Modify	SE	No Change	No Change	No Change
TCHDN	New	SW	Y	Y	No Change
WHAEL	New	SW	Y	Y	No Change
CARNE	Modify	SW	No Change	No Change	No Change
ROYOH	Cancel	SW	-	-	-
RNP AR Approaches					
IAH 8L[1]	New	E	Y	Y	Y
IAH 8R	Modify	E	Y	Y	Y
IAH 9	New	E	Y	Y	Y
IAH 26L	New	W	Y	Y	Y
IAH 26R	New	W	Y	Y	Y
IAH 27	Modify	W	Y	Y	Y
RNAV ILS Transitions[2]					
IAH 8L[1]	Modify	E	Y	Y	Y
IAH 8R	Modify	E	Y	Y	Y
IAH 26L	Modify	W	Y	Y	Y
IAH 26R	Modify	W	Y	Y	Y
IAH 27	Modify	W	Y	Y	Y
HOU 4	Modify	All	Y	Y	Y

Notes:
1. For RNP AR Approaches and RNAV ILS Transitions, the "Procedure Name" is replaced with the associated airport and runway.
2. The proposed RNAV ILS Transitions would be published as modification or amendment to the respective existing ILS approaches.

Source: Houston OAPM D&I Team (see Appendix F)

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