



# Meeting Announcement

## Technical Working Group

**Wednesday, November 15, 2023**  
**3:30 p.m. – 5:00 p.m.**  
**\*VIA HYBRID ACCESS\***

Foster City Council Chambers Conference Room  
620 Foster City Blvd. – Foster City, CA 94404

Public may also join the webinar:

<https://smcgov.zoom.us/j/93523059657>

Or Dial-in:

US: +(669)900-6833 Webinar ID: 935 2305 9657

This meeting of the Technical Working Group (TWG) will be in person at the above-mentioned address. Members of the public will be able to participate in the meeting remotely via the Zoom platform or in person at 620 Foster City Boulevard, Foster City, CA 94404. For information regarding how to participate in the meeting, either in person or remotely, please refer to instructions at the end of the agenda.

### **HYBRID PUBLIC PARTICIPATION:**

List of attendees (using zoom sign-in credentials) will be displayed periodically throughout the meeting.

The TWG Subcommittee meeting may be accessed through the above-mentioned Zoom webinar. Members of the public may also attend this meeting physically in the Foster City Council Chambers Conference Room at 620 Foster City Blvd. Foster City, CA 94404.

\*Written public comments can be emailed to [SFORoundtable@smcgov.org](mailto:SFORoundtable@smcgov.org) and should include the specific agenda item to which you are commenting.

\*Spoken public comments will also be accepted during the meeting in-person or via Zoom on Items NOT on the Agenda and for each Agenda Item at the option of the speaker.

\*\*Please see instructions for written and spoken comments at the end of this agenda.

### **ADA Requests**

Individuals who require special assistance or a disability-related modification or accommodation to participate in this meeting, or who have a disability and wish to request an alternative format for the agenda packet or other writings that may be distributed at the meeting, should contact SFO Roundtable Staff at [SFORoundtable@smcgov.org](mailto:SFORoundtable@smcgov.org) as early as possible but no later than 10:00am the day before the meeting at Notification in advance of the meeting will enable Staff to make reasonable arrangements to ensure accessibility to this meeting, the materials related to it, and your ability to comment.

## AGENDA

### Call to Order

### Public Comment on Items NOT on the Agenda

## REGULAR AGENDA

### 1. SFO Ground Based Augmentation System (GBAS) Group 2A Innovative Procedures

a. **SFO GBAS Project Update–Innovative Procedure Timeline and Latest Community Requests**

Paul Hannah, SFO Consultant, Chief Airspace and Flight Operations Engineer

*Attachment: SFO GBAS Project Update - Innovative Procedure Timeline and Latest Community Requests* p.4

b. **Review of Proposed GLS Group 2A Innovative Approach Procedures at SFO**

Jason Stoddard, Airspace Analyst, HHMMH, Consultants to the SFO Roundtable

*Attachment: SFO GLS 2A HMMH Review Memo*

*Attachment: Review of Proposed GLS Group 2A Innovative Approach Procedures at SFO* p.27

c. **Questions - Roundtable Members**

Sam Hindi, Chairman, SFO Roundtable

Paul Hannah, SFO Consultant, Chief Airspace and Flight Operations Engineer

Jason Stoddard, Airspace Analyst, HHMMH, Consultants to the SFO Roundtable

d. **Discussion by Roundtable Members**

Sam Hindi, Chairman, SFO Roundtable

### 2. Flight Procedures, Flight Tracks & Airport Director's Report Data

Bert Ganoung, SFO, Aircraft Noise Office Manager

*Attachment: Airport Director's Report, SFO Layout, Arrivals & Departures Presentation* p.41

### 3. Adjourn

#### **\*\*Instructions for Public Comment during Videoconference Meeting**

**During the TWG Subcommittee hybrid meeting, members of the public may address the Membership as follows:**

#### **Written Comments:**

Written public comments may be emailed in advance of the meeting. Please read the following instructions carefully:

1. Your written comment should be emailed to [SFORoundtable@smcgov.org](mailto:SFORoundtable@smcgov.org)
2. Your email should include the specific agenda item on which you are commenting.
3. Members of the public are limited to one comment per agenda item.
4. The length of the emailed comment should be commensurate with two minutes customarily allowed for verbal comments, which is approximately 250-300 words.
5. If your emailed comment is received by 5:00 pm on the day before the meeting, it will be provided to the Roundtable and made publicly available on the agenda website under the specific item to which comment pertains. The Roundtable will make every effort to read emails received after that time but cannot guarantee

## Technical Working Group

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such emails will be read during the meeting, although such emails will still be included in the administrative record.

### **Spoken Comments:**

#### **In-person Participation:**

1. If you wish to speak to the Membership, please fill out a speaker's slip located at the entrance. If you have anything you wish distributed to the Membership and included in the official record, please hand it to the Clerk who will distribute the information to the Membership and Staff.

#### **Via Teleconference (Zoom):**

1. The TWG Subcommittee meeting may be accessed through Zoom online at <https://smcgov.zoom.us/j/93523059657> Webinar ID: 935 2305 9657 . The meeting may also be accessed via telephone by dialing in +1-669-900-6833, entering webinar ID 935 2305 9657 then press #.
2. Members of the public can also attend this meeting physically in the Foster City Council Chambers Conference Room at 620 Foster City Blvd, Foster City, CA 94404.
3. You may download the Zoom client or connect to the meeting using the internet browser. If you are using your browser, make sure you are using current, up-to-date browser: Chrome 30+, Firefox 27+, Microsoft Edge 12+, Safari 7+. Certain functionality may be disabled in older browsers including Internet Explorer.
4. You will be asked to enter an email address and name. We request that you identify yourself by name as this will be visible online and will be used to notify you that it is your turn to speak.
5. When the Chairperson calls for the item on which you wish you speak click on "raise-hand" icon. You will then be called on and unmuted to speak.

### **\*Additional Information:**

For any questions or concerns regarding Zoom, including troubleshooting, privacy, or security settings, please contact Zoom directly.

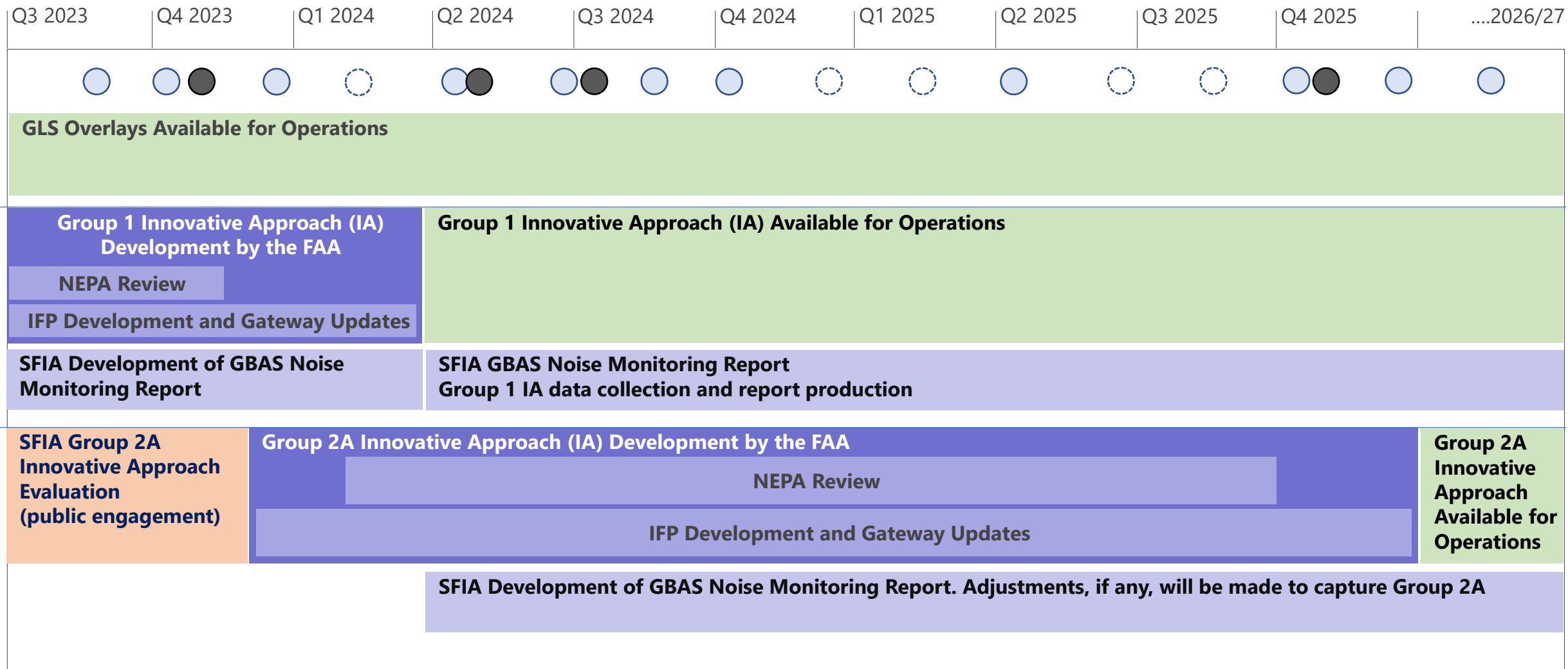
# SFO GBAS Project Update

Innovative Procedure Timeline  
and Latest Community Requests  
November 15, 2023

SFO

1. Timeline for Group 1 and Group 2A GLS Procedures
2. Overview of roundtable and community Group 2A requests
3. Next Steps

# SFIA GLS Procedure Development Schedule and Planned Outreach



SFO Roundtable TWG presentation



SFO Roundtable TWG update



Other Public Presentation (LATO/IGWG, and others)

# Group 1 Innovative GLS Approaches and Noise Monitoring



## Group 1 GLS Updates in the IFP Gateway: 21MAR24

|   |                               |                       |                              |                      |                    |  |
|---|-------------------------------|-----------------------|------------------------------|----------------------|--------------------|--|
| GLS RWY 10L, ORIG                       | SAN FRANCISCO INTL            | SFO (KSFO)            | SAN FRANCISCO, CA            | 3/21/2024            | Pending            | <input checked="" type="checkbox"/> Email FAA            |
| <del>GLS RWY 10R, ORIG</del>            | <del>SAN FRANCISCO INTL</del> | <del>SFO (KSFO)</del> | <del>SAN FRANCISCO, CA</del> | <del>3/21/2024</del> | <del>Pending</del> | <del><input checked="" type="checkbox"/> Email FAA</del> |
| RNAV (GPS) RWY 10L, AMDT 3              | SAN FRANCISCO INTL            | SFO (KSFO)            | SAN FRANCISCO, CA            | 3/21/2024            | Pending            | <input checked="" type="checkbox"/> Email FAA            |
| <del>RNAV (GPS) Y RWY 10R, AMDT 3</del> | <del>SAN FRANCISCO INTL</del> | <del>SFO (KSFO)</del> | <del>SAN FRANCISCO, CA</del> | <del>3/21/2024</del> | <del>Pending</del> | <del><input checked="" type="checkbox"/> Email FAA</del> |
| RNAV (RNP) Z RWY 10R, AMDT 3            | SAN FRANCISCO INTL            | SFO (KSFO)            | SAN FRANCISCO, CA            | 3/21/2024            | Pending            | <input checked="" type="checkbox"/> Email FAA            |

FAA IFP Gateway SFO IFP Production Plan 23AUG23

GLS Rwy 10L approach is designed with a 3.00° final approach course offset (north of the runway centerline) to achieve the lowest precision approach minimums

FAA/NATCA and Airlines, have decided to align RNAV (GPS) Rwy 10L approach to match the offset GLS approaches

GLS Rwy 10R, RNAV (GPS) Y Rwy 10R and RNAV (RNP) Z Rwy 10R are being postponed to a later date



## Group 1 GLS Updates in the IFP Gateway: 21MAR24

|                     |                    |            |                   |           |         |  |
|---------------------|--------------------|------------|-------------------|-----------|---------|--|
| GLS T RWY 28R, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS W RWY 28R, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS X RWY 28R, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS Y RWY 28L, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS Y RWY 28R, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS Z RWY 28L, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |
| GLS Z RWY 28R, ORIG | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 3/21/2024 | Pending |  |

- ← GLS-BVE Rwy 28R
- ← GLS-DB Rwy 28R
- ← GLS-BV Rwy 28R
- ← GLS-TT Rwy 28L
- ← GLS-TT Rwy 28R
- ← GLS Rwy 28L\*
- ← GLS Rwy 28R\*

\*GLS Z Rwy 28L/28R procedures are identical to existing GLS Rwy 28L/28R. When a runway has multiple approach procedures of a common navigation method, an alphabetical character is used to help differentiate them (e.g. RNAV(GPS) X RWY 28R, RNAV(RNP) Y RWY 28R, RNAV(GPS) Z RWY 28R)

## Group 1 GLS Updates in the IFP Gateway: 26DEC24

Additional criteria/FAA software changes (TARGETs) are required to accommodate the proposed GLS U (formerly GLS R concept)

|                              |                    |            |                   |            |         |  |                             |
|------------------------------|--------------------|------------|-------------------|------------|---------|--|-----------------------------|
| GLS U RWY 28R, ORIG          | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 12/26/2024 | Pending |  | <a href="#">✉ Email FAA</a> |
| RNAV (RNP) Y RWY 28R, AMDT 6 | SAN FRANCISCO INTL | SFO (KSFO) | SAN FRANCISCO, CA | 12/26/2024 | Pending |  | <a href="#">✉ Email FAA</a> |

← GLS-R Rwy 28R

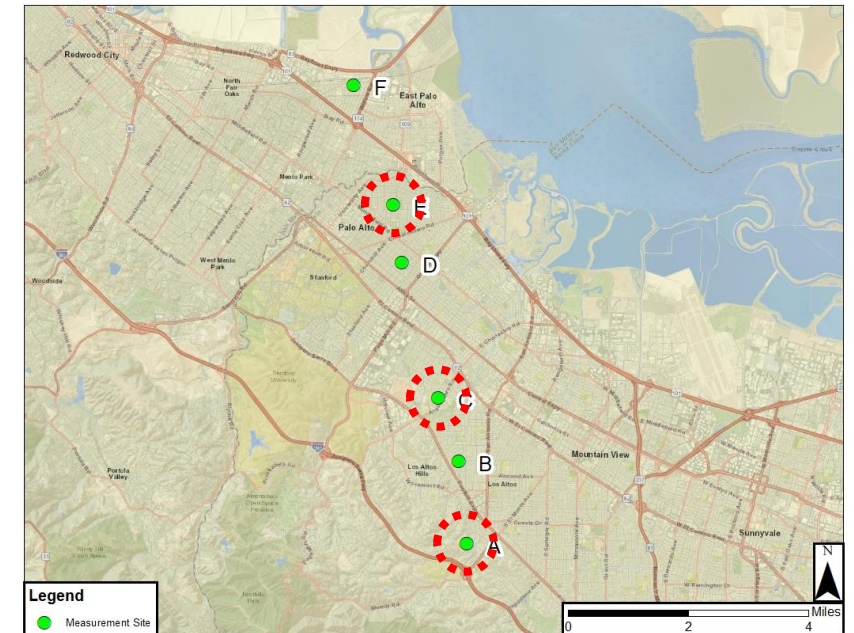
Procedure publication has slipped to 26DEC24 and will involve small modification to the RNAV (RNP) Y Rwy 28R to ensure that common waypoints (lateral) are used

# Group 1 Monitoring Following FAA Implementation (MAR24)

SFO is currently evaluating quarterly monitoring and reporting practices to be implemented upon FAA publication of Group 1 Innovative Approaches

Key Considerations:

- 3 temporary noise monitoring locations (A, C, E), supplemented by permanent monitor site 12 data (Foster City)
- SFO GBAS Project team is working with FAA on how SFO will be informed about GBAS usage and specific GLS procedure utilization
- SFO will actively investigate GLS approaches that do not perform as expected
- SFO's noise reduction goal is for Group 1 GLS approaches to maintain average noise levels at each noise monitor that are lower than non-GLS approaches
- Similar to the GBAS Noise Measurement Report, the GLS Noise Monitoring Report will include Lmax and SEL noise levels, altitude, speed of GLS approaches and comparable non-GLS approaches and describe whether the GLS approaches are meeting the Airport's expectations



Areas considered for  
Temporary noise monitors

# Reporting on Innovative Group 1 GLS Approaches

## Roundtable Portable Monitoring

## GBAS Noise Measurement Report

**MEMORANDUM**

**TO:** PALO ALTO COMMUNITY  
**FROM:** SAN FRANCISCO INTERNATIONAL AIRPORT  
**SUBJECT:** PALO ALTO SHORT TERM NOISE MONITORING  
**DATE:** February 11, 2021

The San Francisco International Airport (SFO) in Palo Alto to determine the noise levels with monitoring occurs 4 times per year for approval period occurred between December 15 and 16 with the assistance of a Palo Alto resident.

Palo Alto is located approximately 17 miles southwest of SFO. The majority of SFO aircraft noise events recorded a noise event were mostly at altitudes included general aviation traffic from Palo Alto approximately 7% and 6% of aircraft noise events traveled the monitoring site while SEL (departures) sources of noise which caused noise from a generator, and tree-trimming at the site.

The noise monitor thresholds were 52 dBA for period, the overall Aircraft Community Noise Equivalent Level (CNEL) was 52 dBA and 55 dBA CNEL by 2.3 dBA.

During the noise monitoring period, the SFO Palo Alto residents. Most of the noise reports were from the majority of SFO aircraft noise events recorded a noise event were mostly at altitudes above ambient levels may have been reported due to the proximity of the Airport.

This report includes 15 parts (charts and graphs) data (values are subject to rounding) collected used in this report are described in the Appendix.

**GBAS Noise Measurement Report**  
 Group 1 Innovative Approach Procedures

March 2022

PREPARED BY  
 San Francisco International Airport

San Francisco International Airport  
 March 2022

**H - Noise Levels of the Most Frequent Aircraft**

| Site A            |              |              | Site B            |              |              | Site C            |              |              |
|-------------------|--------------|--------------|-------------------|--------------|--------------|-------------------|--------------|--------------|
| Aircraft / Events | Avg SEL (dB) | Duration (h) | Aircraft / Events | Avg SEL (dB) | Duration (h) | Aircraft / Events | Avg SEL (dB) | Duration (h) |
| E75L / 266        | 67           | 54           | E75L / 317        | 66           | 53           | E75L / 341        | 67           | 53           |
| A320 / 219        | 69           | 56           | A320 / 244        | 69           | 56           | A320 / 270        | 70           | 57           |
| B738 / 158        | 70           | 57           | CRJ2 / 182        | 64           | 50           | B738 / 224        | 70           | 56           |

**I - Noise Levels of Loudest SFO Aircraft Arrival Events\***

| Site A                 |          |              | Site B                 |          |              | Site C                 |          |              |
|------------------------|----------|--------------|------------------------|----------|--------------|------------------------|----------|--------------|
| Aircraft / Date / Time | SEL (dB) | Duration (h) | Aircraft / Date / Time | SEL (dB) | Duration (h) | Aircraft / Date / Time | SEL (dB) | Duration (h) |
| B748 / 12/16/2021 0:39 | 82       | 74           | B748 / 12/16/2021 0:39 | 83       | 74           | B748 / 12/16/2021 0:39 | 84       | 76           |
| B748 / 12/16/2021 0:38 | 82       | 70           | B748 / 12/16/2021 0:38 | 82       | 70           | B748 / 12/16/2021 0:13 | 83       | 73           |
| B748 / 12/16/2021 0:13 | 81       | 71           | B748 / 12/16/2021 0:13 | 82       | 72           | B748 / 12/16/2021 0:38 | 82       | 72           |

\*Noise events in BOLD were made up of simultaneous aircraft noise and community noise.

**J - Comparison of Existing and GLS Approach Procedures (Boeing 737)**

| Approach Type        | Number of Arrivals | Site A              |                   |                 | Site B              |                   |                 | Site C              |                   |                 |
|----------------------|--------------------|---------------------|-------------------|-----------------|---------------------|-------------------|-----------------|---------------------|-------------------|-----------------|
|                      |                    | Avg SEL / Lmax (dB) | Avg Altitude (ft) | Avg Speed (kts) | Avg SEL / Lmax (dB) | Avg Altitude (ft) | Avg Speed (kts) | Avg SEL / Lmax (dB) | Avg Altitude (ft) | Avg Speed (kts) |
| Non-GLS Approaches   | 5                  | 71/58               | 6,206             | 236             | 72/59               | 5,957             | 236             | 72/60               | 5,656             | 236             |
| Test RNAV Approaches | 4                  | 68/56               | 5,900             | 252             | 68/55               | 5,799             | 253             | 68/55               | 5,505             | 254             |
| Test GLS Approaches  | 3                  | 66/54               | 5,883             | 252             | 67/54               | 5,833             | 251             | 67/54               | 5,625             | 253             |

San Francisco International Airport  
 March 2022

Appendix A

Test Approach Noise Events

| Site | Date/Time       | Procedure            | SEL (dB) | Lmax (dB) | Duration (s) |
|------|-----------------|----------------------|----------|-----------|--------------|
| A    | 12/20/21 18:40  | RNAV (GPS) RWY 28L   | 68.4     | 58        | 51           |
| A    | 12/20/21 18:57  | GLS-A RWY 28L        | 65.4     | 52.7      | 37           |
| A    | 12/20/21 19:19  | RNAV (GPS) 2 RWY 28R | 68       | 63.1      | 32           |
| A    | 12/20/21 19:38  | GLS-A RWY 28R        | 65.8     | 52.8      | 57           |
| A    | 12/16/2021 8:35 | RNAV (RNP) Y RWY 28R | 69.4     | 57.7      | 36           |
| A    | 12/16/2021 8:35 | RNAV (GPS) RWY 28L   | 69.3     | 56.7      | 31           |
| A    | 12/16/2021 7:10 | GLS-R RWY 28R        | 69.7     | 55.5      | 35           |
| A    | 12/16/2021 7:28 | GLS-A RWY 28L        | 67.6     | 55.9      | 41           |
| A    | 12/20/21 18:57  | GLS-A RWY 28L        | 65.4     | 51.3      | 56           |
| B    | 12/20/21 18:19  | RNAV (GPS) 2 RWY 28R | 64.1     | 50.8      | 35           |
| B    | 12/20/21 19:39  | GLS-A RWY 28R        | 64.9     | 51.8      | 57           |
| B    | 12/16/2021 8:35 | RNAV (RNP) Y RWY 28R | 69.5     | 58.5      | 36           |
| B    | 12/16/2021 8:34 | RNAV (GPS) RWY 28L   | 69.3     | 57.7      | 32           |
| B    | 12/16/2021 7:10 | GLS-R RWY 28R        | 69.9     | 57.7      | 42           |
| B    | 12/16/2021 7:28 | GLS-A RWY 28L        | 68.4     | 55.5      | 53           |
| C    | 12/20/21 18:40  | RNAV (GPS) RWY 28L   | 64.7     | 52.8      | 44           |
| C    | 12/20/21 18:57  | GLS-A RWY 28L        | 64.3     | 51.1      | 61           |
| C    | 12/20/21 19:19  | RNAV (GPS) 2 RWY 28R | 64.9     | 51.8      | 49           |
| C    | 12/20/21 19:39  | GLS-A RWY 28R        | 64.2     | 51.5      | 48           |
| C    | 12/16/2021 8:35 | RNAV (RNP) Y RWY 28R | 68.2     | 57.5      | 29           |
| C    | 12/16/2021 8:34 | RNAV (GPS) RWY 28L   | 70.1     | 62.4      | 33           |
| C    | 12/16/2021 7:10 | GLS-R RWY 28R        | 70.4     | 59.3      | 34           |
| C    | 12/16/2021 7:28 | GLS-A RWY 28L        | 68.8     | 57.6      | 35           |
| D    | 12/20/21 18:41  | RNAV (GPS) RWY 28L   | 68.6     | 58.3      | 33           |
| D    | 12/20/21 18:57  | GLS-A RWY 28L        | 69.3     | 62.2      | 45           |
| D    | 12/20/21 19:19  | RNAV (GPS) 2 RWY 28R | 70.1     | 57.2      | 46           |
| D    | 12/20/21 19:39  | GLS-A RWY 28R        | 65.2     | 52.7      | 45           |
| D    | 12/16/2021 8:36 | RNAV (RNP) Y RWY 28R | 70.5     | 59.5      | 32           |
| D    | 12/16/2021 8:34 | RNAV (GPS) RWY 28L   | 72.1     | 60.7      | 32           |
| D    | 12/16/2021 7:11 | GLS-R RWY 28R        | 72.8     | 62.2      | 35           |
| D    | 12/16/2021 7:29 | GLS-A RWY 28L        | 70.1     | 56.1      | 54           |
| E    | 12/20/21 18:41  | RNAV (GPS) RWY 28L   | 66.4     | 55.5      | 29           |
| E    | 12/20/21 18:58  | GLS-A RWY 28L        | 69.1     | 53        | 28           |
| E    | 12/20/21 19:20  | RNAV (GPS) 2 RWY 28R | 72.8     | 63.6      | 34           |
| E    | 12/20/21 19:40  | GLS-A RWY 28R        | 64.5     | 53.1      | 26           |
| E    | 12/16/2021 8:36 | RNAV (RNP) Y RWY 28R | 70.5     | 58.1      | 31           |

# GBAS Noise Monitoring Report

## Flight performance and comparison to procedures

- Flight track maps
- Altitude and speed at various points along the flight path

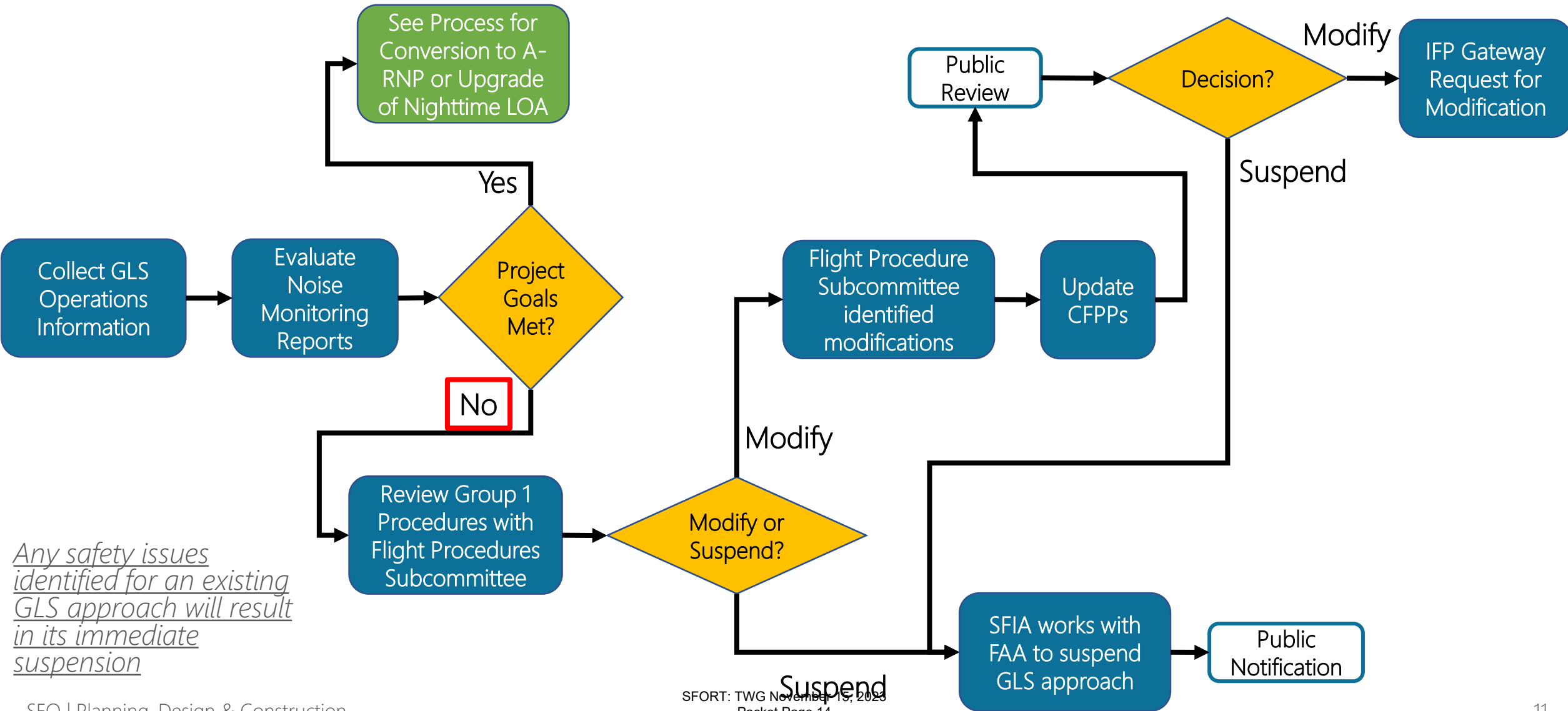
## Noise metrics

- Average and individual Sound Exposure Level (SEL), Maximum Sound Level (Lmax) to compare procedures
- Aircraft and community Community Noise Equivalent Level (CNEL), Average Ambient Noise Level, Number of Events Above (NA)
- Percentage of events by Aircraft Types, Operation Types, noise complaints/reports

## Include all single GLS arrival events at noise monitors

## Compliance with Project Goals and status of consideration for conversion to A-RNP

# Process for Reviewing Non-Performing GLS Procedures



*Any safety issues identified for an existing GLS approach will result in its immediate suspension*

# Group 2A Innovative GLS Approaches



SFIA GBAS Flight Procedures Subcommittee has developed the following Group 2A GLS concept approaches for public evaluation

1. GLS CAT II Rwy 28R\*\* – Addition of CAT II minimums to current GLS overlay approach on Rwy 28R
  2. GLS CAT II Rwy 19L – Addition of CAT II minimums to current GLS overlay approach on Rwy 19L
  3. GLS SB Rwy 19L - New approach to Rwy 19L which overlays vector path used heavily by NCT during Southeast Flow
  4. GLS DB1 Rwy 28R – SFO Roundtable suggested procedure
  5. GLS OW1 Rwy 28R – SFO Roundtable suggested procedure
  6. GLS OW2 Rwy 28R – SFO Roundtable suggested procedure
- } Pick Either  
5. or 6.

## SFO GBAS Website

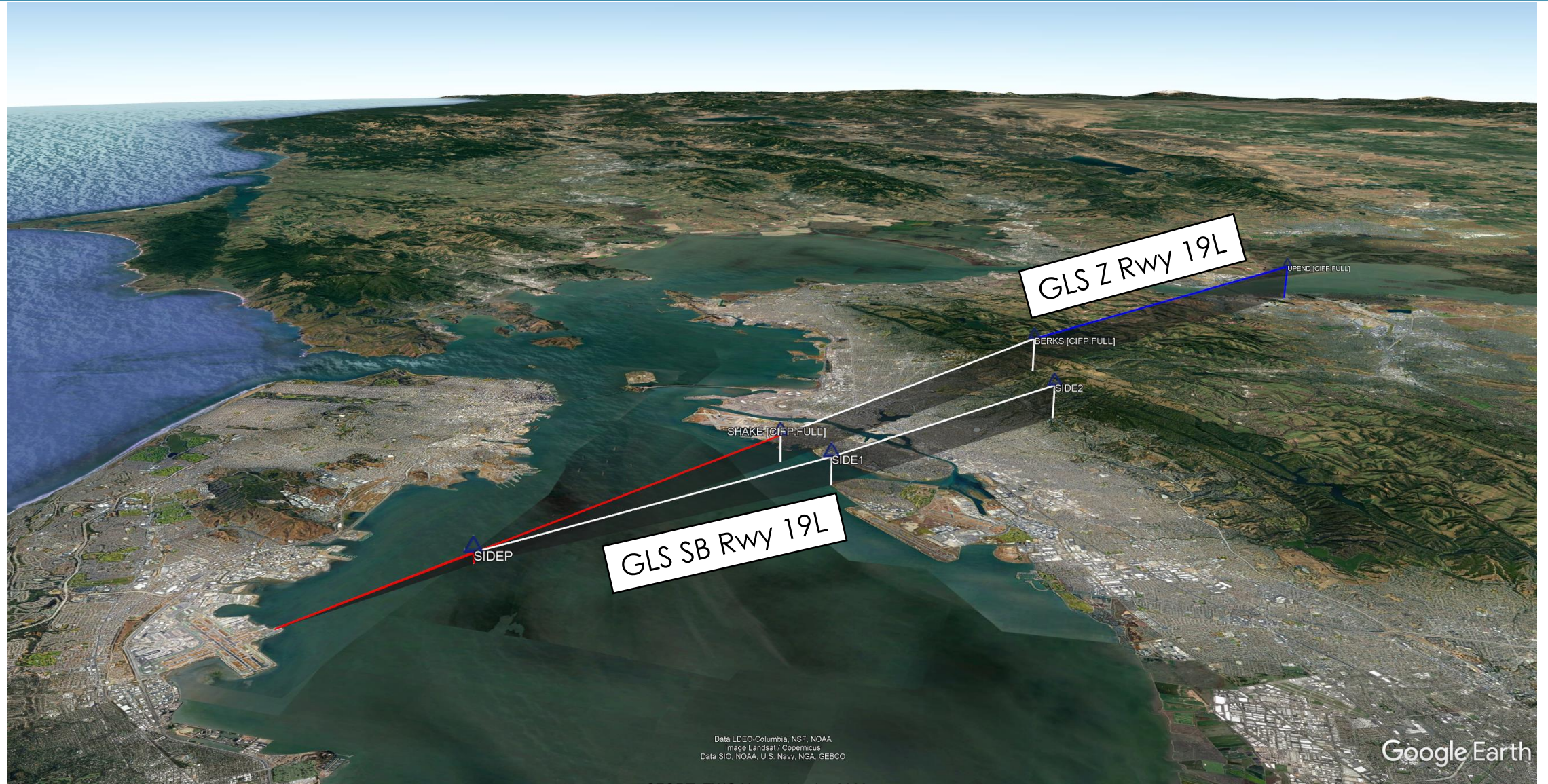
<https://noise.flysfo.com/noise-efforts/ground-based-augmentation/innovative-approach-procedures/>

\*\*GLS CAT II Rwy 28R CFPPs divided into ARCHI and EDDYY transition





### 3. GLS SB Rwy 19L Comparison with GLS Z Rwy 19L



Data LDEO, Columbia, NSF, NOAA  
Image Landsat / Copernicus  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

# 4. GLS DB1 Rwy 28R

## GLS DB1 Rwy 28R

SFO Roundtable suggested procedure that provides an additional "Down the Bay" track with more aggressive residential avoidance

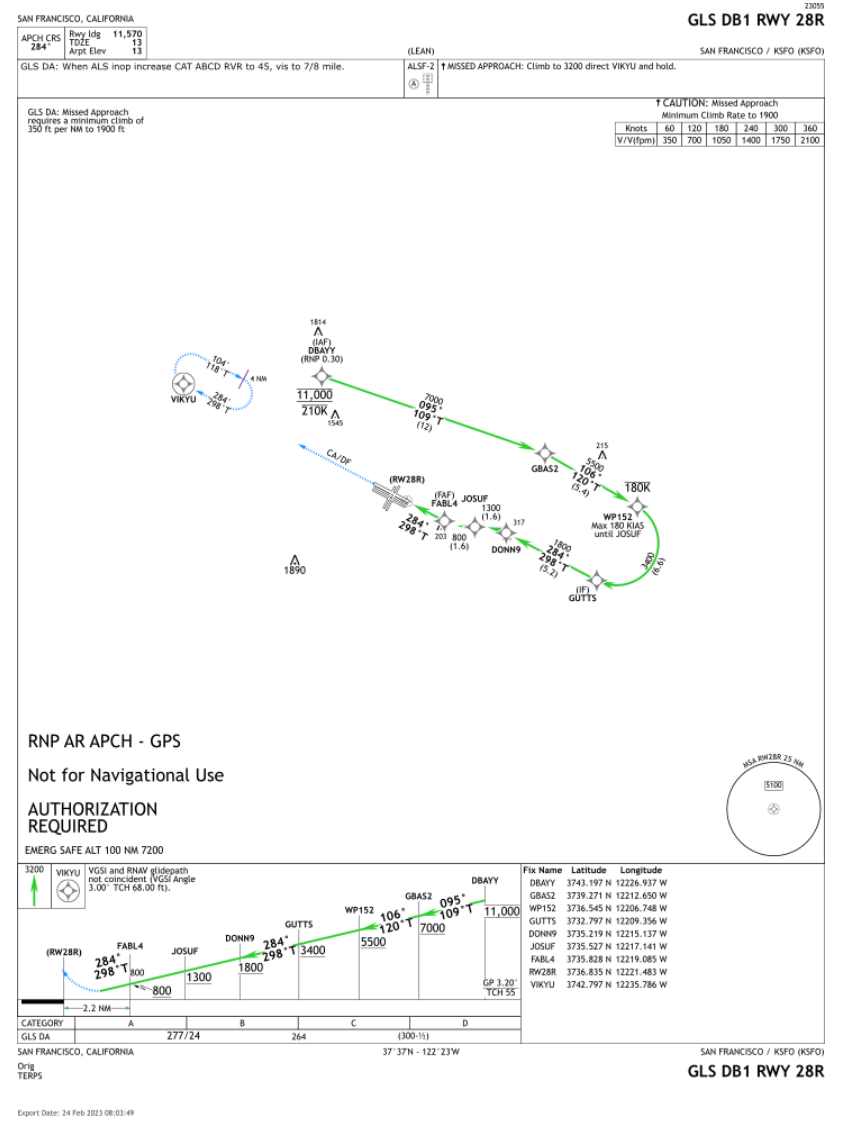
Procedure is intended be used by NCT 24/7/365 up to CAT I conditions

Altitudes and speed restrictions were designed to

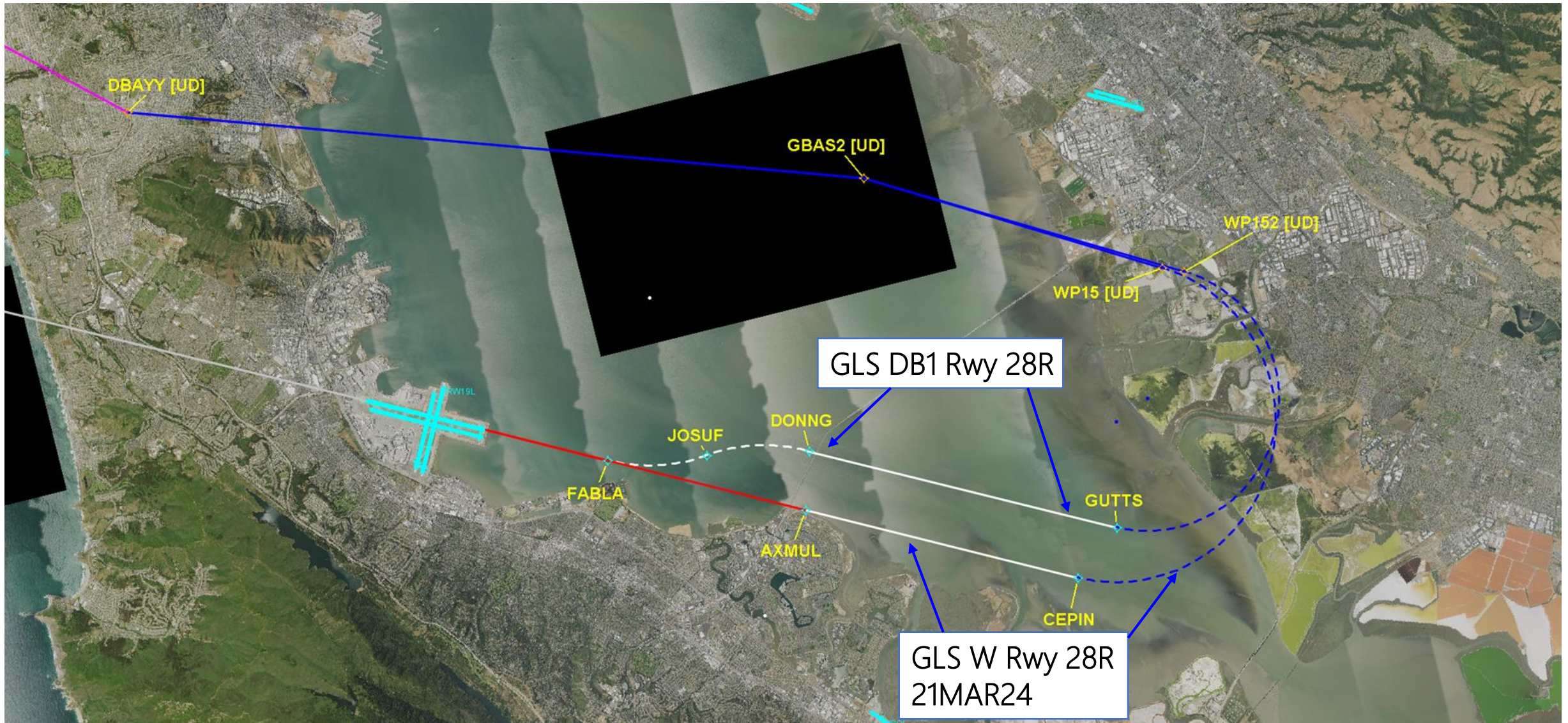
- Mimic the same GLS-W (Down the Bay) path
- Connect to the current RNP-Y / GLS U Rwy 28R approach
- 180 KIAS Restriction intended to reduce the required bank to 20 Degrees

SFIA GBAS Project Team plans to review this approach with the OAK Noise Forum

This would not be a replacement of the GLS-DB Rwy 28R



# GLS DB1 Rwy 28R vs GLS W Rwy 28R



# 5. GLS OW1 Rwy 28R

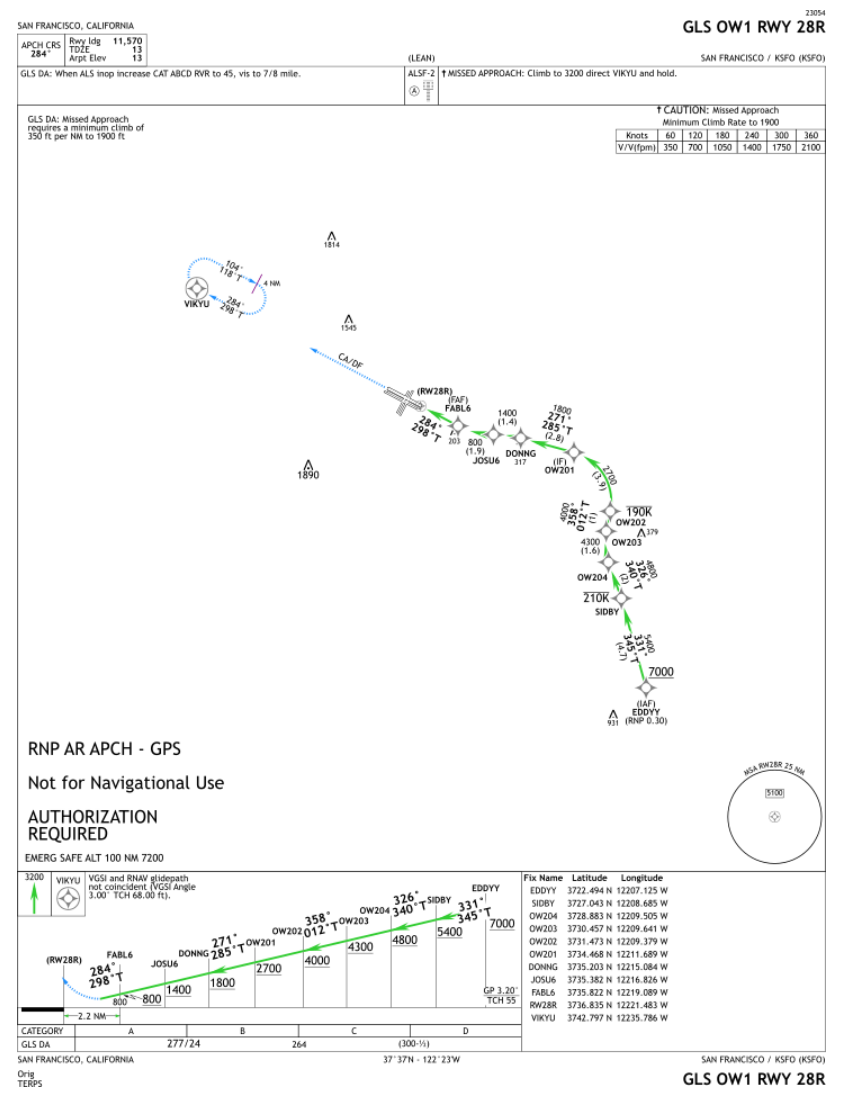
## GLS OW1 Rwy 28R

SFO Roundtable suggested procedure that creates possibility for noise reduction by increasing over water usage for flights originating from EDDYY

Procedure is intended be used by NCT only at nighttime up to CAT I conditions (22:00 – 07:00 L)

Altitudes and speed restrictions were designed to

- Avoid creating any "new" ground tracks over residential areas
- Avoid turning until crossing Highway 84
- Increase overwater usage
- Maximize altitude at EDDYY
- Speed Restrictions required to achieve turns



# 6. GLS OW2 Rwy 28R

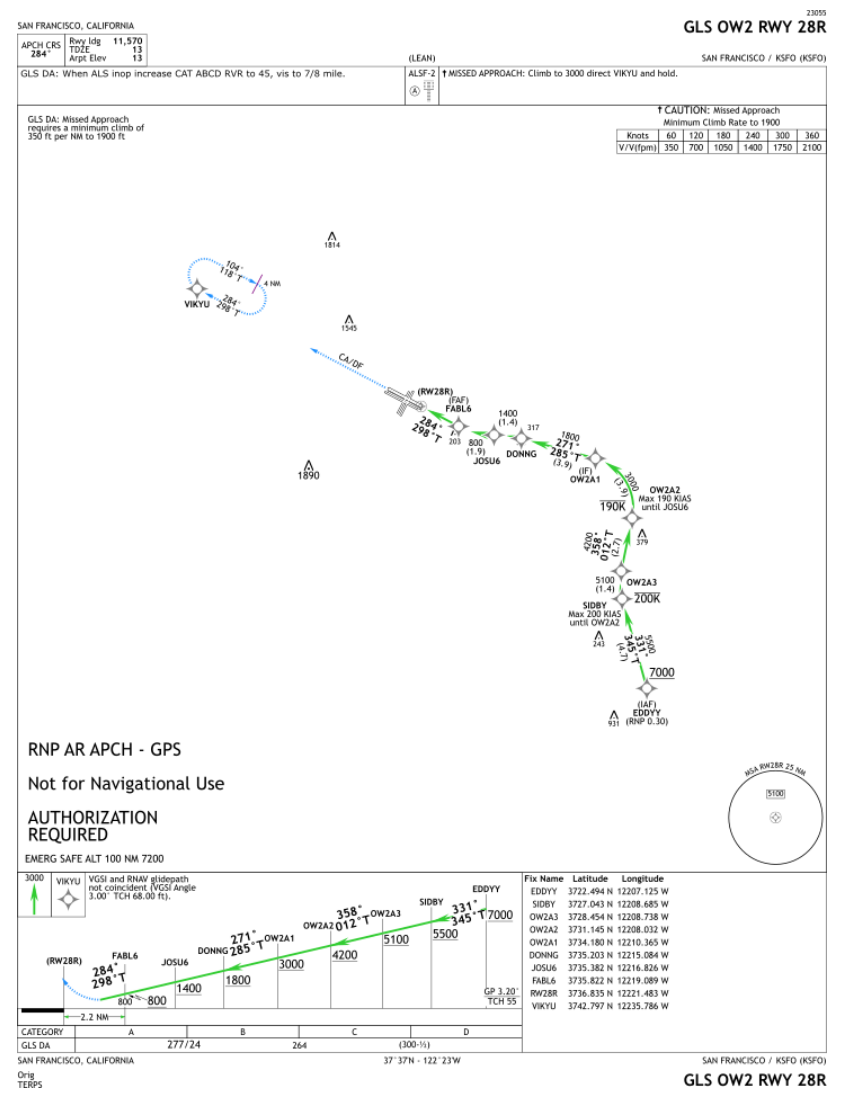
## GLS OW2 Rwy 28R

SFO Roundtable suggested procedure that creates possibility for noise reduction by increasing over water usage for flights originating from EDDYY

Procedure is intended be used by NCT only at nighttime up to CAT I conditions (22:00 – 07:00 L)

Altitudes and speed restrictions were designed to

- Avoid creating any "new" ground tracks over residential areas
- Turn aircraft parallel to Dumbarton Bridge
- Increase overwater usage
- Maximize altitude at EDDYY
- Speed Restrictions required to achieve turns



# GLS OW1, OW2 and R Rwy 28R Comparison



## Both GLS OW1 and OW2 Rwy 28R

Have higher altitudes over residential areas when compared to existing approaches

Have lower initial approach speeds which are less likely to require the use of speed brakes or early flap deployment

Turn aircraft over the Bay before configuring for landing (landing gear and landing flap deployment)

## Small Differences

AEDT calculated noise reduction suggests that both procedures may reduce noise, but GLS OW2 has more potential to reduce noise over residential areas when compared to GLS OW1

GLS OW1 is very similar to GLS-U Rwy 28R while GLS OW2 approximates the maximum practical over the Bay path for approaches starting at EDDYY

We are seeking feedback from the SFO Roundtable on which of these procedures to take forward: Either GLS OW1 or GLS OW2



GBAS Project Team is seeking approval from SFO Roundtable and members of the public on which Group 2A CFPPs to submit to the FAA by 28DEC2023

Similar to Group 1 procedures, Group 2A procedures will be monitored for noise and evaluated for increased utilization opportunities either during additional times of day or two other runways if possible

As a reminder, either the GLS-OW1 or GLS-OW2 may be requested for FAA development, but not both procedures

# Questions?



[SFO.GBAS@flysfo.com](mailto:SFO.GBAS@flysfo.com)



## MEMORANDUM

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**To:** SFO Community Roundtable Technical Working Group

**From:** Jason R. Stoddard, Senior Airspace Analyst  
Sarah C. Yenson, Principal Consultant  
Eugene M. Reindel, Vice President

**Date:** November 9, 2023

**Subject:** Review of SFO GLS Group 2A Innovative Approach Procedures

**Reference:** HMMH Project Number 312310

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HMMH reviewed the following seven draft GLS Innovative Approach Procedures for San Francisco International Airport (SFO) as per the request received on October 13, 2023.

- Group 2A
  - GLS-CAT II 28R | ARCHI
  - GLS-CAT II 28R | EDDYY
  - GLS-CAT II 28R | UPEND
  - GLS-SB 19L | COGGR
  - GLS-DB1 28R | DBAYY
  - GLS-OW1 28R | EDDYY
  - GLS-OW2 28R | EDDYY

The intent of our review was to analyze the overall net noise impact of the procedures when compared to either previously developed GLS procedures, existing procedures currently in use (ILS), or known ATC vectoring paths. For this analysis, HMMH reviewed the GBAS Innovative Approach Procedures documentation provided on SFO's noise website (<https://noise.flysfo.com/noise-efforts/ground-based-augmentation/innovative-approach-procedures/>), as well as existing aviation sectional charts, terminal procedure publications (TPPs) and satellite imagery for reference.

HMMH did not perform a rigorous technical analysis for these draft procedures, nor did we review aircraft performance characteristics. Our review focused on the possible change in single-even noise levels (SEL) from aircraft on the proposed procedures when compared with previously developed GLS procedures, existing procedures or known ATC vectors. As a rule of thumb, single-event noise levels that change by less than 1 dB are not perceptible, single-event noise levels that change between 1 and 3db are barely noticeable, changes between 3 and 5 dB are generally noticeable, and changes of greater than 5db are quite noticeable and can be perceived as twice as loud or half as loud. HMMH accepts any change of less than 1 dB as being no perceptible change. A shifting of noise may occur when a flight path is moved laterally, so our review included an assessment of the effect of lateral shifts in the proposed procedures when comparing to existing or previously developed procedures.

### Group 2A: GLS-CAT II 28R | ARCHII, EDDYY, UPEND transitions

The GLS-CAT II 28R procedures from ARCHII, EDDYY and UPEND have all been selected to include Category II approaches in addition to the standard Category I. CAT II approaches follow all the same altitudes and flight path as CAT I approaches, however the decision height (DH) can be reduced to less than 200ft (60m) but not lower than 100ft (30m). CAT II approaches also reduce the runway visual range (RVR) required to less than 2400ft (800m) but not less than 1200ft (350m). Aircraft flying a CAT II

approach as opposed to the CAT I version of the approach should exhibit no perceptible change to anyone outside the cockpit. HMMH supports the continued development of the GLS-CAT II 28R approaches as they provide additional flexibility to ATC and pilots, while being transparent from a noise perspective for surrounding communities.

### Group 2A: GLS-SB 19L | COGGR

The GLS-SB RWY 19L procedure is an overlay of an existing ATC Vector arrival frequently used during southeast flow operations which flies over the East Bay communities. This procedure is not aimed at noise reduction, but does hope to achieve ILS redundancy, increased efficiency and reduced delays which may impact the broader noise environment in a positive way.

As the GLS-SB 19L is based on existing ATC vectors, we did not have noise data to compare the approach to for accurate SEL changes. The path of the GLS-SB 19L approach is shifted slightly from the predominant path used by ATC between WP SIDE2 and WP SIDE1, which is located over East Bay communities. This may cause a slight shift in the SEL contours for some residents in the East Bay and the overall change should be minimal. HMMH supports the continued development of the GLS-SB 19L | COGGR approach and suggests further analysis into the effects on East Bay residents.

### Group 2A: GLS-DB1 28R | DBAYY

The GLS-DB1 RWY 28R procedure is an alternative to the GLS-DB RWY 28R procedure proposed in Group 1 of the GBAS IA's, which flies over the northern peninsula and southern East Bay communities. This procedure aims to achieve noise reduction, increase usage of over water procedures, ILS redundancy, increase efficiency and reduction of delays.

This approach uses a very similar flight path until the 180 degree turn back toward RWY 28R. After the turn, the GLS-DB1 28R maintains a ground track over water, as opposed to the previous GLS-DB approach which is not entirely over water. Throughout Narrowbody 1&2 type aircraft as well as Widebody 1&2 type aircraft, reduction in overall SEL contours was seen over land, thus positively impacting the communities of San Carlos, Foster City, Hayward park and surrounding areas. HMMH supports the continued development of the GLS-DB1 28R | DBAYY due to the positive shift of the SEL contours when compared to the original GLS-DB 28R approach.

### Group 2A: GLS-OW1 28R | EDDYY

GLS-OW1 RWY 28R procedure is an alternative to the GLS-U RWY 28R procedure (also known as GLS-R RWY 28R) proposed in Group 1 of the GBAS IA's, which flies over South Bay communities. If requested for development, this noise abatement procedure will only be available between 22:00 – 07:00 local time.

This procedure was compared to the GLS-U RWY 28R as well as the ILS or LOC RWY 28R. The proposed GLS-OW1 procedure is both higher and slower than the approaches it was compared to. This was done with the intention of reducing overall noise impacts, but the slower speed may have a negative impact on SEL calculations. SEL uses both magnitude and duration in its calculation, and due to the longer duration caused by slower speeds some communities may experience an increase in SEL levels. While most of these increases are in the imperceptible to slightly perceptible range, they are all seen with the comparison to the GLS-U RWY 28R. When comparing the GLS-OW1 to the existing ILS or LOC RWY 28R, the effect is almost entirely positive, with only a few communities experiencing a negative change around the 50dB SEL contour.

## Group 2A: GLS-OW2 28R | EDDYY

The GLS-OW2 RWY 28R procedure is an alternative to the GLS-U RWY 28R procedure (also known as GLS-R RWY 28R) proposed in Group 1 of the GBAS IA's, which flies over South Bay communities. If requested for development, this noise abatement procedure will only be available between 22:00 – 07:00 local time.

The GLS-OW2 RWY 28R procedure is very similar to its OW1 counterpart but maintains a slightly higher altitude and slightly slower speed than the OW1 approach. It also includes a wider turn towards the runway, moving the ground track further into the bay.

When compared to the GLS-U RWY 28R, the OW2 performs well and shows mostly positive changes for communities south of SFO. These positive changes diminish slightly as the approach is performed by a widebody type aircraft as opposed to a narrowbody aircraft. Widebody aircraft performing this procedure may impact the lower SEL contours and push them further into East Bay communities.

In comparison to the ILS or LOC RWY 28R approach, the GLS-OW2 shows significant positive change for residents surrounding the airport. If the procedure is performed by a widebody 2 type aircraft, there is potential for increased SEL events for some East Bay communities.

## Group 2A: GLS-OW1 vs. GLS-OW2

Both the GLS-OW1 and GLS-OW2 approaches to RWY 28R have been proposed as nighttime only procedures. Additionally, only one of the two approaches can be recommended for further development. While both approaches share similar noise profiles and initial utility, the GLS-OW2 RWY 28R approach may provide additional utility in a Multiple Airport Route Separation (MARS) and Time-Based Flow Management (TBFM) as it is a slightly slower approach and takes a more indirect path to the runway. This would allow ATC to accomplish safe separation based on approach assignment, rather than traditional means, such as vectoring and altitude adjustments. Considering this possibility, we believe the GLS-OW2 approach to be the best candidate for further development.

## Summary

HMMH concurs with the assessments regarding the single-event noise levels associated with the analyses for the applicable GBAS procedures in this document. The documentation for these procedures does not capture the expected change in usage from the existing procedures to the proposed GBAS procedures. If the expected usage of the procedure goes up as a result of GBAS implementation, the cumulative exposure may increase. We do not believe this is an expectation on any of the procedures we evaluated.

HMMH suggests further analysis and discussion regarding the potential impact implementation of these procedures may have on some East Bay communities. All other aspects of the proposed group 2A procedures appear to have been well developed and show promise for noise reduction, increased efficiency and delay reduction.

# Review of Proposed GLS Group 2A Innovative Approach Procedures at SFO

November 15, 2023

# Background

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- Per request of SFO Roundtable, HMMH reviewed seven (7) proposed GLS Innovative Approach Procedures at SFO
  - Group 2A:
    - GLS CAT II 28R|ARCHI
    - GLS CAT II 28R|EDDYY
    - GLS CAT II 19L|UPEND
    - GLS-SB 19L|COGGR
    - GLS-DB1 28R|DBAYY
    - GLS-OW1 28R|EDDYY
    - GLS-OW2 28R|EDDYY
- Purpose of review
  - Affirm the Airport's assertions regarding changes to noise
  - Advise Roundtable on procedure acceptance



# Review Methodology

- Conducted a basic review using
  - GBAS Innovative Approach Procedure documentation from Airport website
  - Satellite imagery and estimated population centers
  - Aviation sectional charts and instrument procedure charts
  - Additional documentation from Airport including comparisons to previously developed GLS procedures, existing ILS procedures and historical ATC vectoring paths.
- Noise may shift when flight paths move laterally, so this review included assessments of lateral shifts as proposed in the procedures.
- We did not conduct a rigorous technical review nor an analysis of aircraft performance characteristics or procedures.
- This review focused on the possible change in single-event noise levels from aircraft on the proposed procedures as compared to the existing procedures or previously developed GLS procedures.

Generally, changes to single-event noise levels are perceptible to the ear as follows:

- < 1 dB: not perceptible
- 1 – 3 dB: barely noticeable
- 3 – 5 dB: noticeable
- > 5 dB: very noticeable; usually experienced as twice as loud or half as loud
- HMMH considers changes of < 1 dB as no perceptible change.



# GLS-CATII 28R (ARCHI & EDDYY) 19L (UPEND)

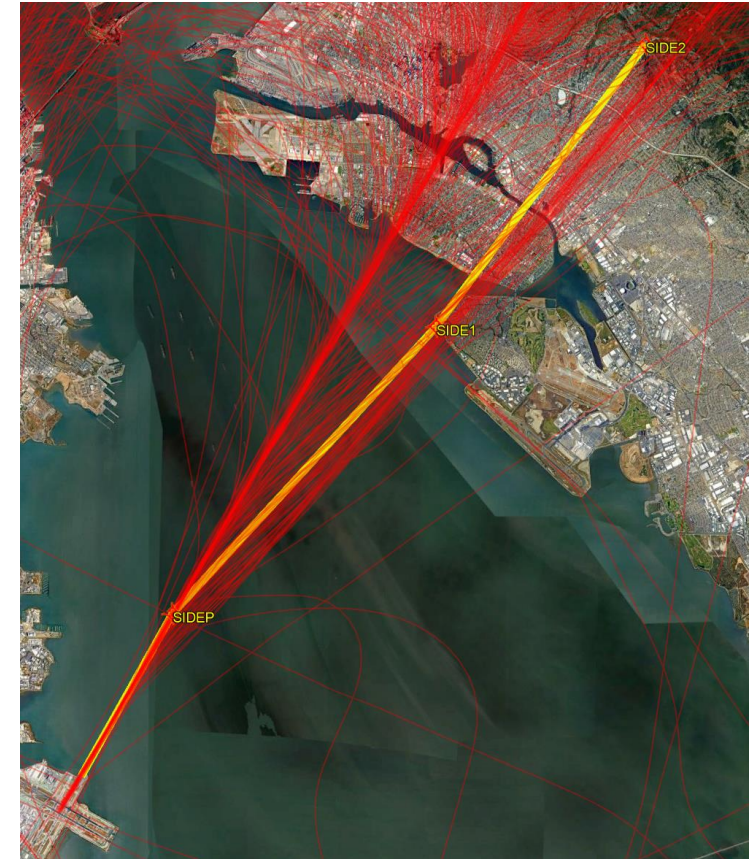
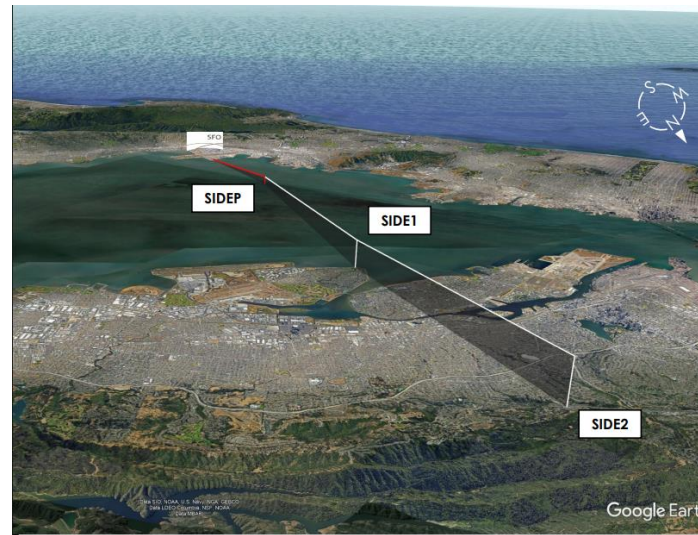
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- The addition of CAT II minimums allows aircraft equipped with the proper personnel and equipment to reduce their decision height (DH) and Runway Visual Range (RVR).
- This should be transparent to the community, and not have any detrimental effect to the existing noise environment.



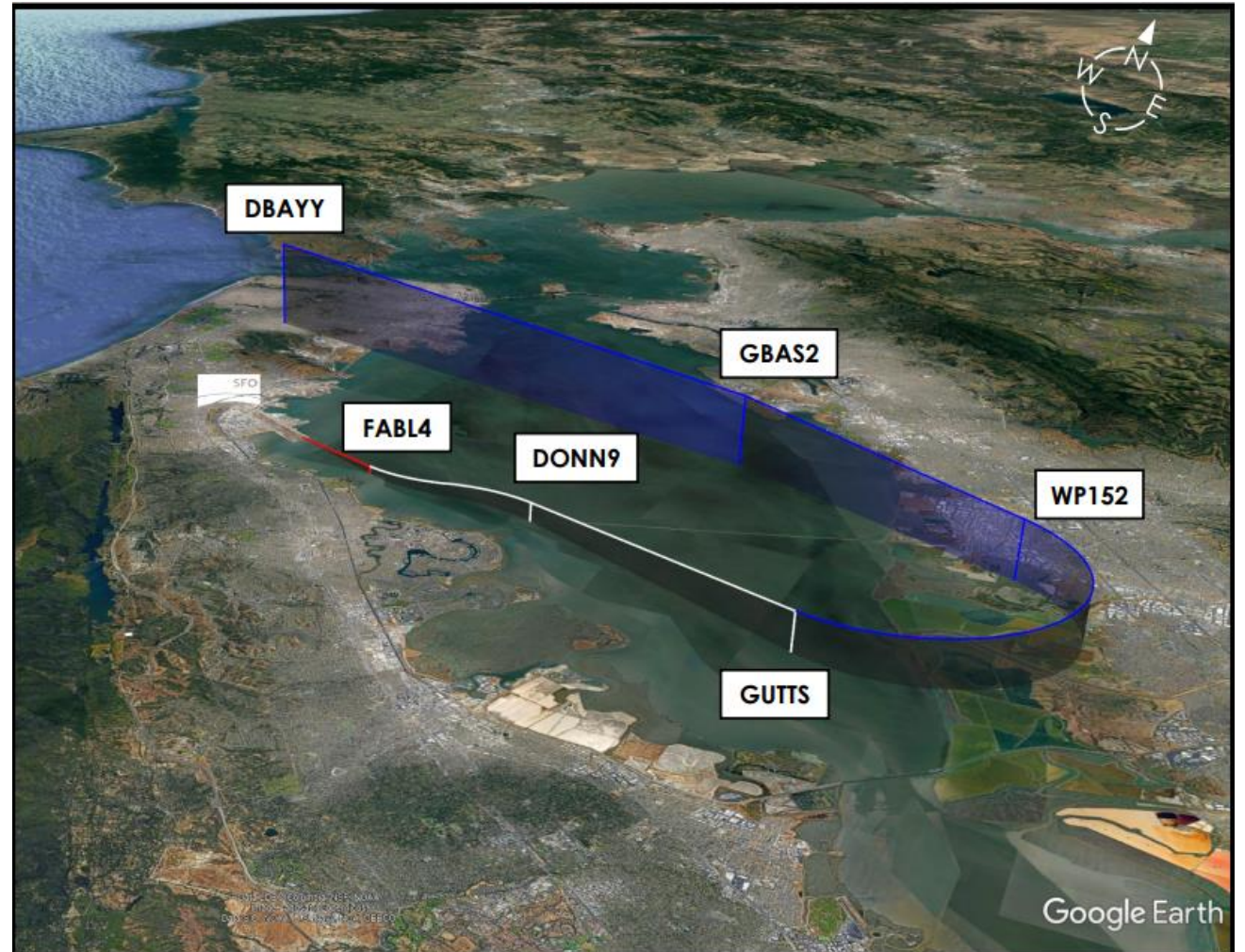
# Group 2A: GLS-SB 19L | COGGR

- Proceduralizes vectors issued by ATC for aircraft arriving from the northeast to the Runway 19L.
- Historical arrivals to SFO Runway 19L are consistent with the proposed flight path of the GLS-SB 19L
- Slight lateral shift to northwest between WP SIDE2 and SIDE1
- No change in current single-event noise levels would be expected for South Bay residents



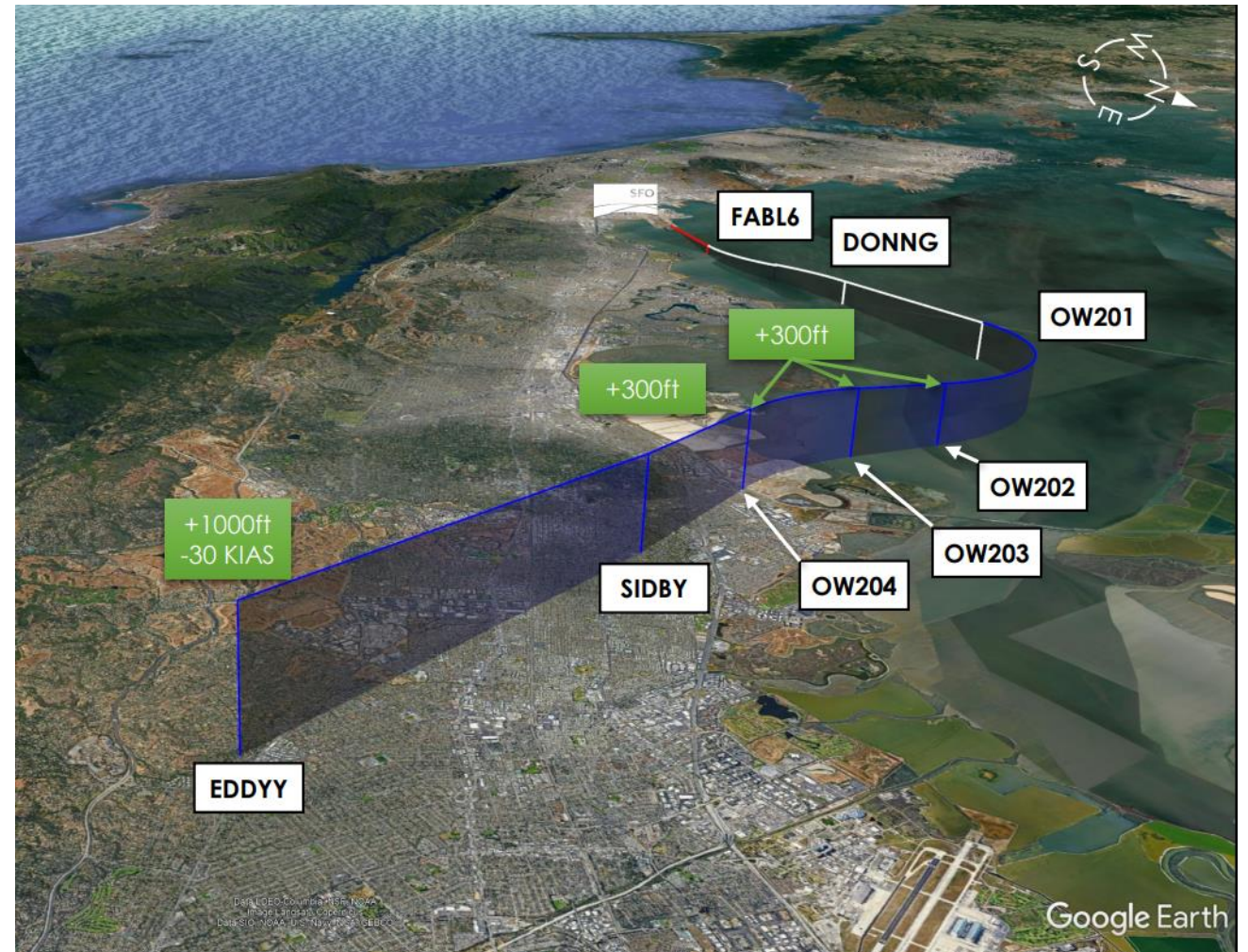
# Group 2A: GLS-DB1 28R | DBAYY

- Based originally on historical ATC vectoring paths, and on the Group 1 GLS-DB Runway 28R | DBAYY
- Paths are consistent until WP152, where the updated procedure aims to keep aircraft within the lateral confines of the bay.
- Potential decrease in SEL levels for communities south of proposed flight path when compared to the Group 1 GLS-DB Runway 28R | DBAYY
- Primary noise benefits to residents of San Carlos, Foster City, Hayward Park and neighboring communities with benefits expanding south for widebody aircraft



# Group 2A: GLS-OW1 28R (Nighttime only)

- Higher initial altitudes compared to GLS-U 28R and ILS 28R may help improve noise impacts
- Slower speed through approach compared to GLS-U 28R and ILS 28R
- Ground track is consistent with GLS-U 28R and ILS 28R until the Palo Alto area, where the GLS-OW1 stays west of previous paths at a higher altitude
- In comparison with the GLS-U 28R, residents in vicinity of Menlo Park, North Fair Oaks, and Redwood city (expanding west as the aircraft moves to widebody) may see and increase in SEL noise events, due to the slower speed and more westerly track of the approach
- In contrast to the GLS-U 28R comparison, the GLS-OW1 shows net positive noise effects across all aircraft body types when compared to the ILS 28R



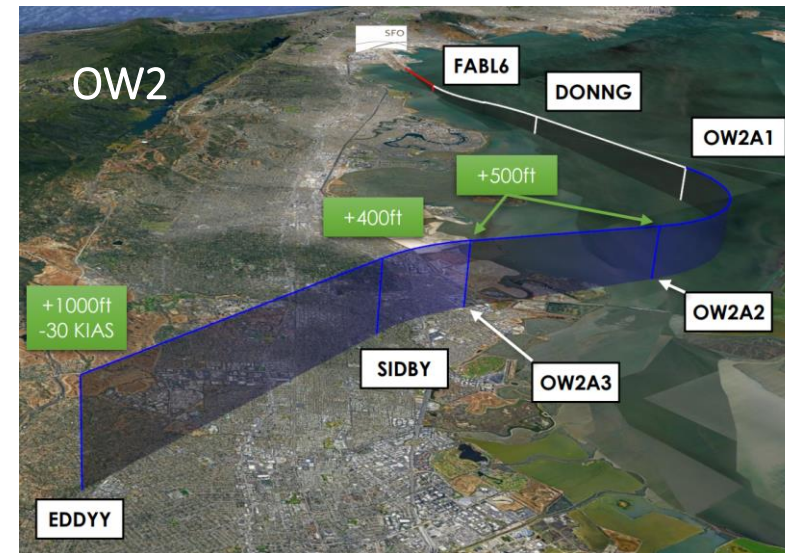
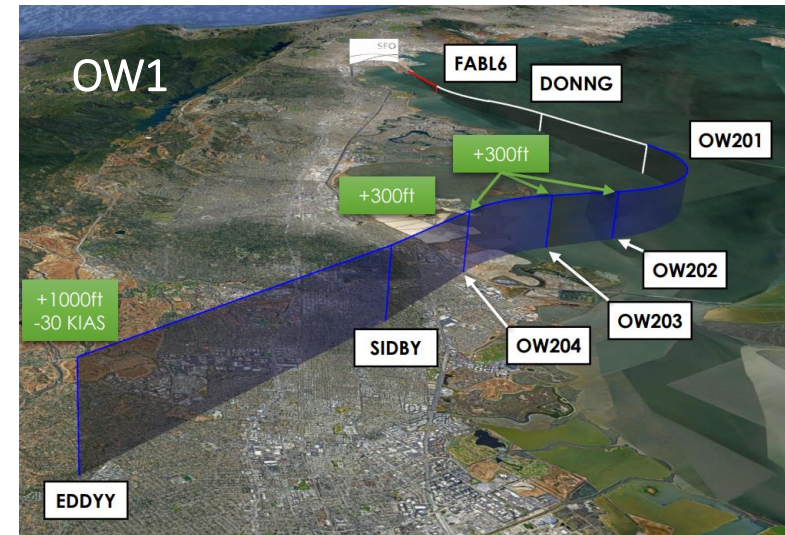
## Group 2A: GLS-OW2 28R (Nighttime only)

- GLS-OW2 28R is performed at a higher altitude and slower speed when compared to the GLS-U 28R and ILS 28R
- Ground track of the OW2 approach is consistent with GLS-U and ILS 28R until WP SIDBY (Palo Alto area), then taking the middle path and heading towards Ravenswood Point
- Greater overall noise reduction for communities from Palo Alto to Redwood City when compared to ILS
- May offer greater utility to ATC in a future where separation may be established via approach assignment



# Group 2A: GLS-OW1 28R | EDDY – vs. GLS OW2 28R | EDDYY

- Only one GLS-OW procedure will be recommended to the GBAS team for further development
- Potential considerations for recommendation of either GLS-OW procedure include use of Multiple Airport Route Separation (MARS) and Time-Based Flow Management (TBFM) whereby separation can be accomplished via approach assignment rather than traditional vectors for spacing.
- Both approaches have similar net noise effects, while GLS-OW2 may provide greater utility to ATC in the future
- OW2 approach is slightly higher and slightly slower than the OW1 approach
- Equal initial utility to ATC in terms of ability to use



# Summary

- HMMH agrees with Airport's conclusions regarding expected changes to noise as a result of the proposed Innovative GLS Approach Procedures
- We suggest the Roundtable support the Airport's implementation of the following GBAS procedures:
  - Group 2A:
    - GLS-CAT II 28R|ARCHI
    - GLS-CATII 28R|EDDYY
    - GLS-CATII 19L|UPEND
    - GLS-DB1 28R|DBAYY
    - GLS-SB 19L|COGGR
- GLS OW1 and OW2 28R approaches have similar noise effects, however OW2 may provide broader utility for ATC in a MARS/TBFM enabled environment



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GLS Innovative Approach Procedure  
documentation can be viewed at  
<https://noise.flysfo.com/noise-efforts/ground-based-augmentation/innovative-approach-procedures/>





# Airport Director's Report, SFO Layout, Arrivals & Departures

SFO Airport/Community Roundtable  
Technical Working Group Meetings  
August 29, and November 15, 2023

# Agenda

1. Airport Director's Report Deep Dive
2. The Layout of SFO's Runways
3. Arrivals
4. Departures

# The Monthly Airport Director's Report

A Deep Dive



## Airport Director's Report

Presented at the August 2, 2023  
Airport/Community Roundtable  
Meeting

Aircraft Noise Office  
June 2023

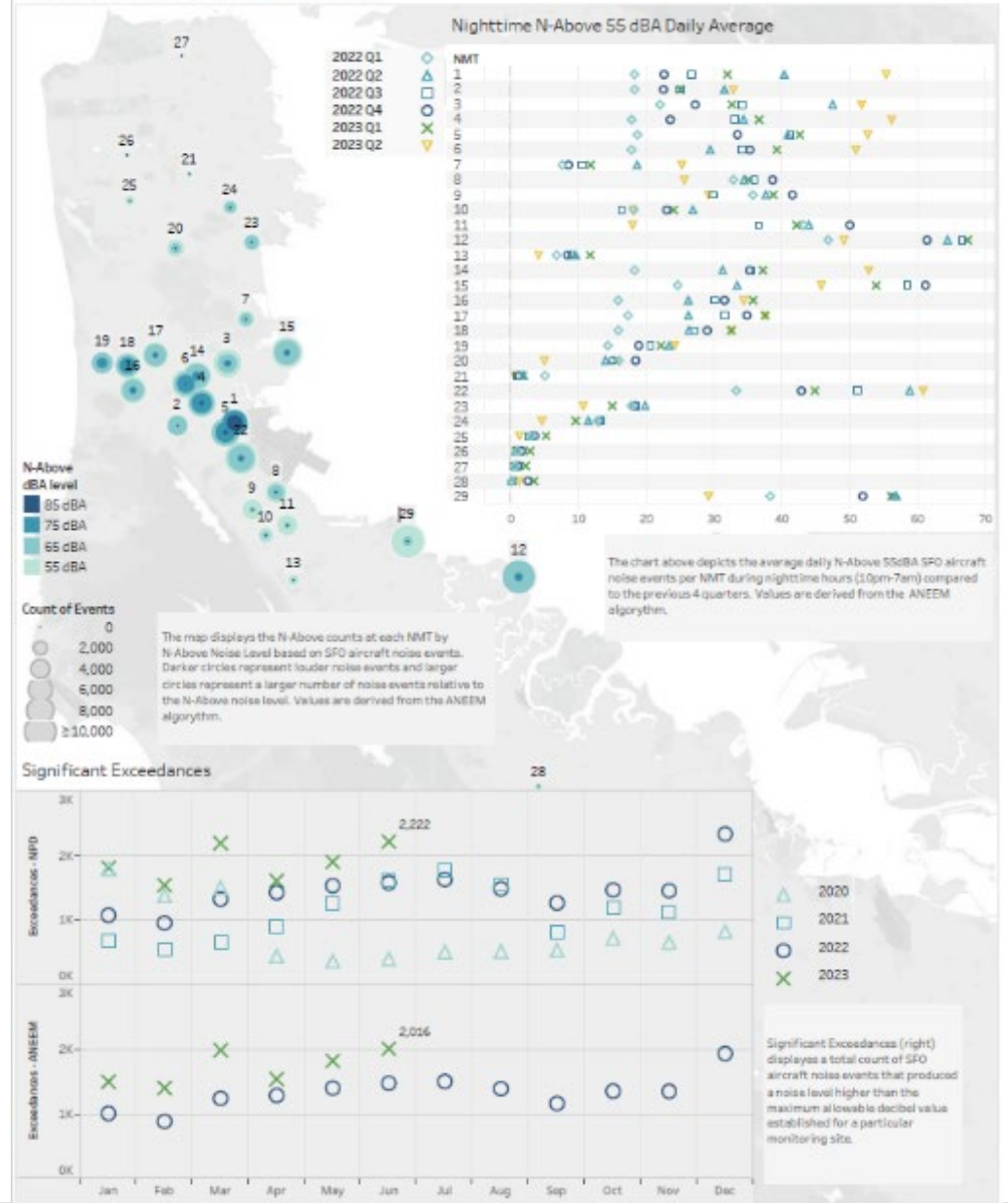


# The Monthly Airport Director's Report

## Aircraft Noise Levels Summary Page

### Aircraft Noise Levels Summary

June 2023



# The Monthly Airport Director's Report

## Aircraft Noise Levels Details

### Aircraft Noise Levels Details

June 2023

| NMT | CRV           | ANOMS                  |            |           |            |            |                     | ANEEM                  |            |           |            |
|-----|---------------|------------------------|------------|-----------|------------|------------|---------------------|------------------------|------------|-----------|------------|
|     |               | Noise Events (AVG Day) | CNEL (dBA) | SEL (dBA) | LMax (dBA) | CNEL (dBA) | Ambient Level (dBA) | Noise Events (AVG Day) | CNEL (dBA) | SEL (dBA) | LMax (dBA) |
| 1   | San Bruno     | 226                    | 74         | 93        | 82         | 66         | 54                  | 223                    | 74         | 93        | 82         |
| 2   | San Bruno     | 125                    | 57         | 90        | 68         | 63         | 51                  | 137                    | 58         | 90        | 68         |
| 3   | SSF           | 109                    | 60         | 82        | 70         | 60         | 43                  | 274                    | 60         | 79        | 65         |
| 4   | SSF           | 197                    | 68         | 89        | 77         | 59         | 43                  | 267                    | 68         | 87        | 73         |
| 5   | San Bruno     | 211                    | 68         | 88        | 76         | 60         | 45                  | 272                    | 68         | 87        | 73         |
| 6   | SSF           | 170                    | 65         | 87        | 75         | 58         | 43                  | 258                    | 65         | 85        | 70         |
| 7   | Brisbane      | 49                     | 53         | 79        | 68         | 59         | 46                  | 106                    | 54         | 77        | 64         |
| 8   | Milbrae       | 7                      | 49         | 89        | 75         | 64         | 48                  | 141                    | 53         | 77        | 66         |
| 9   | Milbrae       | 6                      | 37         | 75        | 64         | 57         | 38                  | 142                    | 48         | 71        | 59         |
| 10  | Burlingame    | 4                      | 37         | 77        | 65         | 60         | 42                  | 77                     | 48         | 73        | 62         |
| 11  | Burlingame    | 5                      | 39         | 77        | 65         | 57         | 41                  | 151                    | 49         | 71        | 59         |
| 12  | Foster City   | 393                    | 63         | 82        | 71         | 58         | 42                  | 455                    | 63         | 81        | 69         |
| 13  | Hillsborough  | 2                      | 35         | 79        | 65         | 57         | 42                  | 41                     | 46         | 72        | 60         |
| 14  | SSF           | 182                    | 62         | 83        | 71         | 59         | 42                  | 262                    | 62         | 81        | 68         |
| 15  | SSF           | 182                    | 59         | 82        | 70         | 59         | 45                  | 242                    | 60         | 80        | 67         |
| 16  | SSF           | 141                    | 60         | 82        | 71         | 58         | 43                  | 231                    | 60         | 80        | 67         |
| 17  | SSF           | 150                    | 60         | 83        | 70         | 60         | 45                  | 208                    | 60         | 81        | 68         |
| 18  | Daly City     | 147                    | 64         | 87        | 75         | 59         | 45                  | 208                    | 64         | 85        | 71         |
| 19  | Pacific       | 131                    | 61         | 84        | 73         | 59         | 41                  | 144                    | 61         | 83        | 72         |
| 20  | Daly City     | 81                     | 50         | 77        | 66         | 60         | 43                  | 116                    | 50         | 75        | 63         |
| 21  | San Francisco | 32                     | 44         | 76        | 64         | 61         | 52                  | 18                     | 42         | 75        | 65         |
| 22  | San Bruno     | 141                    | 59         | 81        | 71         | 61         | 43                  | 334                    | 60         | 78        | 67         |
| 23  | San Francisco | 60                     | 53         | 79        | 69         | 60         | 45                  | 110                    | 54         | 78        | 66         |
| 24  | San Francisco | 82                     | 57         | 84        | 71         | 70         | 50                  | 96                     | 51         | 77        | 65         |
| 25  | San Francisco | 10                     | 42         | 77        | 65         | 56         | 42                  | 39                     | 42         | 73        | 61         |
| 26  | San Francisco | 9                      | 42         | 80        | 66         | 61         | 46                  | 21                     | 42         | 74        | 62         |
| 27  | San Francisco | 4                      | 38         | 80        | 67         | 57         | 43                  | 20                     | 40         | 74        | 62         |
| 28  | Redwood City  | 6                      | 36         | 76        | 64         | 51         | 32                  | 30                     | 39         | 71        | 59         |
| 29  | San Mateo     | 122                    | 52         | 78        | 65         | 59         | 47                  | 345                    | 53         | 73        | 61         |

Noise Monitor's CNEL values (above) are derived from actual measured events and are used to validate the 65dBA CNEL noise footprint. Aircraft monthly CNELs from both ANOMS and ANEEM algorithms for each monitor site are provided with daily average aircraft counts, the average Sound Exposure Level (SEL), and average Maximum Level (LMax). Noise levels from other noise sources in the community calculated by ANOMS is provided as Community CNEL. Ambient Level is represented by the L90 noise value which is the noise level exceeded at the monitor for 90% of the time.

#### SFO N-Above NPD

#### SFO N-Above ANEEM

| NMT | LMax   | Min-Max |        |        |        |        |        |        |        | LMax   | Min-Max |        |        |        |        |        |  |  |
|-----|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--|--|
|     |        | 55 dBA  | 60 dBA | 65 dBA | 70 dBA | 75 dBA | 80 dBA | 85 dBA | 90 dBA |        | 55 dBA  | 60 dBA | 65 dBA | 70 dBA | 75 dBA | 80 dBA |  |  |
| 1   | 66-101 | 6,034   | 6,834  | 6,834  | 6,549  | 5,695  | 4,361  | 56-101 | 6,658  | 6,652  | 6,633   | 6,387  | 5,566  | 4,237  |        |        |  |  |
| 2   | 61-83  | 3,805   | 3,805  | 3,416  | 1,121  | 44     | 4      | 53-80  | 4,039  | 3,998  | 3,480   | 1,092  | 28     | 1      |        |        |  |  |
| 3   | 62-90  | 3,234   | 3,234  | 2,915  | 1,263  | 506    | 123    | 53-87  | 7,289  | 6,224  | 3,346   | 1,244  | 476    | 117    |        |        |  |  |
| 4   | 61-95  | 5,944   | 5,944  | 5,822  | 4,961  | 3,845  | 2,041  | 53-95  | 7,843  | 7,316  | 6,049   | 4,893  | 3,757  | 1,990  |        |        |  |  |
| 5   | 63-92  | 6,330   | 6,330  | 6,309  | 5,628  | 3,403  | 1,395  | 53-92  | 7,945  | 7,718  | 6,952   | 5,771  | 3,819  | 1,349  |        |        |  |  |
| 6   | 61-91  | 5,133   | 5,133  | 5,033  | 4,308  | 3,000  | 753    | 53-91  | 7,343  | 6,762  | 5,199   | 4,179  | 2,909  | 734    |        |        |  |  |
| 7   | 61-80  | 1,348   | 1,348  | 1,134  | 454    | 89     | 2      | 53-80  | 2,601  | 2,140  | 1,739   | 474    | 73     | 2      |        |        |  |  |
| 8   | 68-90  | 181     | 181    | 155    | 72     | 29     | 29     | 53-88  | 4,106  | 3,890  | 2,120   | 594    | 153    | 43     |        |        |  |  |
| 9   | 59-74  | 95      | 92     | 37     | 1      | 0      | 0      | 53-78  | 3,577  | 1,611  | 906     | 37     | 3      | 0      |        |        |  |  |
| 10  | 60-76  | 65      | 63     | 26     | 6      | 2      | 0      | 53-76  | 3,962  | 1,414  | 489     | 61     | 3      | 0      |        |        |  |  |
| 11  | 60-75  | 45      | 45     | 21     | 4      | 1      | 0      | 53-66  | 3,769  | 1,517  | 357     | 54     | 5      | 1      |        |        |  |  |
| 12  | 63-86  | 11,968  | 11,968 | 11,901 | 7,836  | 735    | 24     | 54-82  | 13,553 | 12,963 | 11,470  | 7,466  | 654    | 32     |        |        |  |  |
| 13  | 59-74  | 27      | 25     | 17     | 7      | 0      | 0      | 53-73  | 950    | 479    | 125     | 5      | 0      | 0      |        |        |  |  |
| 14  | 61-80  | 5,489   | 5,489  | 5,288  | 3,408  | 893    | 27     | 53-83  | 7,439  | 7,079  | 5,605   | 3,366  | 871    | 23     |        |        |  |  |
| 15  | 61-84  | 5,504   | 5,504  | 5,227  | 2,709  | 387    | 11     | 53-84  | 8,448  | 7,808  | 5,782   | 2,737  | 391    | 5      |        |        |  |  |
| 16  | 61-86  | 4,262   | 4,262  | 4,104  | 2,626  | 507    | 2      | 53-80  | 6,338  | 5,527  | 4,219   | 2,552  | 495    | 0      |        |        |  |  |
| 17  | 60-92  | 4,552   | 4,552  | 4,355  | 2,504  | 382    | 26     | 53-90  | 5,989  | 5,653  | 4,362   | 2,301  | 312    | 9      |        |        |  |  |
| 18  | 64-88  | 4,402   | 4,402  | 4,383  | 3,889  | 2,431  | 587    | 53-88  | 5,942  | 5,462  | 4,608   | 3,792  | 2,367  | 575    |        |        |  |  |
| 19  | 65-84  | 3,954   | 3,954  | 3,954  | 3,114  | 1,113  | 53     | 54-84  | 4,320  | 4,273  | 3,997   | 2,967  | 1,062  | 50     |        |        |  |  |
| 20  | 59-85  | 2,200   | 2,168  | 1,103  | 253    | 77     | 9      | 53-79  | 2,650  | 2,288  | 939     | 125    | 18     | 0      |        |        |  |  |
| 21  | 59-79  | 418     | 405    | 146    | 10     | 1      | 0      | 60-72  | 265    | 265    | 136     | 6      | 0      | 0      |        |        |  |  |
| 22  | 64-84  | 4,207   | 4,207  | 4,195  | 2,569  | 399    | 22     | 53-85  | 9,712  | 8,605  | 6,349   | 2,829  | 407    | 19     |        |        |  |  |
| 23  | 63-83  | 1,670   | 1,670  | 1,600  | 525    | 40     | 3      | 53-79  | 2,479  | 2,256  | 1,634   | 498    | 27     | 0      |        |        |  |  |
| 24  | 59-83  | 2,137   | 2,134  | 1,837  | 1,188  | 520    | 36     | 54-83  | 1,964  | 1,667  | 1,022   | 404    | 85     | 6      |        |        |  |  |
| 25  | 58-79  | 171     | 154    | 179    | 38     | 4      | 0      | 53-75  | 732    | 473    | 159     | 16     | 0      | 0      |        |        |  |  |
| 26  | 60-77  | 141     | 141    | 66     | 7      | 4      | 0      | 53-76  | 261    | 220    | 70      | 5      | 1      | 0      |        |        |  |  |
| 27  | 60-78  | 21      | 21     | 14     | 8      | 1      | 0      | 53-78  | 122    | 86     | 25      | 8      | 1      | 0      |        |        |  |  |
| 28  | 59-74  | 93      | 89     | 21     | 1      | 0      | 0      | 53-68  | 421    | 157    | 15      | 0      | 0      | 0      |        |        |  |  |
| 29  | 59-85  | 3,941   | 3,884  | 3,349  | 961    | 90     | 8      | 53-79  | 10,322 | 6,767  | 911     | 66     | 3      | 0      |        |        |  |  |

Noise Monitor N-Above values (above) are derived from actual measured events and assigned to aircraft overflights using both ANOMS NPD and ANEEM algorithms. N-Above represents the count of events where the peak noise (LMax) reached above the designated dBA value. Note, the charts on this page represent only SFO aircraft-related noise events.

# The Monthly Airport Director's Report

## Operations

### Operations

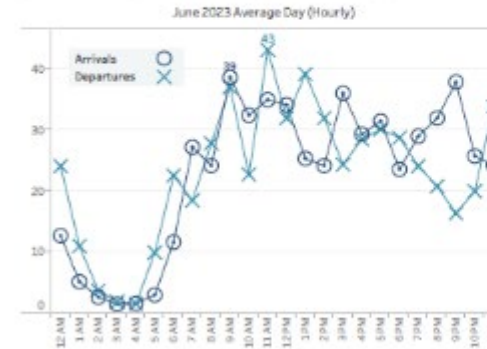
June 2023

| Monthly Ops | AVG Daily Ops | 12 Month AVG | YDY Growth |
|-------------|---------------|--------------|------------|
| 32,983      | 1,099         | 30,446       | 5%         |

Major Arrival and Departure Routes (West Flow)

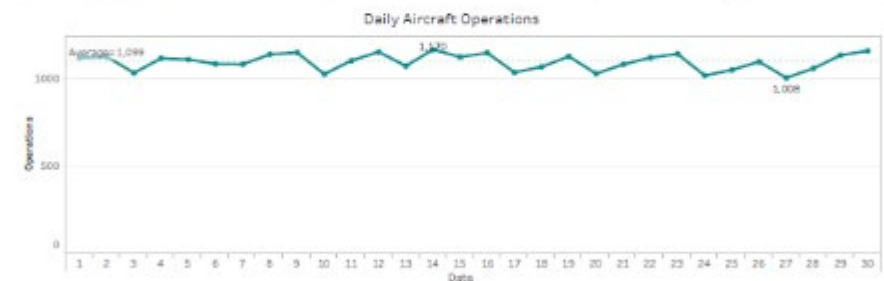
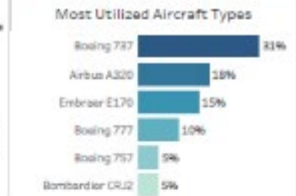
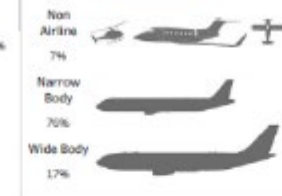
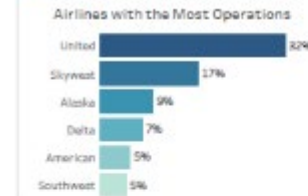


West Flow is depicted in the above image and is a predominant flow at SFO. West Flow 100%



| Top Destinations |     |         | Down the Bay vs Peninsula |     |
|------------------|-----|---------|---------------------------|-----|
| Los Angeles      | JFK | Seattle | 1.1 Down the Bay Visual   | 30% |
| 6%               | 4%  | 4%      | 1.2 BDEGA Arrival         | 64% |

| Arrival Route | Departure Route |
|---------------|-----------------|
| 1. BDEGA      | A. GAP          |
| 2. OYAMD      | B. SSTN         |
| 3. SERFR      | C. NITE         |
| 4. FIRAT      | D. TRUKN RWY 01 |
|               | D. TRUKN RWY 28 |



# The Monthly Airport Director's Report

## Runway Usage and Nighttime Operations

### Runway Usage and Nighttime Operations

Leftmost Runway Utilization table shows percent of runway usage for arrivals and departures by runway based on all carrier operations using jet, regional jet, and turboprop aircraft. Late Night Preferential Runway Use table depicts departure runway usage between 1am - 6am for jet aircraft for the whole month (top) and during nighttime hours only (bottom). Percentages (%) are rounded to the nearest whole number.

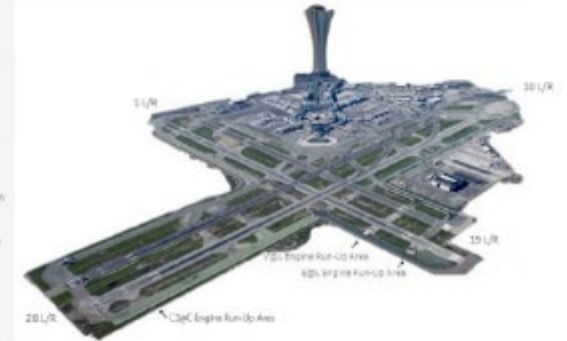


#### Nighttime Power Run-Ups (10pm-7am)

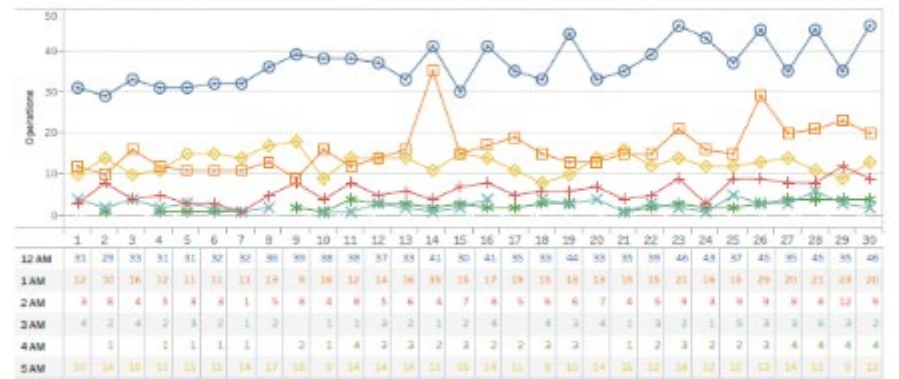
American Airlines: 4  
United Airlines: 14

A power runup is a procedure used to heat an aircraft engine after maintenance is completed. This is done to ensure safe operating standards prior to returning the aircraft to service. The aircraft power settings range from idle to full power and may vary in duration.

Designated Power Runup locations are 19 L/R depicted on the airfield map (right) with airlines nighttime power runup counts shown above.



#### Hourly Nighttime Operations



# The Monthly Airport Director's Report

## Noise Reports

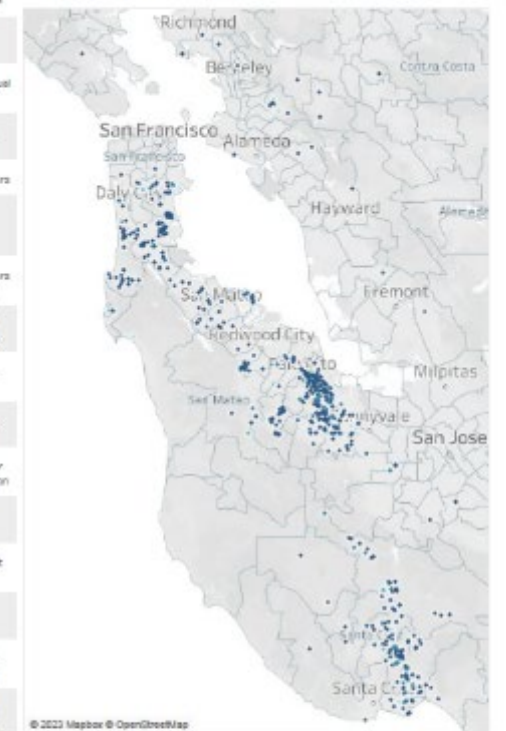
### Noise Reports

|                     | Noise Reporters / Noise Reports | Reporters Annual AVG      |
|---------------------|---------------------------------|---------------------------|
| Atherton            | 2 / 258                         | 535                       |
| Belmont             | 3 / 43                          |                           |
| Brisbane            | 20 / 706                        | Reports Annual AVG        |
| Burlingame          | 4 / 7                           |                           |
| Colma               | 1 / 4                           | New Reporters             |
| Daly City           | 10 / 1,897                      |                           |
| El Granada          | 1 / 1,301                       | New Reporters Top City    |
| Foster City         | 10 / 509                        |                           |
| Hillsborough        | 2 / 76                          | Furthest Report           |
| Menlo Park          | 11 / 893                        |                           |
| Millbrae            | 4 / 12                          | Reports per SFO Operation |
| Montara             | 2 / 572                         |                           |
| Pacifica            | 26 / 1,121                      | Top Aircraft Types        |
| Portola Valley      | 22 / 4,862                      |                           |
| Redwood City        | 5 / 368                         | B727                      |
| San Bruno           | 9 / 378                         | E75                       |
| San Carlos          | 2 / 7                           |                           |
| San Francisco       | 16 / 2,453                      | KAL218                    |
| San Mateo           | 12 / 438                        | JKU598                    |
| South San Francisco | 33 / 1,062                      | AMX994                    |
| Woodside            | 6 / 1,814                       |                           |
| Alameda             | 1 / 1                           |                           |
| Aptos               | 2 / 6                           |                           |
| Ben Lomond          | 1 / 6                           |                           |
| Berkeley            | 2 / 923                         |                           |
| Boulder Creek       | 2 / 5                           |                           |
| Capitola            | 2 / 59                          |                           |
| Castro Valley       | 1 / 25                          |                           |
| Cupertino           | 1 / 261                         |                           |
| East Palo Alto      | 2 / 6                           |                           |
| El Cerrito          | 1 / 1                           |                           |
| Emerald Hills       | 8 / 896                         |                           |
| Felton              | 3 / 107                         |                           |
| Fremont             | 1 / 325                         |                           |
| Lafayette           | 1 / 5                           |                           |
| Los Altos           | 50 / 8,966                      |                           |
| Los Altos Hills     | 12 / 788                        |                           |
| Los Gatos           | 31 / 4,703                      |                           |
| Mill Valley         | 1 / 1                           |                           |
| Morega              | 2 / 110                         |                           |
| Mountain View       | 18 / 3,366                      |                           |
| Oakland             | 8 / 3,625                       |                           |
| Orinda              | 1 / 19                          |                           |
| Palo Alto           | 115 / 22,527                    |                           |
| Richmond            | 3 / 221                         |                           |
| San Jose            | 4 / 4                           |                           |
| Santa Cruz          | 44 / 9,207                      |                           |
| Scotts Valley       | 26 / 4,216                      |                           |
| Soquel              | 25 / 2,986                      |                           |
| Stanford            | 4 / 535                         |                           |
| Sunnyvale           | 2 / 1,167                       |                           |
| Union City          | 1 / 251                         |                           |
| Watsonville         | 1 / 71                          |                           |
| <b>Grand Total</b>  | <b>577</b> / <b>84,170</b>      |                           |

Notes:  
Address validation failures on ZIP code and ZIP Code look up table and LOST specified for each city values.



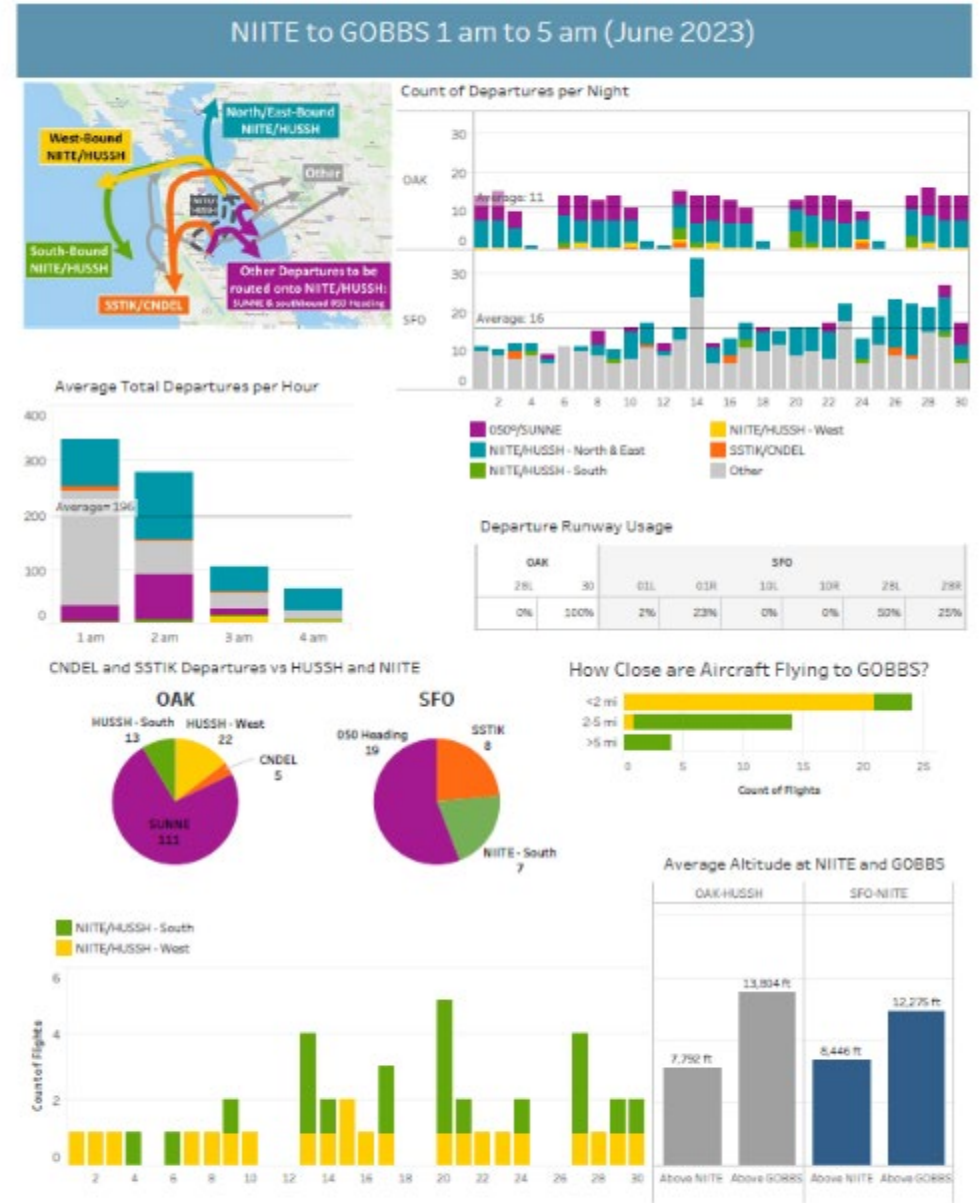
### Noise Reporters Location Map





# The Monthly Airport Director's Report

## NIITE to GOBBS 1am to 5 am



# The Layout of SFO

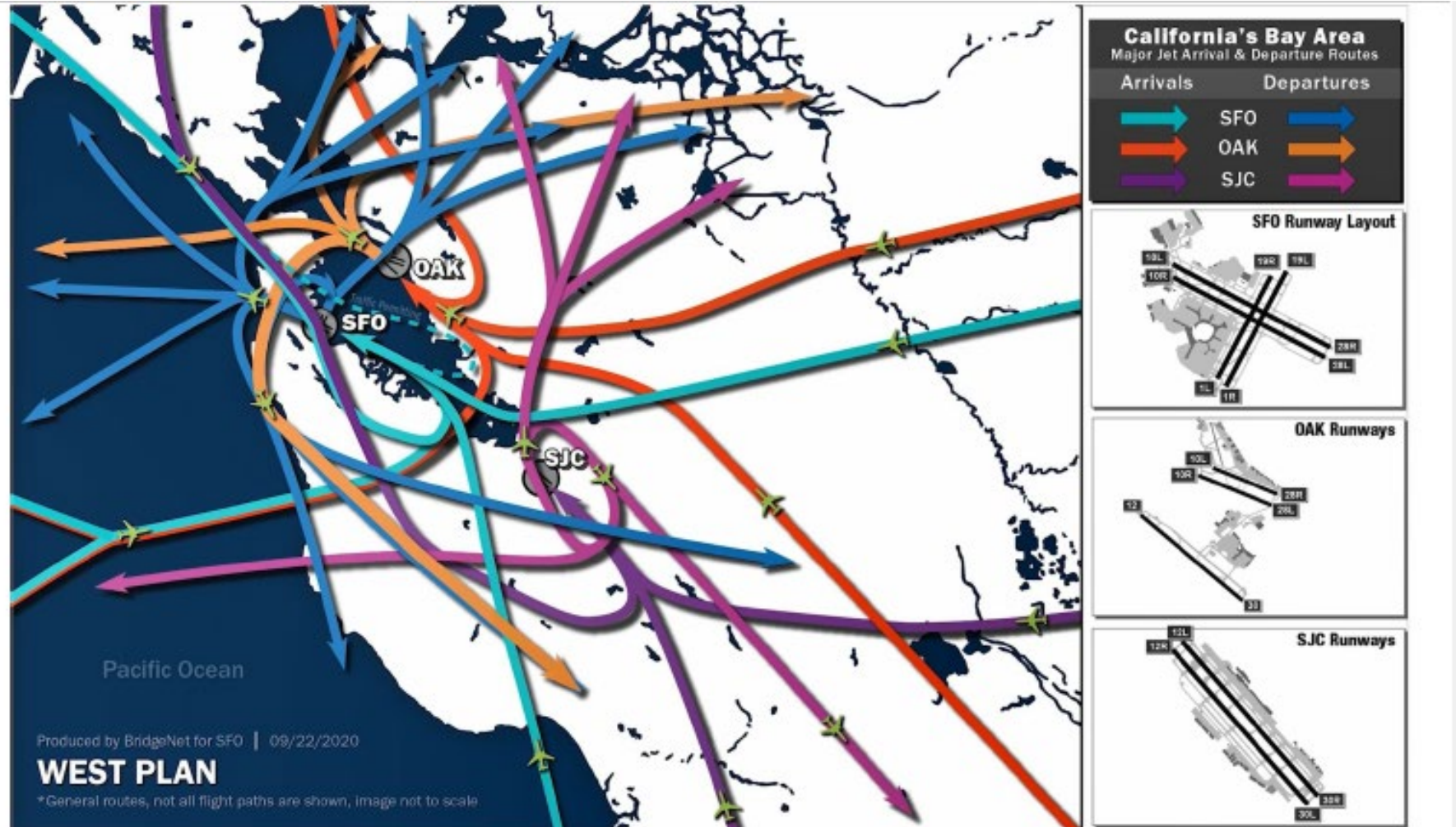
## Runways:

- 01L
- 01R
- 10L
- 10R
- 19L
- 19R
- 28L
- 28R



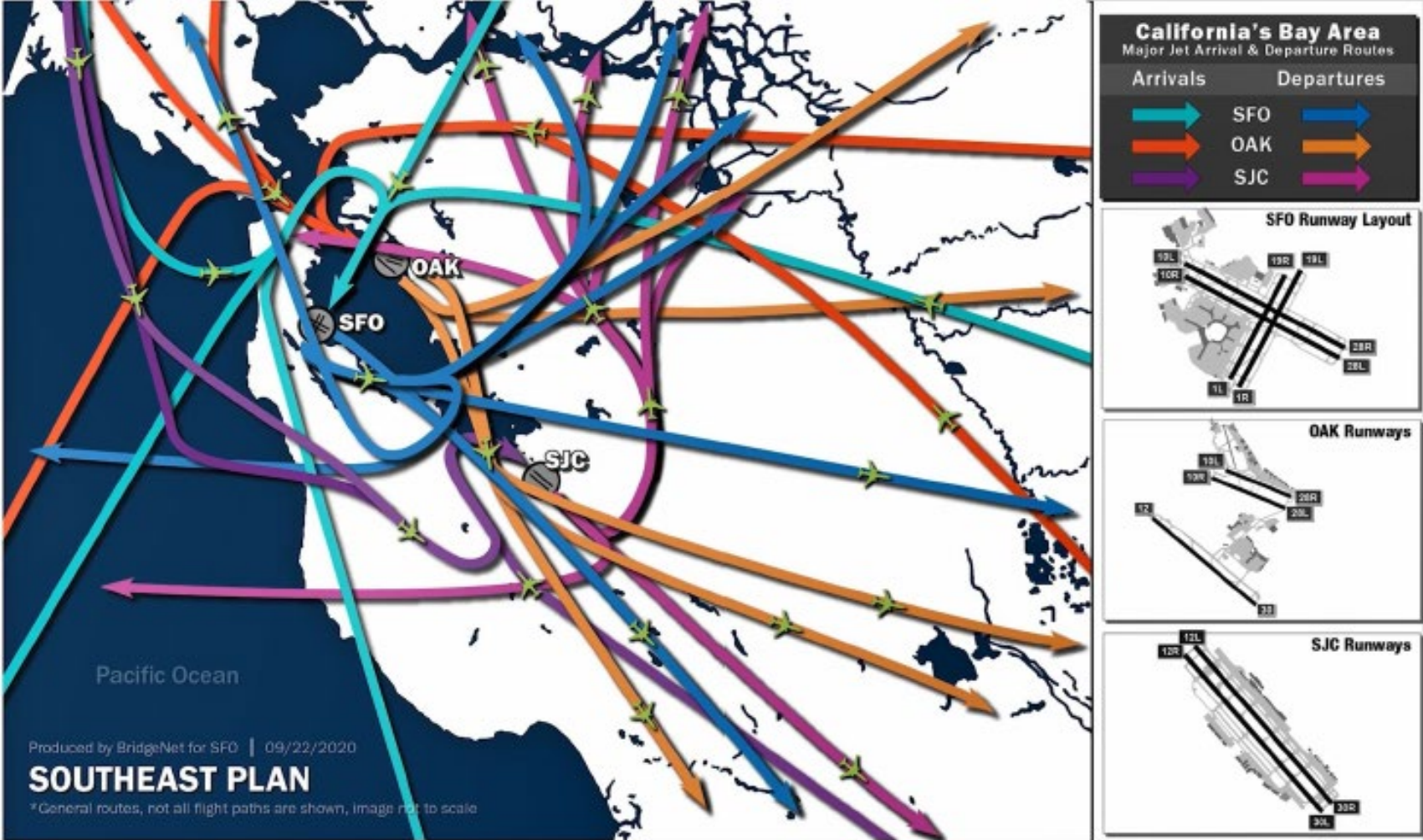
# Bay Area Flight Operations

West Plan



# Bay Area Flight Operations

Southeast Plan





# SFO Departures

SSTIK  
NIITE  
TRUKN  
GAP  
SNTNA

