7 OPERATIONAL ALTERNATIVES

14 CFR PART 150 UPDATE

14 CFR PART 150 UPDATE

CHAPTER 7. OPERATIONAL ALTERNATIVES

This chapter describes the operational noise abatement alternatives that were carried forward for further evaluation in the Title 14, Code of Federal Regulations (CFR) Part 150 Study Update (14 CFR Part 150 Study) process and summarizes the operational noise modeling results. Alternatives were screened based on potential to reduce noise in the Future Base Case 65 Community Noise Equivalent Level (CNEL) or greater noise exposure area and potential feasibility, as described in the **Appendix H - Alternatives Screening Memo**. Noise modeling analysis was conducted to determine if it provided an overall reduction in aircraft noise levels at 65 CNEL or greater for Future Base Case conditions. Operational noise abatement alternatives considered the modification of existing flight paths to concentrate aircraft over compatible areas or to distribute aircraft over a larger area, based on changing navigational procedures a pilot would use while operating aircraft at the airport.

This chapter summarizes the potential operational noise abatement alternatives identified through Airport Noise Advisory Committee (ANAC) – ANAC Recommendations, as well as the Technical Advisory Committee (TAC), Citizen Advisory Committee (CAC), and the public meeting held November 21, 2019, which were considered for detailed analysis in this 14 CFR Part 150 Study Update. For the purposes of this 14 CFR Part 150 Study Update, only alternatives involving departure procedures are included, as no arrival alternatives were identified to reduce noise due to the concentration of non-compatible land uses on the east side of the airport. The operational noise abatement alternatives are separated by type: noise abatement flight path (use of a new flight path for noise purposes), operation distribution (use of existing flight paths but with a new distribution), or changes to climb performance profiles. Land use, facility and administrative alternatives are evaluated in **Chapter 8**.

SAN DIEGO INTERNATIONAL AIRPORT

7.1 OPERATIONAL ALTERNATIVES - BACKGROUND

The primary goal of the operational alternatives analysis was to identify alternative flight path(s) that will reduce noise exposure for residents exposed to 65 CNEL or greater by moving flight paths.[1] The exact navigation technology that a procedure may be based on is dependent on Federal Aviation Administration (FAA) Performance Based Navigation (PBN) procedure analysis, operator equipment, and pilot instruction given by air traffic control. This 14 CFR Part 150 Study evaluates desired flight paths and dispersion for noise abatement, not a specific type of navigation procedure. Although a specific type of procedure is not the focus, PBN Area Navigation (RNAV) procedures were designed based on FAA RNAV criteria to ensure a modeled flight track design is feasible.

The noise abatement flight path alternatives presented in this chapter provide an analysis for the 65 CNEL or greater noise exposure contour ("contour") area, as this is the threshold contour area for determining land use compatibility per the 14 CFR Part 150 land use guidelines. Because the 65 CNEL or greater contour is the contour for determining whether a measure meets the requirements for approval under 14 CFR Part 150, this chapter addresses only the noise exposure changes within the 65 CNEL or greater contour. The alternatives described in this chapter may also address noise levels lower than 65 CNEL, but they are not evaluated as part of the 14 CFR Part 150 Study. If an alternative does not provide a reduction in noise exposure levels at or greater than 65 CNEL or provides a shifting of noise to a newly affected area,[2] the FAA may not be able to approve them as part of the Noise Compatibility Program (NCP). **Simply stated, as the purpose of a 14 CFR Part 150 Study is to reduce impacts to non-compatible land uses, shifting noise to new noise sensitive areas does not align with the purpose of the Study.**

7.1.1 Air Traffic and Flight Procedure Terminology

A general understanding of the delegated authority of the FAA to regulate and manage airspace, air traffic control, flight procedure navigation design, and traffic flow will aid in understanding the methodology applied for the review of the proposed operational noise abatement alternatives. This section provides an overview of delegated authority over the airspace, air traffic control of the airspace, and terminology related to flight procedure navigation design and traffic flow.

7.1.1.1 National Airspace System (NAS)

Under the Federal Aviation Act of 1958 (49 USC § 40101 et seq.), the FAA was delegated control over use of the nation's navigable airspace and regulation of domestic civil and military aircraft operations in the interest of maintaining safety and efficiency.[3] To help fulfill this mandate, the FAA established the National Airspace System (NAS). Within the NAS, the FAA provides air traffic services for aircraft takeoffs, landings, and the flow of aircraft between airports through a system of infrastructure (e.g., air traffic control facilities), people (e.g., air traffic controllers, maintenance, and support personnel), and technology (e.g., radar, communications equipment, ground-based

[1] Flight path represents a set of tracks (e.g., noise model tracks or radar tracks) that account for general area where aircraft overflights are expected to occur.

[2] A "newly affected area" is a noise sensitive land uses considered not compatible to aircraft noise levels at or greater than 65 CNEL that were not exposed to 65 CNEL or greater levels under the 2026 future baseline condition but is expected to be exposed to levels at or greater than 65 CNEL under an alternative scenario.

[3] Title 49 United States Code, Section 40101(d)4.

NAVAIDs[4], etc.) The NAS is governed by various FAA rules and regulations. The NAS comprises one of the most complex aviation networks in the world. The FAA continuously reviews the design of all NAS resources to ensure they are efficiently and effectively managed. The FAA Air Traffic Organization (ATO) is the primary organization responsible for managing airspace and flight procedures in the NAS. When changes are proposed to the NAS, the FAA works to ensure that the changes maintain or enhance system safety and improve efficiency. One way to accomplish this mission is to employ emerging technologies to increase system flexibility and predictability.[5]

7.1.1.2 Air Traffic Control in the NAS

The combination of infrastructure, people, and technology used to monitor and guide (or direct) aircraft within the NAS is referred to collectively as Air Traffic Control (ATC). One of ATC's responsibilities is to maintain safety and expedite the flow of traffic in the NAS by applying defined minimum distances or altitude between aircraft (referred to as "separation"). This is accomplished through required communications between air traffic controllers and pilots, the use of navigational technologies, and the use of surveillance.

Described in Title 14, Code of Federal Regulations Part 91, aircraft operate under two distinct categories of flight rules: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).[6] These flight rules generally correspond to two categories of weather conditions: Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC).

VMC generally occur during fair to good weather, when good visibility conditions exist. IMC occur during periods when visibility falls to less than three statute miles or the cloud ceiling (i.e., the distance from the ground to the bottom layer of clouds, defined as the point where the clouds cover more than 50 percent of the sky) drops to lower than 1,000 feet. Correspondingly, a pilot is responsible to "see and avoid" under VFR to maintain safe separations from other aircraft and obstacles. IFR are designed for use when separation from other flying aircraft and terrain is maintained by cockpit instrument reference and radar separation. Under IFR, aircraft operators are required to file flight plans, use navigational instruments, and establish positive contact via communication with ATC, to operate within the NAS. Pilots must follow IFR during IMC. Regardless of weather conditions, however, the majority of commercial air traffic operates under IFR.[7]

Depending on whether aircraft are operating under IFR or VFR, air traffic controllers apply various techniques to maintain defined minimum distances (referred to as separations) between aircraft,[8] including the following:

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[4] NAVAIDs are facilities that transmit signals that define key points or routes.

[5] Department of Transportation, Federal Aviation Administration. *FY 2018 Organizational Success Increase/Measures*. December 12, 2017. https://www.faa.gov/about/plans_reports/media/fy18_osi_osm.pdf (Accessed on September 12, 2018)

[6] Title 14 Code of Federal Regulations 91.151 through 91.193, "Visual Flight Rules" and "Instrument Flight Rules."

[7] Title 14 Code of Federal Regulations Part 121, "Operating Requirements: Domestic, Flag, and Supplemental Operations," current as of October 2, 2018.

[8] Defined in FAA Order JO 7110.65X, *Air Traffic Control.* October 12, 2017.

- **Vertical or "Altitude" Separation**: separation between aircraft operating at different altitudes,
- **Longitudinal or "In-Trail" Separation:** separation between two aircraft operating along the same flight route, referring to the distance between a lead and a following aircraft; and
- **Lateral or "Side-by-Side" Separation:** separation between aircraft (left or right side) operating along two separate but nearby flight routes.
- **Divergent Heading**: separation between two aircraft operating from the same or parallel runways must be going away from each other (diverging) at least at a 15-degrees (or 10-degrees if both aircraft are assigned an RNAV procedure – previously termed as Equivalent Lateral Spacing Operations [ELSO]) from each other based on assigned (issued by ATC or indicated on a procedure) headings from the departure end of the runway.

As controllers manage the flow of aircraft into, out of, and within the NAS, they maintain some of the following separation distances between aircraft[9]:

- **Altitude Separation (vertical):** When operating below 41,000 feet Mean Sea Level (MSL), two aircraft must be at least 2,000 feet above/below each other unless aircraft are operating within the terminal area control, or Reduced Vertical Separation Minimum (RVSM) can be applied, or they are operating in the en route airspace, in which cases separation is 1,000 feet, or until lateral separation is ensured (see below).
- **In-Trail Separation (longitudinal)**: Within a radar-controlled area, the minimum distance between two aircraft on the same route (i.e., in-trail) can be between 2.5 to 10 nautical miles (NM), depending on factors such as aircraft class, weight, and type of airspace.
- **Side-by-Side Separation (lateral):** Similar to in-trail separation, the minimum side-by-side separation between aircraft must be at least 3 NM in terminal airspace and 5 NM in en route airspace.
- **Visual Separation:** Aircraft may be separated by visual means when other approved separation is assured.

In its effort to modernize the NAS, the FAA is developing instrument procedures that use advanced technologies. A primary technology in this effort is RNAV. RNAV uses technology, including Global Positioning Satellites (GPS)[10], to allow an equipped aircraft to fly a more efficient route that is separated from other procedures and is not solely dependent upon ground-based NAVAIDS. **Section 7.1.1.3** provides more details on RNAV.

Air traffic controllers use radar to monitor aircraft and provide services that ensure separation. Published instrument procedures also provide separation, predictable, and efficient routes that move aircraft through the NAS in a safe and efficient manner. These procedures reduce verbal communication between air traffic controllers and pilots. **Section 7.1.1.4** provides more information on approach and departure flows associated with published instrument procedures.

[9] For a detailed explanation of separation standards, see FAA Order 7110.65X, *Air Traffic Control*. October 12, 2017.

[10] Global Positioning System (GPS) is a space-based radio-navigation system consisting of a constellation of satellites and a network of ground stations used for monitoring and control.

In addition to published instrument procedures, air traffic controllers use a variety of methods and coordination techniques to maintain safety and efficiency within the NAS, including:

- **Vectors**: Directional headings issued to aircraft to provide navigational guidance and to maintain separation between aircraft and/or obstacles,
- **Speed Control**: Instructions issued to aircraft to reduce or increase aircraft speed to maintain separation between aircraft,
- **Reroute**: Controllers may change an aircraft's route for a variety of reasons, such as avoidance of inclement weather, to maintain separation between aircraft, and/or to protect airspace,
- **Point-out**: Notification issued by one controller when an aircraft might pass through or affects another controller's airspace and radio communications will not be transferred,
- **Holding Pattern/Ground Hold**: Controllers assign aircraft to a holding pattern in the air or hold aircraft on the ground before departure to maintain separation between aircraft and to manage arrival/departure volume; and/or
- **Altitude Assignment/Level-off**: Controllers assign altitudes to maintain separation between aircraft and/or to protect airspace. This may result in aircraft "leveling off" during ascent or descent.

ATC controllers will use these other techniques dependent upon the current air traffic environment and demand. Although RNAV standard flight procedures provide additional predictability, the air traffic environment is constantly changing and often require diversions from the published procedures to maintain a safe and efficient airspace system. Alternative noise analysis may assume some dispersion as a result of ATC using other techniques.

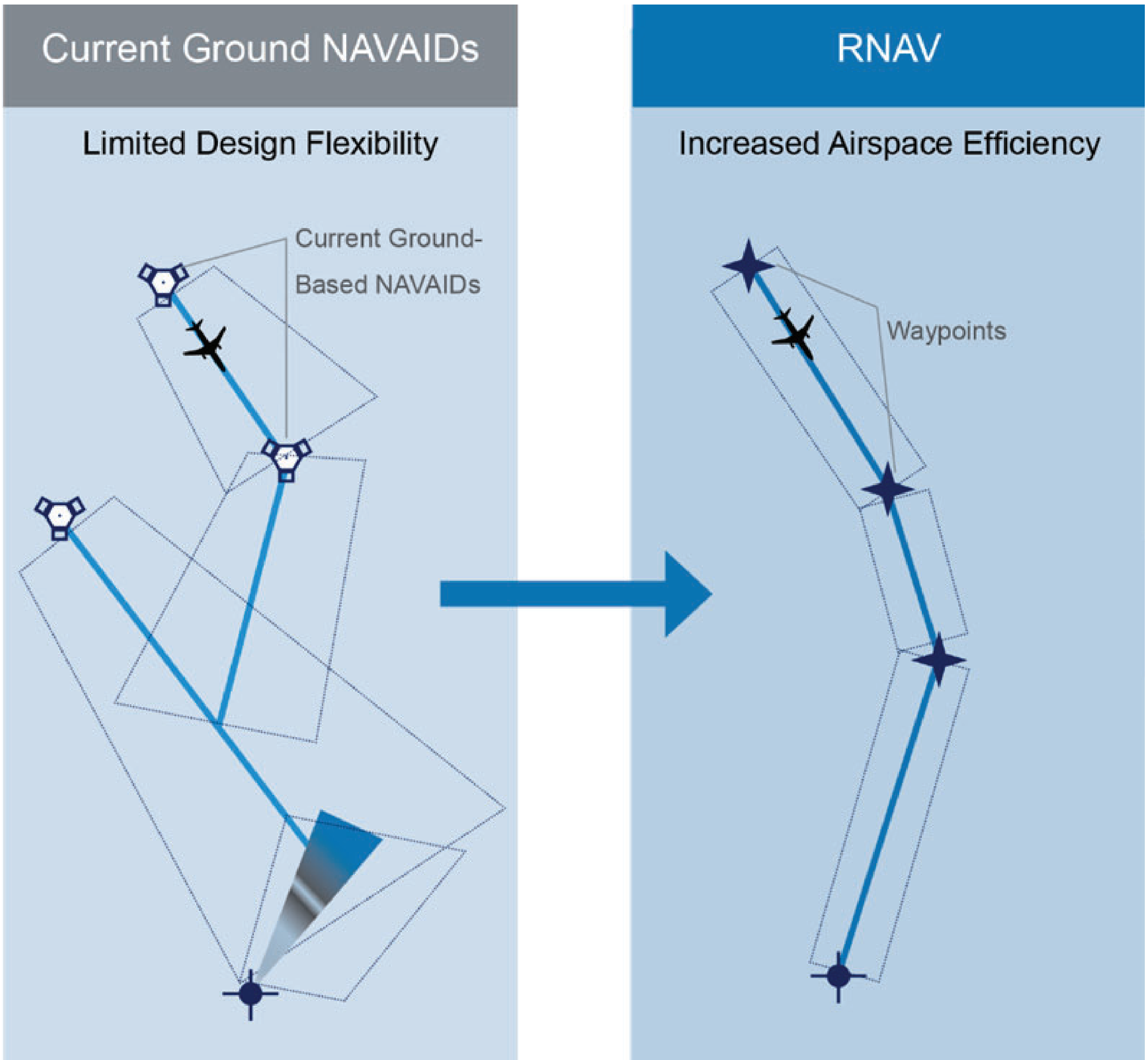
7.1.1.3 Flight Procedure Navigation Design

The following information provides an overview of flight procedure design terminology. More details can be found in the FAA's Airmen Information Manual (AIM), Chapter 1, "Air Navigation", Section 2, "Performance-Based Navigation and Area Navigation."[11] Understanding basic PBN design is important because all of the noise abatement flight path alternatives in this study were evaluated based on PBN RNAV technology. Non-RNAV or conventional procedures rely primarily on ground-based NAVAIDs. Routes based on ground-based NAVAIDs rely on the aircraft equipment directly communicating with the NAVAID radio signal and are often limited by issues such as line-of-sight and signal reception accuracy. NAVAIDs such as Very High Frequency (VHF) Omni-Directional Ranges (VORs) are affected by variable terrain and other obstructions that can limit their signal accuracy. PBN enables aircraft traveling through terminal and en route airspace to follow any desired flight route within the coverage of ground-based navigational aids or GPS-based navigational aids, rather than flying a point-to-point route over NAVAIDs following a conventional procedure, which enables aircraft traveling through terminal and en route airspace to follow more accurate and better-defined routes compared to conventional procedures. This results in more predictable routes and altitudes that can be preplanned by the pilot and ATC. Predictable routes improve the ability to ensure vertical, longitudinal, and lateral separation among aircraft and enhance operational efficiency. **Figure 7.1** compares conventional and RNAV routes.

[11] Federal Aviation Administration. Airmen Information Manual – Change 1. January 20, 2020 (accessed on March 10, 2020 at https://www.faa.gov/air_traffic/publications/atpubs/aim_html/index.html.)

RNAV procedures are designed based on a series of waypoints and routes (legs) that join the waypoints. A waypoint is defined based on a latitude and longitude. It can be located anywhere as long as the distance between waypoints that define a route[12] meets FAA design distance requirements. A waypoint is typically used to indicate a change in direction, speed, or altitude along the desired path. An RNAV procedure can define how an aircraft operates near a waypoint by defining a waypoint as “Fly-by” or “Fly-over.” A Fly-by (FB) waypoint is used when an aircraft should begin a turn to the next course prior to reaching the waypoint that separates the two route segments. The navigation computer in the aircraft (known as the Flight Management System or FMS) anticipates where to begin the turn prior to reaching the waypoint based on current aircraft performance and the degree of turn to join the next course of the procedure. A Fly-over (FO) waypoint is used when the aircraft must fly over the waypoint prior to starting a turn to the next course. **Figure 7.2** illustrates the difference between the two types of waypoints.

[12] A “route” represents a line between two fixes or waypoints. It does not necessarily represent the expected flight path of a procedure.

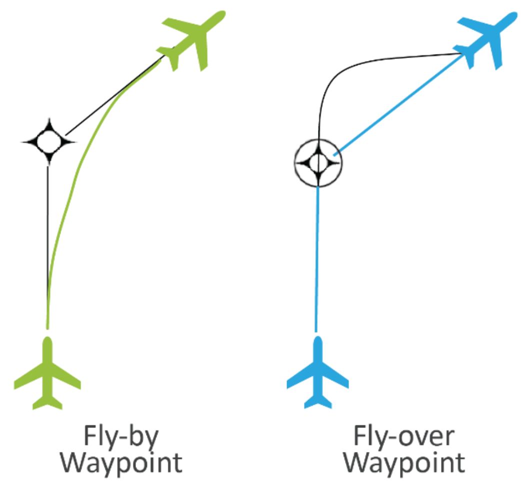


NOTE: NAVAIDS – Navigational Aids.

NOTE: RNAV – Area Navigation.

SOURCE: U.S. Department of Transportation, Federal Aviation Administration, June, 2016.

FIGURE 7.1 **COMPARISON OF ROUTES FOLLOWING CONVENTIONAL VERSUS RNAV PROCEDURES**



SOURCE: Ricondo & Associates, Inc., March, 2020.

FIGURE 7.2 **COMPARISON OF FLY-BY AND FLY-OVER WAYPOINTS**

The path between waypoints is defined based on the leg type. Leg type describes the desired path proceeding, following or between waypoints on an RNAV procedure. Leg types are identified by a two–letter code that describes the path (e.g., heading, course, track) and the termination point (e.g., the path terminates at an altitude, distance, fix). This type of design ensures that every leg of a procedure has a path that leads to a termination point. At the termination point, an aircraft continues on the next leg that leads to the next termination point. Leg types used for RNAV procedure design are included in the aircraft navigation database, but not normally provided on the procedure chart. The narrative depiction of the RNAV chart describes how a procedure is flown. There are over 23 unique leg types. The leg types used for this evaluation are described in **Table 7.1**.

TABLE 7.1 **RNAV LEG TYPE EXAMPLES**

LEG TYPE (TWO LETTER CODE)	DESCRIPTION
Vector to Altitude (VA)	An aircraft continues on an assigned heading until reaching a defined altitude
Vector to Intercept (VI)	An aircraft continues on an assigned heading until intercepting and joining a path leg to another waypoint
Direct to Fix (DF)	An aircraft's path from where the previous path leg terminates and goes direct to the next waypoint
Track to Fix (TF)	An aircraft intercepts and joins the path that leads to the following waypoint

SOURCE: Federal Aviation Administration, FAA-H-8083-16B: Instrument Procedure Handbook. September, 2017.

7.1.1.4 Traffic Flow

For purposes of this 14 CFR Part 150 Study, the general arrival and departure traffic flows within the controlled airspace are described. **Chapter 4** provides a description of the runway operating configuration flows that are assumed for aircraft noise modeling. The phase when aircraft reach the planned maximum altitude well above 18,000 feet MSL takes place during the en route flow. Since this is normally beyond the 65 CNEL contour, this phase of flight is not considered in 14 CFR Part 150 Studies. The following sections describe the general departure and arrival traffic flow within the controlled airspace.

DEPARTURE FLOW. As an aircraft operating under IFR[13] (also known as an "IFR aircraft") departs a runway and follows its assigned heading, it moves from the airport Traffic Control Tower (ATCT) airspace, through the terminal airspace, and into en route airspace where it proceeds on a specific path[14] to its destination airport.

Within the terminal airspace, Terminal Radar Approach Control Facilities (TRACON) controllers provide services to aircraft departing from the ATCT airspace to transfer control points referred to as "exit points." An exit point represents an area along the boundary between terminal airspace and en route airspace. Exit points are generally established near commonly used paths to efficiently transfer aircraft between terminal and en route airspace. When aircraft pass through the exit point, control transfers from TRACON to Air Route Traffic Control Center (ARTCC) controllers as the aircraft joins a specific route.

At busy airports like San Diego International Airport (SDIA), departing IFR aircraft use a procedure called a Standard Instrument Departure (SID). A SID provides pilots with defined lateral and vertical guidance to facilitate safe and predictable navigation from an airport through the terminal airspace to a specific high-altitude route in the en route airspace. A "conventional" SID follows a route defined by ground-based NAVAIDs, may be based on air traffic controller-issued headings or vectoring, or both. Because of the increased precision inherent in RNAV technology, an RNAV SID defines a more predictable path through the airspace than a conventional SID through the combination of GPS and aircraft FMS.[15] Some RNAV SIDs may be designed to include routes called "runway transitions" that serve specific runways at airports.

Transitions are a series of fixes leading to/from a common route. A runway transition serves as a defined route from a runway to join a specific point or commonly used route. A runway transition may be based on an ATCT-issued heading towards a waypoint or a well-defined route starting near the departure end of a runway. A portion of a runway

[13] Title 14 Code of Federal Regulations 91.151 through 91.193, "Visual Flight Rules" and "Instrument Flight Rules."

[14] FAA standard procedures refer to a line between two fix points (e.g., waypoints, fixes or NAVAIDS) as a "route." FAA standard procedure plates depict the defined route. Procedure design may not translate to an aircraft located exactly on the route, especially if the route involves turns. For purposes of this evaluation, the expected location of an aircraft on a standard procedure is referred to as a "path." Difference between "route" and "path" definitions are applied to avoid confusion between FAA's definition of a route and where aircraft are expected to be located.

[15] Flight Management System (FMS) is an onboard navigation system that includes a navigation database, positioning sensors, automatic flight guidance, and a flight management computer. As a system, it references the entered flight path, uses various sensors to determine the aircraft's position, and provides automatic flight guidance to fly the aircraft or assist the pilot along the designated flight path laterally and vertically.

transition can have an effect on areas exposed to 65 CNEL or greater levels; therefore, are a focus for this 14 CFR Part 150. After the runway transition, aircraft fly along a common path or to a common waypoint before being directed along one or several diverging routes referred to as “en route transitions.” En route transitions may terminate at exit fixes or continue into en route airspace where aircraft join a specific high-altitude route.

ARRIVAL FLOW. An aircraft begins the descent phase of flight within the en route airspace. During descent, the aircraft transitions into the terminal airspace through an “entry point,” bound for the destination airport. The entry point represents a point along the boundary between terminal airspace and en route airspace where control of the aircraft transfers from ARTCC to TRACON controllers.

Aircraft that arrive in a busy terminal airspace, like the Southern California (SCT) TRACON, normally follow an instrument procedure called a Standard Terminal Arrival Route (STAR). Conventional and RNAV STARs are similar to conventional and RNAV SIDs. Aircraft leaving en route airspace and entering terminal airspace may follow an en route transition route from an entry fix to the STAR’s common route or common waypoint in the terminal airspace. From the common route segment, aircraft may follow a runway transition route that directs aircraft along a path to a point near an airport or a point where an instrument final approach starts (called the Initial Approach Fix) before joining the final approach to an airport. The final approach is the segment of flight along which an aircraft is aligned with the landing runway and operates along a straight route at a constant descent rate to the runway. A STAR can also provide partial guidance through the terminal airspace (e.g., it may not include runway transitions, so air traffic controllers would vector aircraft to the final approach to a runway). To efficiently manage the merge of arrivals from multiple directions on to a final approach to a runway, air traffic controllers typically direct pilots to turn and descend at various locations. Once an aircraft is established on the final approach to a runway and is between 4 to 5 NM from the runway, TRACON transfers control over to ATCT. ATCT monitors the aircraft on final approach and clears the pilot to land on the runway. Areas exposed to noise levels at or greater than 65 CNEL are typically caused by aircraft on the final approach to a runway.

7.1.2 CURRENT PROCEDURE AND ALTERNATIVES EVALUATED

It is important to note that there are two types of times of day considered for the analysis. One is the definition of time of day based on the inputs required for AEDT to create the CNEL contours. AEDT inputs for CNEL as follows:

- Daytime: 7:00 a.m. to 6:59 p.m.
- Evening: 7:00 p.m. to 9:59 p.m.
- Night: 10:00 p.m. to 6:59 a.m.

However, this is different than the time-of-day considerations when assigning of operations relative to time at SDIA and how that affects which procedure an aircraft flies. Those definitions for SDIA are as follows and affect how the alternatives are assigned/reassigned for the modeling of new procedures.

Daytime	Evening	Nighttime (10:00 p.m. to 6:59 a.m.)		
		Nighttime Noise Abatement	Departure Curfew[16]	Early Morning
7:00 a.m. to 6:59 p.m.	7:00 p.m. to 9:59 p.m.	10:00 p.m. to 11:29 p.m.	11:30 p.m. to 6:30 a.m.	6:30 a.m. to 6:59 a.m.

Daytime, evening, and nighttime jet departures heading to the west or north from Runway 27 are typically assigned the PADRZ RNAV SID. Aircraft stay on runway heading (275-degrees magnetic) until reaching 520 feet MSL[17]. Once the aircraft reaches 520 feet MSL, the aircraft turns to proceed direct to a waypoint which is located over the ocean approximately 7 NM northwest from the end of Runway 27. The waypoint is located to ensure jet aircraft diverge from other jet aircraft by at least 15-degrees. Aircraft reach 520 feet MSL at various locations over the ground due to aircraft performance, piloting, and weather. The variance in location when aircraft reach 520 feet MSL causes dispersion along the initial departure path from the end of Runway 27 and where aircraft turn right to head towards the waypoint. Aircraft that climb faster will turn sooner to the waypoint and will typically cross just north of the Mission Bay Channel. Aircraft such as heavy jets may reach 520 feet MSL slightly further west of the end of Runway 27 and end up just over the Mission Bay Channel. Because the majority of aircraft are large narrowbody jets flying shorter distances such as the Boeing 737 and Airbus 320, the majority of jet aircraft reach 520 feet MSL near the departure end of Runway 27 and end up just north of the Mission Bay Channel.

Daytime, evening, and early morning (6:30 a.m. to 6:59 a.m. only) jet departures heading to the east from Runway 27 are typically assigned the ZZOOO RNAV SID. Aircraft stay on the runway heading until the aircraft flies over JETTI waypoint located just under 4 NM from the end of Runway 27. Aircraft then turn left to go direct to the ZZOOO waypoint. An RNAV SID for eastbound jet departures between 10:00 p.m. and 6:30 a.m. that turn right from Runway 27 does not exist. Eastbound jet departures heading east that turn to the right from Runway 27 during nighttime noise abatement hours will be issued a 290-degree magnetic heading by the ATCT. SCT TRACON will then turn the aircraft south and issue vectors to keep the aircraft south of Point Loma residents.

The operational alternatives evaluated are related to the current jet departure procedures previously described for Runway 27. All other procedures used by turboprop and small jets are not evaluated and are to remain the same in all alternatives. These existing flight tracks are included in **Chapter 4**. **Table 7.2** lists the alternatives evaluated. The following sections provide a summary of each operational alternative evaluated. The summary includes the intent, existing conditions, proposed design, operational considerations for noise modeling, and aircraft noise analysis results related to each alternative.

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[16] If aircraft departs during curfew hours, ATC will assign the same procedures used for the nighttime noise abatement hours, which is PADRZ RNAV SID if heading north or west or an ATCT issued heading of 290-degrees if heading to the east.

[17] Mean Sea Level is an average level of the surface of one or more of Earth's bodies of water from which heights such as elevation may be measured.

TABLE 7.2 **LIST OF OPERATIONAL NOISE ABATEMENT ALTERNATIVES**

Alternative Type	Alternatives	Description	Existing Procedure
Noise Abatement Flight Path Alternatives (Section 7.2)			
Concentration	**Alternative 1A**	Departures Over the Mission Bay Channel with Dispersion	PADRZ RNAV SID and the 290-degree Eastbound Conventional
	Alternative 1B	Departures Over the Mission Bay Channel with Concentration	
	Alternative 1C	Departures Over the Mission Bay Channel with a Fly-over Waypoint	
	Alternative 1D	Departures Over the Mission Bay Channel with Concentration (Alternative 1B with Nighttime [10:00 p.m. to 6:30 a.m.] Only Operations) – *Also a nighttime-focused alternative*	
	Alternative 2A	Equivalent Lateral Spacing Operations (ELSO) for Departures with Dispersion (285-degree Heading)	PADRZ RNAV SID and the 290-degree Eastbound Conventional
	Alternative 2B	Equivalent Lateral Spacing Operations (ELSO) for Departures with Concentration (285-degree Heading)	
	Alternative 2C	Equivalent Lateral Spacing Operations (ELSO) for Departures with Dispersion (287-degree Heading)	
	Alternative 2D	Equivalent Lateral Spacing Operations (ELSO) for Departures with Concentration (287-degree Heading)	
Dispersion	**Alternative 3A**	Three SIDs for Runway 27 – Northbound Departure Split	PADRZ RNAV SID, 290-degree Eastbound Conventional and ZZOOO RNAV SID
	Alternative 3B	Three SIDs for Runway 27 – Eastbound Departure Split	
Operational Distribution Alternatives (Section 7.3)			
Nighttime	**Alternative 4**	Nighttime (10:00 p.m. to 6:30 a.m.) Eastbound Departures on ZZOOO RNAV SID	ZZOOO RNAV SID and 290-degree Eastbound Conventional

SOURCE: Ricondo & Associates, Inc., October, 2020.

7.2 NOISE ABATEMENT FLIGHT PATH ALTERNATIVES

The operational alternatives discussed in this section evaluate changes in a flight procedure with the intent to reduce non-compatible land uses affected by the 65 CNEL or greater contour.

7.2.1 Alternative 1 – Departures Over the Mission Bay Channel

Alternative 1 – Departures Over the Mission Bay Channel represents an initial departure path concept that turns jet departures to the northwest along a specific path heading to the Mission Bay Channel. The overall intent is to rely on RNAV procedure design to provide a more predictable route that may reduce exposure to residents north and south of the flight path due to reduced variance in dispersion. Relocation of the path may also take advantage of more compatible areas. The concept may also provide a benefit in reducing noise exposure levels for communities exposed to CNEL levels lower than 65 A-weighted decibel (dBA). The initial departure path would be the first leg of a runway transition for an RNAV SID at SDIA. The initial departure path concept could apply to aircraft heading to the west and north (the PADRZ RNAV SID traffic) and eastbound traffic during the nighttime noise abatement timeframe (10:00 p.m. to 6:30 a.m.) that are instructed by ATC to turn right from Runway 27 on a 290-degree magnetic heading.[18] This would take them beyond the 65 CNEL or greater contour. Jet aircraft would stay on the initial heading until one and a half miles from the shoreline, which is consistent with the current FAA Noise Dot Agreement[19] between the FAA and coastline communities. The following sections describe 4 different design versions of Alternative 1.

7.2.1.1 Alternative 1A - Departures Over the Mission Bay Channel with Dispersion

NOISE ABATEMENT PROCEDURE GOAL. Provide a predictable and repeatable initial jet departure path with some dispersion similar to what is experienced with the PADRZ RNAV SID along the path from Runway 27 that direct jet aircraft towards the Mission Bay Channel over more open area and possibly reduce number of people exposed to 65 CNEL or greater levels. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures turning to the right from Runway 27, including the eastbound jet departures issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, would be assigned the proposed Alternative 1A departure heading procedure. Figure 7.3 depicts the proposed design departure route (line connecting from one waypoint or fix to another), anticipated departure path (the actual departure path that most aircraft are anticipated to fly) and expected dispersion area (how departure paths are dispersed around the anticipated path due to differences in flight characteristics and weather) for Alternative 1A. This alternative procedure would direct aircraft on a runway heading (275-degree magnetic) until reaching 520 feet MSL.

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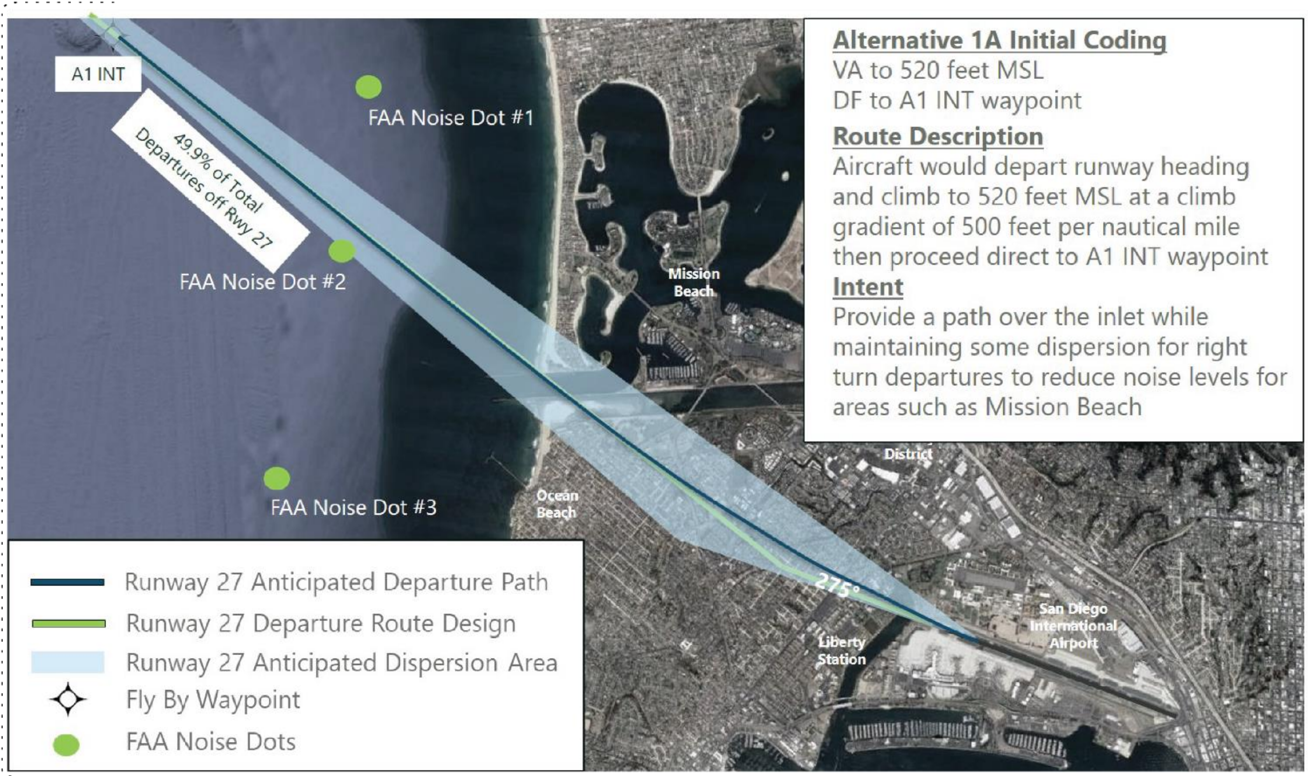
[18] SDIA enforces a departure curfew between 11:30 p.m. and 6:30 a.m. The 11:30 p.m. to 6:30 a.m. accounts for the curfew, but if a departure operates during the curfew hours, the aircraft would be assumed to operate on a specific flight path.

[19] In October 1998, Representative Brian Bilbray, the FAA, and Point Loma community members collaborated to reduce aircraft noise exposure in residential areas of Point Loma caused by Runway 27 jet departures turning east over Point Loma. As a result of these efforts, FAA added dots to the Southern California Terminal Radar Approach Control (SCT TRACON) radar screens as visual references to assist controllers with vectoring aircraft out and south of the residential areas of Point Loma. Runway 27 jet departures and Runway 27 arrival missed approaches are to stay on the initial heading until 1.5 NM west of the shoreline. Although there is no formal agreement in place, this initiative is commonly referred to as the "FAA Noise Dot Agreement."

Once the aircraft reaches 520 feet MSL, the aircraft turns to proceed direct to a waypoint (A1 INT) located over the ocean 6.6 NM northwest from the end of Runway 27. The design of this initial departure path is called a Vector to Altitude then Direct to a Fix (VA and DF), which is the same type of design used for the PADRZ RNAV SID. The A1 INT waypoint is located less than a quarter of a NM south of the existing WNFLD waypoint used for the PADRZ RNAV SID. The waypoint is located to ensure jet aircraft diverge from other jet aircraft by at least 15-degrees and directs aircraft over the Mission Bay Channel area. Aircraft would reach 520 feet MSL at various locations over the ground, which causes dispersion along the initial departure path from the end of Runway 27 to the shoreline, but would be less dispersion to the north compared to existing traffic. The majority of jet aircraft would expect to operate over the Mission Bay Channel area with some traffic just north and south of the Mission Bay Channel area.



SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.3 **ALTERNATIVE 1A – DEPARTURES OVER THE MISSION BAY CHANNEL WITH DISPERSION**

MODELING ASSUMPTIONS. Figure 7.4 depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 1A. The center of the Alternative 1A noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow.

All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound jet departures are issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, are assigned to the Alternative 1A initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 1A were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.5**).

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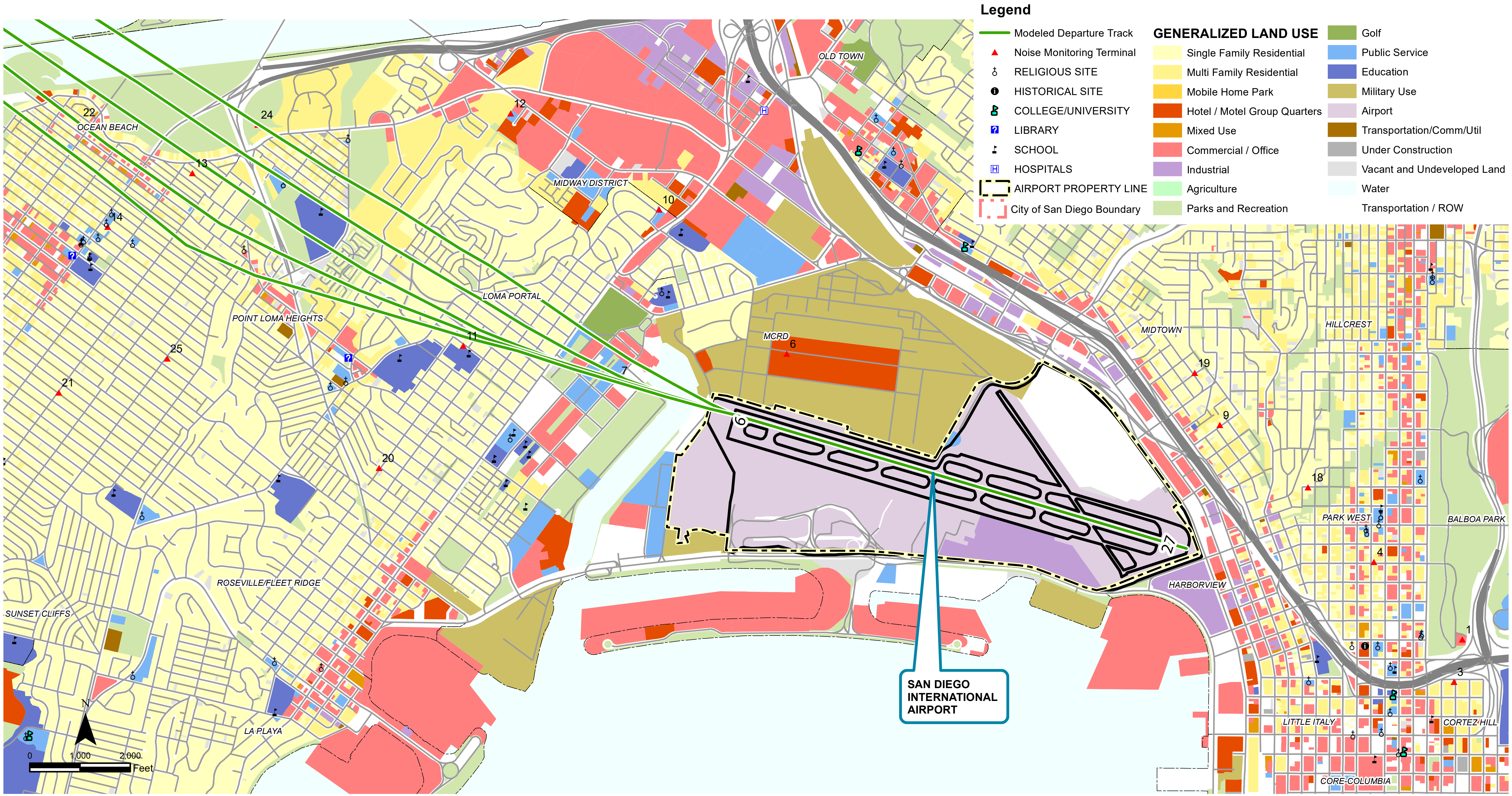
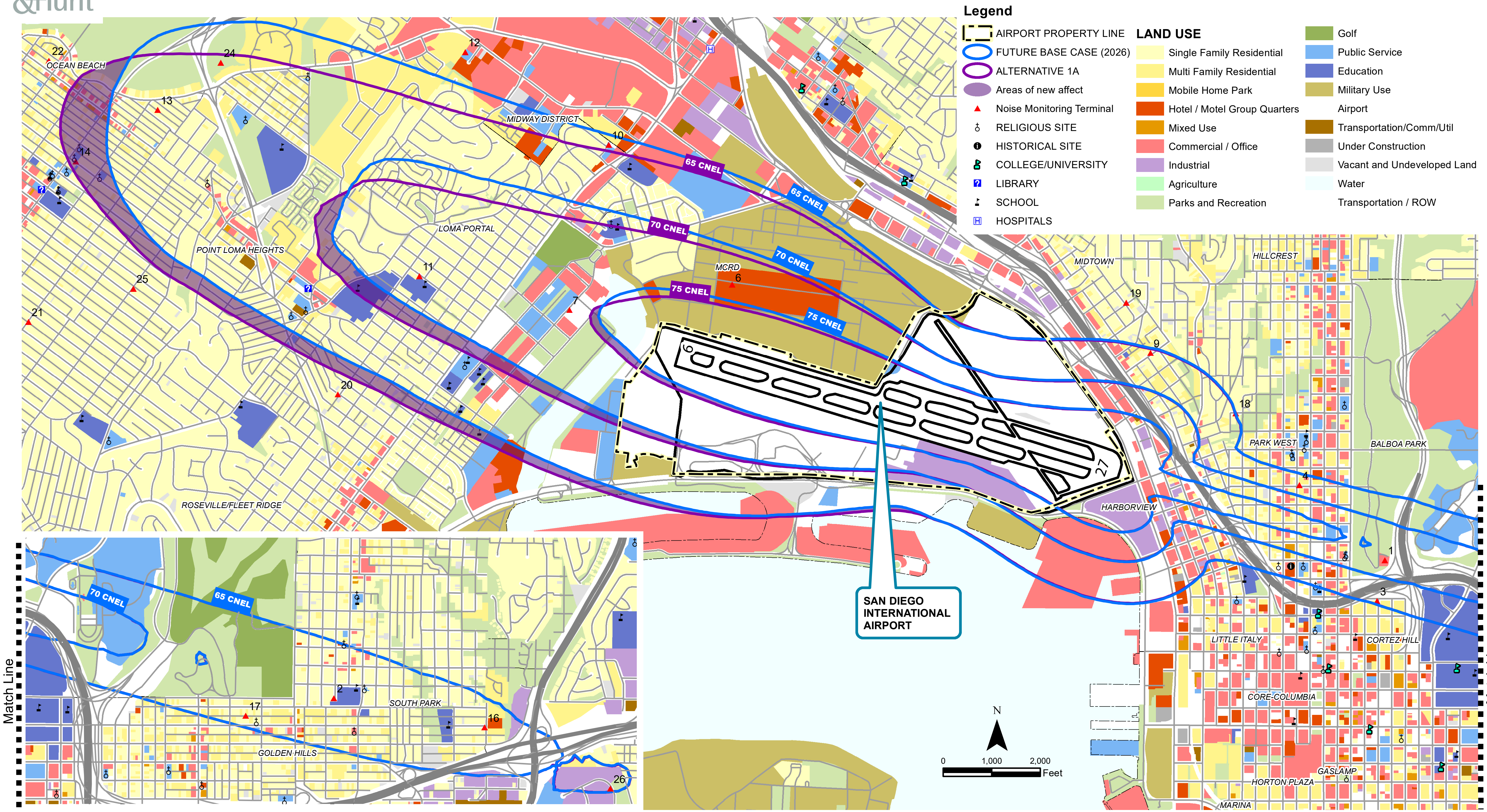


SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.4 **ALTERNATIVE 1A NOISE MODEL TRACKS**

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates September, 2020 (Alternative Contours)

FIGURE 7.5 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 1A COMPARISON**

This alternative would result in a shift in the noise to the south and to the west. **Table 7.3** summarizes the population and housing units within the 65 CNEL or greater noise exposure contours for Alternative 1A in comparison with the Future Base Case.[20] As this table notes, this alternative would result in a decrease of 591 people exposed to 65 CNEL, 339 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 348. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 950 new housing units in the 65 CNEL and 230 new units in the 70 CNEL, and zero new housing units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.3 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 1A**

Contour Interval	Housing Units	Estimated Population
Alternative 1A		
65 CNEL or greater	14,801	30,385
70 CNEL or greater	2,569	4,834
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 1A vs. Future Base Case Difference		
65 CNEL or greater	-348	-591
70 CNEL or greater	-73	-339
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+950	-1,280
70 CNEL or greater	+230	-300
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010**.** HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020. [21]

[20] 14 CFR Part 150 Section 150.23 (e)

[21] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (National Environmental Policy Act, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.1.2 Alternative 1B – Departures Over the Mission Bay Channel with Concentration

NOISE ABATEMENT PROCEDURE GOAL. Provide a more predictable and repeatable initial jet departure path with greater concentration along the path from Runway 27 compared to Alternative 1A. Alternative 1B would direct jet aircraft towards the Mission Bay Channel over more open area and possibly reduce number of people exposed to 65 CNEL or greater levels. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE Daytime, evening, and nighttime jet departures turning to the right, including the eastbound jet departures issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, from Runway 27 would be assigned the proposed Alternative 1B initial departure heading procedure. **Figure 7.6** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 1B. Aircraft would be directed on runway heading (275-degrees magnetic) until reaching an intercept point located close to 1 NM from the departure end of Runway 27 and climb at a climb gradient of 500 feet per NM. Once the aircraft reaches close to the intercept point, the aircraft would proceed on a right turn to join a course on approximately a 293-degree magnetic heading that leads to a waypoint (A1 INT) located over the ocean 6.6 NM northwest from the end of Runway 27, beyond the 65 CNEL contour. The design of this initial departure path is called a Vector to Intercept (VI) a course and then stay on the Course to Fix (CF).[22] The A1 INT waypoint over the ocean is located to ensure jet aircraft diverge from other jet aircraft on the ZZOOO RNAV SID by at least 15-degrees and direct more aircraft over the Mission Bay Channel area. Because aircraft must join a course prior to the waypoint over the ocean, the dispersion from the end of Runway 27 would be less compared to the design proposed for Alternative 1A. Aircraft will continue to proceed in a westerly direction to join the course; therefore, the dispersion from the runway to where aircraft will begin to turn on the course will be less compared to Alternative 1A dispersion.

[22] A design with a Vector to Altitude and then a Course to Fix was assessed but determined the anticipated dispersion area would be similar; therefore, the Vector to Intercept then Course to Fix design was selected to represent both design options.

The course is designed to place aircraft over the Mission Bay Channel; therefore, the majority of jet aircraft are expected to be over the channel with some traffic just north and south of the Mission Bay Channel area if this procedure was implemented.

SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.6 **ALTERNATIVE 1B – DEPARTURES OVER THE MISSION BAY CHANNEL WITH CONCENTRATION**

MODELING ASSUMPTIONS. **Figure 7.7** depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 1B. The center of the Alternative 1B noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.), and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound jet departures issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, are assigned to the Alternative 1B initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 1B were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.8**).

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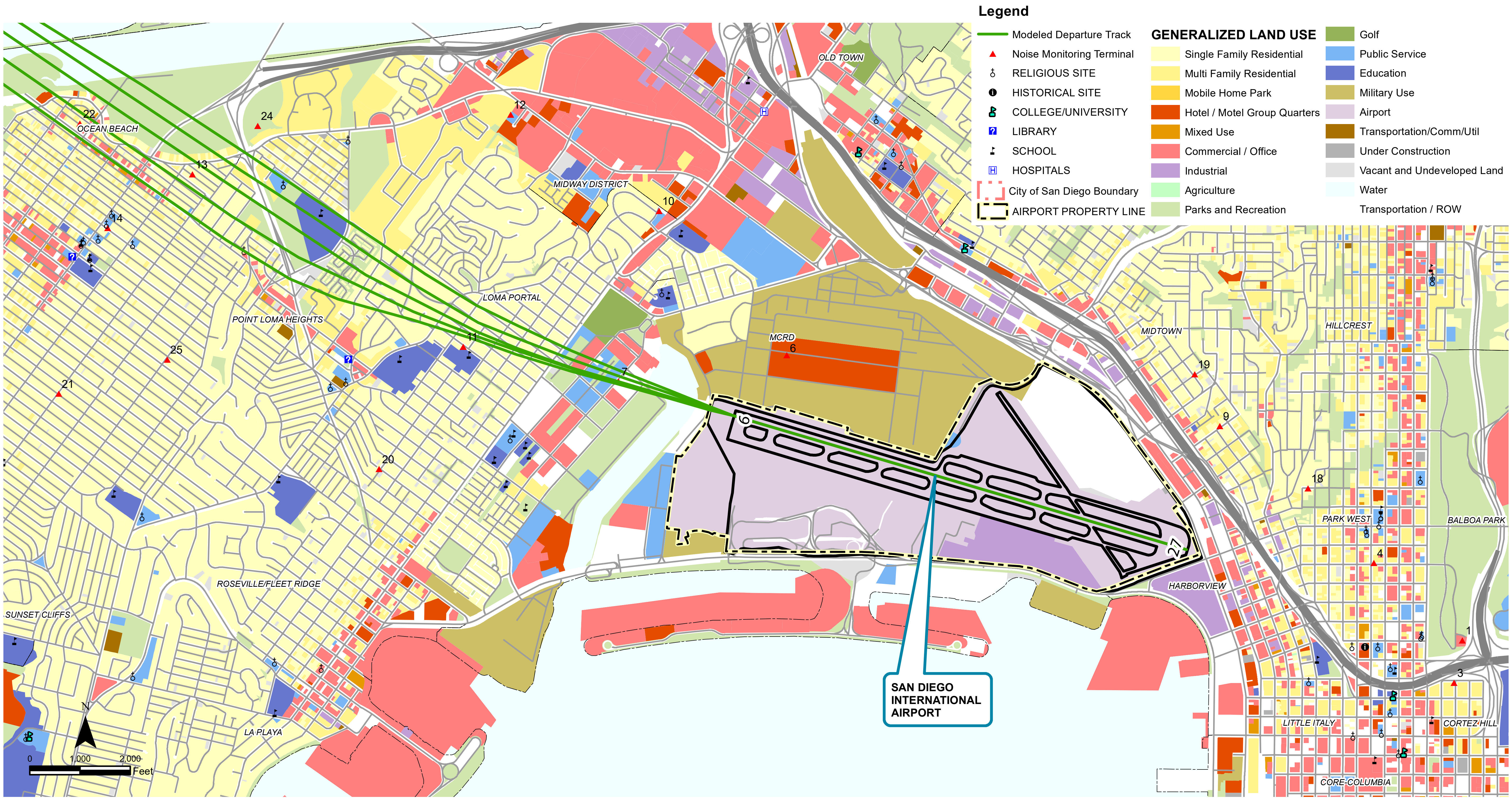
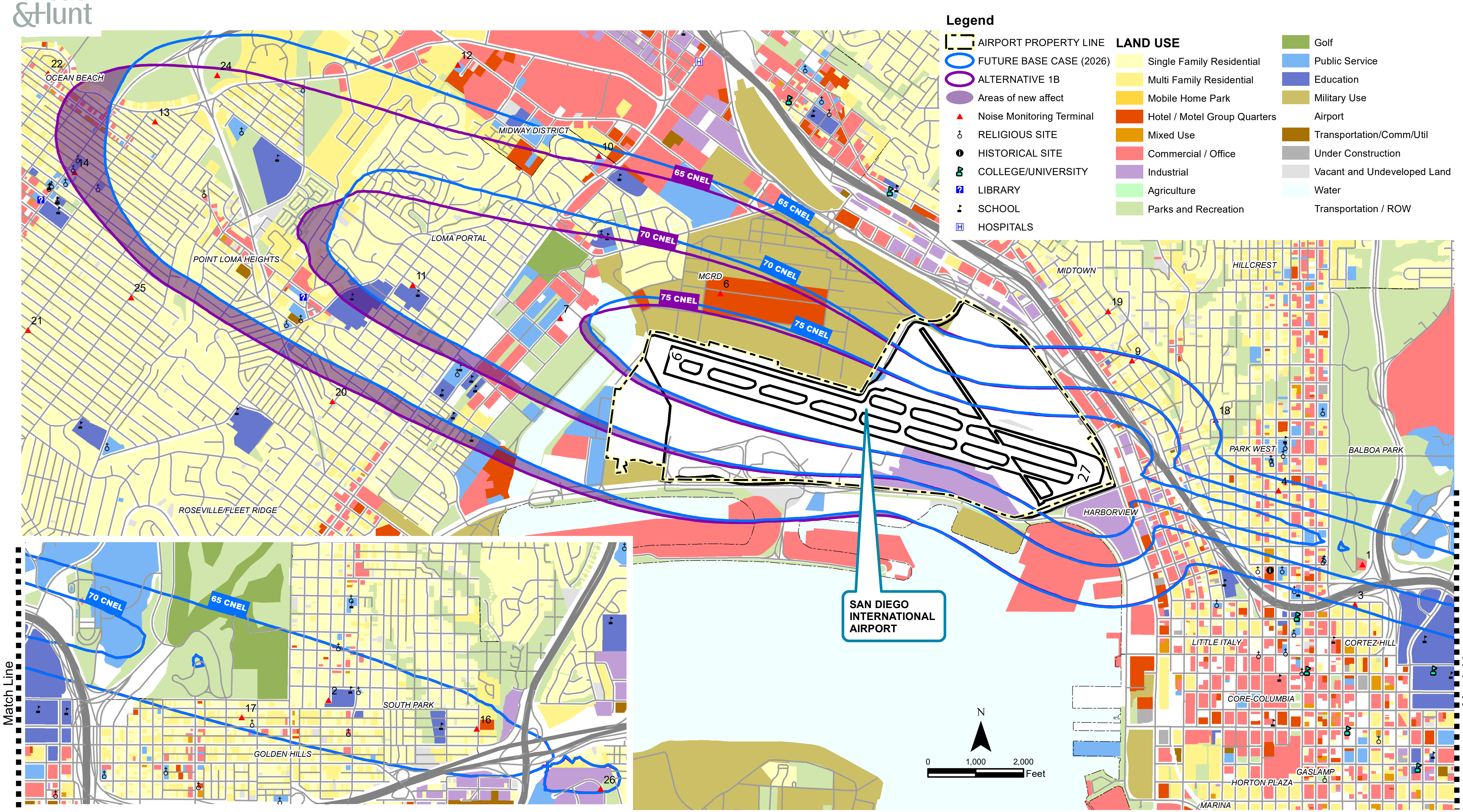


SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.7 **ALTERNATIVE 1B NOISE MODEL TRACKS**

Mead & Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
22. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates September, 2020 (Alternative Contours)

FIGURE 7.8 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 1B COMPARISON**

Table 7.4 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours for Alternative 1B in comparison with the Future Base Case. As this table notes, this alternative would result in a decrease of 867 people exposed to 65 CNEL, 191 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 487. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,030 new housing units within the 65 CNEL,310 new housing units in the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.4 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 1B**

Contour Interval	Housing Units	Estimated Population
Alternative 1B		
65 CNEL or greater	14,662	30,109
70 CNEL or greater	2,625	4,982
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 1B vs. Future Base Case Difference		
65 CNEL or greater	-487	-867
70 CNEL or greater	-17	-191
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,030	-1,500
70 CNEL or greater	+310	-320
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[23]

[23] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation:** This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.1.3 Alternative 1C - Departures Over the Mission Bay Channel with a Fly-Over Waypoint

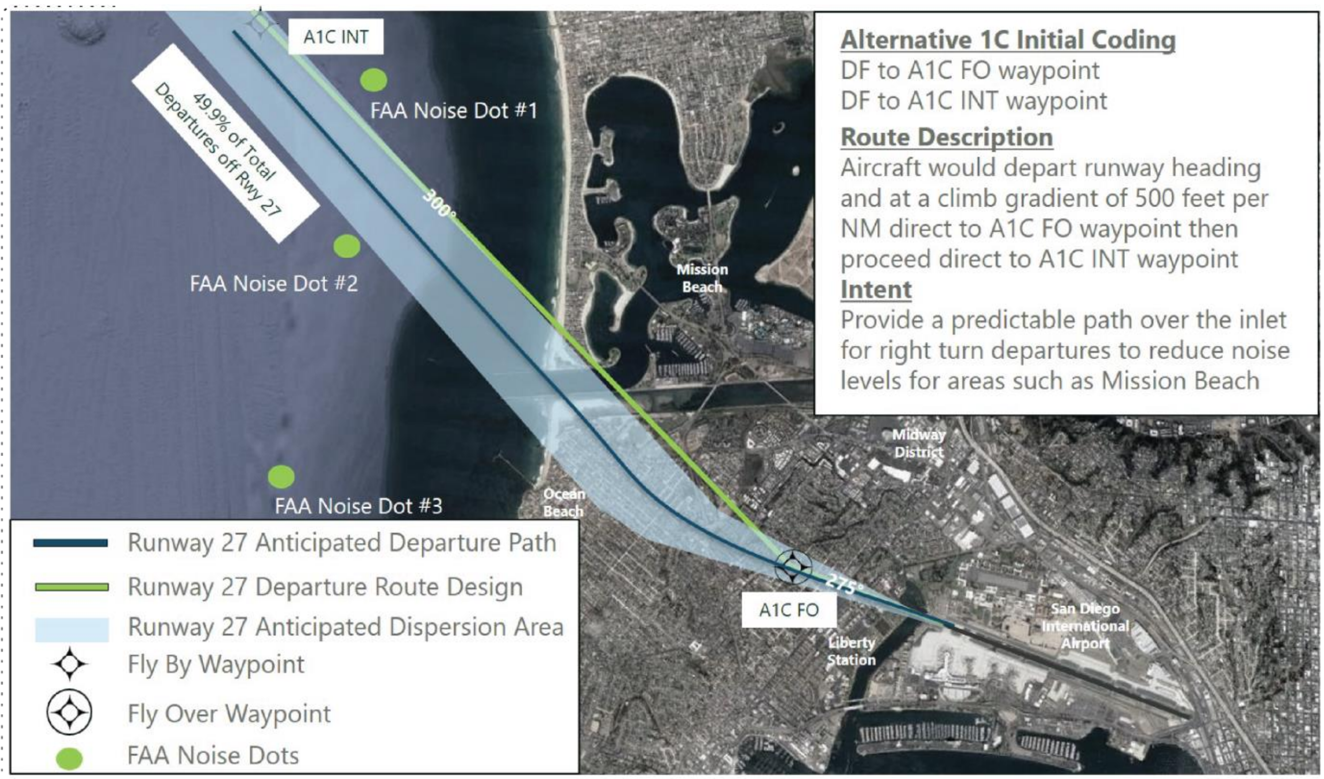
NOISE ABATEMENT PROCEDURE GOAL. Provide a predictable and repeatable initial jet departure path with very little to no dispersion along the path from Runway 27 that direct jet aircraft towards a fixed point on runway heading thence a turn to the northwest to direct jet aircraft over the Mission Bay Channel to possibly reduce number of people exposed to 65 CNEL or greater levels. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE: Daytime, evening, and nighttime jet departures turning to the right from Runway 27, including the eastbound jet departures issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, would be assigned the proposed Alternative 1C initial departure heading procedure. **Figure 7.9** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 1C. Aircraft would be directed on runway heading (275-degrees magnetic) until it flies over a waypoint (A1C FO) located 1 NM from the end of Runway 27. All jet aircraft must fly over the A1C FO waypoint before turning right to the next leg of the route. The next leg directs aircraft to go direct to a waypoint (A1C-INT) approximately 7 NM northwest of the end of Runway 27 far beyond the 65 CNEL contour. Waypoint A1C INT is designed to ensure jet aircraft diverge from other jet aircraft on the ZZOOO RNAV SID by at least 15-degrees and direct more aircraft over the Mission Bay Channel area.

Because aircraft must fly over A1C FO waypoint prior to turning northwest, the level of concentration from the end of Runway 27 to A1C FO is expected to be high, but dispersion will increase after aircraft pass over the waypoint and turn to the northwest towards A1C INT waypoint. The course is designed to place aircraft over the Mission Bay Channel, but dispersion of jet aircraft is expected to be wider compared to Alternatives 1A and 1B and will operate over areas north and south of the Mission Bay Channel area more frequently compared to Alternatives 1A and 1B. The traffic will be more dispersed over the Mission Bay Channel because aircraft that fly over the waypoint will make the turn heading north at different locations.

To direct aircraft over the Mission Bay Channel, this design requires waypoint A1C INT to be located just over a half NM north of the existing WNFLD waypoint, which will direct jet aircraft closer to La Jolla and Pacific Beach shoreline areas. The RNAV design route indicates a course heading between A1 FO and A1C INT of 300-degree magnetic, but aircraft are expected to turn more than 300-degrees after flying over A1 FO to get close to A1C INT waypoint.

An issue with the proposed design is the relocation of the WNFLD waypoint to the proposed A1C INT waypoint. The design requires moving the waypoint further north of the existing WNFLD waypoint in order to direct traffic over the Mission Bay Channel, which moves departures closer to Pacific Beach and La Jolla. This conflicts with an ANAC recommendation to move northbound departures further east of Pacific Beach and further south of La Jolla. Because this design conflicts with previous ANAC recommendations, Alternative 1C would not be feasible. Although this alternative may not be deemed feasible by ANAC, a noise modeling analysis was conducted to assess potential changes to noise for areas exposed to 65 CNEL or greater.

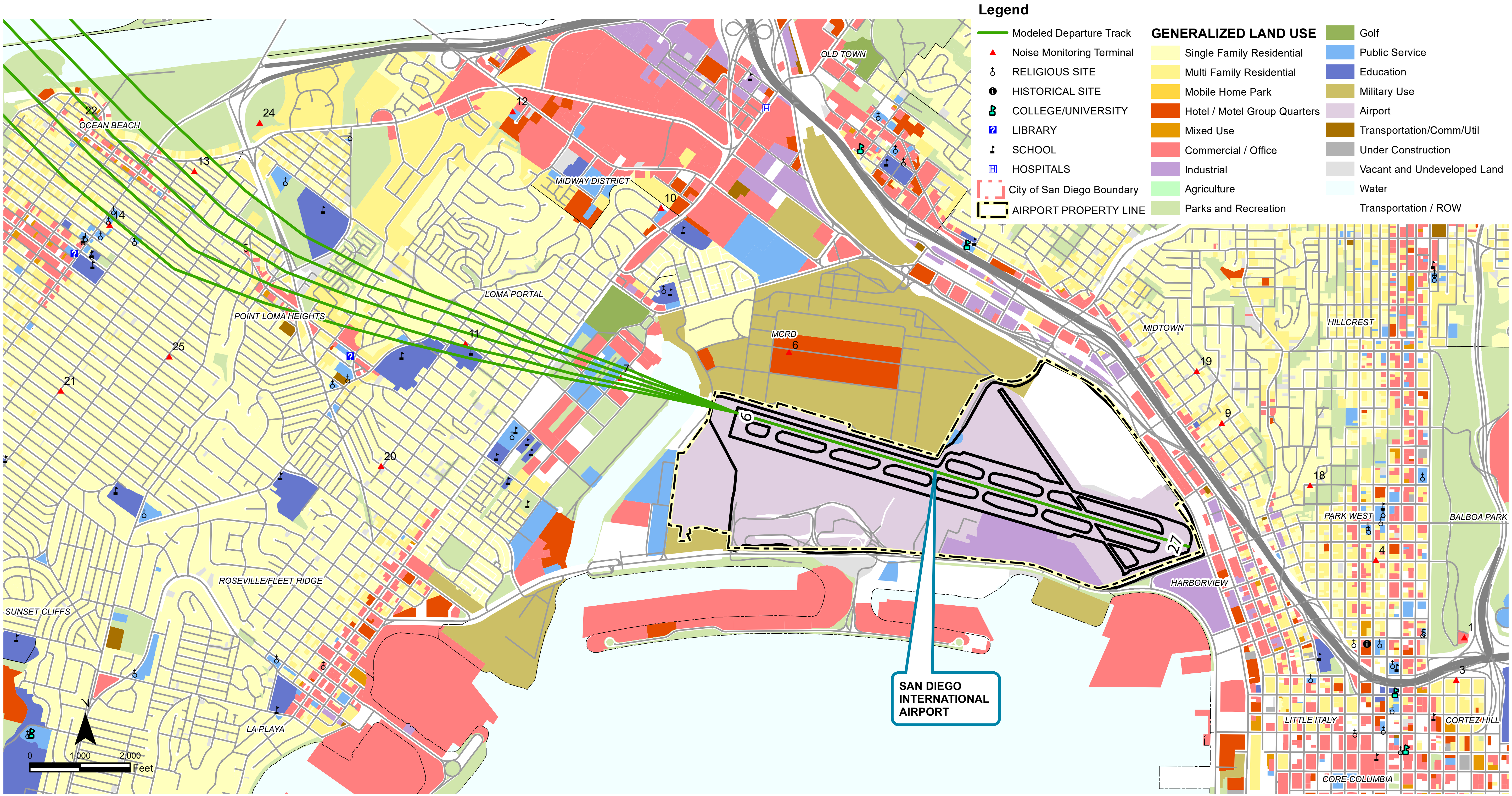


SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.9 **ALTERNATIVE 1C – DEPARTURES OVER THE MISSION BAY CHANNEL WITH FLY-OVER WAYPOINT**

MODELING ASSUMPTIONS. **Figure 7.10** depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 1C. The center of the Alternative 1C noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.), and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound jet departures issued a 290-degree magnetic heading by ATCT during nighttime noise abatement hours, are assigned to the Alternative 1C initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

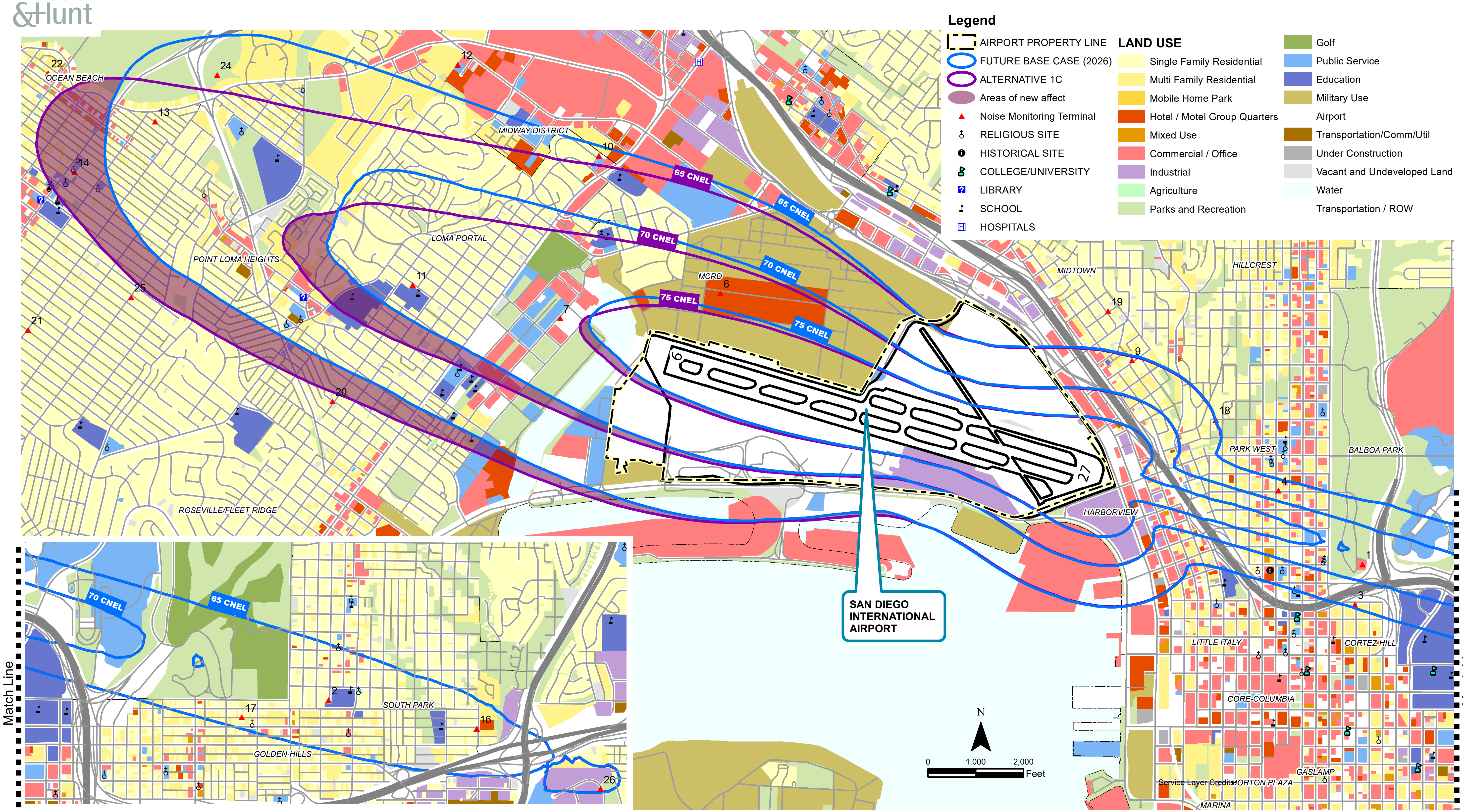
CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 1C were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.11**).



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.10 **ALTERNATIVE 1C NOISE MODEL TRACKS**

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September 2020 (Alternative Contours)

FIGURE 7.11 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 1C COMPARISON**

Table 7.5 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 1,144 people exposed to 65 CNEL, 84 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 690. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,640 new housing units within the 65 CNEL, 450 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.5 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 1C**

Contour Interval	Housing Units	Estimated Population
Alternative 1C		
65 CNEL or greater	14,459	29,832
70 CNEL or greater	2,685	5,089
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 1C vs. Future Base Case Difference		
65 CNEL or greater	-690	-1,144
70 CNEL or greater	+43	-84
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,640	-2,320
70 CNEL or greater	+450	-400
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[24]

[24] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation:** This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.1.4 Alternative 1D - Departures Over Mission Bay Channel with Concentration (Alternative 1B with Nighttime [10:00 p.m. to 6:30 a.m.] Only Operations)

NOISE ABATEMENT PROCEDURE GOAL. The procedure is a modified version of Alternative 1B, that would be applicable only during the nighttime noise abatement hours (10:00 p.m. to 6:30 a.m.). The goal is to provide a more predictable and repeatable initial jet departure path with greater concentration along the path from Runway 27 and direct jet aircraft towards the Mission Bay Channel over more open area. The intent is to possibly reduce number of people exposed to 65 CNEL or greater levels as intended by the current nighttime noise abatement procedure.

PROPOSED ALTERNATIVE. As a modification to Alternative 1B only nighttime (10:00 p.m. to 6:29 a.m.) jet departures turning to the right from Runway 27 would be assigned the proposed Alternative 1B initial departure heading procedure including the eastbound departures issued a 290-degree magnetic heading by ATCT. **Figure 7.12** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 1D (the same as Alternative 1B). As mentioned above, this departure heading procedure is the same as Alternative 1B, but would be used for nighttime noise abatement hours operations only.

SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.12 **ALTERNATIVE 1D – DEPARTURES OVER THE MISSION BAY CHANNEL WITH CONCENTRATION (ALTERNATIVE 1B WITH NIGHTTIME [10:00 P.M. TO 6:30 A.M.] ONLY OPERATIONS)**

MODELING ASSUMPTIONS. **Figure 7.13** depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 1D, which are the same as Alternative 1B. The center of the Alternative 1B/1D noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet departures during the nighttime noise abatement hours (10:00 p.m. to 6:29 a.m.) that turn right from Runway 27 are assigned to the Alternative 1D initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 1D were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.14**).

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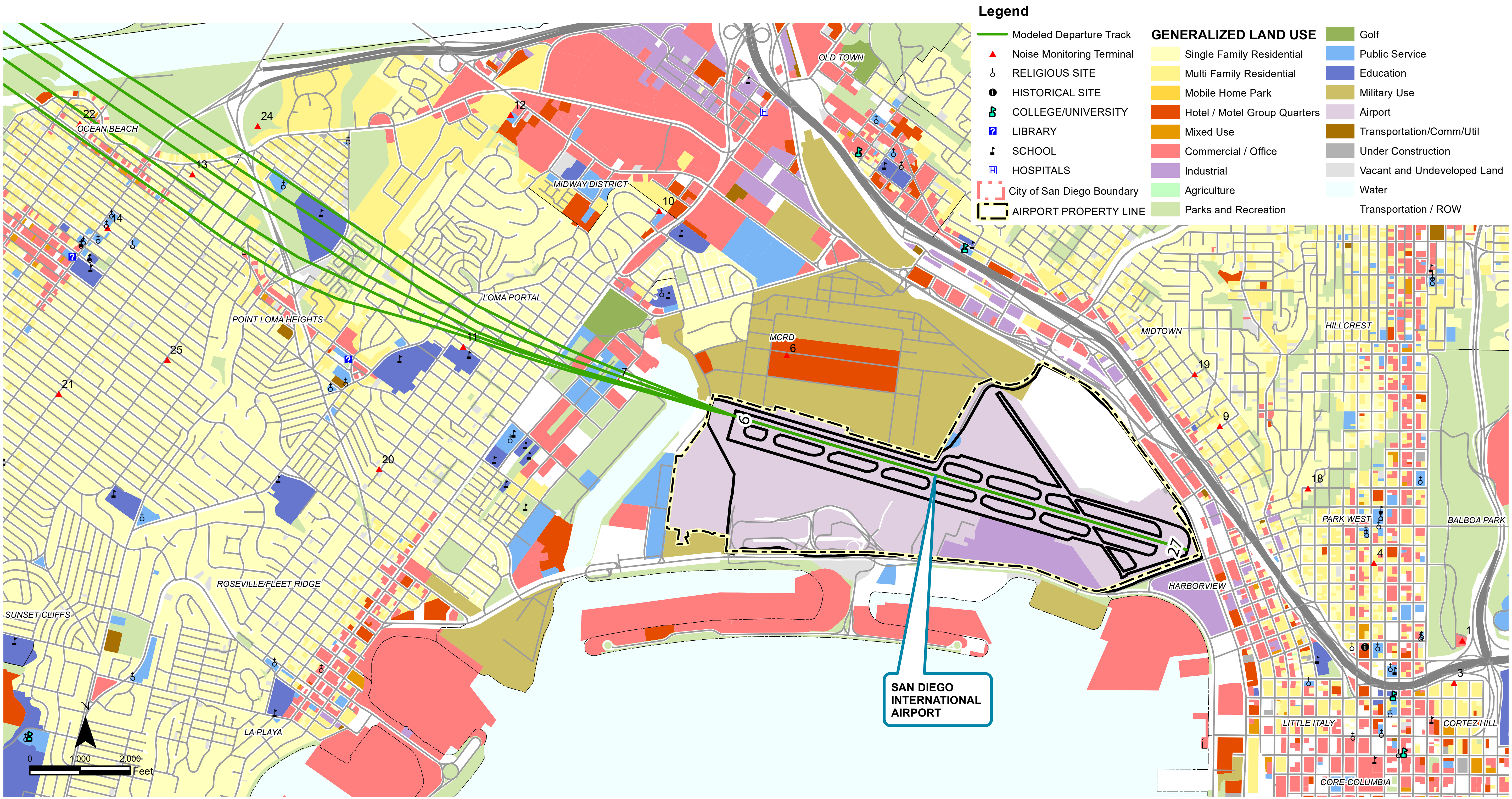
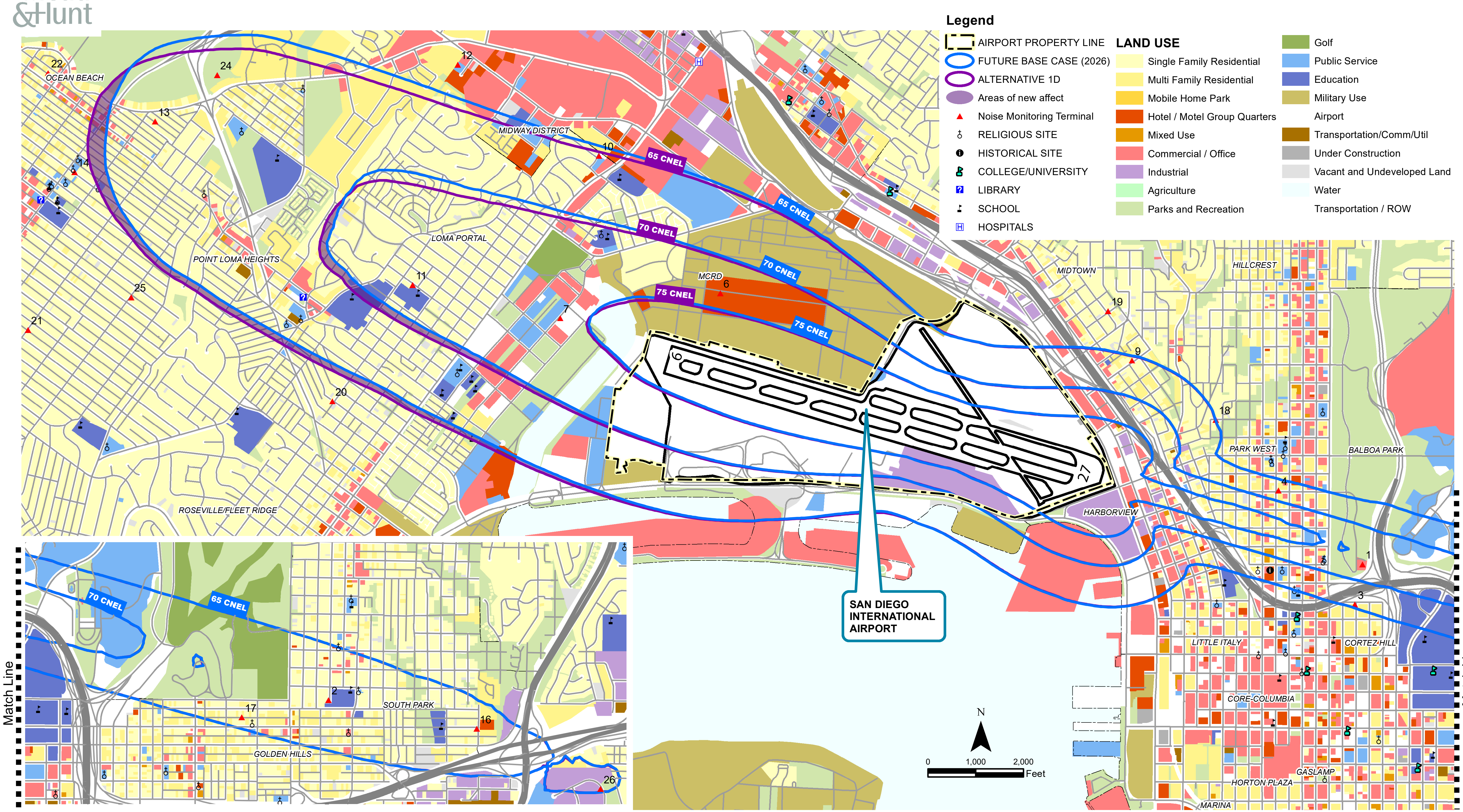


SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.13 **ALTERNATIVE 1D NOISE MODEL TRACKS**



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.14 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 1D COMPARISON**

Table 7.6 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours for Alternative 1D in comparison with the Future Base Case. As this table notes, this alternative would result in a decrease of 289 people exposed to 65 CNEL, 172 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 198. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 330 new housing units within the 65 CNEL, 100 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach. It represents a smaller shift in noise compared to Alternative 1B, as Alternative 1D only reallocates the nighttime noise abatement hour operations.

TABLE 7.6 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 1D**

Contour Interval	Housing Units	Estimated Population
Alternative 1D		
65 CNEL or greater	14,951	30,687
70 CNEL or greater	2,595	5,001
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 1D vs. Future Base Case Difference		
65 CNEL or greater	-198	-289
70 CNEL or greater	-47	-172
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+330	-520
70 CNEL or greater	+100	-140
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[25]

[25] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (National Environmental Policy Act, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.2 Alternative 2 - Equivalent Lateral Spacing Operations (ELSO) For Departures

Alternative 2 – Equivalent Lateral Spacing Operations (ELSO) for Departures – represents an initial departure path concept that turns jet departures to the northwest along a 10-degree divergent heading, as opposed to a 15-degree divergent heading, from the ZZOOO RNAV SID heading (which is 275-degrees magnetic). The overall intent is to rely on RNAV procedure design to provide a more predictable route that may reduce exposure to residents north and south of the flight path due to reduced variance in dispersion. The concept may also provide a secondary benefit in reducing noise exposure levels for communities exposed to levels lower than 65 CNEL. The initial departure path would be the first leg of an RNAV SID runway transition from Runway 27 at SDIA. The initial departure path concept could apply to aircraft heading to the west and north (the PADRZ RNAV SID traffic) and eastbound traffic that are instructed by ATC to turn right from Runway 27 during the nighttime noise abatement timeframe (10:00 p.m. to 6:30 a.m.). Jet aircraft would stay on the initial heading until one and a half miles from the shoreline, which is consistent with the current FAA Noise Dot Agreement between the FAA and coastline communities. The following sections describe 4 different design versions of Alternative 2.

7.2.2.1 Alternative 2A - Equivalent Lateral Spacing Operations (ELSO) For Departures with Dispersion (285-Degree Heading)

NOISE ABATEMENT PROCEDURE GOAL. Provide a predictable and repeatable initial jet departure path with some dispersion along the path from Runway 27 that direct jet aircraft along a heading that diverges from the ZZOOO RNAV SID (existing departure) heading by at least 10-degrees. This change moves traffic further south of the current base case flight path, which may provide relief to people exposed to 65 CNEL or greater levels located under and north of the current path. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures turning to the right from Runway 27 would be assigned the proposed Alternative 2A initial departure heading procedure. **Figure 7.15** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 2A. Aircraft would be directed on runway heading (275-degrees magnetic) until reaching 520 feet MSL. Once the aircraft reaches 520 feet MSL, the aircraft turns to proceed direct to a waypoint (A2 INT) located over the ocean 6.5 NM northwest from the end of Runway 27. The design of this initial departure path is called a Vector to Altitude then Direct to a Fix (VA and DF). The A2 INT waypoint is located to ensure jet aircraft diverge from other jet aircraft by at least 10-degrees and directs aircraft south of the Mission Bay Channel area. Aircraft would reach 520 feet MSL at various locations over the ground, which causes dispersion along the initial departure path from the end of Runway 27 to the shoreline but would be less dispersion to the north compared to the existing departure traffic that turns right from Runway 27.

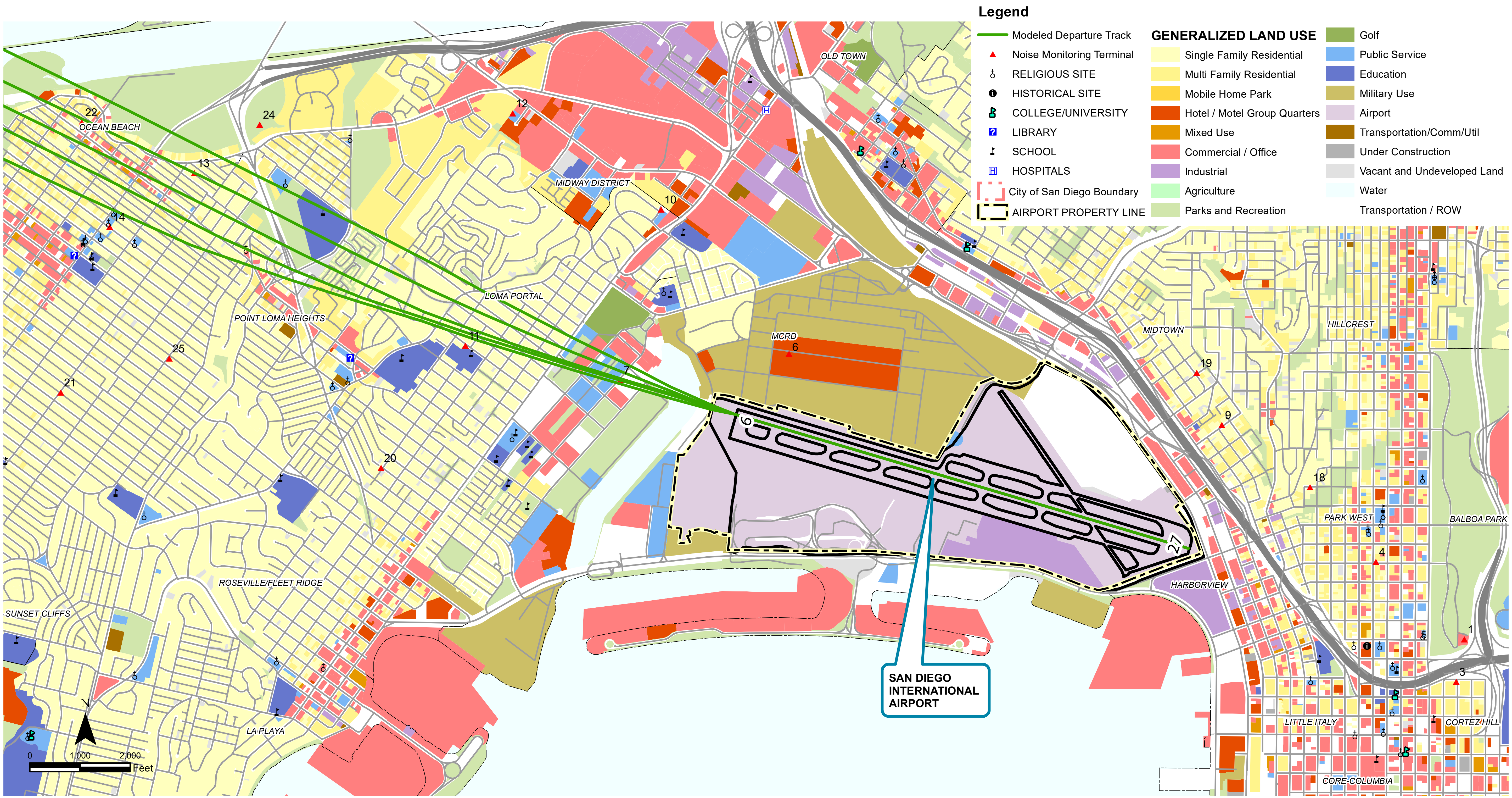
SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.15 **ALTERNATIVE 2A – EQUIVALENT LATERAL SPACING OPERATIONS (ELSO) FOR DEPARTURES WITH DISPERSION**

MODELING ASSUMPTIONS. Figure 7.16 depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 2A. The center of the Alternative 2A noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound departures issued a 290-degree magnetic heading by ATCT, are assigned to the Alternative 2A initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

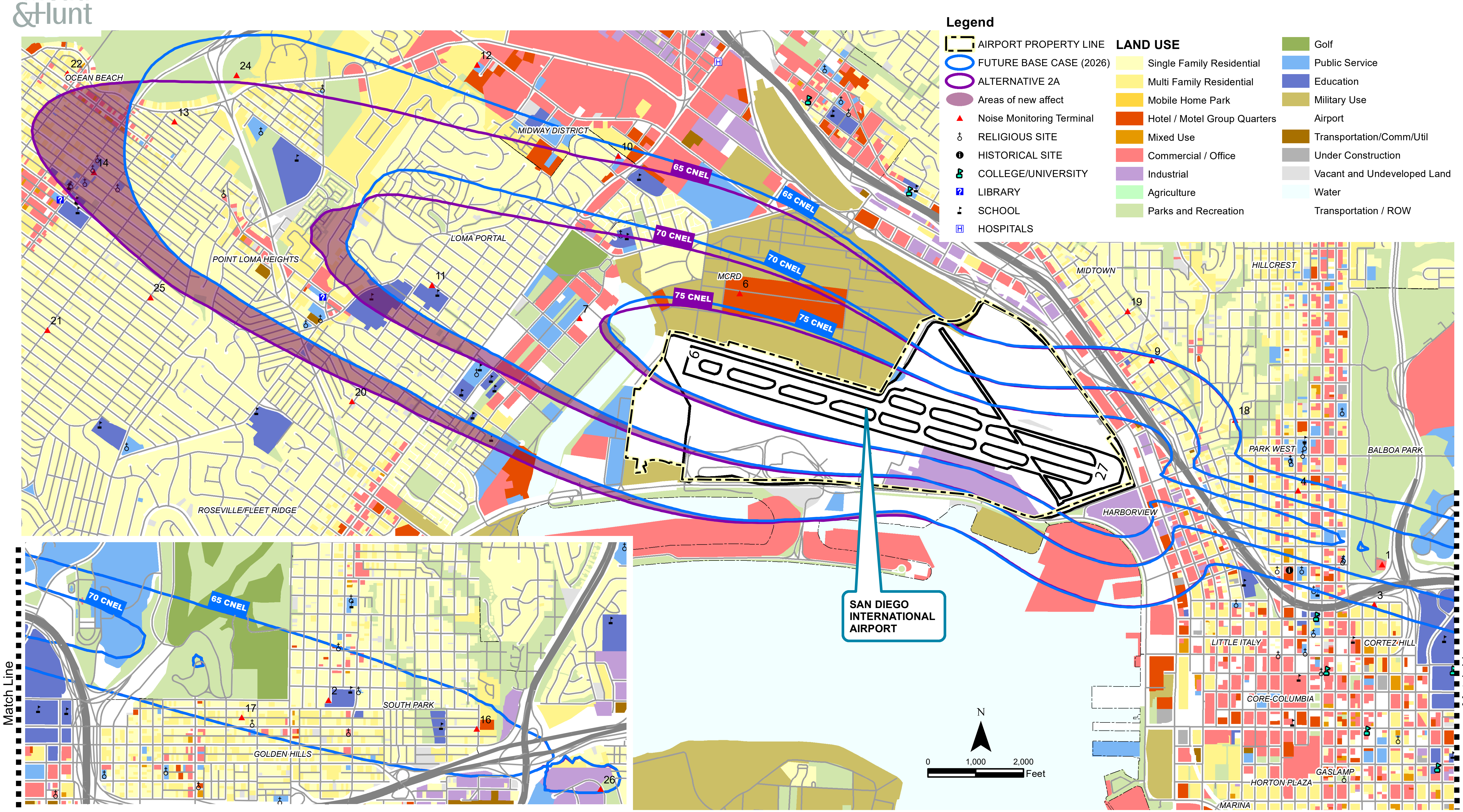
CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 2A were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.17**).

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.16 **ALTERNATIVE 2A NOISE MODEL TRACKS**



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.17 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 2A COMPARISON**

Table 7.7 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in an additional 106 people exposed to 65 CNEL, a decrease of 138 people exposed to 70 CNEL, and a decrease of 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would increase by 43 units. There would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,870 new housing units within the 65 CNEL, 350 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.7 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 2A**

Contour Interval	Housing Units	Estimated Population
	Alternative 2A	
65 CNEL or greater	15,192	31,082
70 CNEL or greater	2,653	5,035
75 CNEL or greater	513	698
	Future Base Case	
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
	Alternative 2A vs. Future Base Case Difference	
65 CNEL or greater	+43	+106
70 CNEL or greater	+11	-138
75 CNEL or greater	-2	-1
	Number of Housing Units New In/New Out of Contours	
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,870	-1,780
70 CNEL or greater	+350	-330
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[26]

[26] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative and the application of the ELSO criteria, to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.2.2 Alternative 2B - Equivalent Lateral Spacing Operations (ELSO) For Departures with Concentration (285-Degree Heading)

NOISE ABATEMENT PROCEDURE GOAL. Provide a more predictable and repeatable initial jet departure path along the path from Runway 27 that direct jet aircraft along a heading that diverges from the ZZOOO RNAV SID heading by at least 10-degrees. This alternative provides greater predictability and repeatability compared to Alternative 2A due to less dispersion. This change moves traffic further south of the current base case flight path, which may provide relief to people exposed to 65 CNEL or greater levels located under and north of the current path. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures turning to the right from Runway 27 would be assigned the proposed Alternative 2B initial departure heading procedure. **Figure 7.18** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 2B. Aircraft would be directed on runway heading (275-degrees magnetic) until reaching an intercept point close to 1 NM from the departure end of Runway 27 and climb at a rate of 500 feet per NM. Once the aircraft reaches close to the intercept point, the aircraft would turn right to join a course on approximately a 285-degree magnetic heading that heads towards a waypoint (A2 INT) located over the ocean 6.5 NM northwest from the end of Runway 27.

The design of this initial departure path is called a Vector to Intercept a course and then stay on the Course to a Fix (VI and CF). The A2 INT waypoint is located to ensure jet aircraft diverge from other jet aircraft on the ZZOOO RNAV SID by at least 10-degrees and direct more aircraft south of the Mission Bay Channel area. Aircraft will continue to proceed in a westerly direction to join the course; therefore, the dispersion from the runway to where aircraft will begin to turn on the course will be less compared to Alternative 1A dispersion.

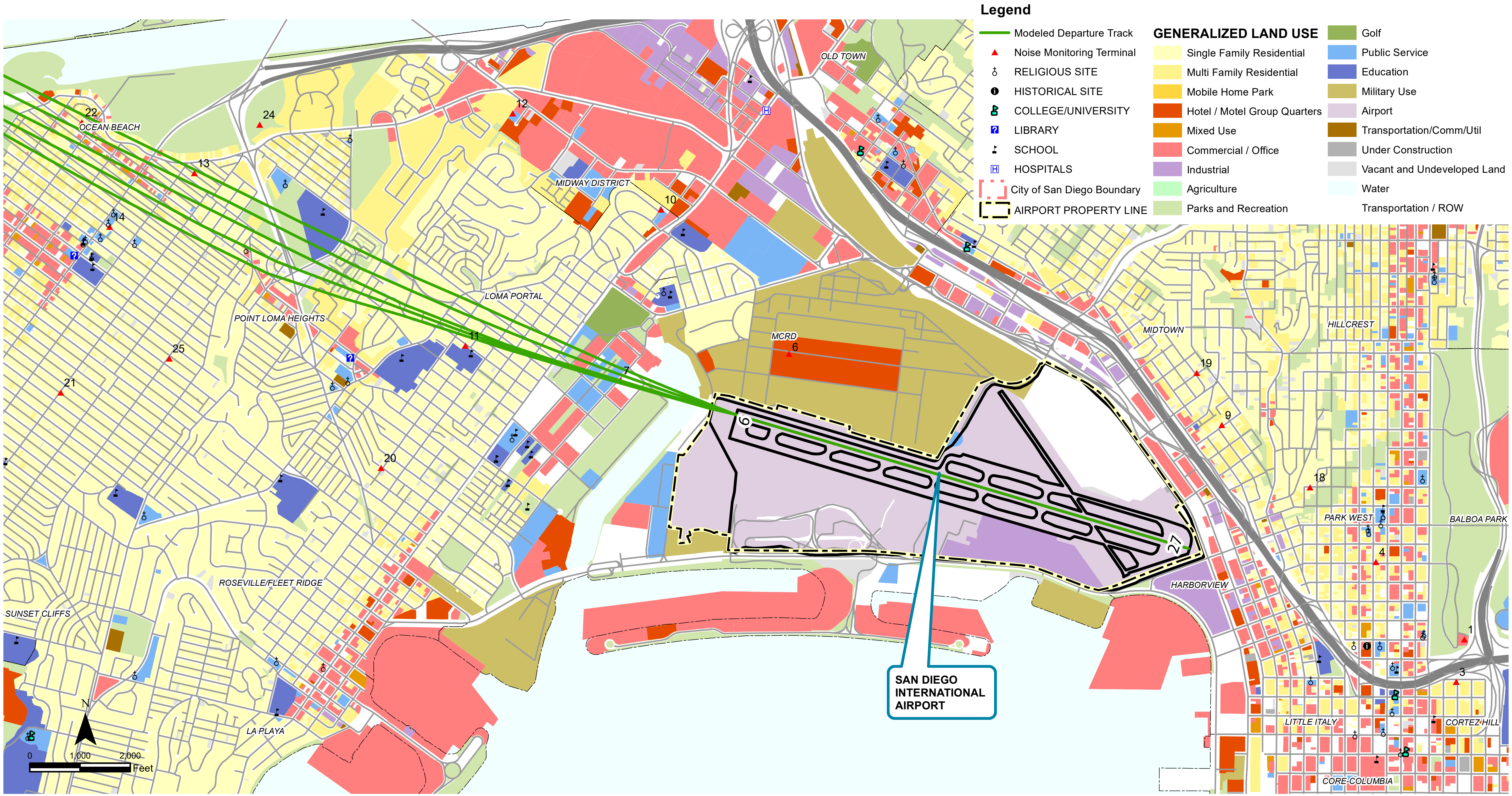
SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., January 2020 (proposed paths and dispersion area).

FIGURE 7.18 **ALTERNATIVE 2B – EQUIVALENT LATERAL SPACING OPERATIONS (ELSO) FOR DEPARTURES WITH CONCENTRATION**

MODELING ASSUMPTIONS. Figure 7.19 depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 2B. The center of the Alternative 2B noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27 including the eastbound departures issued a 290-degree magnetic heading by ATCT, are assigned to the Alternative 2B initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

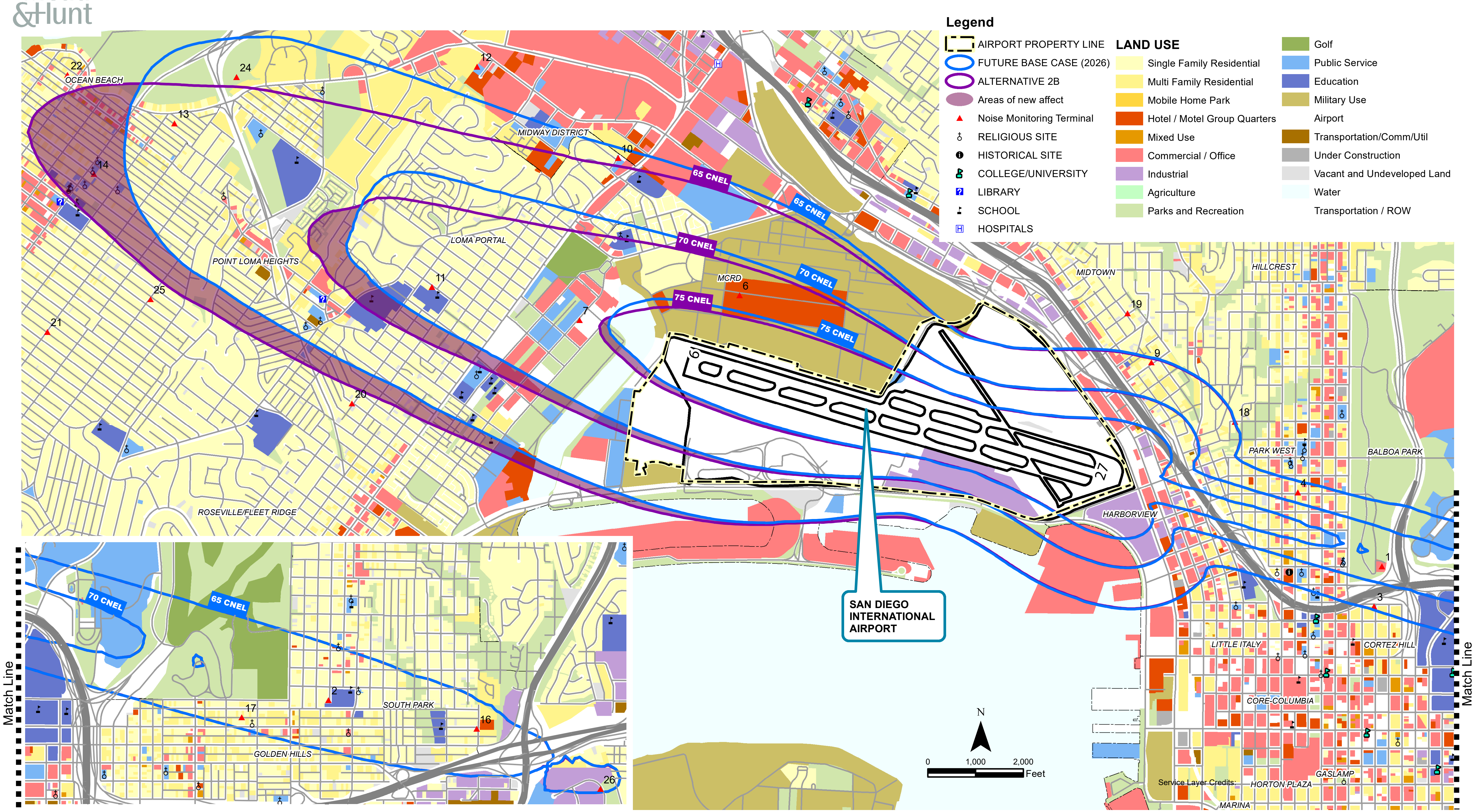
CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 2B were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.20**).

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.19 **ALTERNATIVE 2B NOISE MODEL TRACKS**



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.20 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 2B COMPARISON**

Table 7.8 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 2 people exposed to 65 CNEL, a decrease of 103 people exposed to 70 CNEL, and a decrease of 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 4 units, but increase in the 70 CNEL or greater by 26 units. There would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,960 new housing units within the 65 CNEL,380 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.8 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 2B**

Contour Interval	Housing Units	Estimated Population
Alternative 2B		
65 CNEL or greater	15,145	30,974
70 CNEL or greater	2,668	5,070
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 2B vs. Future Base Case Difference		
65 CNEL or greater	-4	-2
70 CNEL or greater	+26	-103
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,960	-1,950
70 CNEL or greater	+380	-350
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[27]

[27] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative.

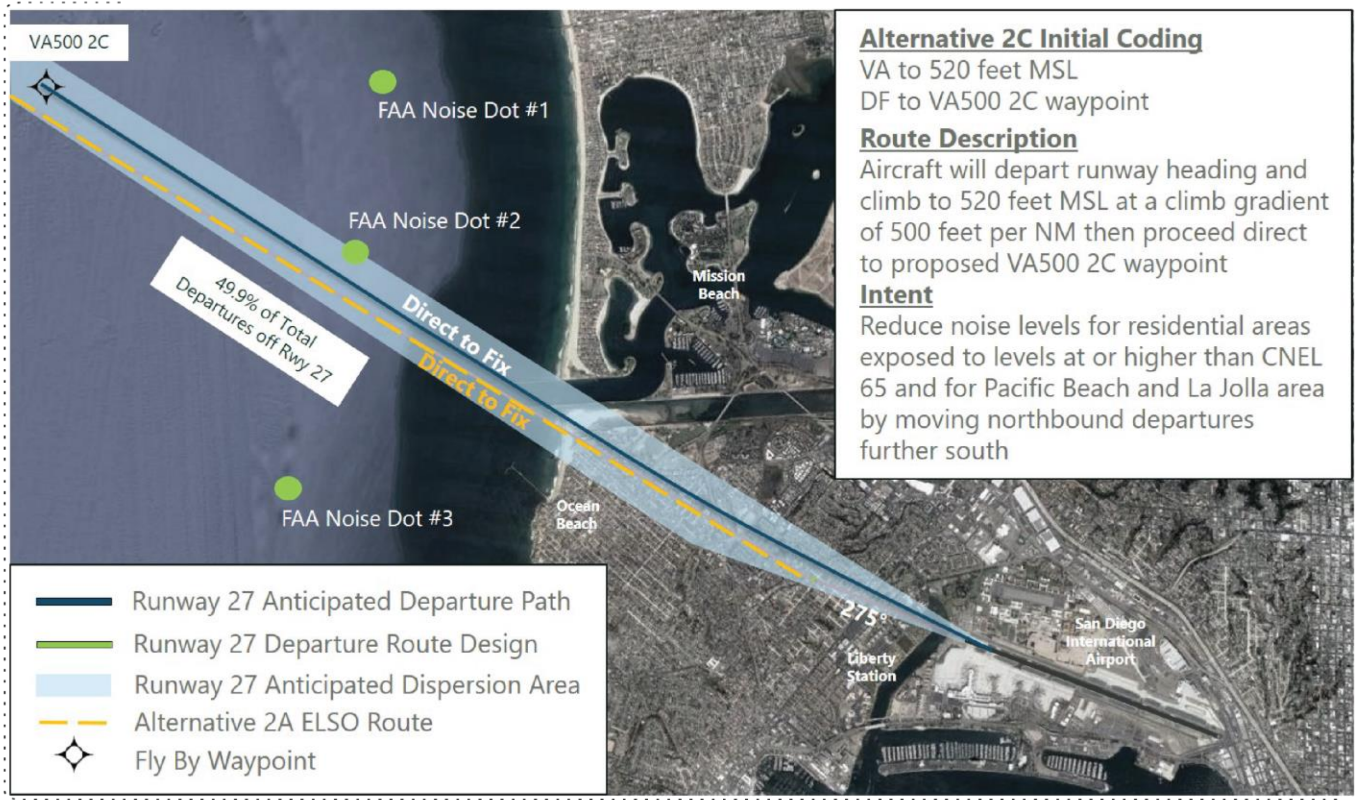
- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative, and the application of ELSO criteria, to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.2.2 Alternative 2C - Equivalent Lateral Spacing Operations (ELSO) for Departures with Dispersion (287-Degree Heading)

Alternative 2C is similar to Alternative 2A, except the right turn heading is two degrees further north at 287-degrees instead of 285-degrees. The intent is to achieve the same goals as Alternative 2A, but reduce the potential for shifting noise to newly affected non-compatible areas caused by Alternative 2A.

NOISE ABATEMENT PROCEDURE GOAL. Provide a more predictable and repeatable initial jet departure path along the path from Runway 27 that direct jet aircraft along a heading that diverges from the ZZOOO RNAV SID heading by at least 12-degrees. This alternative provides the same predictability and repeatability compared to Alternative 2A. This change moves traffic further south of the current base case flight path, which may provide relief to people exposed to 65 CNEL or greater levels located under and north of the current path. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures turning to the right from Runway 27, including the eastbound departures issued a 290-degree magnetic heading by ATCT, would be assigned the proposed Alternative 2C initial departure heading procedure. **Figure 7.21** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 2C. Aircraft would be directed on runway heading (275-degrees magnetic) until reaching 520 feet MSL. Once the aircraft reaches 520 feet MSL, the aircraft turns to proceed direct to a waypoint (VA500 2C) located over the ocean 6.5 NM northwest from the end of Runway 27. The design of this initial departure path is called a Vector to Altitude then Direct to a Fix (VA and DF). The VA500 2C waypoint is located to ensure jet aircraft diverge from other jet aircraft by at least 12-degrees and directs aircraft just south of the Mission Bay Channel area. Aircraft would reach 520 feet MSL at various locations over the ground, which causes dispersion along the initial departure path from the end of Runway 27 to the shoreline but would be less dispersion to the north compared to the existing departure traffic that turns right from Runway 27.



SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., September 2020 (proposed paths and dispersion area).

FIGURE 7.21 **ALTERNATIVE 2C – EQUIVALENT LATERAL SPACING OPERATIONS (ELSO) FOR DEPARTURES WITH DISPERSION**

MODELING ASSUMPTIONS. **Figure 7.22** depicts the noise model tracks developed to represent the forecast nominal traffic flow for Alternative 2C. The center of the Alternative 2C noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound departures issued a 290-degree magnetic heading by ATCT, are assigned to the Alternative 2C initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 2C were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.23**).

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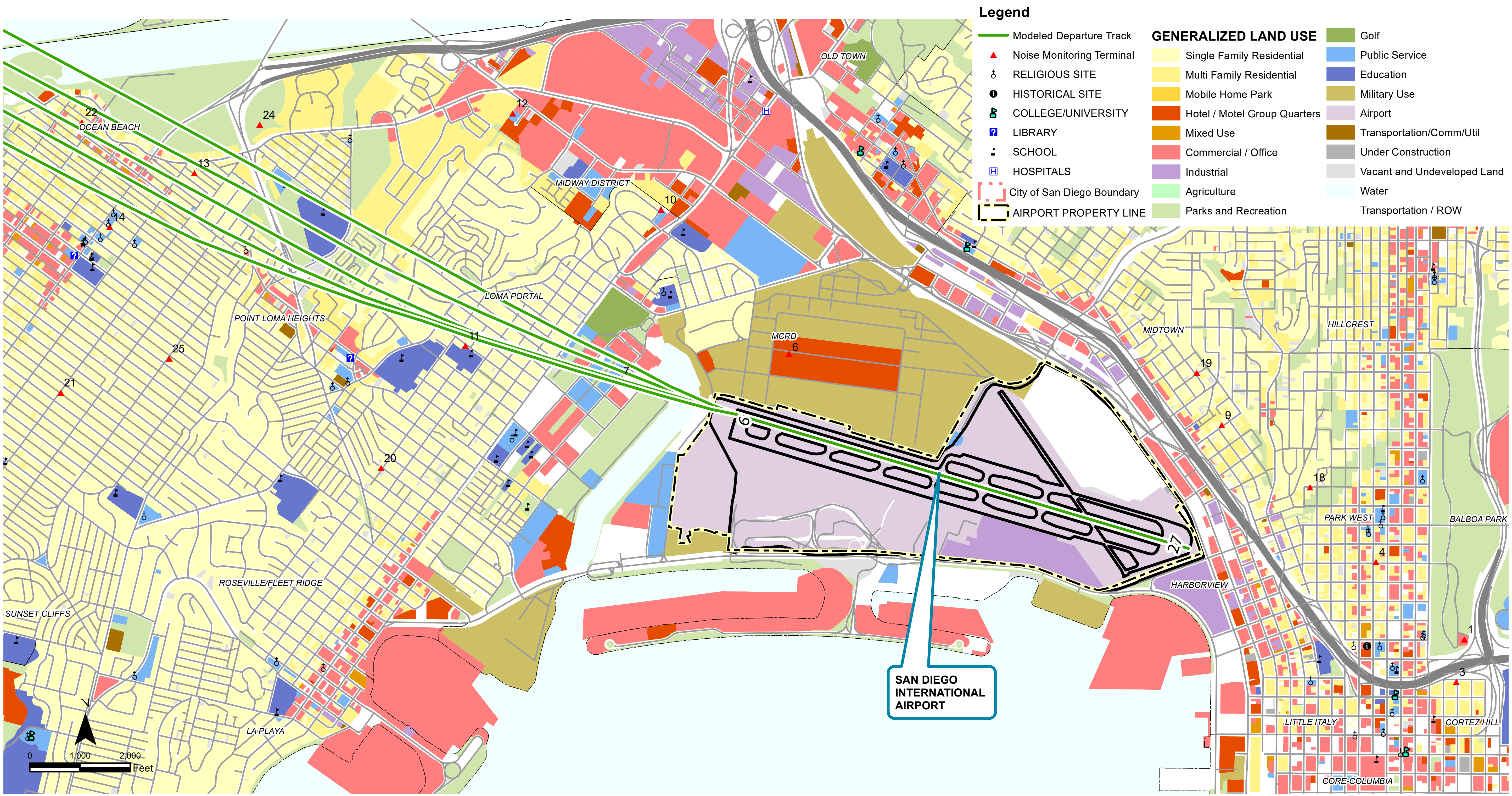
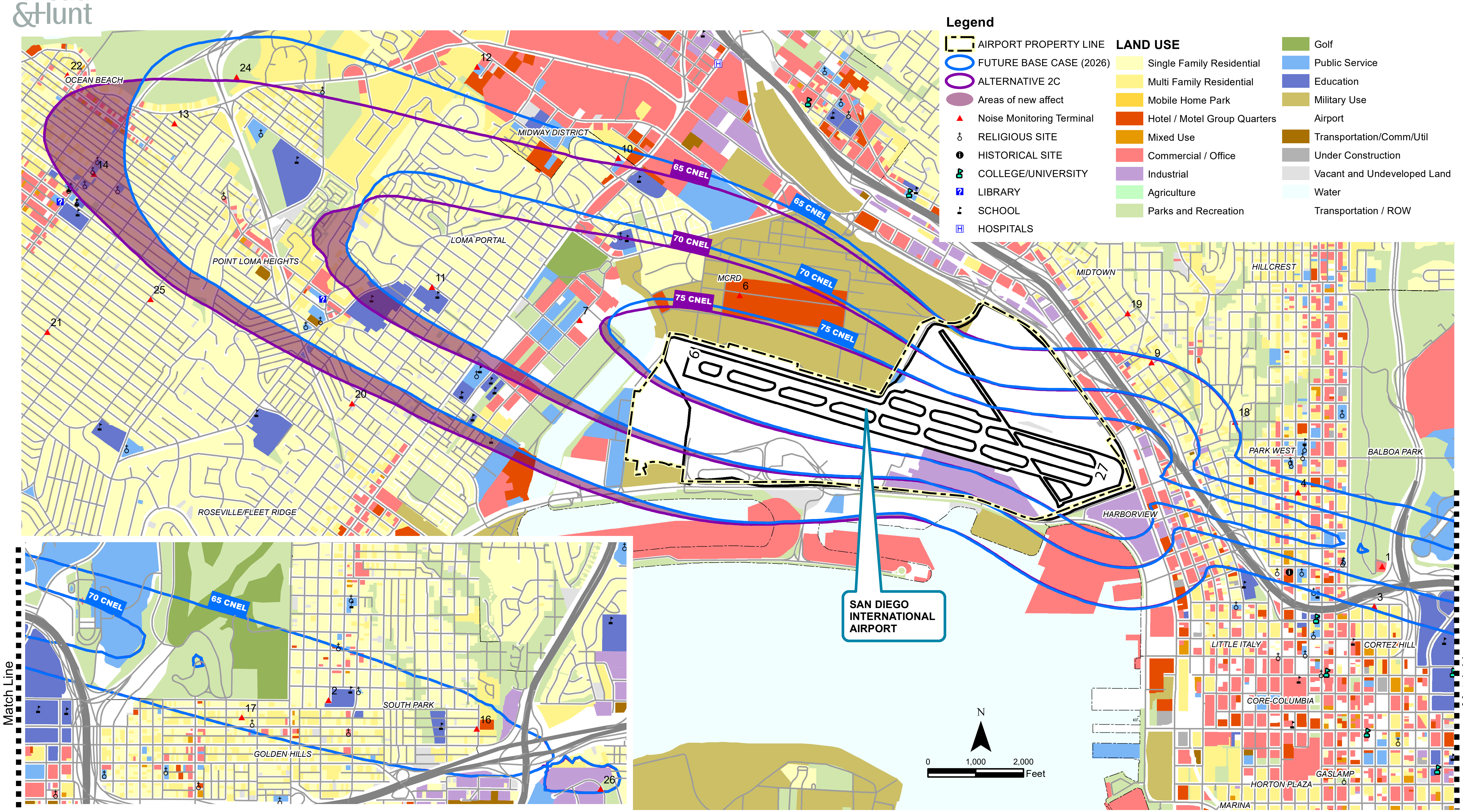


SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.22 **ALTERNATIVE 2C NOISE MODEL TRACKS**

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.23 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 2C COMPARISON**

Alternative 2C did reduce the number of non-compatible units newly exposed to 65 CNEL or greater compared to Alternative 2A, but still causes non-compatible units to be newly exposed to 65 CNEL or greater levels. **Table 7.9** summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 155 people exposed to 65 CNEL, a decrease of 154 people exposed to 70 CNEL, and a decrease of 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 106 units, but increase slightly in the 70 CNEL or greater. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,630 new housing units within the 65 CNEL, 340 new housing units withing the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.9 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 2C**

Contour Interval	Housing Units	Estimated Population
Alternative 2C		
65 CNEL or greater	15,043	30,821
70 CNEL or greater	2,651	5,019
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 2C vs. Future Base Case Difference		
65 CNEL or greater	-106	-155
70 CNEL or greater	+9	-154
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,630	-1,720
70 CNEL or greater	+340	-320
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[28]

[28] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative, and the application of ELSO criteria, to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.2.4 Alternative 2D - Equivalent Lateral Spacing Operations (ELSO) for Departures with Concentration (287-Degree Heading)

Alternative 2D is similar to Alternative 2B, except the right turn heading is two degrees further north at 287-degrees instead of 285-degrees. The intent is to achieve the same goals as Alternative 2B, but reduce the potential for shifting noise to newly affected non-compatible areas caused by Alternative 2B.

NOISE ABATEMENT PROCEDURE GOAL. Provide a more predictable and repeatable initial jet departure path along the path from Runway 27 that direct jet aircraft along a heading that diverges from the ZZOOO RNAV SID heading by at least 12-degrees. This alternative provides the same predictability and repeatability compared to Alternative 2B. This change moves traffic further south of the current base case flight path, which may provide relief to people exposed to 65 CNEL or greater levels located under and north of the current path. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures turning to the right from Runway 27, including the eastbound departures issued a 290-degree magnetic heading by ATCT, would be assigned the proposed Alternative 2D initial departure heading procedure. **Figure 7.24** depicts the proposed departure route, anticipated departure path and expected dispersion area for Alternative 2D. Aircraft would be directed on runway heading (275-degrees magnetic) until reaching an intercept point close to 1 NM from the departure end of Runway 27 and climb at a rate of 500 feet per NM. Once the aircraft reaches close to the intercept point, the aircraft would turn right to join a course on approximately a 287-degree magnetic heading that heads towards a waypoint (VA500 2C) located over the ocean 6.5 NM northwest from the end of Runway 27.

SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., September 2020 (proposed paths and dispersion area).

FIGURE 7.24 **ALTERNATIVE 2D – EQUIVALENT LATERAL SPACING OPERATIONS (ELSO) FOR DEPARTURES WITH CONCENTRATION**

MODELING ASSUMPTIONS. **Figure 7.25** depicts the noise model tracks developed to represent the nominal traffic flow for Alternative 2D. The center of the Alternative 2D noise model track is defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.) departures that turn right from Runway 27, including the eastbound departures issued a 290-degree magnetic heading by ATCT, are assigned to the Alternative 2D initial departure heading noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 2D were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.26**).

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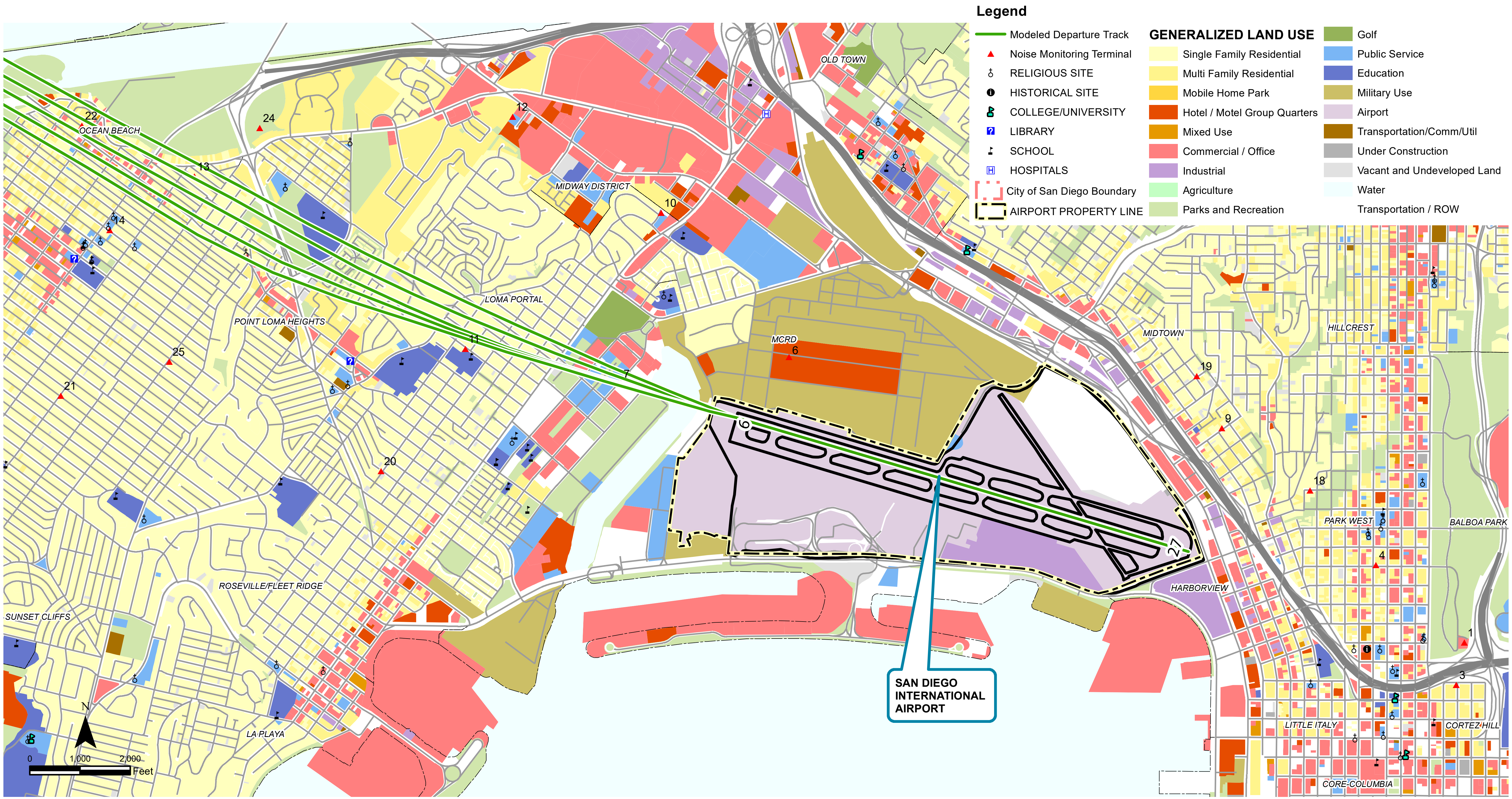
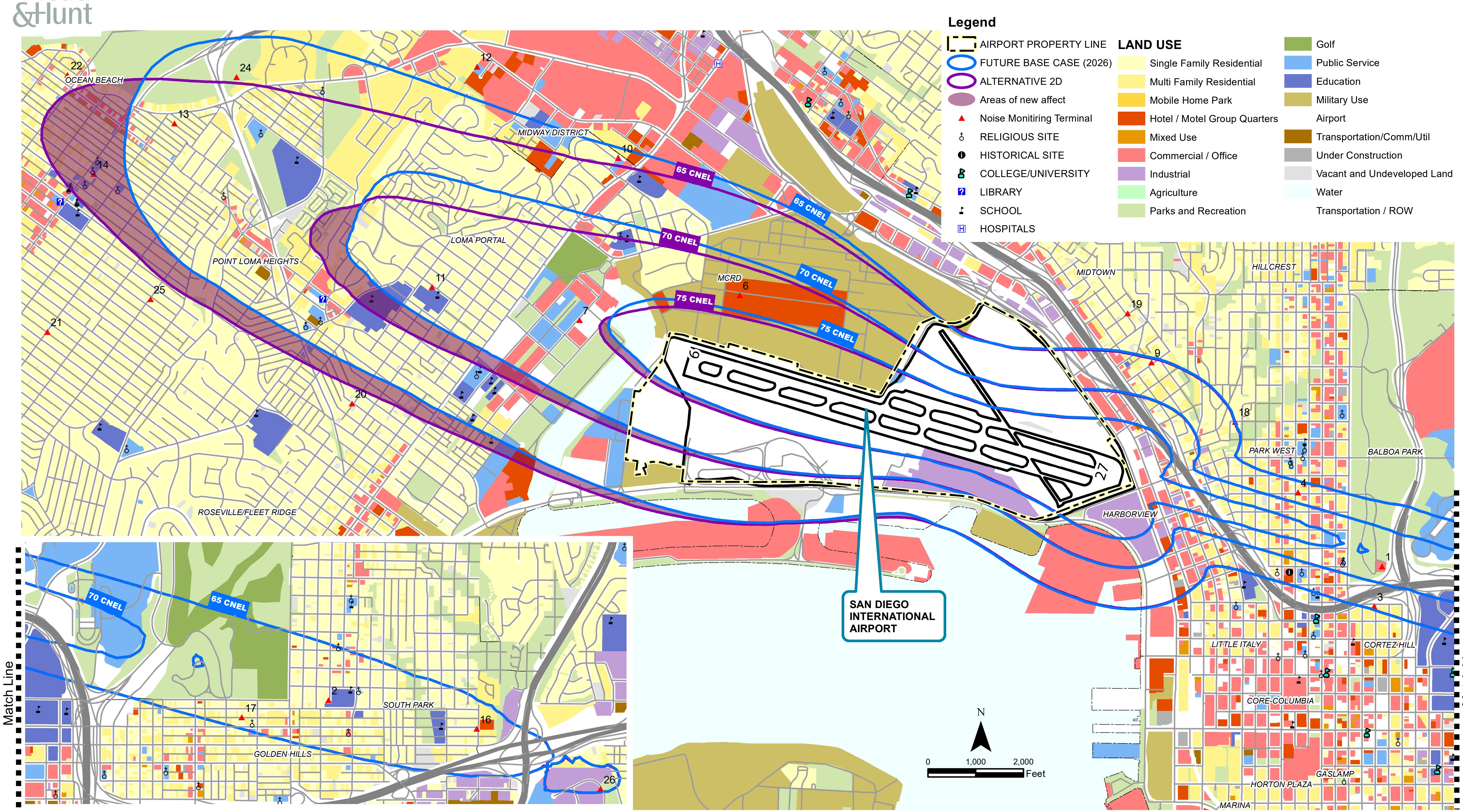
Mead & Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.25 **ALTERNATIVE 2D NOISE MODEL TRACKS**



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, Septermber, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.26 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 2D COMPARISON**

Alternative 2D did reduce the number of non-compatible units newly exposed to 65 CNEL or greater compared to Alternative 2B, but still causes non-compatible units to be newly exposed to 65 CNEL or greater levels. **Table 7.10** summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 234 people exposed to 65 CNEL, a decrease of 119 people exposed to 70 CNEL, and a decrease of 1 person exposed to 75 CNEL. Housing units located within the 65 CNEL would decrease by 153 units, but increase by 21 units in the 70 CNEL. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,700 new housing units within the 65 CNEL, 370 new housing units withing the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Ocean Beach and Point Loma.

TABLE 7.10 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 2D**

Contour Interval	Housing Units	Estimated Population
Alternative 2D		
65 CNEL or greater	14,996	30,742
70 CNEL or greater	2,663	5,054
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 2D vs. Future Base Case Difference		
65 CNEL or greater	-153	-234
70 CNEL or greater	+21	-119
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,700	-1,840
70 CNEL or greater	+370	-340
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[29]

[29] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative, and the application of ELSO criteria, to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.2.3 Alternative 3 – Three SIDS for Runway 27

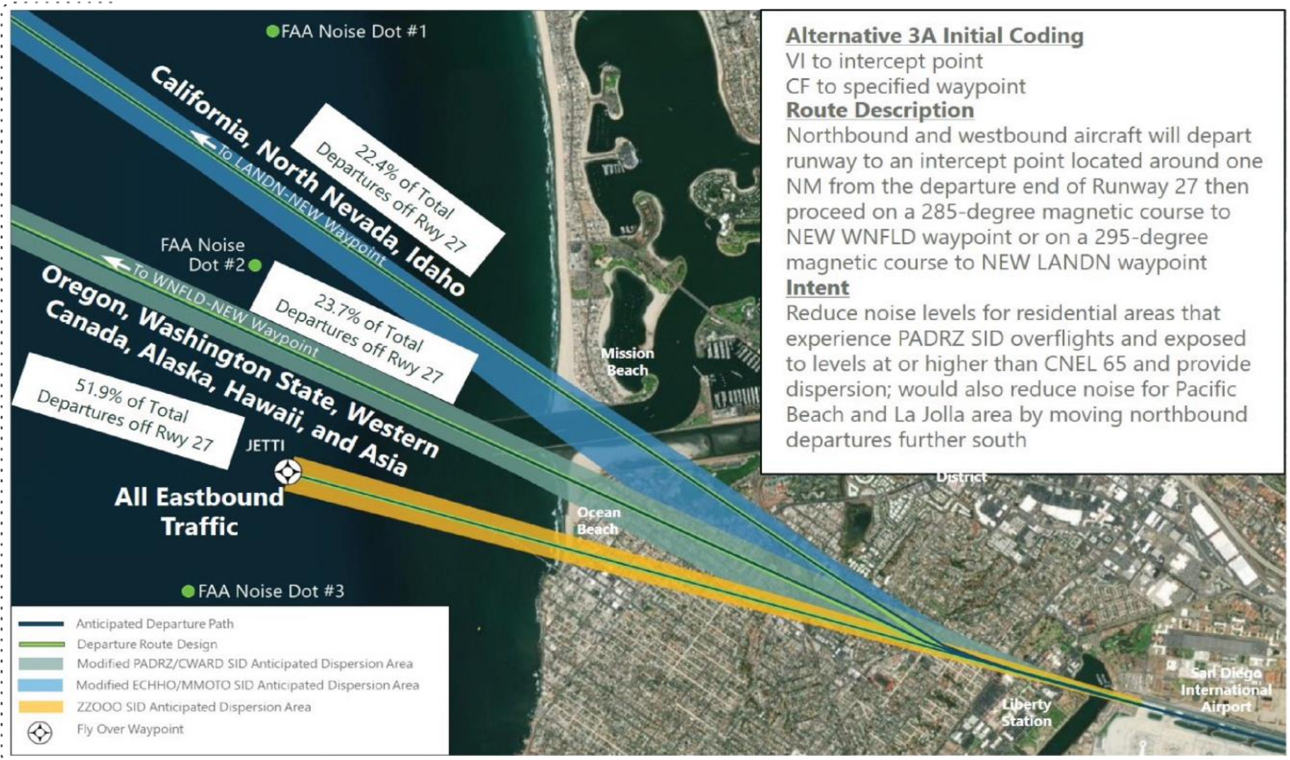
Alternative 3 – Three SIDs for Runway 27 –proposes three unique RNAV SIDs for Runway 27 departures that would be used at the same time. The alternative represents a three initial departure path concept that relies on the ZZOOO RNAV SID with a 275-degree heading, a modified version of the PADRZ and CWARD RNAV SIDs with a 285-degree departure route; and a modification to the ECHHO and MMOTO RNAV SIDS with a 295-degree departure route. The three initial departure routes diverge from each other at 10-degrees. The initial departure paths would be the first leg of a runway transition from Runway 27 at SDIA for each of the three unique SIDs. The overall intent is to rely on RNAV procedure design to provide a more predictable routes that together provide dispersion over areas exposed to noise levels at or greater than 65 CNEL.

The current ECHHO and MMOTO RNAV SIDs are only used when aircraft land on Runway 9 and take off from Runway 27. Use of a SID intended for only when aircraft land on Runway 9 may involve substantial concerns for the FAA as it relates to potential conflict with arrivals to Runway 27 on the COMIX RNAV Standard Terminal Arrival Route (STAR) procedure and management of dual northbound or eastbound routes in the air route traffic control center airspace. For purposes of this 14 CFR Part 150 Study, the feasibility assessment does not extend beyond the proposed routes over non-compatible areas west of SDIA. The concept of three divergent departure headings at 10-degrees or more meets FAA separation standards, especially with the proposed Vector-to-Intercept and Course-to-Fix design that provides a more predictable and repeatable path compared to a Vector-to-Altitude and Direct-to-Fix design and ensures safe separation. Jet aircraft would stay on the initial headings until one and a half miles from the shoreline, which is consistent with the current FAA Noise Dot Agreement between the FAA and coastline communities. The following sections describe two different design versions of Alternative 3.

7.2.3.1 Alternative 3A – Three SIDS for Runway 27 - Northbound Departure Split

NOISE ABATEMENT PROCEDURE GOAL. Provides three predictable and repeatable initial jet departure paths from Runway 27 used at the same time that direct jet aircraft along headings that diverges from each other by at least 10-degrees. This alternative provides the same predictability and repeatability compared to Alternative 1B and 2B, but provides more dispersion and reduction in frequency of flights over areas overflown by current PADRZ and CWARD SID traffic and eastbound jet departures during the nighttime noise abatement timeframe, and exposed to noise levels at or greater than 65 CNEL. The procedure would be applicable during daytime, evening, and nighttime hours.

PROPOSED ALTERNATIVE. Daytime, evening, and nighttime jet departures would be assigned one of the proposed Alternative 3A initial departure heading procedures. **Figure 7.27** depicts the proposed departure routes, anticipated departure path and expected dispersion area for Alternative 3A. For both the modified PADRZ/CWARD and ECHHO/MMOTO RNAV SIDs, aircraft would be directed on runway heading (275-degrees magnetic) until reaching an intercept point close to 1 NM from the departure end of Runway 27 and climb at a rate of 500 feet per NM. Once the aircraft reaches close to the intercept point, the aircraft assigned to the PADRZ/CWARD RNAV SIDs would turn right to join a course on approximately a 285-degree magnetic heading that heads towards a waypoint (WNFLD NEW) located over the ocean 8 NM northwest from the end of Runway 27 and 1.6 NM west of the existing WNFLD waypoint. For the modified ECHHO/MMOTO RNAV SIDs, aircraft will turn right and join a 295-degree course and head towards a waypoint (LANDN NEW) 7 NM northwest from the end of Runway 27 and 1 NM northwest of the existing LANDN waypoint. The alternative keeps all eastbound jets on the ZZOOO RNAV SID on a 275-degree heading (including eastbound jet departures assigned a 290-degree magnetic heading between 10:00 p.m. and 6:30 a.m.); assigns flights with west and northbound destinations such as those in the State of Washington, State of Oregon and in Canada on the 285-degree departure route (modified PADRZ/CWARD RNAV SID); and assigns flights with destinations in California, northern portion of Nevada and Idaho on the 295-degree departure route (modified ECHHO/MMOTO RNAV SID).



SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., October 2020 (dispersion area); ABCX2, July 2020 (proposed modified PADRZ/CWARD and ECHHO/MMOTO SID designs).

FIGURE 7.27 **ALTERNATIVE 3A – THREE SIDS FOR RUNWAY 27 – NORTHBOUND DEPARTURE SPLIT**

MODELING ASSUMPTIONS. Figure 7.28 depicts the noise model tracks developed to represent the forecast nominal traffic flow for the two proposed departure routes for Alternative 3A. The noise model tracks for the base case ZZOOO RNAV SID do not change. The center of the Alternative 3A noise model tracks for the modified PADRZ/CWARD and ECHHO/MMOTO RNAV SID initial departure routes are defined along the expected path for the majority of all jet departures operating on the procedure. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.), and nighttime (10:00 p.m. to 6:59 a.m.) departures are assigned to one of the three initial departure noise model tracks for Alternative 3A.

Because noise model operations data does not provide destinations, operations are assigned based on directivity of the base case noise model tracks. All westbound departures are assigned to the modified PADRZ/CWARD RNAV SID initial departure noise model tracks. Northbound departures on the base case PADRZ SID noise model tracks are split evenly among the modified PADRZ/CWARD and ECHHO/MMOTO RNAV SID initial departure noise model tracks.

All eastbound departures, including those issued a 290-degree magnetic heading by ATCT during nighttime noise abatement timeframe, are assigned to the noise model tracks representing the ZZOOO RNAV SID flight paths. Traffic on base case northbound noise model tracks (e.g., traffic on the base case noise model tracks representing the ECHHO/MMOTO SID flight paths) are assigned to the modified ECHHO/MMOTO RNAV SID initial departure noise model track. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 3A were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.29**).

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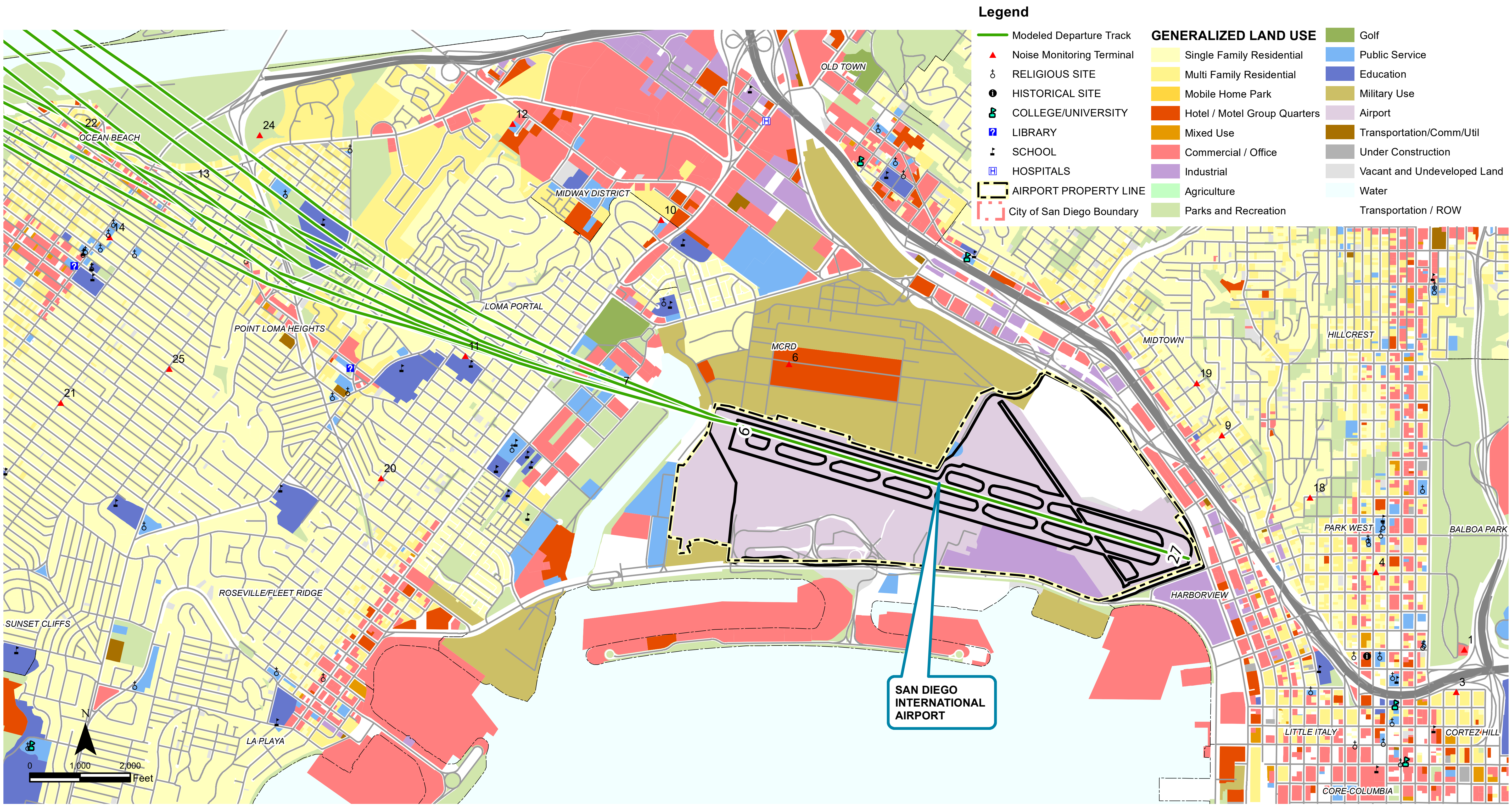
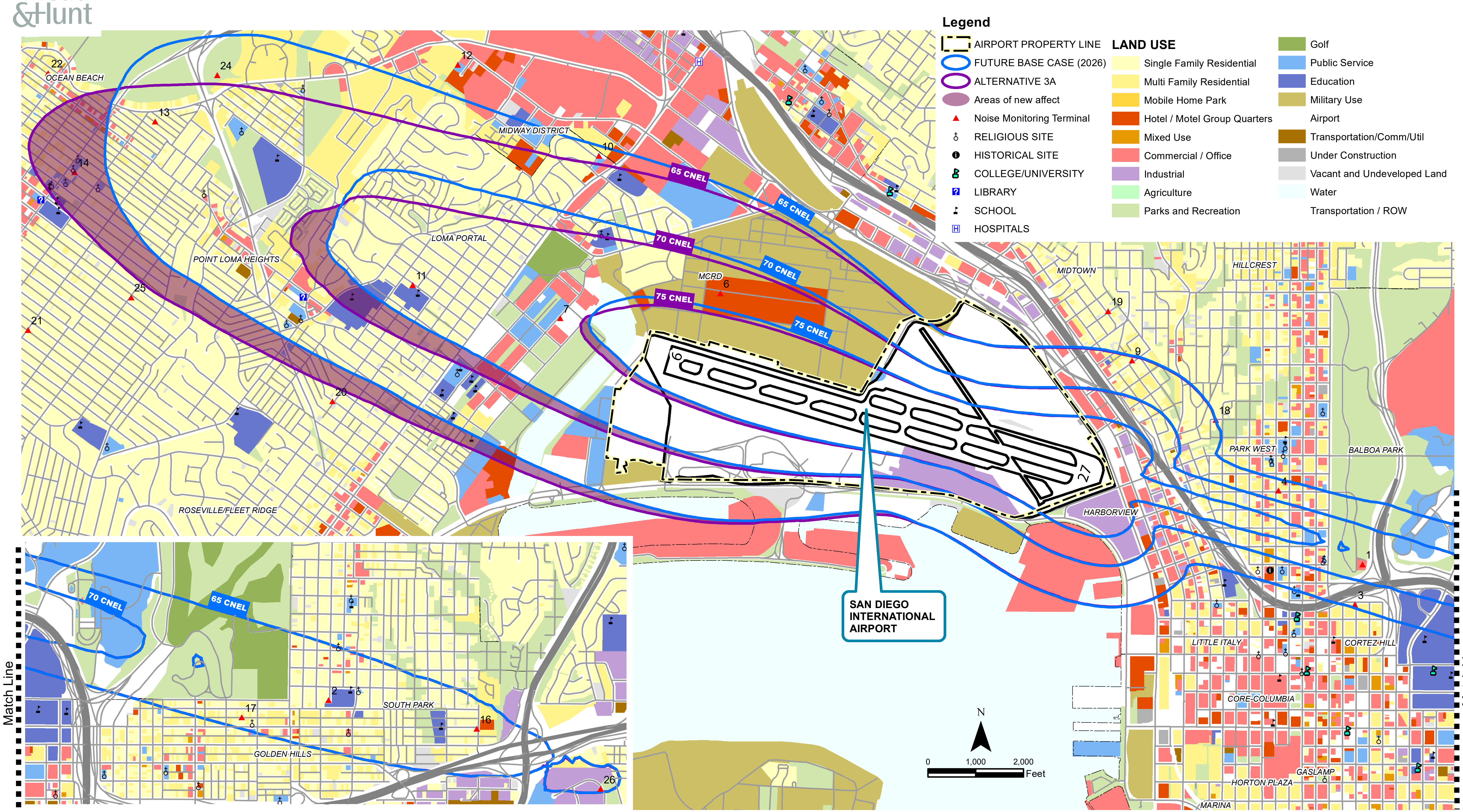


SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. Ricondo & Associates, September, 2020 (Alternative Flight Tracks)

FIGURE 7.28 **ALTERNATIVE 3A/3B NOISE MODEL TRACKS**

Mead & Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.29 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 3A COMPARISON**

Table 7.11 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 555 people exposed to 65 CNEL, 150 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 342 units, but increase by 11 units in the 70 CNEL. There would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 1,587 new housing units within the 65 CNEL, 367 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.11 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 3A**

Contour Interval	Housing Units	Estimated Population
Alternative 3A		
65 CNEL or greater	14,807	30,421
70 CNEL or greater	2,653	5,023
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 3A vs. Future Base Case Difference		
65 CNEL or greater	-342	-555
70 CNEL or greater	+11	-150
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+1,587	-1,917
70 CNEL or greater	+367	-351
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[30]

[30] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

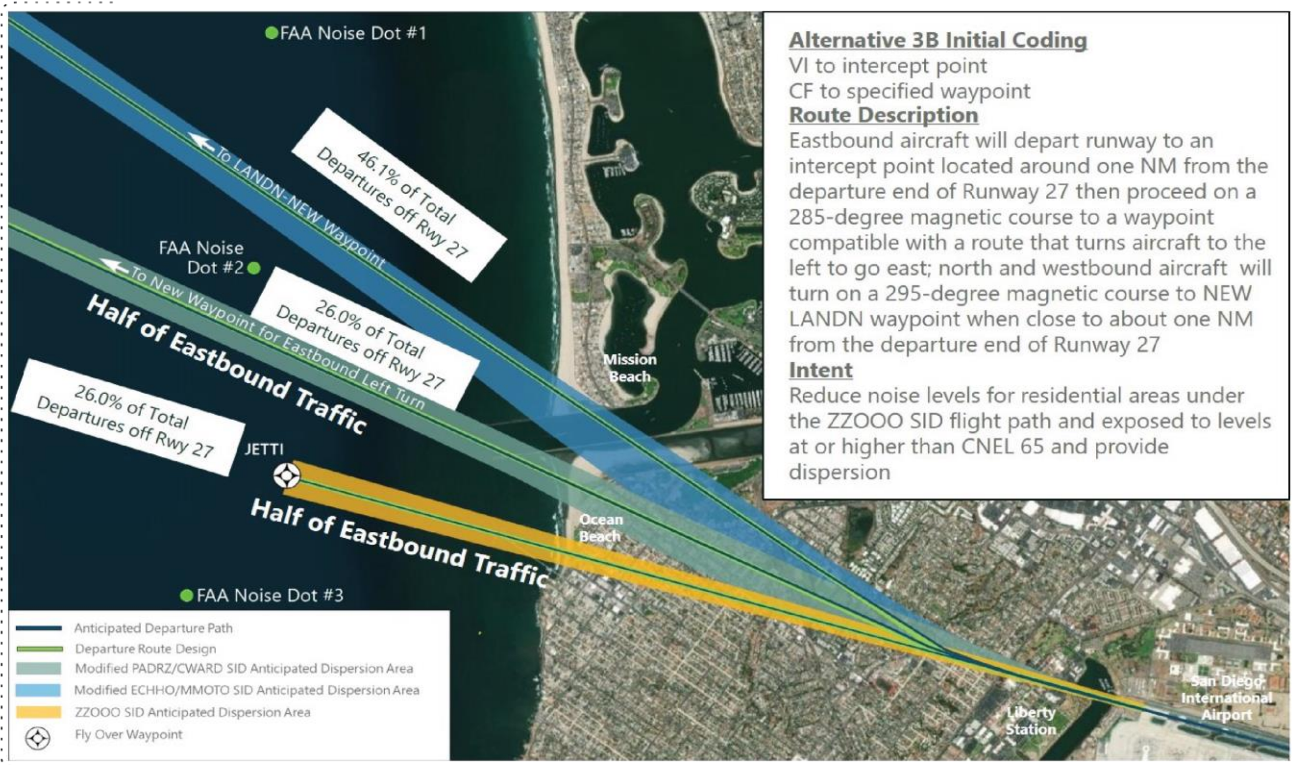
7.2.3.2 Alternative 3B – Three SIDS for Runway 27 - Eastbound Departure Split

Alternative 3B design is the same as Alternative 3A. The only difference is the expected operation assignments to the SIDs. Instead of the northbound and westbound split between the modified PADRZ/CWARD and ECHHO/MMOTO SIDs, Alternative 3B splits eastbound traffic between the ZZOOO RNAV SID and the modified PADRZ/CWARD SID proposed initial departure route, and all northbound and westbound departures are assigned to the modified ECHHO/MMOTO SID initial departure route. It is important to note that a full design of an eastbound RNAV SID with an initial route of 285-degrees was not designed. The assessment is limited only to the initial departure route over the non-compatible areas west of SDIA.

NOISE ABATEMENT PROCEDURE GOAL. Provides three predictable and repeatable initial jet departure paths from Runway 27 used at the same time that direct jet aircraft along a headings that diverges from each other by at least 10-degrees. This alternative provides the same predictability and repeatability compared to Alternative 1B and 2B, but provides more dispersion and reduction in frequency of flights over areas overflown by current ZZOOO SID traffic and exposed to noise levels at or greater than 65 CNEL. The procedure would be applicable during daytime, evening, and nighttime hours.

Proposed Alternative. Daytime, evening, and nighttime jet departures would be assigned one of the proposed Alternative 3B initial departure heading procedures. **Figure 7.30** depicts the proposed departure routes, anticipated departure path and expected dispersion area for Alternative 3B. Eastbound traffic would be split between the ZZOOO RNAV SID and the modified PADRZ/CWARD RNAV SID initial departure route. For both the modified PADRZ/CWARD and ECHHO/MMOTO RNAV SIDs, aircraft would be directed on runway heading (275-degrees magnetic) until reaching an intercept point close to 1 NM from the departure end of Runway 27 and climb at a rate of 500 feet per NM.

Once the aircraft reaches close to the intercept point, the northbound and westbound aircraft will turn right to join a 295-degree course to a waypoint over the ocean (NEW LANDN NEW) 7 NM northwest from the end of Runway 27. The eastbound aircraft assigned to the modified PADRZ/CWARD RNAV SIDs would turn right to join a course on a 285-degree magnetic heading that heads towards a waypoint located over the ocean northwest from the end of Runway 27 and at least 1.5 NM from the shoreline that would be compatible with turning left to join a route to the east.



SOURCE: Google, January, 2020 (aerial photo); Ricondo & Associates, Inc., October 2020 (dispersion area); ABCX2, July 2020 (proposed modified PADRZ/CWARD and ECHHO/MMOTO SID designs).

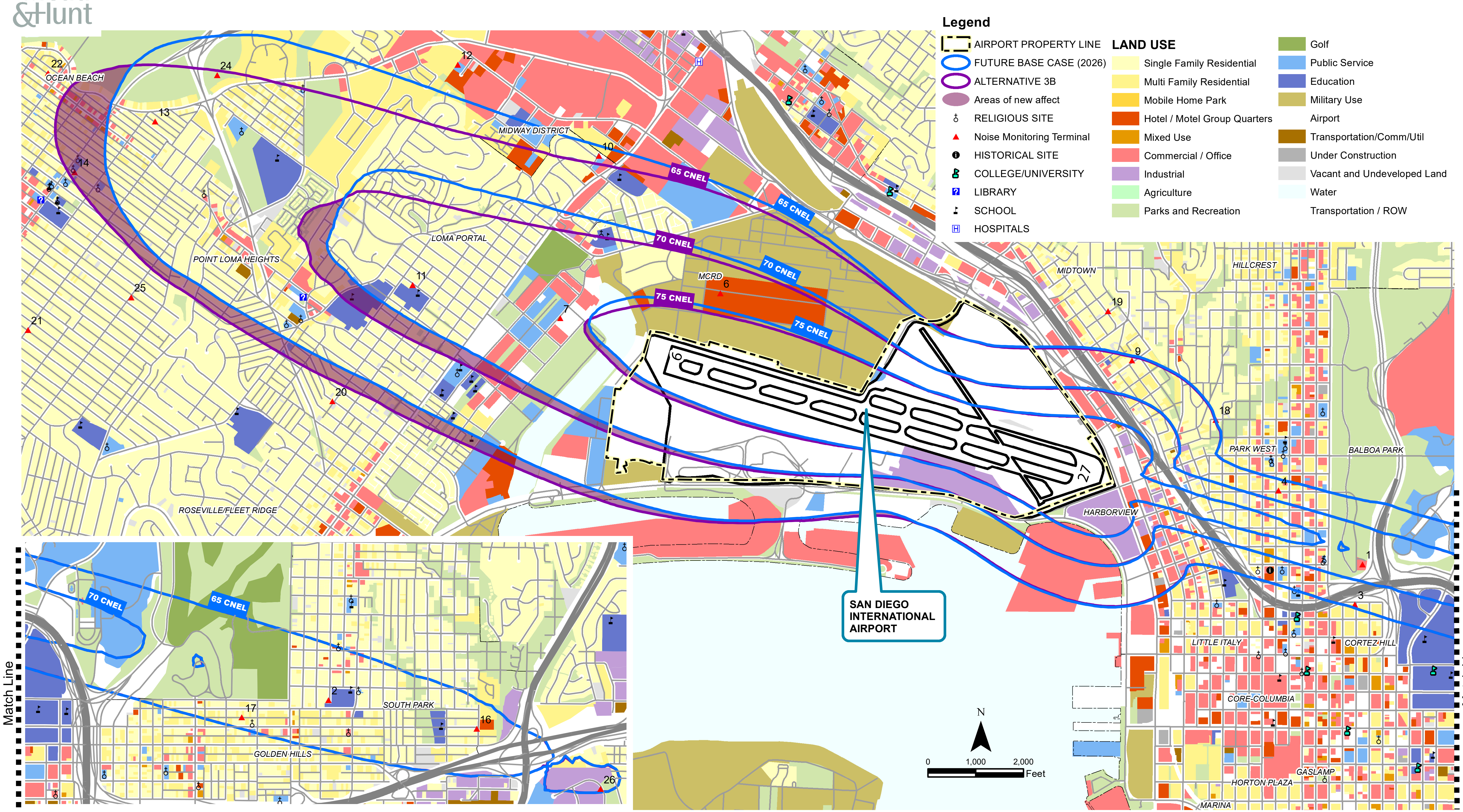
FIGURE 7.30 **ALTERNATIVE 3B – THREE SIDS FOR RUNWAY 27 – EASTBOUND DEPARTURE SPLIT**

MODELING ASSUMPTIONS. Figure 7.28 depicts the noise model tracks developed to represent the forecast nominal traffic flow for the two proposed departure routes for Alternative 3B, which is the same as Alternative 3A. The noise model tracks for the base case ZZOOO RNAV SID do not change. The center of the Alternative 3B noise model tracks for the modified PADRZ/CWARD and ECHHO/MMOTO RNAV SID initial departure routes are defined along the expected path for the majority of all jet departures operating on the procedures. The noise model tracks include tracks on both sides of the center track to account for dispersion along the traffic flow. All jet daytime (7:00 a.m. to 6:59 p.m.), evening (7:00 p.m. to 9:59 p.m.), and nighttime (10:00 p.m. to 6:59 a.m.) departures are assigned to one of the three initial departure noise model tracks for Alternative 3B.

Because noise model operations data does not provide destinations, operations are assigned based on directivity of the base case noise model tracks. All northbound and westbound departures are assigned to the modified ECHHO/MMOTO RNAV SID initial departure noise model tracks. Eastbound operations, including those that occur during the nighttime noise abatement timeframe, are split evenly between the ZZOOO RNAV SID and modified PADRZ/CWARD RNAV SID initial departure noise model tracks. All other aircraft on different initial departure headings (e.g., small jet and propeller aircraft) remain on existing noise model tracks.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 3B were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.31**).

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September, 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.31 **FUTURE BASE CASE CNEL NOISE CONTOUR 2026 AND ALTERNATIVE 3B COMPARISON**

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Table 7.12 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 1,054 people exposed to 65 CNEL, 237 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 572 units. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 987 new housing units within the 65 CNEL,301 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Ocean Beach and Point Loma.

TABLE 7.12 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 3B**

Contour Interval	Housing Units	Estimated Population
Alternative 3B		
65 CNEL or greater	14,577	29,922
70 CNEL or greater	2,614	4,936
75 CNEL or greater	513	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 3 vs. Future Base Case Difference		
65 CNEL or greater	-572	-1,054
70 CNEL or greater	-28	-237
75 CNEL or greater	-2	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+987	-1,544
70 CNEL or greater	+301	-322
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[31]

[31] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study. Additionally, in addition to NEPA analysis required, the FAA ATO is required to conduct an independent evaluation of any proposed new or amended RNAV procedures as described in FAA Order 7100.41, *Performance Based Navigation Implementation Process*. The evaluation may identify additional potential barriers to implementation.

7.3 OPERATIONAL DISTRIBUTION ALTERNATIVE

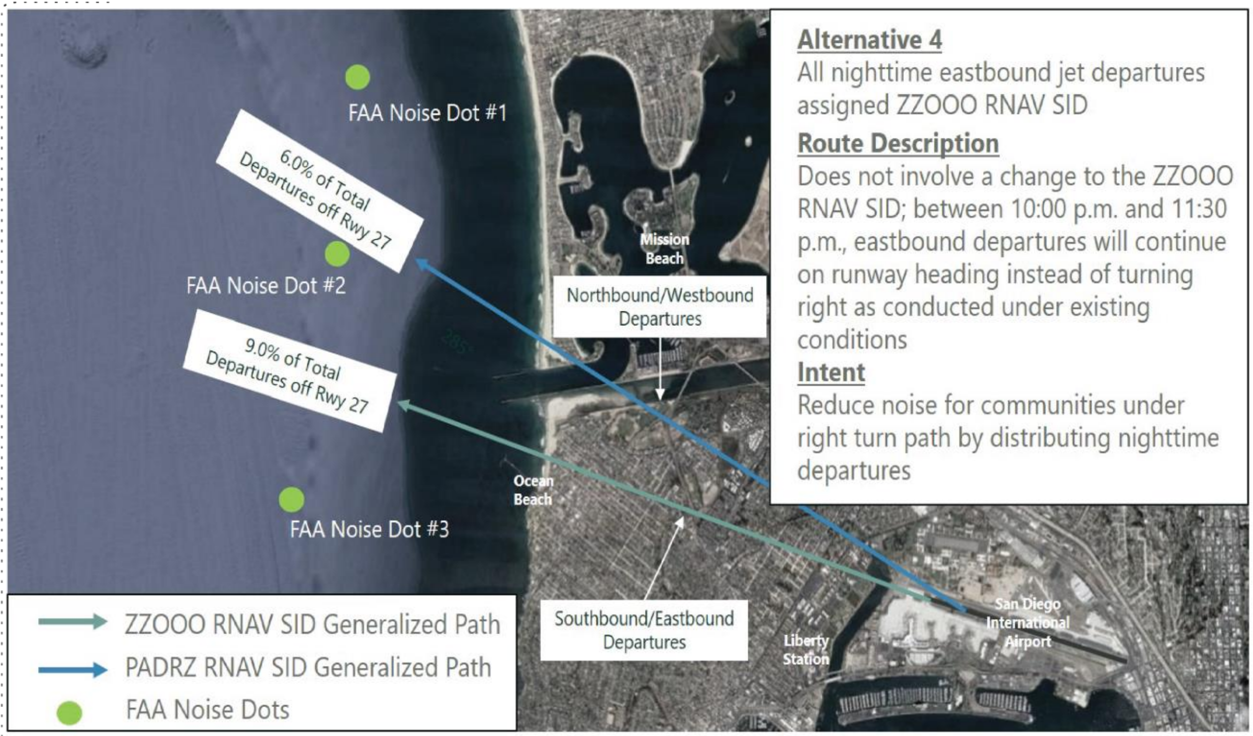
One alternative was identified that does not change a flight procedure but seeks to assign a different initial departure heading for nighttime eastbound jet departures that occur between 10:00 p.m. and 6:30 a.m. than currently exists. The following information describes the goal, existing procedure, and the proposed changes related to adjusting operation distribution.

A nighttime noise abatement procedure is currently in place at SDIA for Runway 27 departures between 10:00 p.m. to 6:30 a.m. All departures that occur between 10:00 p.m. to 6:30 a.m. turn right from Runway 27. For jet departures heading north, northwest, or west, the PADRZ RNAV SID is assigned. For departures heading south or east, SDIA ATCT direct pilots to turn 290-degrees magnetic. The eastbound and southbound departures remain on the heading until 1.5 NM from the shoreline and are then issued headings by SCT TRACON to the south or east. In addition to the nighttime noise abatement procedure, SDIA has a nighttime departure curfew between 11:30 p.m. and 6:30 a.m. Therefore, most departures that are assigned the noise abatement procedure occur between 10:00 p.m. and 11:30 p.m.

7.3.1 Alternative 4 - Nighttime (10:00 p.m. to 6:30 a.m.) Eastbound Departures on ZZOOO RNAV SID

NOISE ABATEMENT PROCEDURE GOAL. The goal for Alternative 4 is to distribute Runway 27 departures during nighttime noise abatement hours based on flight direction. Distributing the nighttime departures would reduce CNEL noise exposure levels for those residing under the current nighttime noise abatement procedure, which turns all aircraft to the right on a heading ranging between 290- to 293-degrees magnetic after departing Runway 27.

PROPOSED ALTERNATIVE. Instead of turning eastbound departures to the right on a 290-degree magnetic heading, assign the ZZOOO RNAV SID to eastbound departures between 10:00 p.m. and 6:30 a.m. **Figure 7.32** depicts the generalized initial departure direction for the PADRZ and ZZOOO RNAV SIDs. Alternative 4 would move eastbound departures over areas such as Ocean Beach instead of communities such as Mission Beach. The proposed distribution of eastbound/southbound and westbound/northbound departures for nighttime is the same as what occurs currently during daytime and evening hours. In essence, Alternative 4 removes the nighttime noise abatement procedure currently in place at SDIA and extends normal operation during daytime and evening hours into the nighttime hours.



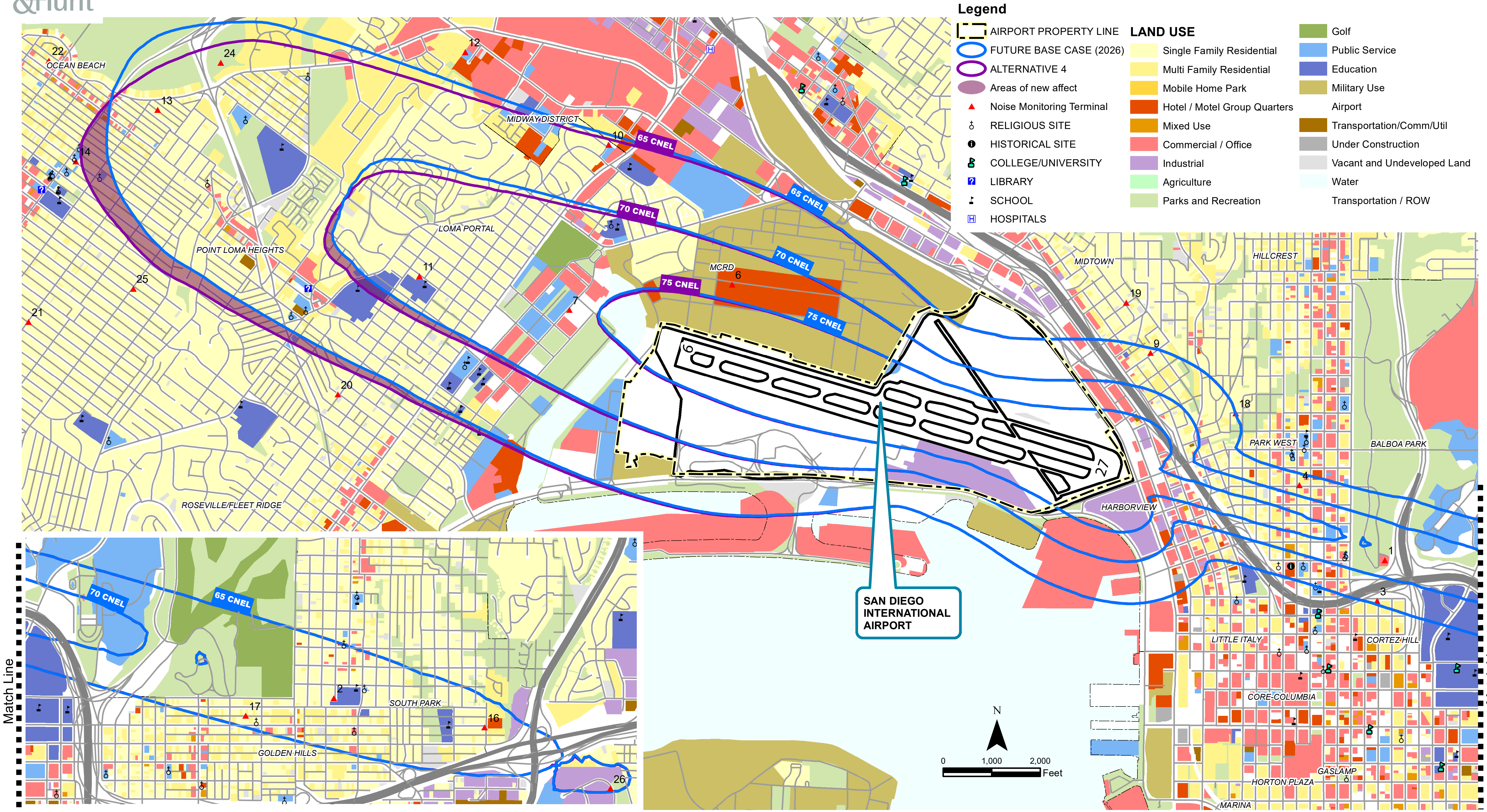
SOURCE: Google, January 2020 (aerial photo); Ricondo & Associates, January 2020 (proposed paths).

FIGURE 7.32 **ALTERNATIVE 4 – NIGHTTIME (10:00 P.M. TO 6:30 A.M.) EASTBOUND DEPARTURES ON ZZOOO RNAV SID**

MODELING ASSUMPTIONS. No new flight tracks were developed for this alternative. Instead of turning eastbound departures to the right on a 290-degree magnetic heading, operations are assigned the existing ZZOOO RNAV SID to eastbound departures between 10:00 p.m. and 6:30 a.m. for Alternative 4.

CNEL ANALYSIS. The average annual 65 CNEL or greater noise contours for the future 2026 time period associated with Alternative 4 were compared to the base case 2026 65 CNEL or greater noise contour (**Figure 7.33**).

Mead &Hunt



SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. HMMH, September 2020 (Refined Base Case Contours); Ricondo & Associates, September, 2020 (Alternative Contours)

FIGURE 7.33 **FUTURE BASE CASE CNEL NOISE CONTOURS 2026 AND ALTERNATIVE 4 COMPARISON**

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Table 7.13 summarizes the population and housing units within the 65 CNEL or greater noise exposure contours in comparison to the Future Base Case. As this table notes, this alternative would result in a decrease of 74 people exposed to 65 CNEL, 127 people exposed to 70 CNEL, and 1 person exposed to 75 CNEL, relative to the Future Base Case. Housing units located within the 65 CNEL would decrease by 146 units. However, there would be a resulting shift in noise, resulting in newly impacted non-compatible land uses (approximately 450 new housing units within the 65 CNEL, 100 new housing units within the 70 CNEL, and zero new units in the 75 CNEL) to the south and west over Point Loma and Ocean Beach.

TABLE 7.13 **COMPARISON OF HOUSING UNITS AND POPULATION FOR ALTERNATIVE 4**

Contour Interval	Housing Units	Estimated Population
Alternative 4		
65 CNEL or greater	15,003	30,902
70 CNEL or greater	2,610	5,046
75 CNEL or greater	514	698
Future Base Case		
65 CNEL or greater	15,149	30,976
70 CNEL or greater	2,642	5,173
75 CNEL or greater	515	699
Alternative 4 vs. Future Base Case Difference		
65 CNEL or greater	-146	-74
70 CNEL or greater	-32	-127
75 CNEL or greater	-1	-1
Number of Housing Units New In/New Out of Contours		
Contour Interval	**Housing Units – New In**	**Housing Units – New Out**
65 CNEL or greater	+450	-600
70 CNEL or greater	+100	-120
75 CNEL or greater	0	0

SOURCES: Mead & Hunt, April 2020 (GIS spatial analysis results); U.S. Census, 2010. HMMH, September, 2020 (refined base case contours). Ricondo & Associates Analysis, September, 2020.[32]

[32] To estimate the housing units that would move into and out of the 65 CNEL under each alternative, a Geographic Information System (GIS) and spatial US census data was used to calculate the difference in area inside and outside of the base case 65 CNEL. Since the 65 CNEL covers a large area relative to the much smaller new-in and new-out areas, some generalization (or simplification) of data occurs as part of the calculation and estimation process. Because of this, small discrepancies in spatial accuracy are introduced in the resulting subset of data that is summarized in this table, which may result in estimates that either slightly overestimate or underestimate the changes under each alternative. In all cases, regardless of the estimation process, there is a shift in noise resulting in new non-compatible land uses, as seen on the contour figures.

OTHER ISSUES. The following issues could result from implementation of this alternative. Also, agencies that would have a role in assisting in the implementation of this alternative are identified.

- **Airport and Air Traffic Control Operational Considerations (safety and efficiency issues)**: The evaluation did not identify safety or efficiency issues, but the FAA ATO has ultimate responsibility for the control of aircraft flight. FAA ATC would need to evaluate this alternative to ensure proper altitudes and separation for aircraft arriving and departing the airport, confirm the procedure does not impact throughput of the runway and airspace, and conduct an independent safety management risk assessment.
- **Other Environmental Issues (NEPA, etc.)**: Implementation of noise abatement flight procedures requires compliance with NEPA. FAA would be the responsible agency in conducting the NEPA environmental analysis. Potential concerns would be related to aircraft noise and impacts to other environmental categories related to aircraft noise.
- **Barriers to Implementation**: This alternative results in a shift in noise, which is not in line with the purpose of a 14 CFR Part 150 Study and therefore does not meet the intent of the Study.

7.4 NOISE ABATEMENT DEPARTURE PROCEDURE (NADP) ALTERNATIVE

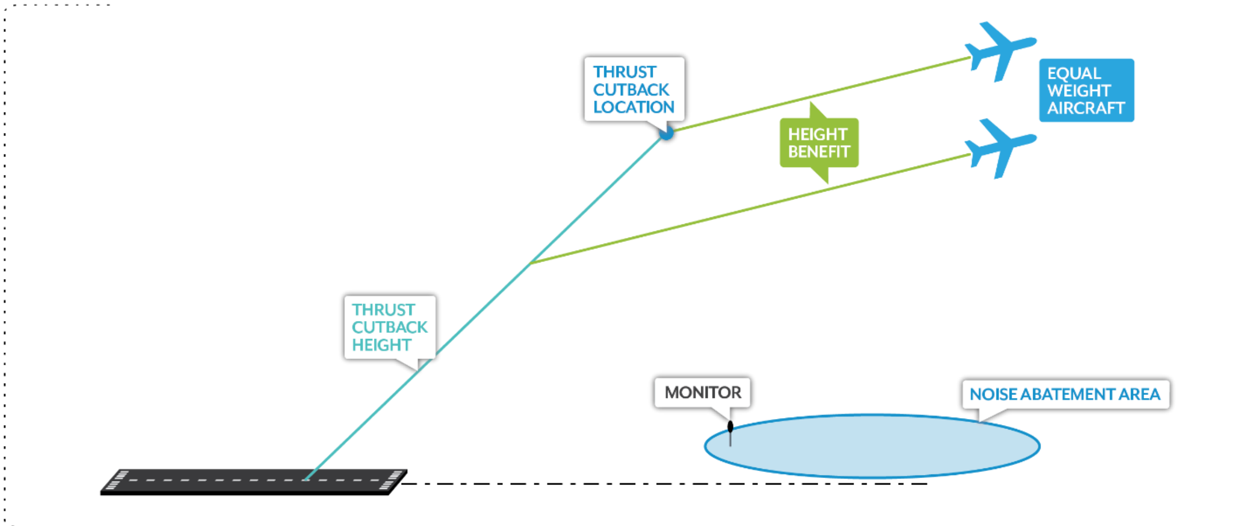
This alternative focuses on the use of Noise Abatement Departure Procedures (NADPs). These procedures are designed to either reduce noise close-in or distant from an airport relative to the climb profile of an aircraft. The relative benefits of using these procedures depends on the land uses under the departure path.

7.4.1 Background

This alternative focuses on noise abatement departure procedures used to reduce noise for sensitive receptors under the departure path. In keeping with 14 CFR Part 150, this alternative analyzes the changes in population exposed to noise within the 65 CNEL contour. In accordance with FAA Advisory Circular (AC) 91-53A *Noise Abatement Departure Profile*, aircraft are limited to two NADP profiles defined as “Close-in NADP – ICAO A” and “Distant NADP – ICAO B”. The AC was updated in 1993 in part to acknowledge that air carriers were using “intricate NADP’s” at certain airports and to provide standardized profiles to help minimize aircraft noise[33]. As noted in section AC 91.53A.7.c, an airplane may have up to two NADP’s; this limits aircraft operators from creating additional unique NADP’s for a specific airport. Therefore, this analysis focuses on the existing NADP’s in the AC.

Of note, AC 91-53A provides for two cutbacks: one is conducted with thrust cutback first, then retraction of the flaps/slats; the other is with flap and slat retraction first, followed by a thrust cutback (**Figure 7.34**). The thrust cutbacks are typically done between 800- and 1,500-feet Above Field Elevation (AFE). However, the advisory circular does not define the level of cutback or where it occurs other than “…at an altitude of no less than 800 feet AFE…”. There is no description as to *how much* the thrust is reduced; that is determined by the operator and the type of aircraft.

[33] https://www.faa.gov/documentLibrary/media/Advisory_Circular/ac91-53.pdf



SOURCE: Federal Aviation Administration.

FIGURE 7.34 **LOCATION-BASED NOISE ABATEMENT**

One of the recommendations received was to include a "John Wayne"-style departure as an alternative in this study. This procedure is used by air carriers to meet local, legacied noise regulations. Application of this departure technique at other airports will naturally yield diverse results given differences in airfield geometry, aircraft performance, pilot technique, and land uses that surround each airport, both under the departure path and behind the departure runway end. John Wayne Airport/Orange County (SNA) has a long-standing noise abatement program that includes a provision requiring departing aircraft to remain below noise level limits, which are measured at noise monitoring sites. The genesis of aircraft using a cutback procedure at SNA in the 1980's was so that departing aircraft could meet these noise limits.[34] Aircraft used this departure procedure at SNA when the typical aircraft was much louder (i.e., it was flown so that Stage 2 aircraft could meet the noise measurement regulations at SNA). Additionally, most aircraft would taxi to the runway end, set the brakes and run the engines to full power before starting the departure roll. This is done in order to maximize the runway used, starting the rotation to climb at an earlier point on the runway than a typical departure "roll" when aircraft taxi on the runway and apply thrust while moving.

As engine and airframe technology have advanced in the past four decades, aircraft aren't required to apply as drastic of a thrust reduction to meet these noise levels. For example, in the past, pilots would warn passengers that the SNA departure cutback would appear different and noticeable compared to what they would experience at other airports; that announcement is no longer done. With the current generation of aircraft, meeting the regulated noise limits is achieved without the need for the noticeable cutbacks that were used in the past.

[34] https://www.ocair.com/aboutjwa/faq-noise

It should be noted that while some air carriers still utilize a thrust cutback procedure at SNA, the procedure is not *required* by the airport. The airport measures and regulates aircraft noise measured on the ground and notifies operators of non-compliance; these regulations were in place prior to the airport Noise and Capacity Act of 1990. Air carriers operate their aircraft in a manner to comply with these noise measurement regulations.

Although the modeling and implementation of the exact "John Wayne Airport" NADP is not applicable to SDIA based on the factors described above, an analysis was performed based on the NADPs described in AC 91.53A.7.c. This analysis is presented in the following paragraphs.

7.4.2 Departure Procedure Profiles

The analysis in this section is focused on the Boeing 737-800 using a departure profile that would simulate a flight from SDIA to Chicago O'Hare (ORD) which was modeled as stage length 4 in the FAA's AEDT, which is a trip length of 1,500 - 2,500 great-circle miles. This aircraft and stage length were chosen to represent one of the most common aircraft and a longer departure stage length operated at SDIA, representing a path that would be used for aircraft traveling to ORD at night. This departure track was for a single flight; therefore, it does not show any of the typical flight track dispersion due to wind shift, vectoring by air traffic control for weather or safety, or aircraft performance. The aircraft profile that was modeled for this 14 CFR Part 150 (CNEL contours for existing/baseline and future years) is the "Standard" departure procedure. For certain aircraft, the "Standard" and ICAO-B departure profiles are the same in the AEDT model; these defaults include takeoff using maximum engine power, climbing to 1,000 feet AFE before accelerating and retracting the flap and slat settings. Therefore, the Standard and ICAO-B are modeled as the same departure profile.

7.4.2.1 Existing Conditions: Distant NADP (ICAO B) – 1,000-foot Cutback Departure (Standard Departure)

The difference between the Close-in NADP and Distant NADP is that the Distant NADP procedure first retracts flaps and slats and then reduces thrust. The Distant NADP procedure as defined in AC 91-53A notes that aircraft do not perform a thrust reduction prior to 800 feet AFE, just as with the Close-in NADP which is to initiate a thrust cut-back no sooner than 800 feet AFE, typically between 800 – 1,000 AFE, after retracting flaps and slats.

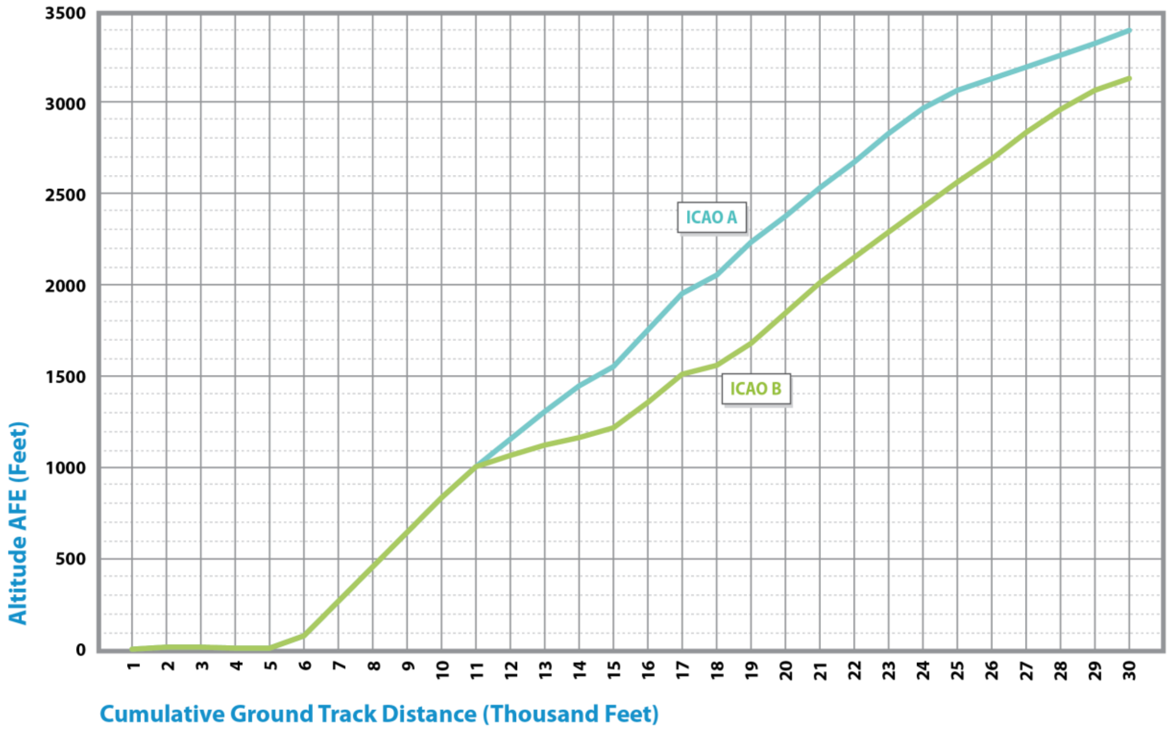
The distant procedure presented shows a cutback at 1,000 feet AFE, delaying the flap/slat retraction and reduction thrust until the aircraft reaches 1,000 feet AFE. The level of thrust reduction is assumed to be the same as with the Close-in NADP procedure for the purposes of this analysis; however, these settings are ultimately determined by the air carrier for each aircraft type. The modeling conducted in this analysis assumes operational characteristics that would be used for the majority of departures.

7.4.2.2 NADP Alternative: Close-in NADP (ICAO A) – 1,500-foot Cutback Departure

The Close-in NADP is used as a method to reduce noise at sensitive receptors within the vicinity of SDIA. While the name of the NADP is "Close-in", this does not refer to the *location* at which aircraft reduce thrust; it refers to the *areas* relative to the airport that may experience a reduction in noise. The land use under the departure path is a factor in determining the NADP that would yield noise reduction to the most people. Airports with sensitive land uses closer to the airport could utilize the Close-in NADP to reduce noise levels closer to the airport.

If an airport had land uses close-in to the airport that were compatible, such as industrial or warehousing and sensitive land uses beyond, it could elect to use the Distant NAPD that would provide more noise reduction further from the airport. This departure procedure includes aircraft departing using the Close-in NADP procedure. Typically, air carriers using this procedure will reduce thrust between 1,200 – 1,500 feet AFE, remaining in a climb configuration, then fully cleaning up the aircraft once reaching 3,000 feet MSL, or in the case of SDIA, once beyond sensitive land uses, which would be past the shoreline. Aircraft that climb to a higher altitude before reducing thrust are higher over sensitive land uses located near the airport. This procedure was modeled using full thrust for takeoff and 85 percent of full thrust for climb. Each airline defines its thrust settings for departure, based on items including aircraft performance, aircraft weight, temperature, and runway geometry.

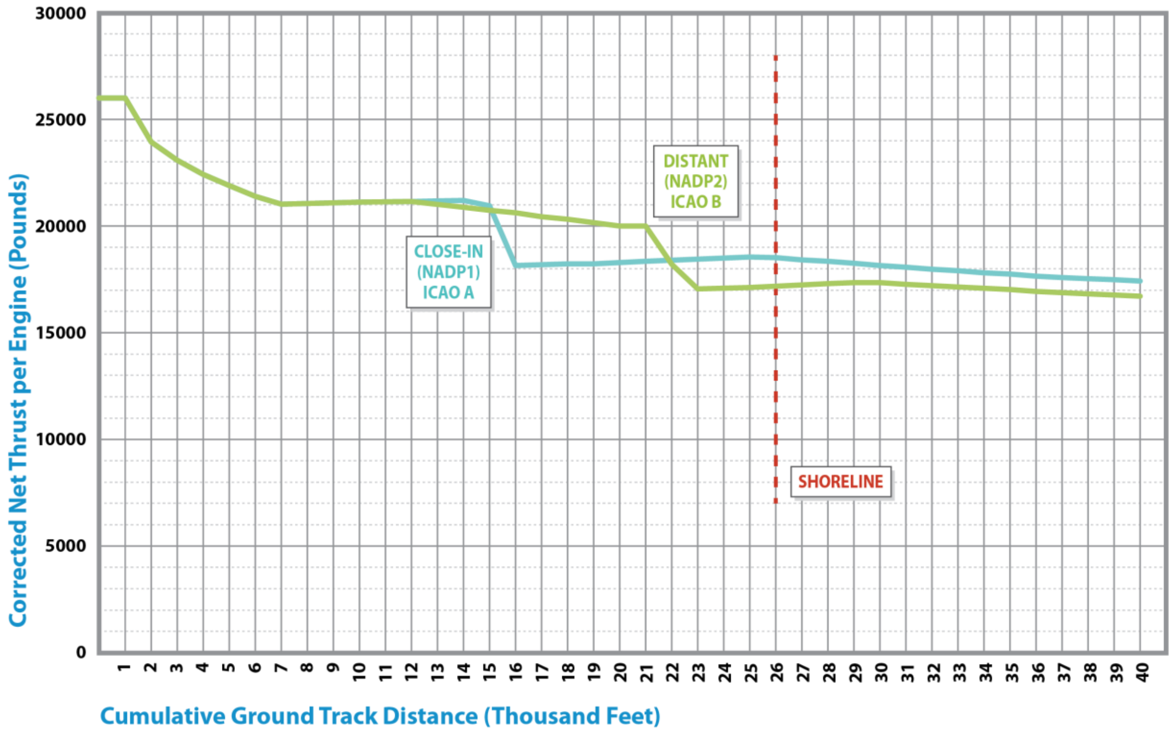
The analysis used for the Close-in NADP to be applied at SDIA used default settings in AEDT. These settings can be adjusted based on air carrier performance; however, the approach used in this analysis was to assume the minimum reduction of thrust, not the maximum allowable thrust reduction. There are three segments of a departure procedure – takeoff, climb, and acceleration. The engine thrust settings for each departure segment are defined by the air carriers operating the aircraft. For the departure profile modeled in this analysis, full thrust was used for the takeoff portion, then 85 percent of maximum thrust was used for climb and 90 percent thrust for acceleration. This thrust setting is available in AEDT as a departure profile setting; as noted previously, each airline has their own performance standards. Thrust was then adjusted for acceleration once reaching 3,000 feet MSL. The Close-in NADP most closely follows the "John Wayne departure," which is to reduce thrust close-in to the airport, then increase thrust once past sensitive land uses. **Figure 7.35** depicts the climb profiles of the Close-in NADP (ICAO A) compared to the existing climb profile (ICAO B), showing the steeper climb of ICAO A.



SOURCE: Federal Aviation Administration.

FIGURE 7.35 **MODELED FLIGHT PERFORMANCE OF CLOSE-IN AND DISTANT NADP**

Aircraft noise and how it is received by receptors on the ground is primarily due to two factors – the altitude of an aircraft and thrust. Aircraft reducing thrust closer to SDIA results in higher single event noise levels; therefore, an alternative showing aircraft reducing thrust closer to the airport (i.e. 800 feet AFE) was not modeled. Departing aircraft that cutback thrust closer to the airport remain at a lower altitude for longer, flying lower over the sensitive land uses that are under the departure path. **Figure 7.36** depicts aircraft thrust levels over the ground; for reference, the shoreline is at approximately 26,000 feet from the departure end of SDIA. While the Close-in NADP (cutback at 1,500 feet AFE) shows a reduction relative to single event levels, it is important to note that the required metric for Part 150 Studies is the CNEL. These reductions to single events would likely not drive a noticeable change to the 65 CNEL, therefore it was not modeled. Due to its potential for reducing single event levels, it can be brought forward as a recommendation, but may or may not be approved by the FAA due to it not noticeably affecting the 65 CNEL. However, even if the alternative it is not approved by the FAA under 14 CFR Part 150, SDIA could still pursue implementation.



SOURCE: Federal Aviation Administration.

FIGURE 7.36 **THRUST VS CUMULATIVE GROUND DISTANCE**

Figure 7.37 shows L_{max} contours for a B737-800 aircraft with a Stage Length 4 for the Close-in NADP (Alternative Evaluated) and Standard/ICAO-B departure profile. At the single event level analysis, the Close-in NADP shows a benefit to those close to SDIA due to the sharper climb profile.

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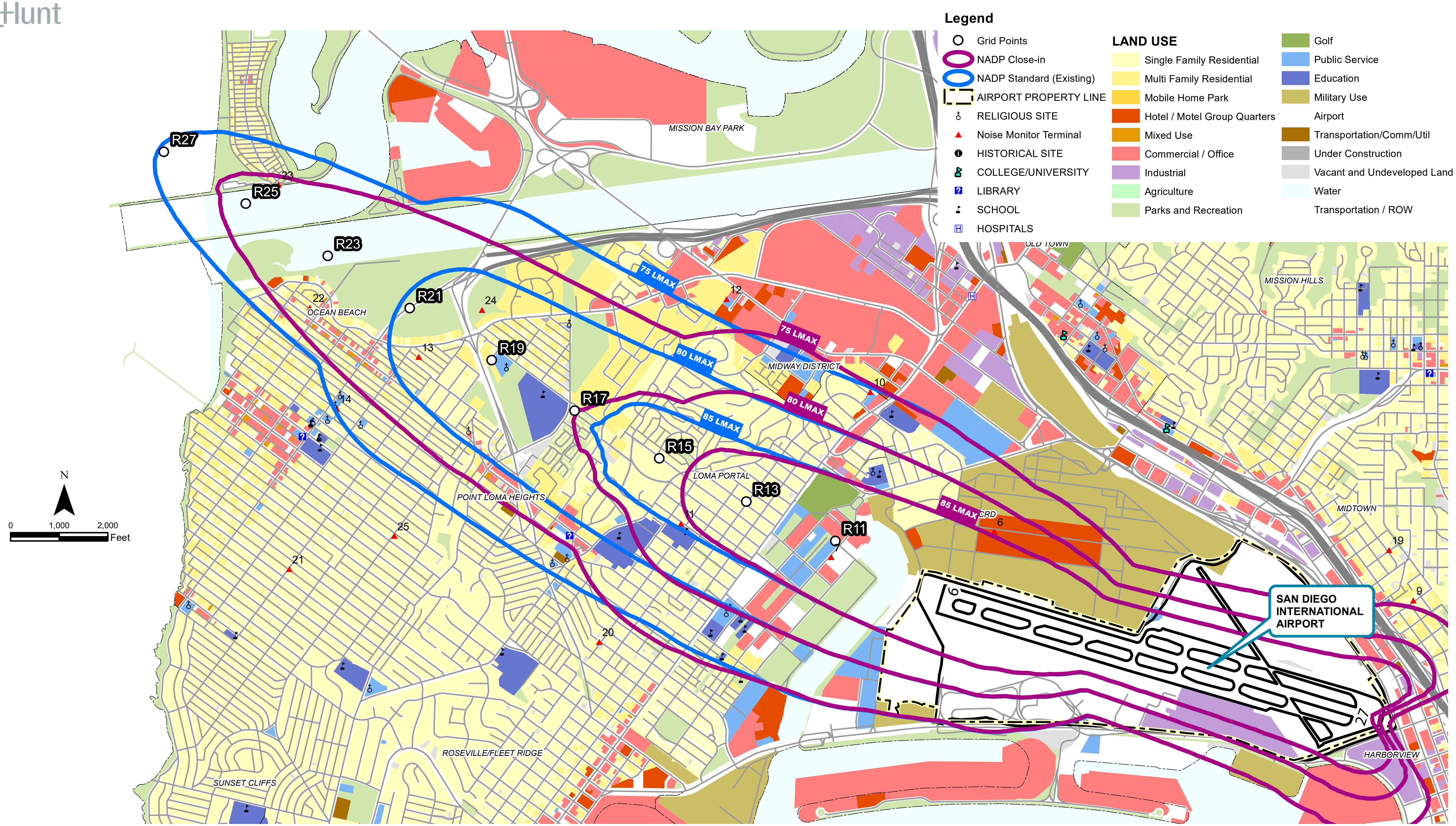

SOURCE: 1. SANDAG Technical Services - GIS, SANDAG Land Layers Inventory Mapping Source: SanGIS landbase (i.e. parcels), SANDAG, County Assessor's Master Property Records file, Cleveland National Forest, Bureau of Land Management (BLM), State Parks, other public agency contacts, and local agency review.
2. BridgeNet International, 2020 (Noise Contours)

FIGURE 7.37 **NADP CONTOUR CLOSE IN & DISTANT - 75-80-85 LMAX - STANDARD PROFILE (EXISTING CONDITION)**

737-800 Standard Profile is the same as ICAO-B.

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7.4.3 Analysis Results

The analysis is presented using grid points (receptors) at 4 locations and maximum noise level (L_{max}) noise contours for each procedure. **Table 7.14** shows the 85 L_{max} dBA value at each point, which was chosen as a single event contour that is close to the 65 CNEL; the grid points were chosen to represent points at various distances from the runway. Locations of these grid points are depicted in **Figure 7.37**. **Table 7.15** shows the population and housing units located within the 85 L_{max} contour.

TABLE 7.14 **85 LMAX DBA GRID POINTS**

AEDT Departure Profile ID	85 L_{max} dBA - Grid Points		
	Existing Distant NADP ICAO B (Cutback at 1,000' AFE)	Alternative Close-in NADP ICAO A (Cutback at 1,500' AFE)	Difference
R11	89.70	89.74	+0.04
R13	88.31	87.12	-1.19
R15	87.16	82.35	-4.81
R17	84.66	79.95	-4.71
R19	83.27	78.54	-4.73
R21	80.62	77.23	-3.39
R23	77.33	76.07	-1.26
R25	76.11	75.17	-0.94
R27	75.06	74.55	-0.51

SOURCE: BridgeNet International, 2020.

TABLE 7.15 **85 LMAX DBA POPULATION COUNT**

AEDT Departure Profile	85 L_{max} dBA - Population	85 L_{max} dBA – Housing Units
Existing Distant NADP – ICAO B (cutback at 1,000' AFE)	2,048	877
Alternative Close-in NADP – ICAO A (cutback at 1,500' AFE)	1,032	439
Difference in Population/Housing Units	**-1,016**	**-438**

SOURCE: BridgeNet International, 2020. U.S. Census, 2010.

The NADPs were compared to determine the change in L_{max} levels. The Close-in NADP (cutback at 1,500 feet AFE) provides a potential benefit relative to single event levels by reducing the population reduction in the 85 L_{max}. The decreased size of the Close-in NADP contours can be attributed to the aircraft remaining higher over sensitive land uses within the 65 CNEL, by reducing thrust once the aircraft is higher.

7.4 SUMMARY

The bulk of the operational alternatives evaluated in this chapter result in a shifting of noise from one area of the community to another. As stated previously, because the purpose of the 14 CFR 150 Study is to reduce the number of people and non-compatible land uses impacted by noise, shifting noise to a new area is not considered to meet the intent of the Study. Therefore, the consultants recommend not moving forward with any of the operational procedure alternatives that result in a shift in the 65 CNEL over new non-compatible land uses. Therefore, Alternatives 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, and 4 are not considered for recommendations of this Study. The NADP Close-in Departure Alternative showed a potential single event benefit. While it would not affect the 65 CNEL, it is important to note that the mature noise program at SDIA is resulting in the need to focus on alternatives that have any noise benefit, even single event level. Therefore, the consultants recommend moving the Close-in NADP Alternative forward to the recommendations in **Chapter 9 (Issues, Actions, and Recommendations)**.