Review of Existing Procedures

APPROACH DEVELOPMENT FEASIBILITY STUDY

Charles M. Schulz - Sonoma County Airport (KSTS)

Prepared by Cignus Consulting LLC

Rev 1.1

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Glossary of Acronyms

Acronym	Definition	Acronym	Definition
AMSL	Above Mean Sea Level	LNAV/VNAV	Lateral navigation/vertical navigation (LNAV/VNAV)
ARTCC	Air Route Traffic Control Center	LOC	Localizer
ATC	Air Traffic Control	LP-LNAV	Localizer performance (LP) - Lateral Navigation
CASP	California Aviation System Plan	LPV	Localizer Performance with Vertical Guidance
CAT I	Category I Precision Approach	MEA	Minimum Enroute Altitude
CAT II/III	Category II and III Precision Approach	MOCA	Minimum Obstacle Clearance Altitude
DA	Decision Altitude	MVA	Minimum Vector Altitude
DER	Departure end of runway (DER)	NCT	Northern California Terminal
DH	Decision Height	NM	Nautical Mile
DME	Distance Measuring Equipment	NoPT	No Procedure Turn
DP	Departure Procedure	NRA	Non-Rulemaking
FAF	Final Approach Fix	OAPM	Optimization of Airspace and Procedures in the Metroplex
FAS	Final approach segment	ODP	Obstacle Departure Procedure
GPS	Global Positioning System	PAPI	Precision Approach Path Indicators
IAF	Initial Approach Fix	Rev	Revision
IF	Intermediate Fix	RNAV	Area Navigation
IF/IAF	Intermediate/Initial Approach Fix	RNP	Required Navigation Performance
IFP	Instrument Flight Procedures	RVR	Runway Visual Range
IFR	Instrument Flight Rules	RWY	Runway
ILS	Instrument Landing System	SM	Statute Mile
KOAK	Metropolitan Oakland International Airport	TARGETS	Terminal Area Route Generation Evaluation and Traffic Simulation System
KSFO	San Francisco International Airport	TODA	Takeoff Distance Available
KSJC	Norman Mineta – San Jose International Airport	TRACON	Terminal Radar Approach Control
KSMF	Sacramento International Airport	T-ROUTES	Low altitude RNAV routes
KSTS	Charles M Schulz – Sonoma County Airport	VFR	Visual Flight Rules
LLC	Limited Liability Company	VOR	VHF Omnidirectional Radio Range
LNAV	Lateral Navigation	ZOA	Oakland Air Route Traffic Control Center

1. Introduction

Sonoma County has sponsored a review of the approach and departure procedures for the Charles M Schulz – Sonoma County (KSTS) Airport. The primary objective of this study is the development of a fully optimized straight-in Global Positioning System (GPS)-based Area Navigation (RNAV) approach to Runway 14 as an alternative to the current RNAV (GPS) RWY 14 approach. All proposed design considerations shall seek where possible to minimize noise and reduce emissions. As a close secondary objective, this review will include a complete assessment of all remaining procedures to evaluate the potential for improved access to the airport within the context of the KSTS as located within the northern California airspace. The examination of new and revised approaches for KSTS in this analysis will include consideration of their ability to connect to the broader aviation system.

The following reference documents were reviewed in the development of this analysis:

1. Charles M. Schulz – Sonoma County Airport Master Plan
2. Charles M. Schulz – Sonoma County Airport Layout Plan
3. Charles M. Schulz – Sonoma County Airport Exhibit A Property Map
4. Optimization of Airspace and Procedures in the Metroplex (OAPM) study
5. IFR and VFR Aeronautical Charts
6. Instrument Approach Procedure (IAP) Charts
7. Departure Procedure (DP) Charts
8. Charles M. Schulz – Sonoma County Airport Diagram

2. Background

The Optimization of Airspace and Procedures in the Metroplex (OAPM) study that addressed the Northern California Metroplex published in 2014 examined airspace delegated to the Northern California Terminal Radar Approach Control (TRACON) (NCT) and the Oakland Air Route Traffic Control Center (ARTCC) (ZOA). As part of that study, operations at the four busiest airports within the lateral confines of NCT's airspace were examined for interactions. They included San Francisco International Airport (KSFO), Metropolitan Oakland International Airport (KOAK), Norman Mineta – San Jose International Airport (KSJC), and Sacramento International Airport (KSMF). The study further stated that "Other airports' operations and issues were also examined, as appropriate."

Additionally, the California Aviation System Plan (CASP) published August 18, 2021, identifies KSTS as one of 23 primary airports in the State of California. However, flight operations into and out of KSTS were not considered within the context of either of the above noted studies.

3. Analysis of procedures and overall design considerations

The procedure analysis was completed using the Terminal Area Route Generation Evaluation and Traffic Simulation System (TARGETS) Version 7.0.2 for RNAV approach and obstacle departure Instrument Flight Procedures (IFPs) which included the latest available Obstacle

Authoritative Source data within 44 Nautical Miles (NM), and 347 Obstruction Evaluation and Non-Rulemaking on airport (NRA) from 2015 thru 2022.

The current airport Epoch Year Magnetic Variation is E16 (1985). The nearest future Epoch Year value is E13 (2025). The standard for limit for airports is 3.0°, 1.0° for airports with Special Authorization CAT I or CAT II, or CAT II/III approach procedures.

4. Enroute airspace analysis

KSTS is located north of the Oakland ARTCC (ZOA). As depicted in Figure 1 below, there are no significant connections to the high-level structure (at/above 18,000 feet AMSL) that would impact the design of procedures for KSTS.

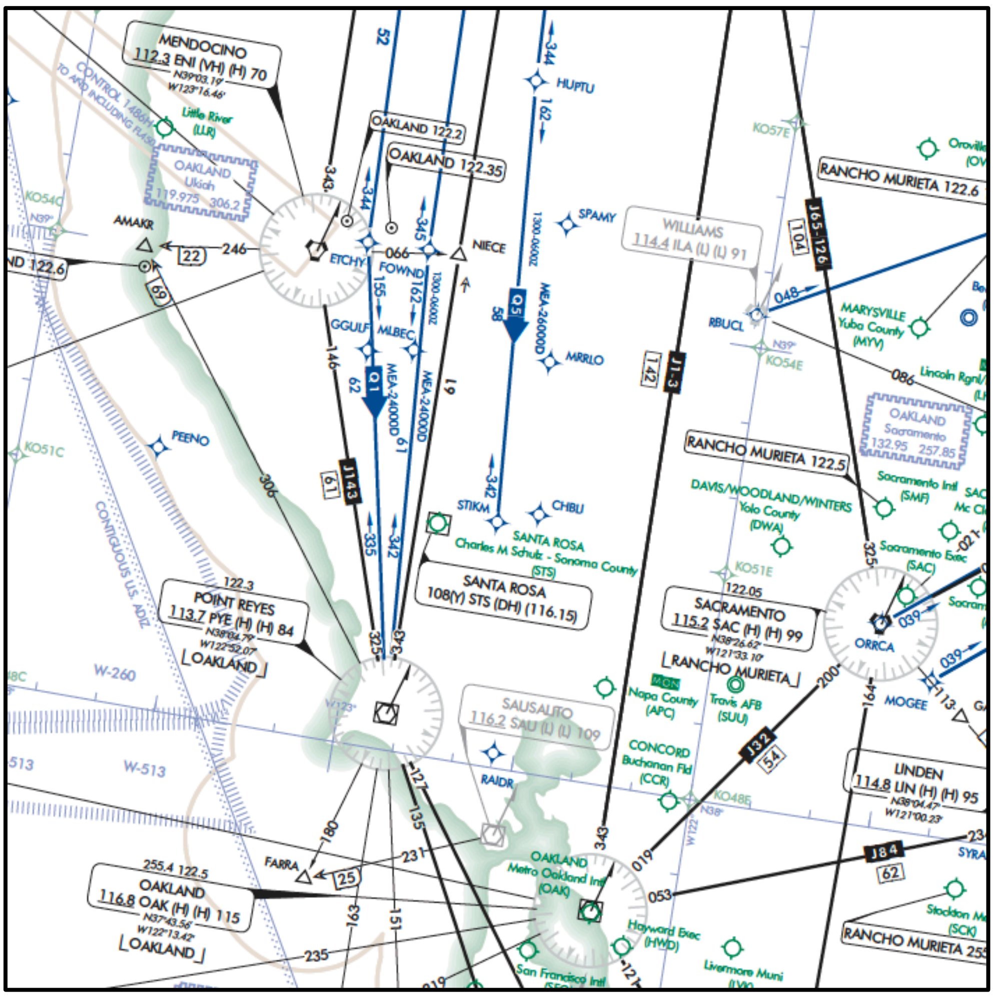

Figure 1- IFR Enroute High Altitude US H-3

In the low-level structure (below 18,000 AMSL), KSTS is co-located at the convergence of three low-level victor airways (V494, V301, V108). The waypoints along these airways, as well as the victor airways and Low altitude RNAV routes (T-routes) in the vicinity of KSTS, are potentially the natural future anchor points for possible connection to KSTS approaches.

In the event of a full redesign of the approach connections to the enroute structure, the list in Table 1 below identifies possible waypoints that could be used as a transition point to a revised approach to KSTS. Using an existing airway waypoint to connect to the initial approach leg provides continuity for flight planning purposes as well as the opportunity for reduced air traffic management workload. This is achieved by applying a known separation between routes rather than using monitored surveillance separation. In addition, management of aircraft vertical profiles can have increased precision, with better optimization of gradients on each leg of the descent.

Table 1 - Enroute Waypoints

Airway	Distance to KSTS (NM)	Waypoint name
V195	32	BESSA
T329-V494	22	POPES
T-263-V87-V108	29	SGD VOR/DME
T257-V301	26	PYE
V-27-V494	28	CABEX
V-27-V494	21	GETER
T257-V25-V27	9	FREES
V25-V200	33	LAPED
V107-V199	23	BOARS
V107-V301-V150	41	COMMO
V199	19	FROSH

*Enroute transitions are not part of this effort.

5. Runway 14 Approach analysis

5.1. Airspace summary

KSTS is serviced by a Class D control zone with a Class E control area extension aligned to accommodate approaches to runway 14/32. The vertical dimensions are from the surface to 2600 feet Above Sea Level (ASL). The Control Tower is operated on a limited basis (0700-2000) with approach and departure service provided by Oakland ARTCC.

As shown in Figure 2 below, the size of KSTS Class D airspace is a 4.3 nm radius, and the limited operational hours of the tower combine to increase the workload provided by Oakland ARTCC to support Instrument Fight Rules (IFR) operations. This escalates the need to have arrival and departure profiles that are procedurally separated, thereby reducing the need for monitored and applied surveillance separation.

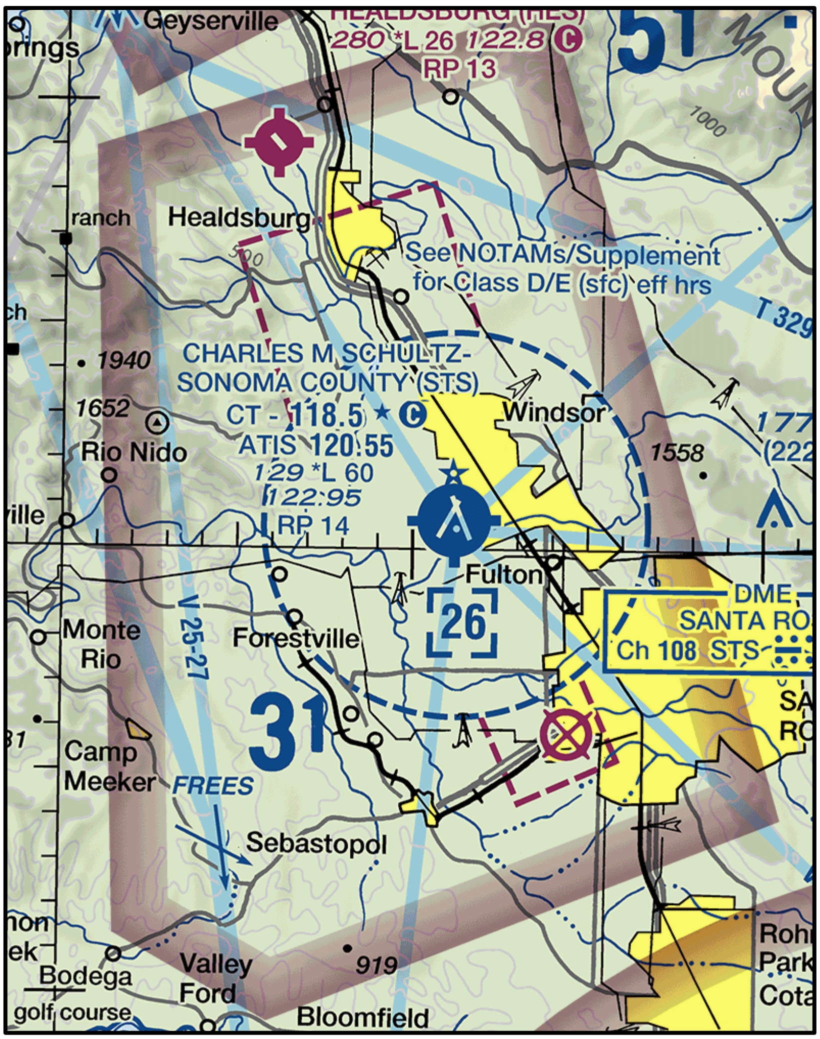

Figure 2 - Exploded View of KSTS Control Zone Test

5.2. Current RNAV(GPS)RWY14

Figure 3 depicts the RNAV(GPS)RWY 14 approach which has been built with transitions from the enroute structures as follows:

- *From the northwest beginning at the Mendocino VOR (ENI)*
- *From the north beginning at the LAPED waypoint (intersection of V200 and V25)*

The transition from ENI VHF Omnidirectional Radio Range (VOR) enables descent from the enroute low structure fed from airways with Minimum Enroute Altitudes (MEAs) of 13000 (V494), 9000 (V199, V607), 6700 (V27), and 5600 (T257). The transition from LAPED allows arrival descent from 9000 (V25 south westbound) and 6200 (V200 westbound).

The no-procedure-turn (NoPT) transition legs from the Initial Approach Fixes (IAFs) CABEX and FIPUM allow for descent to 5000 feet to cross the LOZWU Intermediate/Initial Approach Fix (IF/IAF).

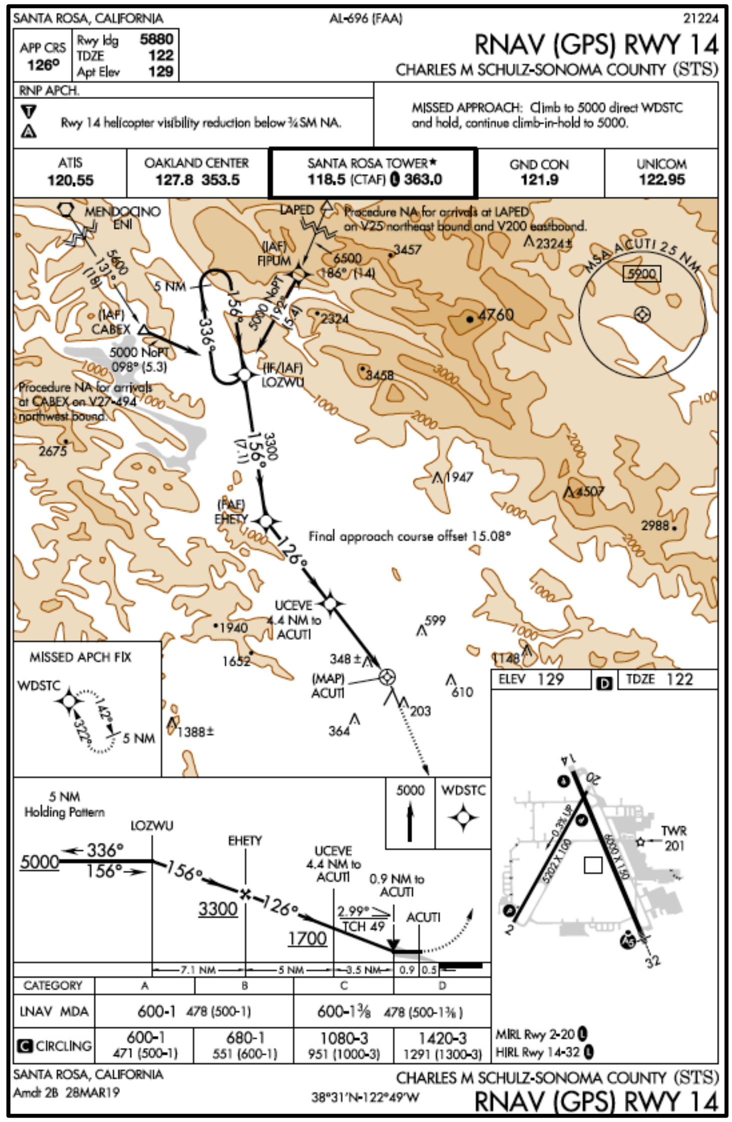

Figure 3 - RNAV (GPS) RWY 14 Approach Chart

5.3. Lateral profiles

Approach and missed approach waypoints as shown in Figure 4 depict the interaction with terrain and populated areas. The current procedure is depicted in magenta, the Class D control zone in blue and the Class E control area extensions in orange.

Figure 4 - RNAV (GPS) RWY 14 Approach

It can be presumed when reviewing the current RNAV (GPS) RWY 14 approach that the procedure design was developed to avoid flying over the City of Healdsburg and West Windsor as depicted by Figure 5. The designed procedure is approximately 1 NM from the City of Healdsburg, crossing west of Windsor. Since this fight path points aircraft towards rising terrain in the intermediate segment of the approach, the current design is less than ideal.

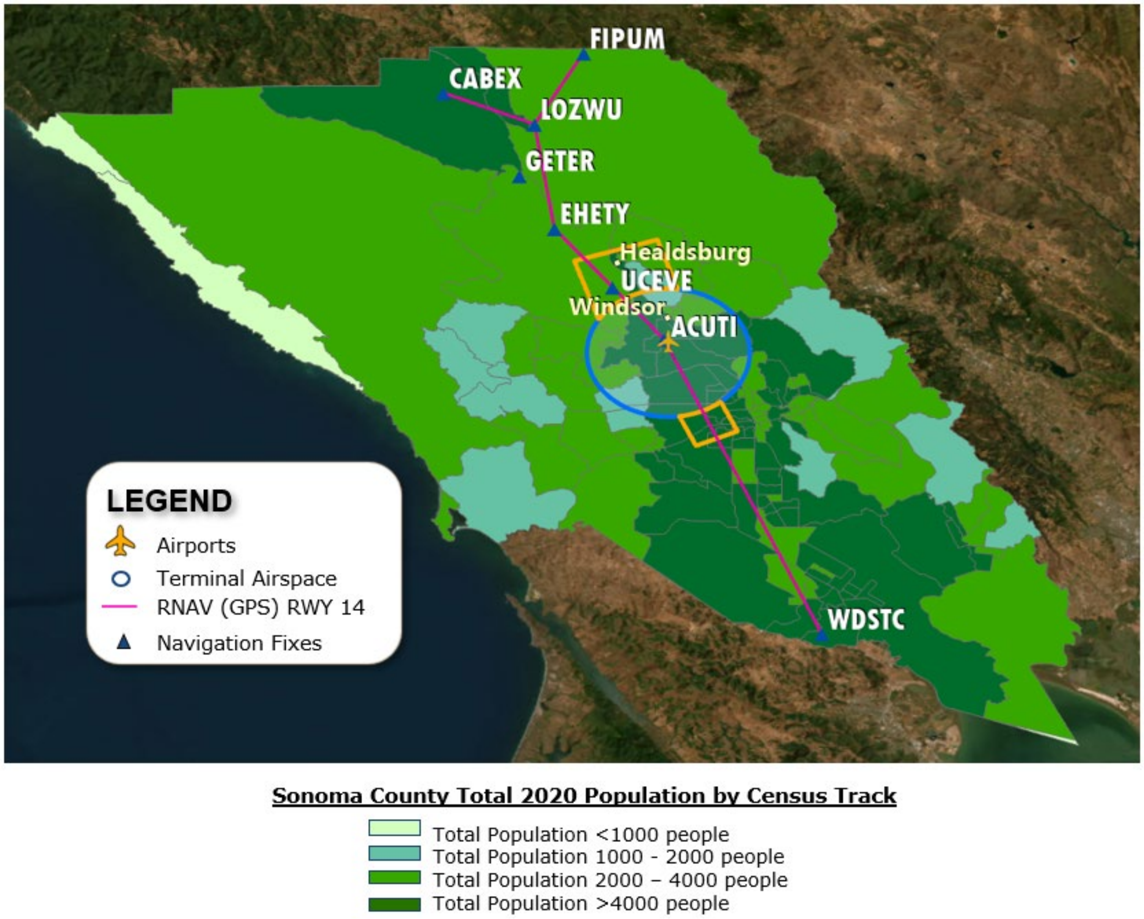

Figure 5 - RW14 Approach with 2020 Population Density

To help improve the current design, consideration could be given to placing the intermediate fix waypoint at GETER, fourteen nautical miles from the Runway threshold with a 3.00 degree offset final approach at 2000 feet AMSL 5.8 nm from the threshold to avoid direct overflight of the City of Healdsburg and West Windsor. Such a change could result in minimizing flights directly over these residential areas. In-depth studies of these possible design changes, along with other options will be performed before any recommendations are brought forth for intermediate and final consideration.

Figure 6 shows the zoomed in view of the ground paths inside the Class D and E airspace of the existing approach in magenta and the 3.00° offset final approach from the extended Runway centerline in red.

Figure 6- RW14 Existing Path and 3.00° Offset Final Inside KSTS Class D and E Airspace

5.4. Vertical profiles

Descent from the enroute is managed by Oakland ARTCC with traffic controlled until reaching the transfer of control point. The impact of traffic flow patterns in this portion of the ZOA ARTCC should not preclude the optimization of a descent profile below 10,000 feet. The Northern California Metroplex OAPM study showed that the traffic patterns closest to KSTS were well east from the concentrated northeast flows servicing KOAK and KSFO. Additionally, the far east traffic coming into this area from the Pacific tracked well west of KSTS and were still in the high-level structure. The lack of complex intersecting high density traffic flows near KSTS in the low-level structure, and particularly down to a level that is above the minimum obstacle clearance altitude (MOCA) and/or the minimum vectoring altitude (MVA) enables greater design flexibility.

Each of the current RNAV (GPS) RWY 14 approach initial and intermediate legs are designed with suitable descent gradients less than 4% with the exception of the FIPUM-LOZWU leg at 4.6%, however the subsequent shallower leg (LOZWU-EHETY) at 3.9% has an appropriate gradient for deceleration and configuration changes for descending aircraft. From the Final Approach Fix (FAF) to the RW14 threshold crossing height the design gradient is as close to a continuous 5.2%-, or three-degrees descent gradient as needed.

To achieve the vertical profile and aircraft configurations needed on the final approach leg, it is standard operating procedure for most airlines and aircraft operators to lower their landing gear, make wing flap changes, and the associated power increases to accommodate the increased aircraft drag profile, either just prior to or as crossing the FAF.

Consequently, the greatest changes in aircraft noise will occur across a range from approximately one-half nautical mile on either side of the lateral path crossing the FAF. The least potential community exposure to these aircraft noise changes would likely be achieved by offsetting the final approach course 3.00 degrees and the intermediate course to the FAF approximately 15 degrees to avoid direct overflight of West Windsor and the City of Healdsburg residential areas. In theory, arriving aircraft would be in a continuous state of descent with low or idle power settings from the point that they cross the IAF until the point one half nautical mile prior to the FAF where these noted configuration changes would be initiated for the final approach to landing.

Summary

5.5. Existing RNAV (GPS) RWY 14, Amendment 2B:

- Originally established January 2009
- Lateral Navigation (LNAV) only
- Final approach 9.9 NM course offset 15°over Sonoma Mountains
- Intermediate offset 30° clockwise to initial approaches limited to V35 and V27-494 arrivals from the North

5.6. Opportunities for Improvement:

There are several opportunities to improve the existing approach to RW14 that the design team will consider when developing conceptual designs. However, it is important to note that the possibility exists that the approach distance can be reduced while at the same time avoiding more densely populated areas. Figure 7 shows RW14 approach with protection zones and obstacles. Additional initial design considerations are listed below.

- LPV, Lateral Navigation/Vertical Navigation (LNAV/VNAV), and Required Navigation Performance (RNP) 0.30 and 0.15 capable
- Offset 3° and reduce final approach to 5.8 NM southwest of Healdsburg US 101
- Offset 7 NM intermediate counter clockwise to GETER, avoiding West Windsor and the City of Healdsburg populated areas (overflies Vineyard Plaza)
- Add FROSH-NACKI arrival

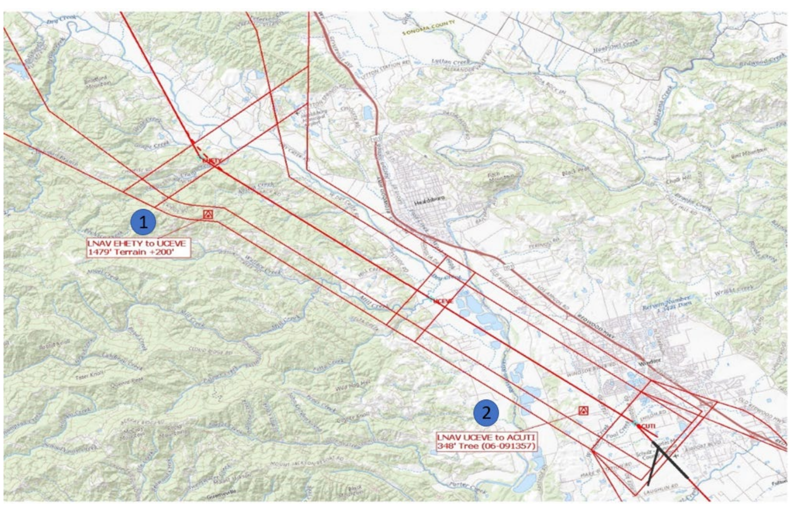

Figure 7 - RW14 RNAV (with protection zones and obstacles)

6. Runway 32 Approach analysis

Runway 32 is the primary approach runway for operations during low visibility and/or low cloud ceilings. The runway is serviced by an Instrument Landing System (ILS) supporting Category I operations to a Decision Height / Altitude (DH/A) of 377 feet above mean sea level (AMSL), requiring a one-half mile visibility or 2400 feet runway visual range for landing. Figure 8 below depicts the approach and landing chart.

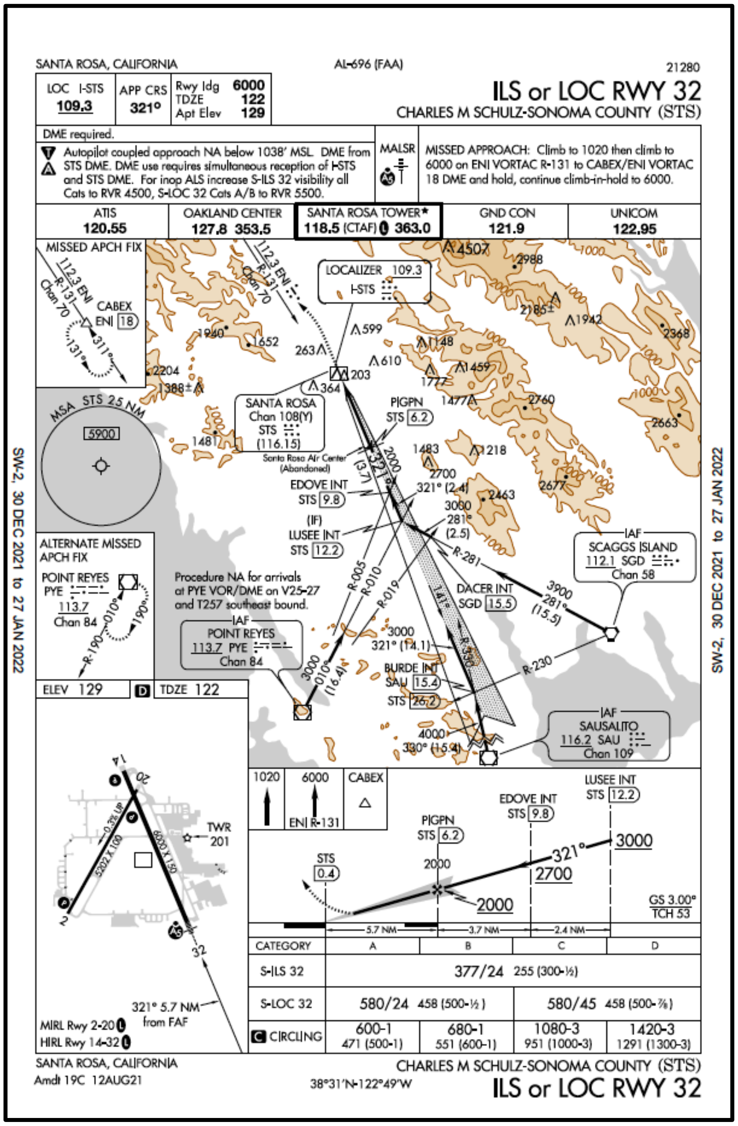

Figure 8- ILS or LOC RWY 32 Approach and Landing Chart

A second separate approach is in place for runway 32, the RNAV (GPS) RWY 32. This approach supports Localizer Performance with Vertical Guidance (LPV) operations to a decision altitude of 200 feet and ½ mile visibility or 2400 Runway Visual Range (RVR). Additional sections of minima are available for LNAV/VNAV and LNAV only as well as circling minima. The Figure 9 chart depicts the various operational levels.

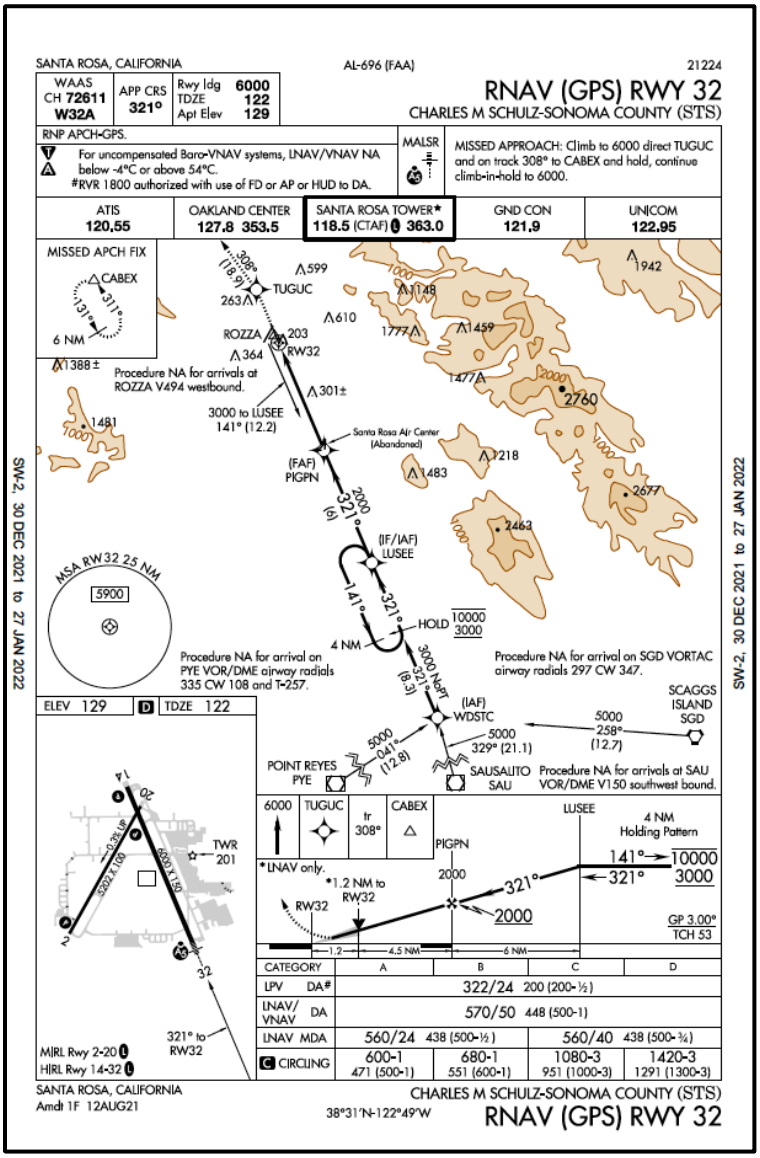

Figure 9- RNAV (GPS) RWY 32 Approach and Landing Chart

Transitions to the ILS approaches are designed using conventional transitions from three VORs, Point Reyes (PYE), Sausalito (SAU), and Scaggs Island (SGD). For the RNAV approach the same IAFs are used with only an additional IAF waypoint added at WDSTC to transition to the extended runway centreline. Each of the initial and intermediate legs for both the ILS and the RNAV have crossing altitudes that create very shallow decent angles of less than two degrees to the final approach fix at PIGPN. From the FAF at PIGPN the ILS has a standard 3° glideslope to the decision height at 377 ft AMSL. Figure 10 shows the ILS or LOC RWY32 initial, intermediate, and final approach course segments.

Figure 10- ILS or LOC RWY 32 Approach Track

The ground path for the RNAV (GPS) RWY 32 are nearly identical, with the exception of heading differences joining the Final Approach Segment (FAS) from the IAFs. Figure 11 shows the RNAV ground path.

Figure 11 - RNAV (GPS) RWY 32 Approach

Figure 12 below shows the final approach segment from the final approach fix at PIGPN to the runway 32 threshold for both the ILS and the RNAV.

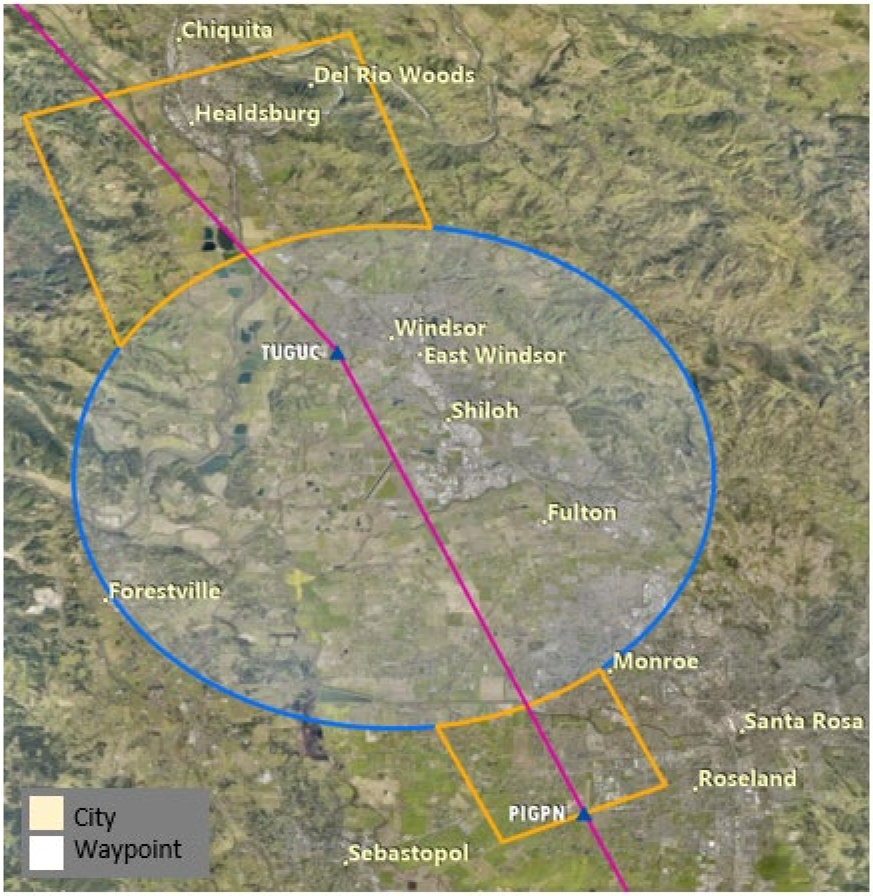

Figure 12- ILS or LOC and RNAV (GPS) RWY 32 Final Approach Segment

Summary

6.1. RNAV (GPS) RWY 32, Amendment 1F

- Original established January 2009
- LNAV/VNAV visibility limited to RVR 5000 (1 Statute Mile SM)
- Sausalito (SAU) VOR with Distance Measuring Equipment (VOR/DME) feeder limited to northeast bound V150 arrivals vs. V107-301 Oakland to COMMO

6.2. Opportunities for Improvement

There are several opportunities to improve the existing approach to RW32 that the design team will consider when developing conceptual designs. Figure 13 shows RW32 approach with protection zones. Some of the initial design considerations are listed below.

- RNP 0.30, 0.15 and 0.10 capable
- Improve LNAV/VNAV visibility
- Add 600 ft AMSL stepdown waypoint to mitigate 200' adverse assumption obstacle above known terrain
- Move SAU VOR/DME feeder to V107-301 COMMO
- Add a T263-T329-V494 feeder transition from POPES

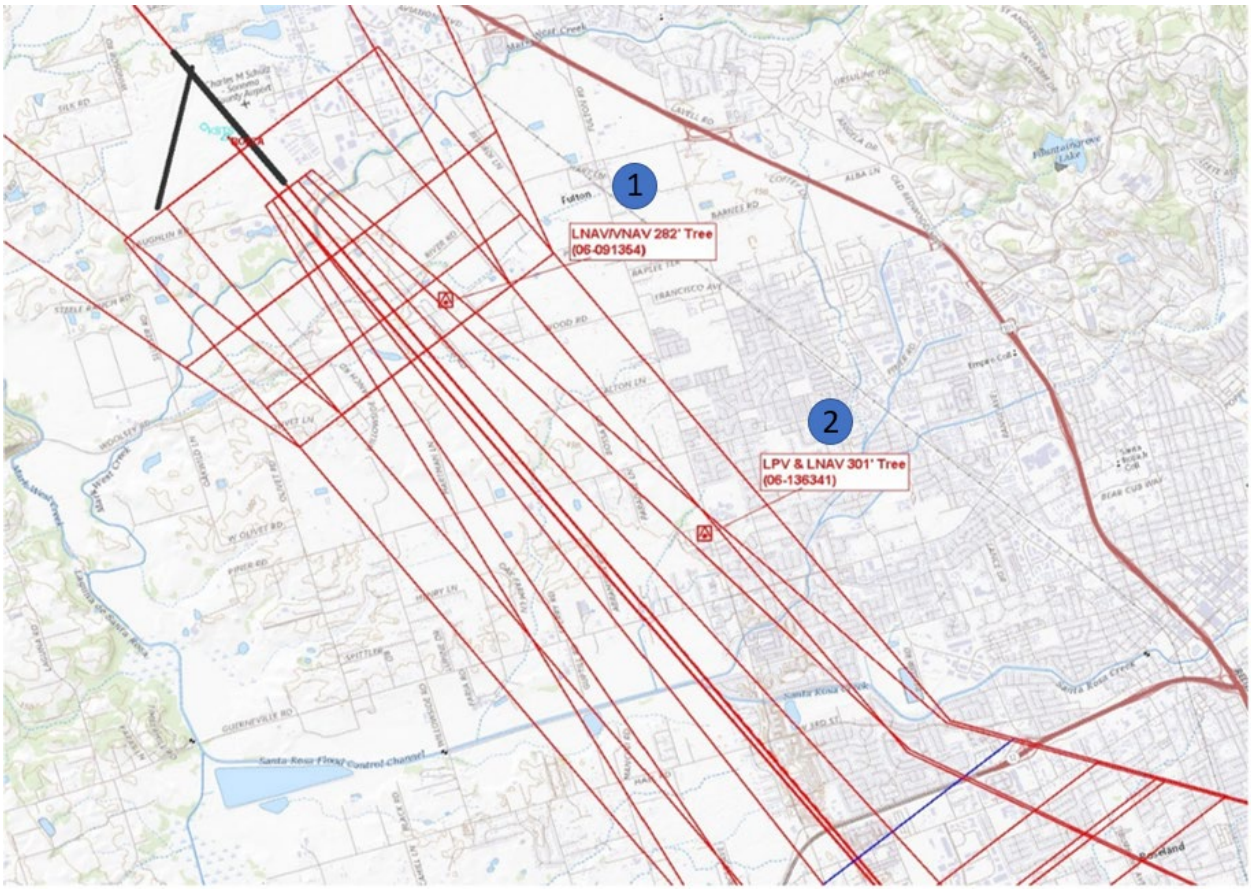

Figure 13 – RWY 32 RNAV (with protection zones and obstacles)

7. Runway 02 Approach analysis

The RNAV (GPS) RWY 2 approach is designed with a "Y" construction for placement of the initial approach fixes. The crossing altitudes for each of these IAFs to the Intermediate Fix (IF) allows for a continuous descent up to the final approach fix where a three-degree descent is used to land. The FAS is aligned with the runway for a straight-in approach. The approach chart is shown in Figure 14 below.

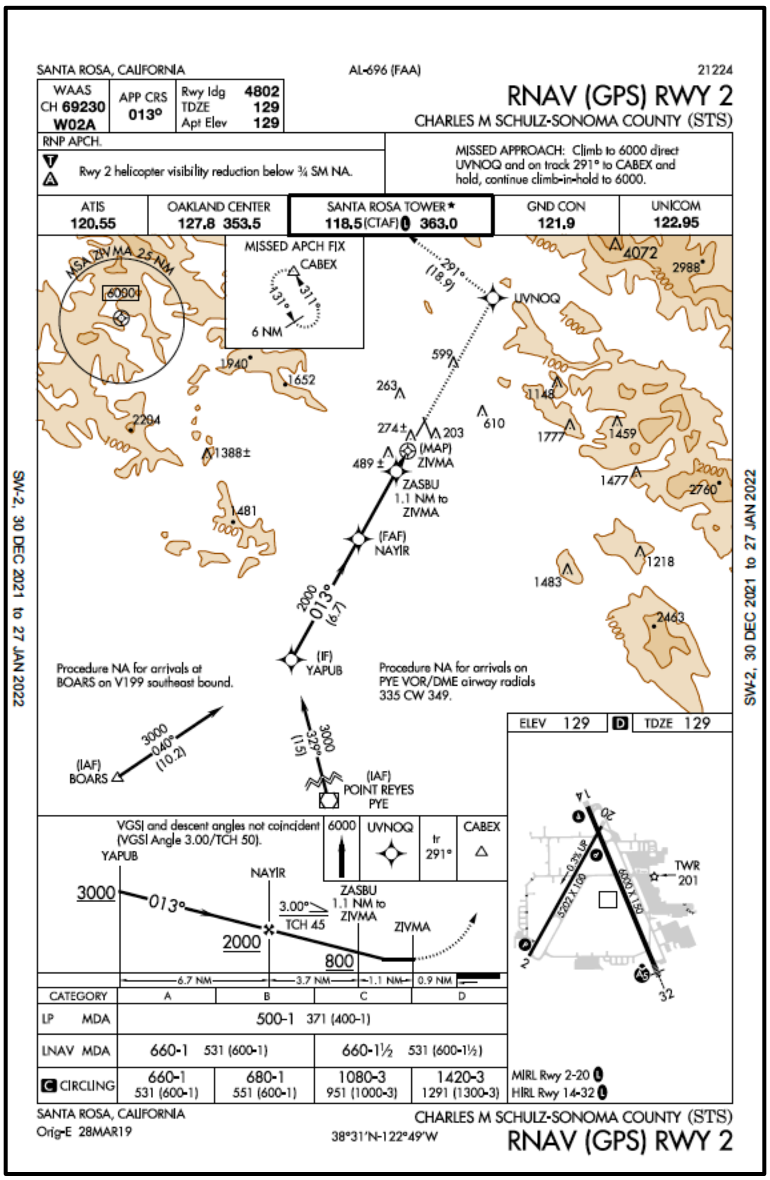

Figure 14 - RNAV (GPS) RWY 2 Approach Chart

Figure 15 shows the RNAV (GPS) RWY 2 approach. The intermediate and final approach segment are aligned with the runway centreline and already provide the optimum ground path. The missed approach is a continuation of the runway centreline out to just over 6 1/2 nautical miles from the departure end of the runway.

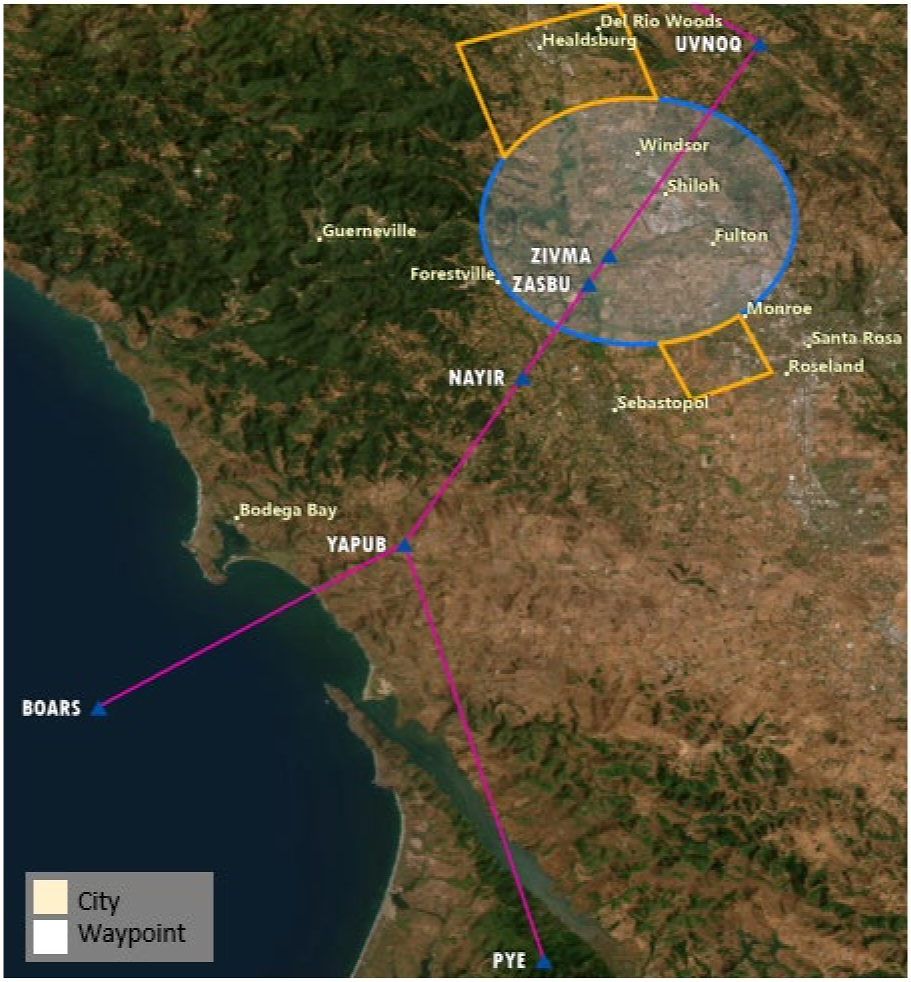

Figure 15 - RNAV (GPS) RWY 2 Approach

Summary

7.1. RNAV (GPS) RWY 2, Orig-E

- Established February 2014
- Non-Precision LP and LNAV only
- Not aligned to Precision Approach Path Indicators (PAPI)

7.2. Opportunities for Improvement

There are several opportunities to improve the existing approach to RW02 that the design team will consider when developing conceptual designs. Figure 16 below depicts the initial design considerations.

- LPV, LNAV/VNAV, LPV and RNP 0.30, 0.15 and 0.10 capable
- Align to PAPI
- Add Scaggs Island V108 feeder
- Add FROSH V199 feeder

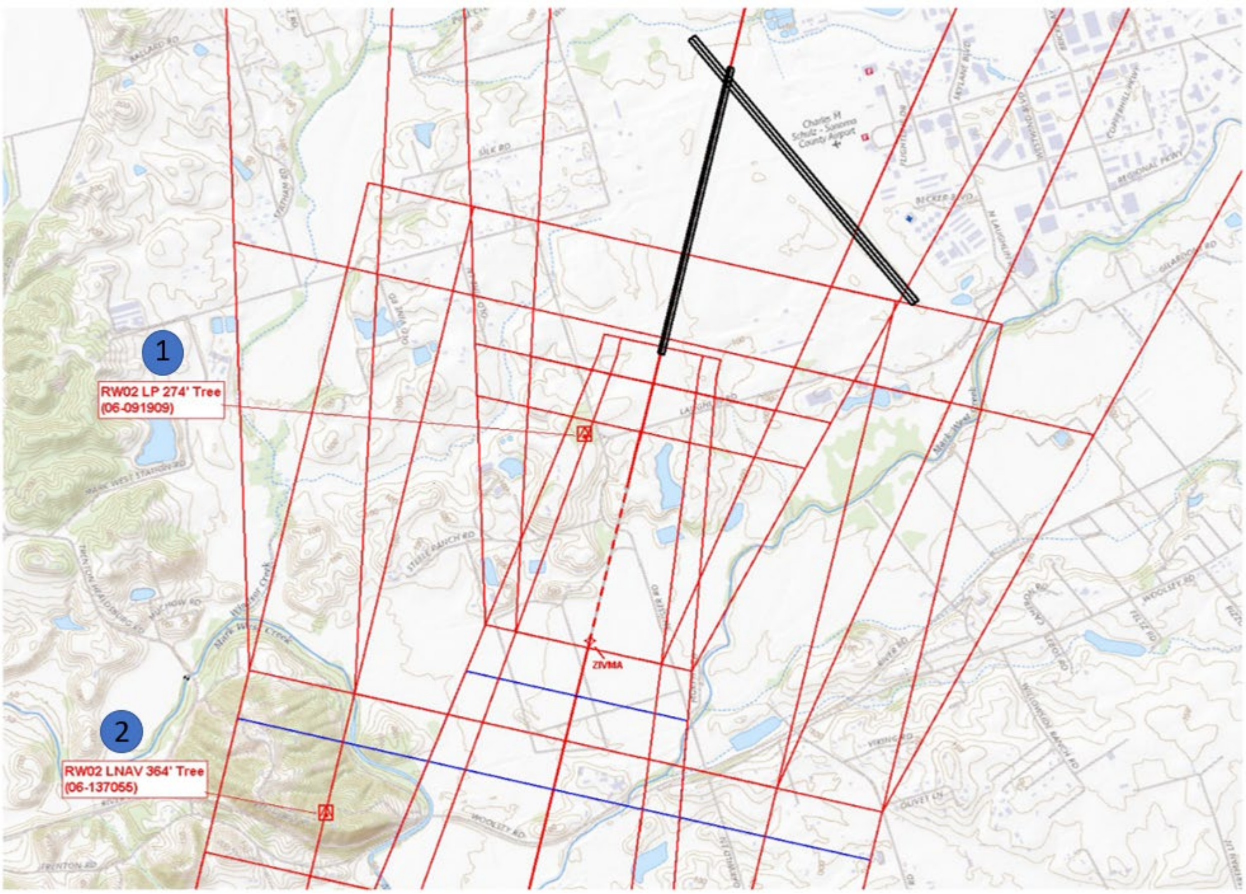

Figure 16 – RWY 02 LP-LNAV

8. Runway 20 Approach analysis

RWY 20 currently has no established instrument flight procedure.

8.1. Opportunities for Improvement:

Given there is no IFP for RW20, the design team will develop an environmentally friendly conceptual design depicted in Figure 17. To that end, an initial design consideration is listed below

- RNAV (RNP) RWY 20 Radius-to-Fix with RNP 0.30 and 0.15 capable

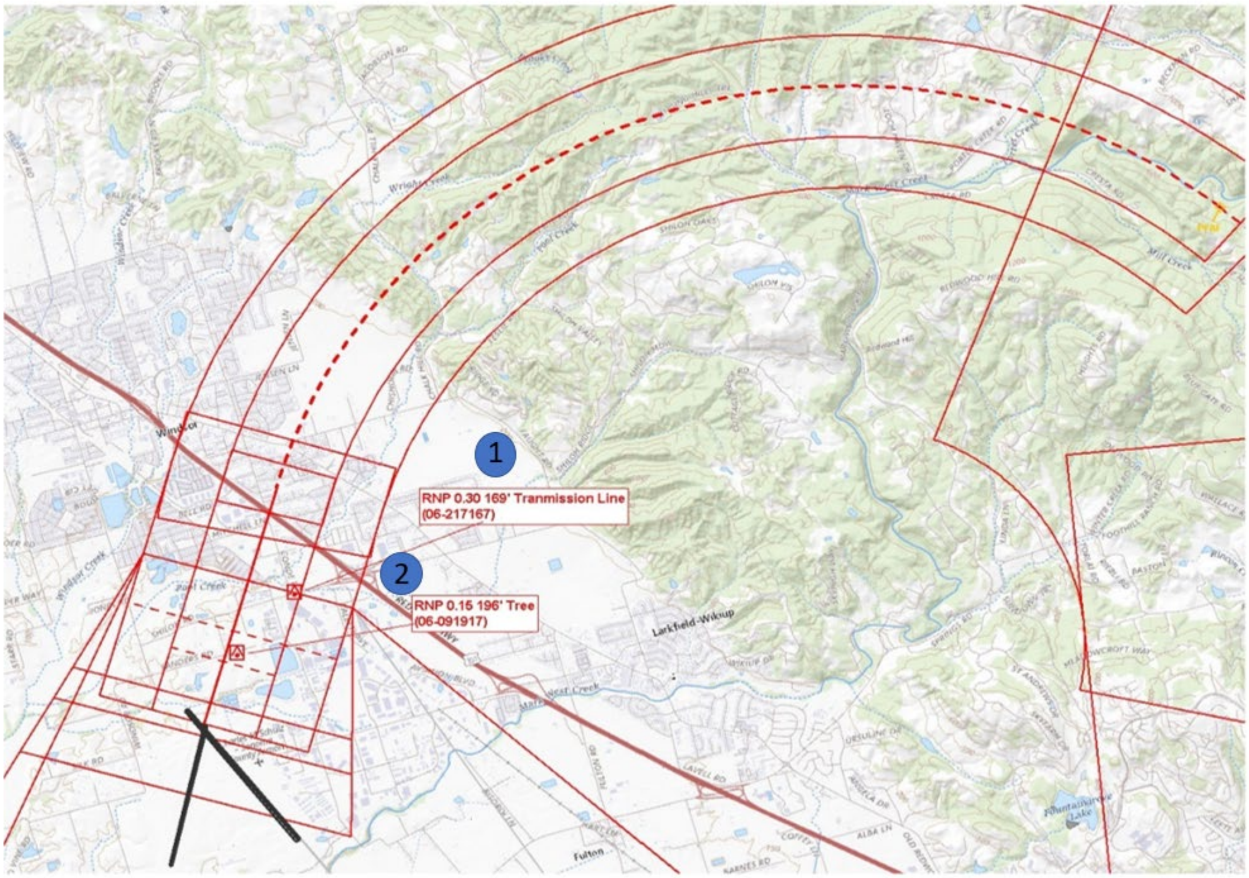

Figure 17 – RWY 20 RNP

9. Runway departure analysis

The Departure Procedures (DPs) from KSTS are specifically designed for obstacle avoidance and are therefore Obstacle Departure Procedures (ODPs). These ODPs are also published as a graphic procedure as the CHARLIE EIGHT DEPARTURE, found in Figure 18.

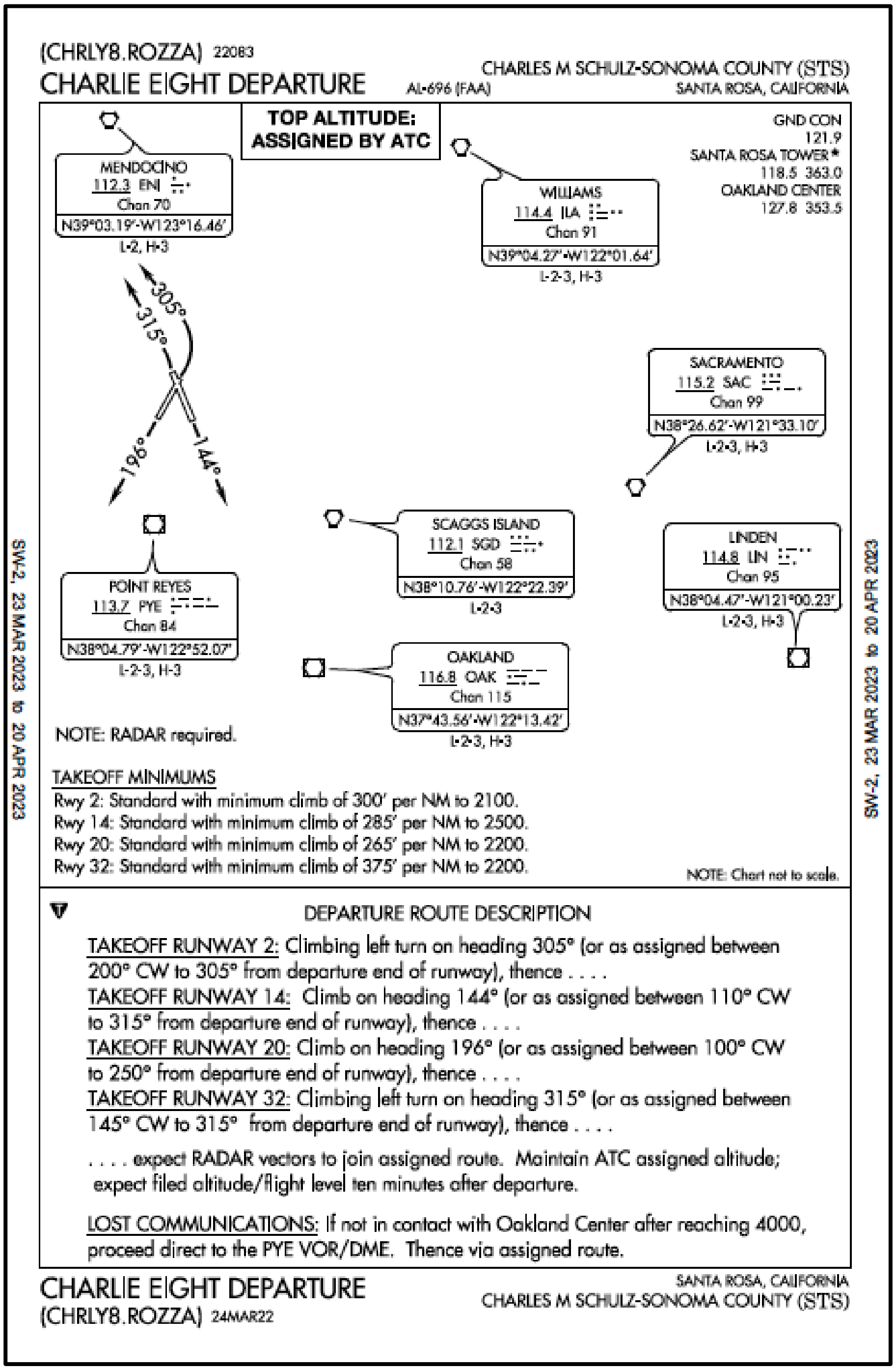

Figure 18 - CHARLIE EIGHT DEPARTURE

All the ODPs have minimum climb gradients associated that allow them to meet the obstacle clearance requirements that could not otherwise be met with a 200 foot per NM climb gradient. The listed obstacles in almost all cases are exclusively trees. In each case the ODP turns the aircraft to point in a southerly direction for transfer to radar control. The ODP chart notes that radar is required for use of the procedures.

Figure 19 shows the extended runway centreline out to a point where aircrafts that use the entire Takeoff Distance Available (TODA) and are capable of achieving only the minimum climb gradient required for departure on that runway, would achieve an altitude of 400 feet above the departure end of the runway (DER) and commence a turn. There is a point indicated for a 90-knot ground speed and a 180-knot ground speed, showing the furthest likely distance from the DER where a turn might be initiated.

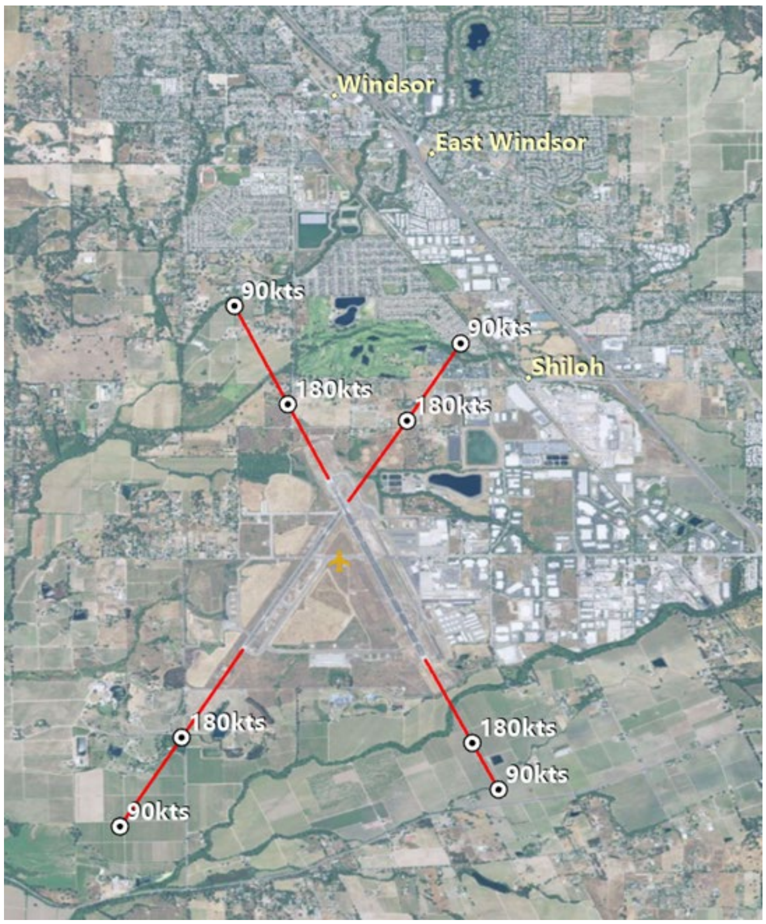

Figure 19 - Expected Latest Departure Turn Initiation Points

Figure 20 shows a possible path for the climbing left turns required on departure from RWY 02 and 32. These show a notional turn initiation at the mid-point between the 90 and 180 knot ground speed locations and are based on a 25-degree bank angle at 150 knots.

In all cases the rate of climb should be easily attainable since the departure path angle is less than ~3.5 for all runways and the climb gradient is not applicable above 2500 feet on any of the departures.

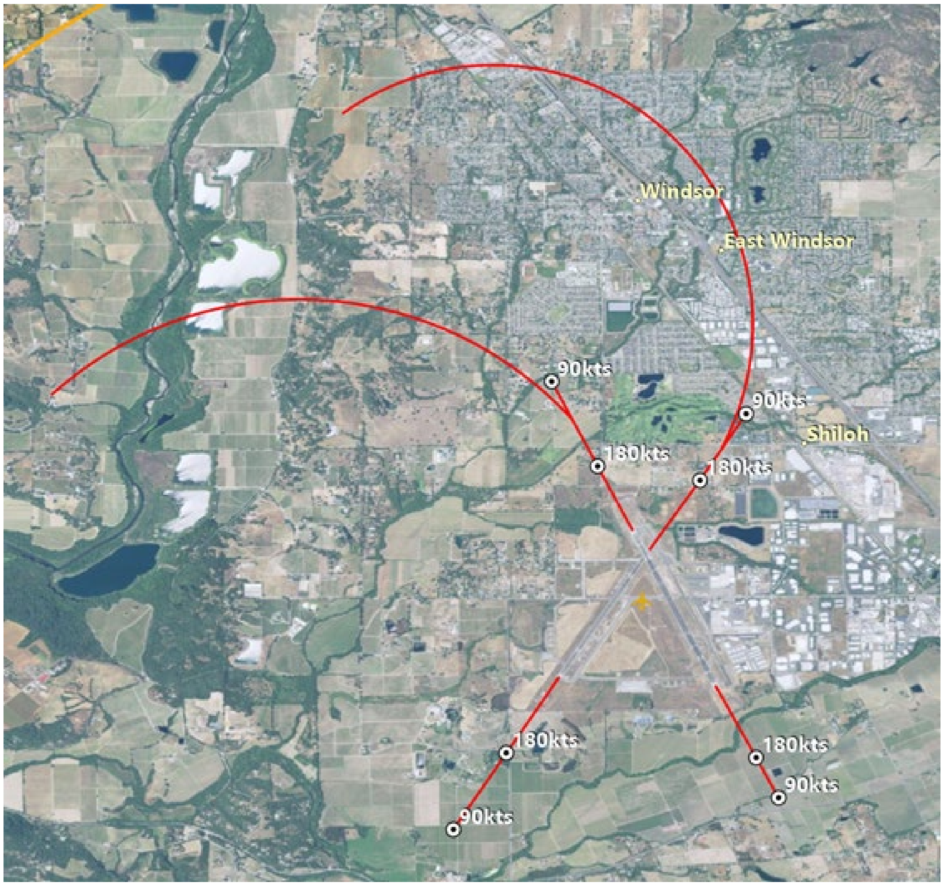

Figure 20 - Potential Paths – Left Climbing Turns RWY 32 and 02

The existing Charlie Eight Departure provides flexibility for departing aircraft to climb to an altitude that enables radar control and the opportunity for a Direct-To clearance. Climb gradients are not excessive and should not limit most aircraft lift capability departing KSTS.

The Charlie Eight Departure is based on achieving required climb gradients ranging from 265' to 375' per NM to altitudes from 2100 AMSL to 2500 AMSL, depending on departure runway, and receiving conventional radar vectors within the sectorized areas listed below, before proceeding on course:

- RWY 2, heading between 200° clockwise to 305°.
- RWY 14, heading between 110° clockwise to 315°.
- RWY 20, 100° clockwise to 250°.
- RWY 32, 145° clockwise to 315°.

Opportunities to improve the departure procedures are dependent on operator and Air Traffic Control (ATC) needs/requests and will be documented through the stakeholder outreach meetings. Figures 21, 22, 23 and 24 depict currently published sectorized departure procedure obstacle evaluation areas for each runway.

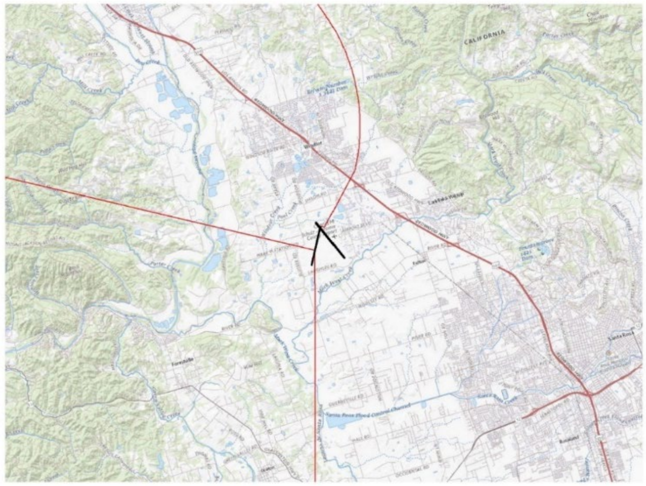

Figure 21 – RWY 02 Departures

Changing the Runway 02 departure to avoid the built-up Town of Windsor residential areas would need to be assessed since this path would point aircraft towards the Mayacamas Mountains to the north and rising terrain east of the airport, influencing the need of a higher (380-foot to 2900 feet AMSL) departure climb gradient. Runway 02 is 800 feet shorter than 14/32, therefore some operators may prefer to accept a crosswind takeoff if it remains within their operational limitations, rather than accepting the penalty of a runway that is significantly shorter.

Departures from runways 14 and 20 provide flexibility to climb within a wide heading range while also resulting in paths that take them clear of built-up areas as shown in Figure 22 and Figure 23.

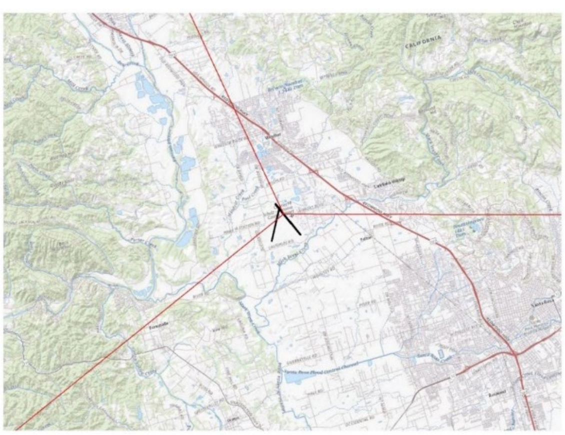

Figure 22 – RWY 14 Departures

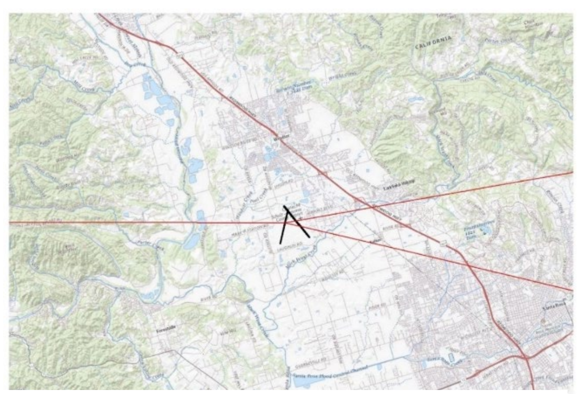

Figure 23 – RWY 20 Departures

The departure on runway 32 includes a climbing turn that should avoid overflight of most built-up areas as shown in Figure 24. However, areas of the southwest portion of the town of Windsor could be overflown by aircraft with lower ground speeds on departure if combined with the minimum climb rate for the procedure.

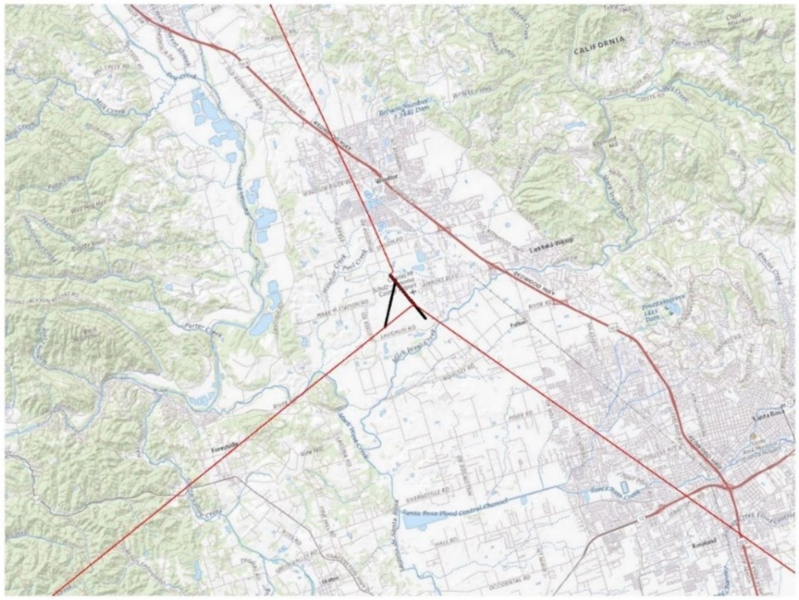

Figure 24 – RWY 32 Departures

10. Radar Data Track Analysis

A review of Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) tracks at KSTS was performed for each runway. Data used for track analysis was sourced from vector tracks for the full month of July 2022. For each runway, a 1nm perpendicular line at varying distances from the extended centerline was used to measure the number of flights and average altitude. This analysis was performed to provide information on track dispersion and the number of flights using the established flight procedure. This analysis could also provide insight into noise complaints received by the airport/county which could be a direct result of aircraft not flying the established procedure as intended.

10.1. Runway 14 Track Analysis

As shown in Figure 25, the analysis of runway 14 arrival tracks showed that about 20% of arrivals used a straight in approach to runway 14 as opposed to the published RNAV(GPS) procedure (16%). Other tracks were comprised of flights arriving from southbound location which would use a procedural turn to establish the base leg and final approach segments. Additionally multiple VFR traffic pattern flights were observed flying over the cities of Windsor, East Windsor, and Shiloh. Flights that used a straight in approach flew over West Windsor and the City of Healdsburg at an average height of 734ft. Track dispersion was significantly less for flights that used the established instrument approach, with approximately 800ft dispersion measured at EHETY fix, compared to 4000ft dispersion measured 10nm from the extended runway 14 centerline.

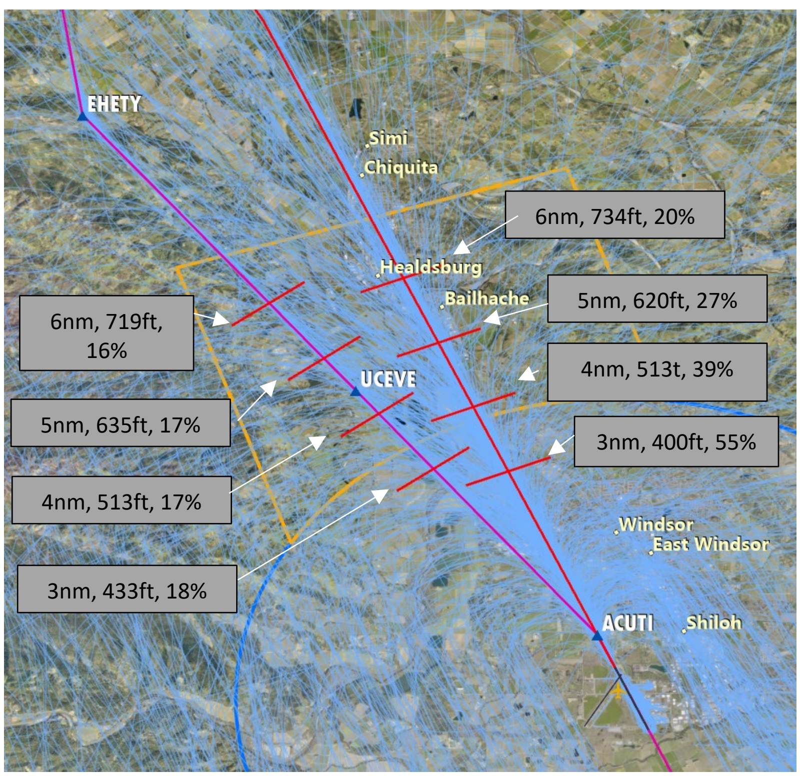

Figure 25 - Runway 14 Arrival Track Analysis

Departures from runway 14 as shown in Figure 26, demonstrated a lower degree of dispersion with about 44% of the flights using a straight southbound departure from runway 14. However, 12% of the southbound departures that did not use a straight-out departure were observed flying over the cities of Monroe, Santa Rosa and Roseland. These departures had a higher dispersion of approximately 7000ft measured 5nm from the departure runway end compared to flights that used a straight departure route (2500ft).

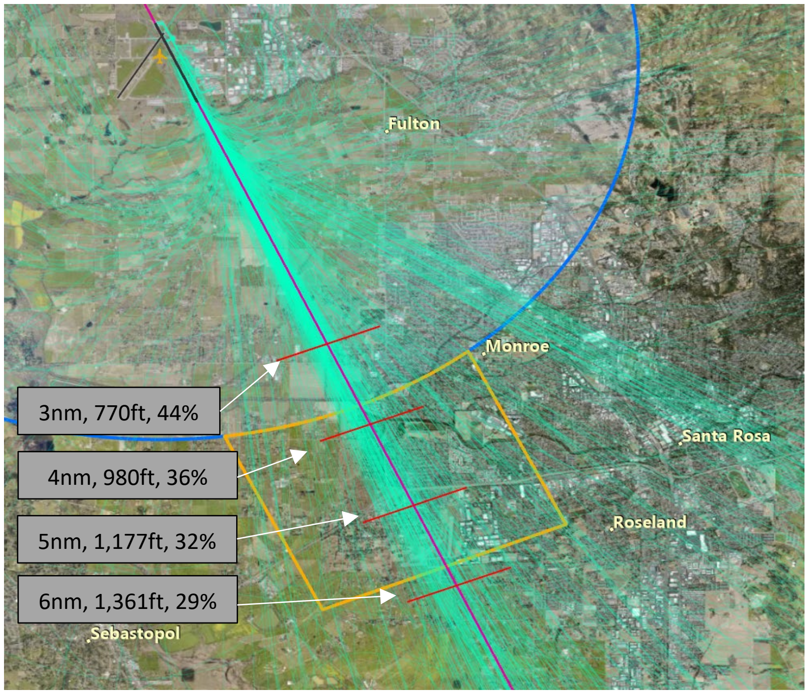

Figure 26 - Runway 14 Departure Track Analysis

10.2. Runway 32 Track Analysis

As shown in Figure 27, ILS or LOC and RNAV (GPS) RWY 32 arrivals showed a larger percentage of flights using the established approach procedure. This approach had significantly less dispersion compared to runway 14 procedures with about 89%-94% of arrivals using the straight-in procedure. Dispersion measured 5nm from the runway threshold was approximately 500ft. 80% of arrivals to runway 32 joined the approach segment at LUSEE fix with 89% of flights established for a straight-in approach at the 6nm mark.

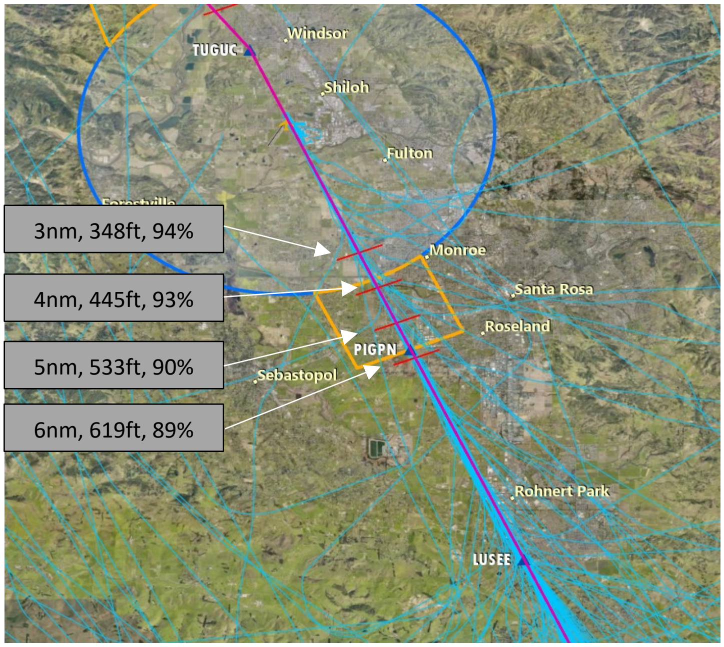

Figure 27 - Runway 32 Arrival Track Analysis

Figure 28 shows departures from runway 32 using a climbing turn that avoided overflight of the Cities of Windsor and Healdsburg. About 48% of northbound departures stayed to the left of Redwood Highway. 12% of departures did not use the climbing left turn and were on average 1,340ft above the city of Healdsburg measured at the 6nm line.

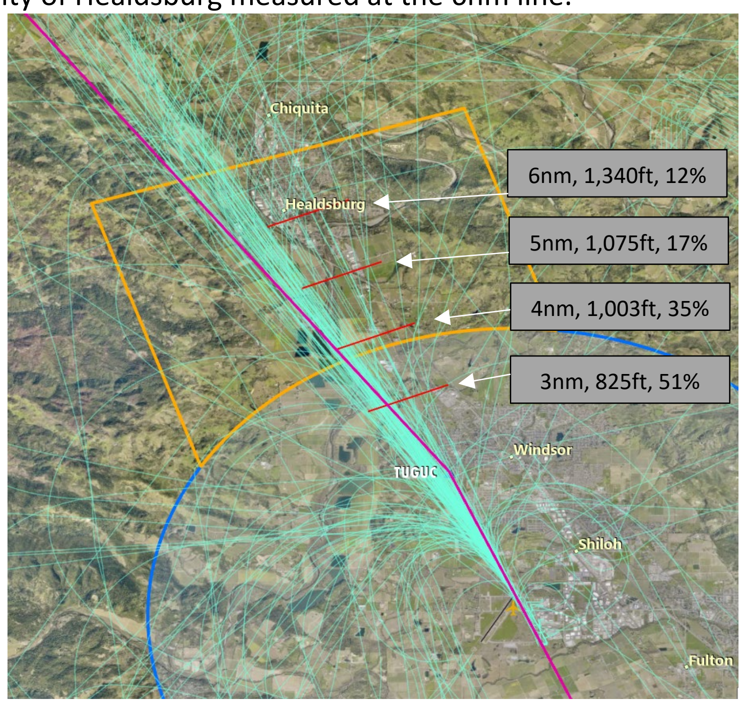

Figure 28 - Runway 32 Departure Track Analysis

10.3. Runway 02 Track Analysis

Arrivals and departures from runway 02 were attributed to VFR flights in the traffic pattern. There were between 13% to 17% of arrivals that performed a straight-in approach from the NAYIR fix. As shown in Figure 29, these flights did not fly over any neighborhoods.

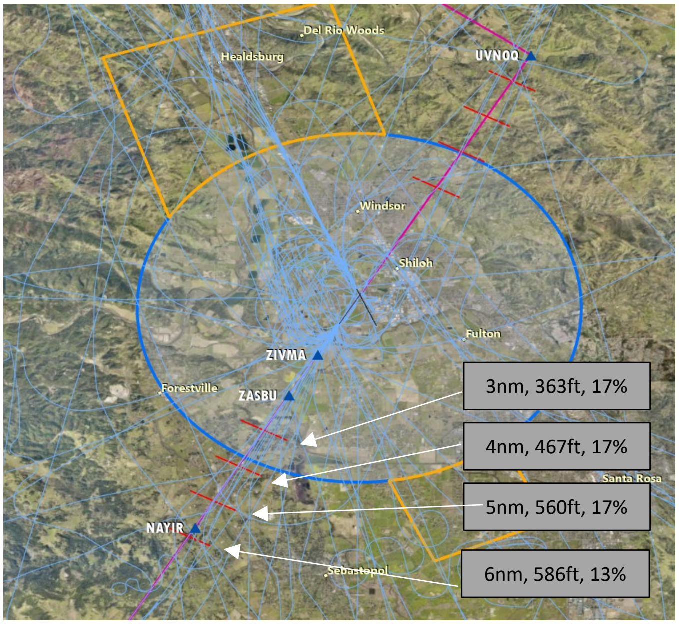

Figure 29 - Runway 02 Arrival Track Analysis

Runway 02 departure flights were mostly comprised of VFR flights in the traffic pattern. There was only approximately 3% of flights that used a straight-out departure. As depicted in Figure 30, departures in the traffic pattern did not fly over any cities.

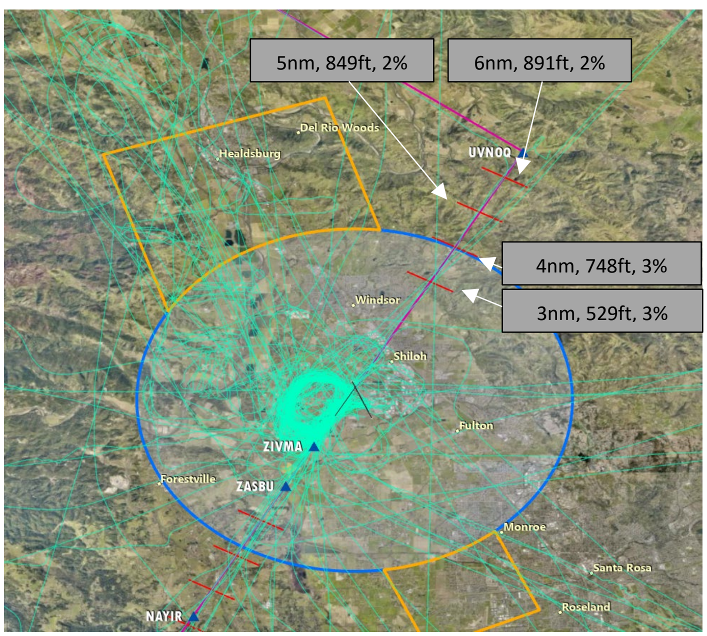

Figure 30 - Runway 02 Departure Track Analysis

10.4. Runway 20 Track Analysis

Runway 20 does not have an established instrument approach procedure. Arrivals and departures at runway 20 were mostly comprised of VFR traffic in the traffic pattern. There were no flights recorded at the 6nm extended centerline as shown in Figure 31.

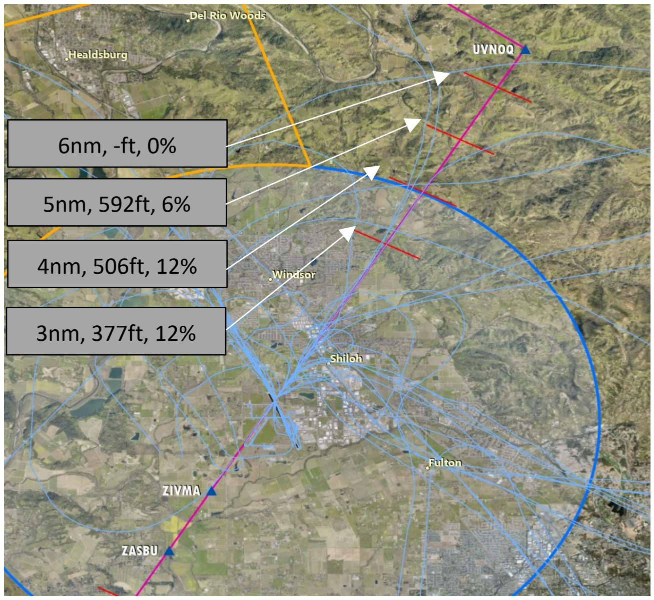

Figure 31 - Runway 20 Arrival Track Analysis

Runway 20 departure flights were mostly comprised of VFR flights in the traffic pattern. There was approximately 8% of flights that used a straight-out departure. Departures in the traffic pattern did not fly over any cities as depicted in Figure 32 below.

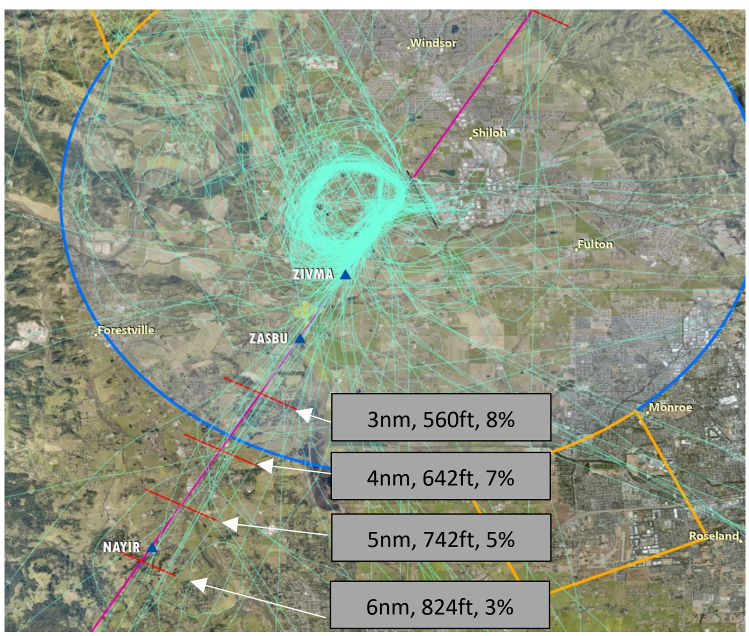

Figure 32 - Runway 20 Departure Track Analysis