John Wayne Orange County Airport - Departure Noise Impact Analysis

Prepared for:
The City of Newport Beach

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I. Introduction

ASRC Research and Technology Solutions (ARTS), was contracted by the City of Newport Beach, to perform an analysis of current and proposed departure operations at the Santa Ana / John Wayne Airport (SNA), with regard to the noise impacts of these operations on Newport Beach Residents. The purpose of this study is to provide the Committee with the necessary information to serve as an advisory to the City Council with regard to airport operations and to enable the Committee, the City Council, community groups, and the residents of Newport Beach to accurately assess the existing approach and departure patterns and any proposed modification to these patterns. This study was conducted by ARTS in cooperation with Orange County and the JWA Airport Director.

The study was based on the Scope of Work (SOW) included in the Professional Services Agreement between the City of Newport Beach and ARTS, dated July 27, 2007. This study was comprised primarily of an analysis of the existing conditions at SNA, a thorough assessment of the existing approach and departure procedures, and an effort to identify potential noise abatement alternatives. This document details the findings of the analysis and presents the noise abatement alternatives identified by the Project Team.

II. Existing Conditions

Existing conditions; including airfield facilities, airspace, air traffic control services, and existing procedures have been identified and analyzed in order to provide a basis from which potential noise abatement alternatives can be developed.

2.1 Airfield Facilities

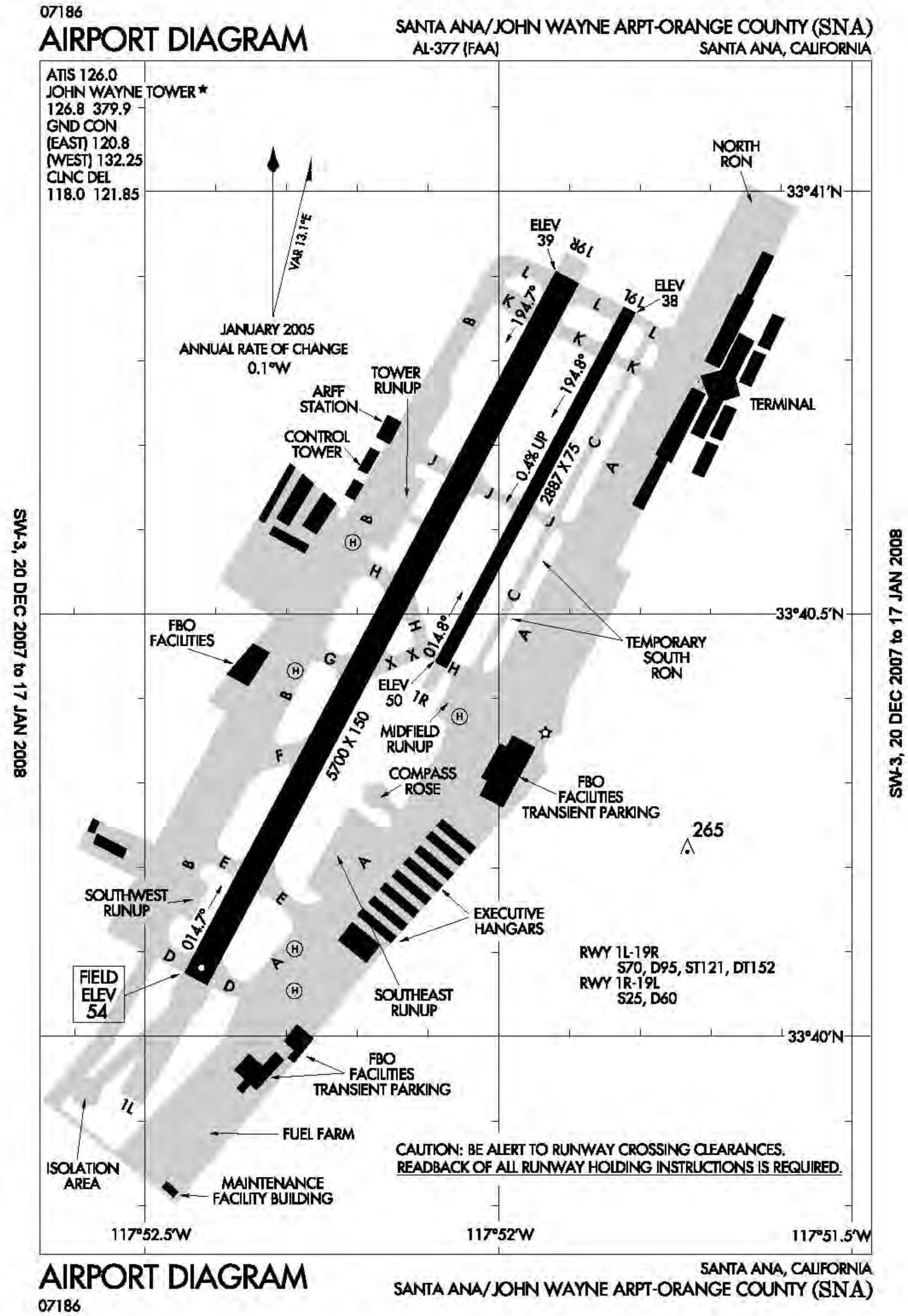
The SNA airfield layout includes two (2) parallel runways running in a southeast/northwest direction, of 5,700 feet and 2,887 feet in length. Eleven taxiways support the movement of aircraft between terminal/support areas and the runways. The terminal building is located to the east and north of the airfield's runways. Parking facilities are located to the east and south of the runways. The Air Traffic Control tower, Airport Rescue Fire Fighting station, and Fixed Base Operator facilities are located to the west of the runways. The airport diagram for the John Wayne Airport is depicted in **Exhibit 2-1**.

2.1.1 Runways

Runway 01L -19R, is the primary runway and is 5,700 feet in length and 150 feet wide. Neither runway has a displaced threshold, so the full length of both Runway 01L and Runway 19R is available to both landing and departing aircraft. This is a precision runway and has a grooved asphalt surface. This runway is equipped with High Intensity Runway Lights (HIRL). Both Runways 01L and 19R are equipped with Visual Approach Slope Indicators (VASI). In addition, aircraft arriving on Runway 19R are supported by Runway Visual Range (RVR) equipment, a Medium Intensity Approach Light System with Runway Alignment Indicators (MALSR), and an Instrument Landing System (ILS).

Runway 01R-19L is 2,887 feet in length and 75 feet wide. Neither runway has a displaced threshold, so the full length of both Runway 01R and Runway 19L is available to both landing and departing aircraft. This is a non-precision runway and has a porous asphalt surface. This runway is equipped with Medium Intensity Runway Lights (MIRL). In addition, Runway 19L is equipped with Visual Approach Slope Indicators (VASI). No additional lighting or navigational equipment exists for this runway.

Exhibit 2-1 Airport Diagram, Santa Ana/John Wayne Airport (SNA)



2.2 Air Traffic Control Services and Airspace

This section describes the FAA's control facilities and their general responsibilities and functions, as well as airspace allocations associated with SNA.

2.2.1 Air Traffic Control Services

Airport tower controllers and terminal controllers watch over all planes traveling through the airport's airspace. Their main responsibility is to organize the flow of aircraft into and out of the airport. Relying on radar and visual observation, they closely monitor each plane to ensure a safe distance between all aircraft and to guide pilots between the hangar or ramp and the end of the airport's airspace. In addition, controllers keep pilots informed about changes in weather conditions such as wind shear, a sudden change in the velocity or direction of the wind that can cause the pilot to lose control of the aircraft.

Three FAA facilities provide ATC services to aircraft arriving and departing the Airport:

- **Los Angeles Air Route Traffic Control Center (L.A. Center) –** Located in Los Angles, CA, provides ATC services to aircraft operating on Instrument Flight Rules (IFR) flight plans within controlled airspace primarily during the en route phase of flight. When equipment capabilities and controller workload permit, certain additional advisory services may be provided to aircraft operating in accordance with Visual Flight Rules (VFR).

  According to ATADS data, during the twelve-month period between July, 2006 and June, 2007, Los Angeles Center reported providing IFR service to 2,342,081 aircraft and VFR services to 181,669 aircraft. During that period, approximately 15 percent of the aircraft serviced by Los Angeles Center were en route to or from John Wayne - Orange County Airport.

- **Southern California Terminal Approach Control (TRACON) Facility (SCT) –** is a FAA facility located in San Diego, CA. SCT provides RADAR service to airports throughout the Los Angeles and San Diego metropolitan areas, including John Wayne - Orange County Airport. RADAR Services is a term encompassing one or more of the following services based on use of RADAR:

  - Radar Monitoring – The radar flight following the aircraft whose primary navigation is being performed by the pilot to observe and note deviations from its authorized flight path, airway, or route.
  - Radar Navigational Guidance – Vectoring aircraft to provide course guidance.
  - Radar Separation – Radar spacing of aircraft in accordance with established minima.

  According to The Air Traffic Activity Data System (ATADS) data, during the twelve-month period between July, 2006 and June, 2007, SCT provided service to 2,186,182 aircraft, with secondary airports and overflights accounting for approximately 70 percent of SCT's operational count. ATADS is the official source of historical air traffic operations for center, airport, instrument and approach counts.

- **Santa Ana/John Wayne Air Traffic Control Tower (SNA ATCT)** – is a limited RADAR facility located on the airfield. The tower provides ATC services to aircraft operating on and within close proximity of the airport. The ATCT authorizes aircraft to land or takeoff at the airport, or to transition through its delegated airspace. John Wayne Tower has been delegated that portion of the John Wayne Class C Surface Area that is within 5 nm of SNA airport and up to and including 2500 feet MSL. As a limited RADAR facility, SNA ATCT is authorized to carry out specific delegated functions. These RADAR functions are to:
    - Determine an aircraft's identification, precise location, and spatial relationship to other aircraft.
    - Provide aircraft with radar traffic advisories.
    - Provide a direction or suggested headings to VFR aircraft as a means of radar identification or as an aid to navigation.
    - Provide information and instructions to aircraft operating within the airspace for which SNA ATCT has responsibility.
    - Ensure separation between successive departures, successive arrivals, between arrivals and departures, between overflights and departures, between overflights and arrivals, and between overflights within the airspace for which SNA ATCT has responsibility.

2.2.2 Airspace

There are two categories of airspace in the National Airspace System (NAS): regulatory and non-regulatory. Within these two categories, there are four types of airspace: Controlled, Uncontrolled, Special Use and Other. Sections 2.2.2.1 – 2.2.2.6 detail these types of airspace.

2.2.2.1 Controlled Airspace

There are five (5) main classes of controlled airspace wherein air traffic control is provided to aircraft filing either visual flight rules (VFR) or instrument flight rules (IFR). The five classes, Class A, Class B, Class C, Class D, and Class E are described below. A sixth class, Class G, is uncontrolled airspace and is also described below.

Class A

Airspace is considered to be Class A if it is above 18,000 feet mean sea level (MSL) up to and including flight level 600 (FL600, in which the number corresponds to altitude in hundreds of feet). Generally, Class A airspace covers all of the contiguous United States and Alaska, and extends out into the ocean 12 nautical miles (NM) from the borders. Any persons operating in Class A airspace, unless otherwise authorized, must operate the aircraft under IFR. Class A airspace is generally not charted.

Class B

Class B airspace occupies the air from the ground level up to 10,000 feet MSL, and is usually found surrounding the nation's busiest airports (in terms of IFR operations). Class B airspace contains a surface area and a series of layers, and oftentimes resembles an upside down wedding cake. Starting from the ground and going vertical, each layer has a lager radius than the one below it. Class B airspace is individually tailored by site and is designed to contain instrument procedures once an aircraft enters the airspace. Pilots must first receive an ATC clearance prior to entering Class B airspace. Aircraft entering Class B airspace must be equipped with 2 way radios and a Mode C altitude encoding transponder.

Mode C Veil

Class B airspace also has a 30 NM Mode C Veil surrounding it that extends from the surface upwards to 10,000 MSL (unless otherwise authorized by ATC). No aircraft may enter the Mode C Veil unless it is equipped with a proper Mode C altitude encoding transponder equipment (unless otherwise authorized by ATC).

Class C

Airports that have an operational control tower, radar approach control, and a certain level of IFR activity are commonly contained within Class C airspace. Every airport is configured differently, however, Class C airspace generally consists of a surface area within a 5 NM radius centered about the airport that extends upwards 4,000 feet above the airport elevation. An outer circle with a 10 NM radius typically extends from 1,200 feet to 4,000 feet above the airport elevation. An aircraft must be equipped with a two-way radio to enter Class C airspace, as well as an operable radar beacon transponder with automatic altitude reporting equipment.

Class D

Class D airspace is located about airports with an operational control tower, and extends from the surface of the airport up to 2,500 feet above the airport elevation. Class D airspace typically extends out 5 NM from the center of an airport but is tailored to fit the airport it surrounds when instrument procedures are published at the facility. An aircraft must have a two-way radio to enter Class D airspace.

Class E

Class E airspace is controlled airspace that is not Class A, Class B, Class C, or Class D. Class E airspace includes the surface area designated for an airport, extension to a surface area of other classes of airspace, airspace used for transition to either the terminal area or enroute environment, enroute domestic areas, Federal Airways, and offshore airspace areas.

2.2.2.2 Uncontrolled Airspace

Uncontrolled airspace includes Class G airspace. Class G airspace is described as follows:

Class G

Class G airspace is any uncontrolled airspace, that is, it is airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E.

2.2.2.3 Special Use Airspace

Although all of the airspace in the contiguous United States, plus Alaska, is Class A, Class B, Class C, Class D, Class E, or Class G airspace, there are other areas of airspace with special designations. These special areas are shown on aeronautical charts, and include hours of operation, affected altitudes, and controlling agencies. These areas include: Prohibited Areas, Restricted Areas, Warning Areas, Military Operations Areas (MOAs), Alert Areas, and Controlled Firing Areas.

<u>Prohibited Areas</u>
A prohibited area is airspace above sensitive ground, usually pertaining to national security or welfare. Aircraft are prohibited from entering such airspace without proper authorization.

<u>Restricted Areas</u>
Restricted areas are areas in which the flight of aircraft is restricted. A restricted area usually involves hazardous activities for other aircraft in the area, such as artillery firing, aerial gunnery, or guided missile firings. If the area is not in use however, ATC facilities can release the airspace for other aircraft to operate in these zones.

<u>Warning Areas</u>
A warning area is a defined area of airspace extending outward starting three nautical miles from the coast of the U.S., containing activity that may be hazardous to other aircraft operating in the area. There are no restrictions here, but they exist to warn pilots of potential danger.

<u>Military Operations Areas (MOAs)</u>
A MOA is an area of space, defined both laterally and vertically, that is designated for military training activities. Nonparticipating aircraft may not enter a MOA that is in use, unless it is given clear separation by the controlling ATC. It is also the practice of ATC that nonparticipating traffic remain at least 3 NM from the boundary of a MOA.

<u>Alert Areas</u>
An alert area is an area that contains a high volume of pilot training or other aerial activity. Pilots traveling in these areas should exercise increased caution, as to avoid any collisions.

<u>Controlled Firing Areas</u>
A controlled firing area is airspace that often contains firing exercises, except these activities are immediately stopped when a nonparticipating aircraft is observed (by a spotter aircraft, radar, or ground lookout) to be approaching the area. Because of this, these areas are not charted.

2.2.2.4 Other Airspace Areas

Other airspace areas include Military Training Routes, areas with Temporary Flight Restrictions, Parachute Jump Areas, Published VFR Routes, Terminal Radar Service Areas and National Security Areas.

Military Training Routes

Military Training Routes (MTR) are jointly developed by the FAA and the Department of Defense for the purpose of conducting low altitude high speed training for military pilots and crews. There are two types of Military Training Routes: IFR and VFR. IFR Military Training Routes are conducted within the IFR rules regardless of weather and typically occur at altitudes above 1,500 feet above the ground (AGL). VFR Military Training Routes are conducted in accordance with VFR rules except visibility shall be 5 miles or more and flights must not be conducted below a ceiling of 3,000 feet above the ground (AGL).

Temporary Flight Restrictions

Temporary Flight Restrictions (TFR) are intended to protect persons and property in the air or on the surface from an existing or imminent hazard, provide a safe environment for the operation of disaster relief aircraft, prevent an unsafe congestion of sightseeing aircraft above an incident or event generating a high degree of public interest, protect declared national disasters for humanitarian reasons, protect the President, Vice President, or other public figures, and to provide a safe environment for space agency operations. TFRs are issued by FAA via Notice to Airman (NOTAM). Pilots are responsible to comply when operating flights in areas where a TFR is in effect.

Parachute Jump Areas

Parachute Jump Areas have been developed to enhance the safety of parachuting operations. Procedures for each established individual jumping area vary and are published in the Airport Facilities Directory.

Published VFR Routes

Published VFR routes for transitioning around, under and through complex airspace, such as Class B, have been developed through FAA and industry initiatives. Published VFR routes include: VFR flyways, VFR corridors, and Class B airspace VFR Transition Routes.

VFR flyways are defined as general flight paths, not as specific courses. They are for use by pilots for flights into, out of, through, or near complex airspace to avoid Class B airspace.

VFR corridors are defined as airspace through Class B airspace with defined vertical and horizontal boundaries where aircraft may operate without an Air Traffic Control (ATC) clearance or communication.

VFR transition routes are designed to accommodate VFR traffic through certain Class B airspace. These routes include specific ATC assigned altitudes, and require pilots to obtain clearance prior to entering the Class B airspace on the route.

Terminal Radar Service Areas

Terminal Radar Service Areas (TRSA) were originally established as part of the Terminal Radar program at selected airports. TRSAs provide pilots with air traffic radar services on a voluntary basis. TRSAs overlie the Class D airspace associated with a primary airport as well as other Class E airspace associated with approaches and departures at that airport.

National Security Areas

National Security Areas consist of airspace defined vertically and laterally where there is a requirement for increased security and safety of ground facilities.

2.2.3 Local Airspace Designations

The airspace associated directly with SNA is Class C, from the surface to 4400 feet MSL. Other controlled airspace in the immediate vicinity includes the Class B airspace associated with LAX, and Class E airspace associated with instrument operations in the Los Angeles area for all airports, as well as published VFR transition routes, parachute jumping areas, and glider operation areas associated with the General Aviation airports in the area. The following sections detail the local airspace.

<u>Local Class B Airspace</u>
The Class B airspace in the vicinity of John Wayne airport is associated with LAX. The surface area of the Class B is irregularly shaped and the surface areas vary in the floor and ceiling elevations.

From the surface area, the Class B airspace contains multiple layers in order to separate IFR traffic operating into and out of LAX and other IFR airports in the Los Angeles area from VFR traffic operating in the area. The LAX, Class B airspace extending closest to John Wayne Airport is located to the West of the airport and has a floor of 7,000 feet MSL, and a ceiling of 10,000 feet MSL.

<u>Local Class C Airspace</u>
As mentioned previously, the airspace associated with SNA is Class C. The Class C airspace consists of the typical 5 NM radius circle, centered on the Airport Reference Point (ARP) extending from the airport elevation of 56 feet up to 4,400 feet MSL. The 10 NM radius, Class C "shelf" associated with SNA is incomplete with sections cut-out, and it is broken into various segments with a range of floor and ceiling elevations.

<u>Local Class E Airspace</u>
Local Class E airspace includes surface areas designated for an airport, extensions to surface areas, transition areas, and Federal Airways. Class E surface areas are present at airports in the Los Angeles area that are not already designated as Class B or Class C. Class E transitional airspace exists to protect the instrument approaches at IFP airports. Class E airspace is also present along the multiple Federal Airways and Victor Airways in the vicinity of the airport.

2.3 Navigational Aids

Essentially, Navigational Aids (NAVAIDS) are ground based, electronic devices that communicate with aircraft instrumentation to provide point-to-point guidance or position data to aircraft in flight. NAVAIDS in the vicinity of an airport and the airways associated with them play a significant role in the flight tracks followed by aircraft.

NAVAIDs can be defined as any visual or electronic device airborne or on the surface that communicate with aircraft instrumentation to provide point to point guidance information or position data to an aircraft in flight. There are various types of NAVAIDs available in the NAS today, each serving a specific purpose. NAVAIDS in the vicinity of an airport and the airways associated with them play a significant role in the flight tracks followed by aircraft. NAVAIDs are owned by various entities, however FAA has the statutory authority to establish, operate, maintain, and to prescribe standards for the operation of any NAVAID used for instrument flight.

There are several types of NAVAIDs operating in the National Air Space (NAS) today. These facilities can be categorized as ground based, satellite based, visual, instrument, and by phase of flight. The following paragraphs detail types of NAVAIDs in the NAS.

2.3.1 Ground Based Radio NAVAIDs

Ground based radio NAVAIDs include Non-directional Beacons, Very High Frequency Omni Directional Range, Distance Measuring Equipment, Tactical Navigation, Instrument Landing Systems, Microwave Landing Systems, and Transponder Landing Systems. These systems are briefly described below.

Non-directional Radio Beacons (NDBs): A ground based UHF radio beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with a directional finder can determine the bearing of the aircraft to/from the beacon. An NDB can be used as in various phases of VFR and IFR flights including enroute, approach, and landing.

VHF Omni-Directional Range (VORs): A ground based electronic navigation aid transmitting Very High Frequency navigational signals, 360˚ in azimuth, oriented from magnetic north. VORs are used as the basis for navigation in the NAS and are used in all phases of IFR and VFR flights including enroute, arrival, approach, landing, missed approach, and departure.

Distance Measuring Equipment: Equipment, airborne or ground, used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid location.

VOR with Distance Measuring Equipment (VOR/DMEs)
This is a VOR co-located with a DME facility providing range and azimuth navigational information to equipped aircraft. VOR/DME may be used in enroute, arrival, approach, landing, missed approach, and departure phases of flight by IFR and VFR aircraft.

Tactical Air Navigation (TACANs): A TACAN is an Ultra High Frequency ground based electronic air navigation aid providing suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station. TACANs are reserved for military use in the enroute, arrival, approach, landing, missed approach, and departure phases of flight by IFR and VFR aircraft.

VOR/TACAN (VORTAC): A ground based aid providing VOR azimuth, TACAN azimuth, and distance measuring equipment at one site. It may be used for both military and civilian aircraft in the enroute, arrival, approach, landing, missed approach, and departure phases of flight by IFR and VFR aircraft.

Instrument Landing System (ILS): A ground based precision instrument approach landing system consisting of a localizer and a glideslope antenna, but may include an outer marker, middle marker, inner marker and/or an approach lighting system. The Localizer component provides course guidance to the runway whereas the glideslope provides vertical positioning information. The outer marker, middle marker and inner marker are beacon systems providing visual and auditory information to pilots while using an ILS.

Microwave Landing System (MLS): A ground based precision instrument approach system operating in the microwave spectrum normally consisting of an azimuth station, an elevation station, and precision DME.

Transponder Landing Systems: TLS is designed to provide approach guidance utilizing existing airborne ILS localizer, glideslope, and transponder equipment. Approval of this system requires the issuance of special instrument approach procedures.

Fix: Fixes are geographical positions determined by visual reference to the surface by, referencing one or more radio NAVAIDs, by celestial plotting or by other NAVAID devices.

2.3.2 Satellite Based NAVAIDS

Satellite NAVAIDs include Global Positioning System, Wide Area Augmentation System, Ground Based Augmentation Systems, Global Navigation and Satellite Systems (GNSS) and Special Category I Differential GPS Systems.

Global Positioning System (GPS): The Global Positioning System is a satellite based radio navigation system broadcasting a signal used by receivers to determine precise position information anywhere in the world. The receiver tracks multiple satellites and determines a pseudorange measurement that is used to determine the location. A minimum of four satellites are required to determine an accurate three dimensional position. The Department of Defense (DOD) is responsible for the operation of the GPS constellation and monitors the GPS satellites to ensure proper orientation.

Wide Area Augmentation System (WAAS): The WAAS was developed by FAA to improve the accuracy, integrity, and availability of GPS signals. The WAAS signal is designed to allow for seamless operations from departure through a Category I approach. WAAS uses precisely surveyed wide area ground reference stations and a wide area master unit to monitor and correct errors in the GPS solution caused by the ionosphere. These corrected signals are rebroadcast and are available for use by WAAS capable GPS receivers.

GNSS Landing System (GLS): The GLS provides precision navigation guidance for exact alignment and descent of aircraft on approach to a runway. It provides differential augmentation to the Global Navigation Satellite System. Examples of a GLS system include the Local Area Augmentation System (LAAS). LAAS systems provide corrections to the GPS signal in the terminal area and are capable of providing navigation on approach to Category III minimums. FAA currently considers the LAAS program a "Research and Development" project. However, schedules exist to implement this technology in the near future.

Special Category I Differential GPS (SCAT-I DGPS): SCAT-I DGPS is designed to provide approach guidance by broadcasting differential correction to GPS. Approval of this system requires the issuance of special instrument approach procedures.

There are several ground based NAVAIDS in the vicinity of SNA used for en route and approach and landing. **Table 2-1** lists these NAVAIDS and provides additional details regarding location and function.

Table 2-1 NAVAIDs in the Vicinity of Santa Ana/John Wayne Airport

NAVAID ID	Name	Type	Function	Distance (NM)
I-SNA	SNA Runway 19R	ILS/LOC	App	On Airfield
SLI	Seal Beach	VORTAC	Enroute/Arr/Dep/App	11
PDZ	Paradise	VORTAC	Enroute/Arr/Dep/App	23
POM	Pomona	VORTAC	Enroute/Arr/Dep/App	24
LAX	Los Angeles	VORTAC	Enroute/Arr/Dep/App	32
SXC	Santa Catalina	VORTAC	Enroute/Arr/Dep/App	33
OCN	Oceanside	VORTAC	Enroute/Arr/Dep/App	35
VNY	Van Nuys	VOR/DME	Enroute/Arr/Dep/App	45
PMD	Palmdale	VORTAC	Enroute/Arr/Dep/App	58
VTU	Ventura	VOR/DME	Enroute/Arr/Dep/App	65
LHS	Lake Hughes	VORTAC	Enroute/Arr/Dep/App	70
TRM	Thermal	VORTAC	Enroute/Arr/Dep/App	72
PSP	Palm Springs	VORTAC	Enroute/Arr/Dep/App	73
GMN	Gorman	VORTAC	Enroute/Arr/Dep/App	84
HEC	Hector	VORTAC	Enroute/Arr/Dep/App	97
DAG	Daggett	VORTAC	Enroute/Arr/Dep/App	100
RZS	San Marcus	VORTAC	Enroute/Arr/Dep/App	107
EHF	Shafter	VORTAC	Enroute/Arr/Dep/App	124

Source: *FAA Digital Aeronautical Information.*
Prepared by: ASRC Research and Technology Solutions

2.4 Meteorological Conditions

Ten years of historical weather data for John Wayne Airport were obtained from the National Oceanic and Atmospheric Administration (NOAA) in order to develop an accurate profile of the local meteorological conditions. Three separate sets of data were acquired; “all-weather”, Visual Flight Rules (VFR), and Instrument Flight Rules (IFR).

Based on analysis of the historical weather data, Visual Meteorological Conditions (ceiling greater than 1,000 ft and visibility greater than 3 miles) occur over 95.5% of the time and Instrument Meteorological Conditions occur 4.5% of the time. The average wind speed is 3.4 knots, with winds predominately out of the southwest.

The principle focus of the weather analysis was on wind conditions, since wind direction plays a large role in dictating runway usage at an airport. This is due to the fact that, for fixed-wing aircraft, it is advantageous to perform takeoffs and landings into the wind to reduce takeoff roll and reduce the ground speed necessary to achieve flying speed.

Therefore the north-south runway alignment at SNA dictates that winds with directional headings between approximately 100° and 260° (essentially winds out of the south) would favor a southward traffic flow, with aircraft landing and departing to the south. Conversely, winds with directional headings between approximately 280° and 80° (winds out of the north) would favor a northward traffic flow, with aircraft landing and departing to the north.

Typically in aviation, wind speeds measured at 3 knots or less result in conditions that are termed “calm” conditions. Conditions involving wind speeds measured at greater than 3 knots are termed “other-than-calm” conditions. In calm conditions, the flow of air traffic is dictated by the air traffic control tower order. In other-than-calm conditions, air traffic flow is dictated by wind direction. However, Runway 19 is the preferential runway at SNA and is used with tailwinds of up to 10 knots.

2.4.1.1 All-Weather Conditions

All-weather conditions include all of the observations recorded over the ten year period; including all ceiling heights and visibilities. When averaged for “all-weather” observations, conditions are calm approximately 35.4% of the time. Therefore other-than-calm conditions exist 64.6% of the time. The 64.6% of other-than-calm conditions can be broken down to 30.6% with winds at 4-6 knots, 27.3% at 7-10 knots, 6.2% at 11-16 knots, 0.4% at 17-21 knots, and 0.1% at 22-27 knots.

Wind direction varies but winds are predominately out of the southwest, with the prevailing directional headings being approximately 180° to 250°. Winds with directional headings between 100° and 260° (winds out of the south) occur approximately 65% of the time. Winds with directional headings between 280° and 80° (winds out of the north) occur approximately 10% of the time. The remaining 25% consists of observations made during conditions of no measurable wind.

2.4.1.2 Visual Flight Rules (VFR) Conditions

VFR conditions include all of the observations recorded over the 10 year that permit Visual Flight Rules, which, at SNA, comprises conditions with ceilings at or above 1,000 feet and visibility of 3 statute miles or more. When averaged for VFR observations, conditions are calm 34.2% of the time. Therefore other-than-calm conditions exist 65.8% of the time during VFR conditions. The 65.8% of other-than-calm conditions can be broken down to 30.4% with winds at 4-6 knots, 28.5% at 7-10 knots, 6.4% at 11-16 knots, 0.4% at 17-21 knots, and 0.1% at 22-27 knots.

Under VFR conditions, wind direction varies but winds are predominately out of the southwest, with the prevailing directional headings being approximately 190° to 250°. Winds with directional headings between 100° and 260° (winds out of the south) occur approximately 66% of the time. Winds with directional headings between 280° and 80° (winds out of the north) occur approximately 10% of the time. The remaining 24% consists of observations made during conditions of no measurable wind.

2.4.1.3 Instrument Flight Rules (IFR) Conditions

IFR conditions include all of the observations recorded over the 10 year period that do not permit Visual Flight Rules and therefore require that Instrument Flight Rules be followed. At SNA, this is comprised of conditions having ceilings of less than 1,000 feet and visibility of less than 3 statute miles. When averaged for IFR observations, conditions are calm 51.5% of the time. Therefore other-than-calm conditions exist 48.5% of the time during IFR conditions. The 48.5% of other-than-calm conditions can be broken down to 36% with winds at 4-6 knots, 10.2% at 7-10 knots, 2.1% at 11-16 knots, and 0.2% at 17-21 knots.

Under IFR conditions, wind direction varies but winds are predominately out of the southwest, with the prevailing directional headings being approximately 190° to 240°. Winds with directional headings between 100° and 260° (winds out of the south) occur approximately 55% of the time during IFR weather. Winds with directional headings between 280° and 80° (winds out of the north) occur approximately 12% of the time. The remaining 33% consists of observations made during conditions of no measurable wind.

2.5 Runway Usage

As discussed in the previous section, airport runway usage is dictated largely by wind direction, with aircraft departing and landing into the wind. Therefore the north-south runway alignment at SNA dictates that in other-than-calm conditons, wind headings between approximately 100° and 260° would favor a southward traffic flow (aircraft landing and departing to the south). Other-than-calm conditions that favor a southerly air traffic flow, occur approximately 58% of the time at SNA. Conversely, winds with directional headings between approximately 280° and 80° would favor a northward traffic flow, with aircraft landing and departing to the north. Other-than-calm conditions that favor a northerly air traffic flow occur approximately 8% of the time at SNA.

Since wind conditions favoring a south-flow air traffic configuration occur approximately 58% of the time, it stands to reason that this is the predominate air traffic flow configuration in use at SNA. In a south-flow configuration, aircraft land and depart primarily on Runway 19R. Wind conditions only necessitate the use of a north-flow air traffic configuration approximately 8% of the time, in which case aircraft land and depart primarily on Runway 01L. The remaining 34% of the time, conditions are calm and favor no particular air traffic flow. As discussed previously, in calm conditions, the flow of air traffic is at the discretion of air traffic controllers and is normally dictated by the air traffic control tower order.

2.6 Commercial Activity

According to FAA's Air Traffic Activity Data System (ATADS), during the 2007 calendar year, 342,061 aircraft operations occurred at John Wayne Airport with a resulting average of approximately 937 operations per day. Approximately 27% of operations were by commercial air carriers. Approximately 7.5% were air taxi operations, which are defined as operations by aircraft designed to have a maximum seating capacity of 70 seats or less, operating at gross takeoff weights of not more than 90,000 pounds, and carrying passengers or cargo for hire or compensation. Approximately 38% were itinerant GA operations, and approximately 27% were local GA operations.

Since commercial activity is typically the primary source of noise, and noise complaints at airports, the focus of this analysis is on commercial operations at SNA. For the purposes of this analysis, "commercial" operations include commercial air carriers, commuter air carriers, and air cargo carriers. **Table 2-2** lists the commercial airlines serving SNA, the types of aircraft operated by each airline, and the terminal out of which each airline operates based on data obtained from the John Wayne Airport Noise Abatement Program quarterly reports.

Table 2-2 Airlines Operating at Santa Ana/John Wayne Airport (SNA)

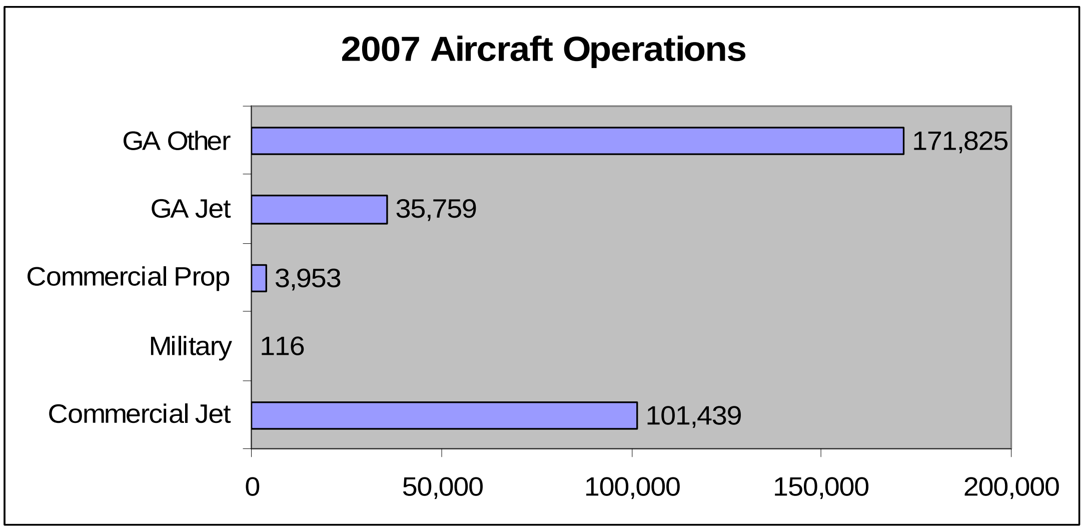
Airline	Type of Carrier	Types of Aircraft Operated	Location
Alaska Airlines	Commercial	B7374, B7377, B7378	Terminal A
American Airlines	Commercial	B7378, B757, MD80	Terminal A
Continental Airlines	Commercial	B7377	Terminal A
Delta Airlines	Commercial	B7373, B7377, B7378, B757, MD90	Terminal A
Frontier Airlines	Commercial	A319	Terminal B
Northwest Airlines	Commercial	A320	Terminal B
Southwest Airlines	Commercial	B7377	Terminal B
United Airlines	Commercial	A320, B7373, B757	Terminal B
US Airways	Commercial	A320, B7373, B757	Terminal B
Mesa	Commercial	CL60, CRJ9	Terminal B
American Eagle	Commuter	E140	Terminal A
Skywest	Commuter	CL60, CRJ7, CRJ9, E120	Terminal A
Federal Express	Cargo	A300, A310	n/a
UPS	Cargo	B757	n/a

Prepared by: *ASRC Research & Technology Solution*

2.7 General Aviation Activity

General Aviation operations accounted for approximately 65% (224,159) of all operations at SNA during the 2007 calendar year. This includes both itinerant and local GA operations. Approximately 38% of the total operations were itinerant GA operations, and approximately 27% were local GA operations. General Aviation jet aircraft can be another significant source of noise at airports. Of the GA operations at SNA in 2007, approximately 11% (36,000) were performed by jet aircraft. **Exhibit 2-2** delineates the number of aircraft operations, by type, for the 2007 calendar year at SNA, based on data obtained from the John Wayne Airport Noise Abatement Program quarterly reports.

Exhibit 2-2 Santa Ana/John Wayne Airport (SNA) 2007 Aircraft Operations



2.8 Charted Instrument Procedures

Charted procedures include Standard Instrument Departures (SIDs), Standard Terminal Instrument Arrivals (STARs), Instrument Approach Procedures (IAP), and Charted Visual Flight Procedures (CVFP).

A SID is a preplanned procedure providing routing and obstruction clearance from the terminal area to the appropriate enroute structure. SIDs provide obstruction clearance for pilots and also increase efficiency and reduce communications at airports. A STAR is an ATC coded IFR arrival route that provides routing for arriving IFR aircraft destined for certain airports. IAPs provide instrument flight operations into civil and military airports. IAP obstacle protection is provided from the initial approach or the beginning of an arrival route to a point where a landing is completed or thereafter if a landing can not be completed to a holding position where enroute or holding obstacle protection is provided. CVFP are approach procedures conducted while on an IFR flight plan, and when authorized by ATC, allowing a pilot to proceed visually and clear of clouds to the airport via visual reference points and other information charted on the approach plate. Weather minimums are typically required as part of a CVFP.

2.8.1 Charted Standard Instrument Departures

There are three charted departures published for SNA; The ANAHEIM THREE, the CHANNEL ONE, and the MUSEL SIX. The ANAHEIM THREE departure is used by aircraft departing all four runways at SNA and is primarily used by General Aviation (GA) aircraft. It is not authorized for turbojet or turboprop aircraft. The MUSEL SIX and CHANNEL ONE departures are used by aircraft departing Runways 19L and 19R. Departure plates for each of these procedures can be found in **Appendix A**.

While most departure procedures are designed for obstacle clearance and workload reduction, some are developed solely to comply with noise abatement requirements. The CHANNEL ONE AND MUSEL SIX departures incorporate a turn that appears to provide the best path over Newport Bay in addition to a higher than standard climb gradient. Although not expressly stated on the FAA forms, it would appear that noise abatement may have been a consideration during early development, but the forms indicate that both are ATC graphic departures.

2.8.1.1 ANAHEIM THREE Departure

The ANAHEIM THREE departure includes three transitions, wherein aircraft transition from the departure procedure to the enroute phase of flight. The three transitions associated with the ANAHEIM THREE departure are the Ventura, Hector, and Lake Hughes transitions.

Aircraft departing via the ANEHEIM THREE departure from Runways 19L and 19R first turn right heading 220° and then receive radar vectors to the Seal Beach VORTAC (SLI). Aircraft departing from Runways 01L and 01R, and flying the Hector or Lake Hughes transition first turn left heading 330° and receive radar vectors to SLI. Aircraft departing from Runways 01L and 01R, and flying the Ventura transition, first turn left heading 240° for radar vectors to the Los Angeles VORTAC (LAX) and then pick-up the Ventura transition from LAX.

After reaching SLI, aircraft flying the Hector transition turn right and fly northeast via the SLI 58° (PDZ 238°) radial to the Paradise VORTAC (PDZ). Upon reaching PDZ, aircraft continue northeast on the PDZ 12° (HEC 232°) radial to the Hector VORTAC (HEC), where they transition to the enroute phase of flight.

After reaching SLI, aircraft flying the Lake Hughes transition turn right and fly northeast via the SLI 58° (PDZ 238°) radial to the POXKU intersection. Aircraft then turn north and fly the Pomona VORTAC (POM) 164° radial to the BAYJY intersection, then turn east and fly the Van Nuys VORTAC (VNY) 95° radial to the DARTS intersection. At the DARTS intersection aircraft turn north and fly the Lake Hughes VORTAC (LSH) 319° radial to LHS, where they transition to the enroute phase of flight.

After reaching SLI, aircraft flying the Ventura transition fly west via the SLI 251° radial to the WILMA intersection, then turn northwest and fly to the LAX VORTAC via the LAX 123° radial. Upon reaching LAX, aircraft fly west via the LAX 276° (VTU 93°) radial to the Ventura VOR/DME (VTU), where they transition to the enroute phase of flight.

2.8.1.2 MUSEL SIX Departure

The MUSEL SIX departure includes four transitions, wherein aircraft transition from the departure procedure to the enroute phase of flight. The four transitions associated with the ANAHEIM THREE departure are the Daggett, Oceanside, Seal Beach and Thermal transitions.

All aircraft departing via the MUSEL SIX departure maintain the runway heading, or the localizer (I-SNA) south course, until they reach the I-SNA 1 DME (or SLI 118° intersection) fix. Aircraft then turn left to heading 175° for radar vectors to the MUSEL intersection. Aircraft then fly one of the four published transitions, or are assigned a route by ATC. Aircraft are expected to receive clearance for their filed altitude ten minutes after departure.

After reaching the MUSEL intersection, aircraft flying the Daggett transition turn right and fly north via the SLI 150° radial to the Seal Beach VORTAC (SLI), then turn right and fly the SLI 022° (POM 202°) radial to the Pomona VORTAC (POM). Aircraft then continue northeast on the POM 033° (DAG 214°) radial to the Daggett VORTAC (DAG) where they transition to the enroute phase of flight.

After reaching the MUSEL intersection, aircraft flying the Oceanside transition turn left and fly southeast via the OCN 282° radial to the Oceanside VORTAC (OCN), where they transition to the enroute phase of flight.

After reaching the MUSEL intersection, aircraft flying the Seal Beach transition turn right and fly north via the SLI 150° radial to the Seal Beach VORTAC (SLI), where they transition to the enroute phase of flight.

After reaching the MUSEL intersection, aircraft flying the Thermal transition turn left and fly west via the Santa Catalina VORTAC (SXC) 150° radial and the Thermal VORTAC (TRM) 263° radial to TRM, where they transition to the enroute phase of flight.

2.8.1.3 CHANNEL ONE Departure

The CHANNEL ONE departure includes three transitions, wherein aircraft transition from the departure procedure to the enroute phase of flight. The four transitions associated with the CHANNEL ONE departure are the Gorman, San Marcus, and Shafter transitions.

All aircraft departing via the CHANNEL ONE departure maintain the runway heading, or the localizer (I-SNA) south course, until they reach the I-SNA 1 DME (or SLI 118° intersection) fix. Aircraft then turn left to heading 175°, cross the SLI 132° radial, then turn right heading 200°, intercept and proceed via the SXC 84° radial to SXC. Aircraft then fly one of the three published transitions, or are assigned a route by ATC. Aircraft are expected to receive clearance for their filed altitude ten minutes after departure.

After reaching the SXC VORTAC, aircraft flying the Gorman transition turn right and fly north via the SXC 344° (LAX 164°) radial to the Los Angeles VORTAC (LAX). Aircraft then turn left and fly the LAX 323° radial (GMN 142°) to the Gorman VORTAC (GMN), where they transition to the enroute phase of flight.

After reaching the SXC VORTAC, aircraft flying the San Marcus transition turn right and fly to the Ventura VOR/DME (VTU) via the SXC 310° (VTU 129°) radial. At VTU, aircraft turn left and fly to the San Marcus VORTAC (RZS) via the VTU 289° (RZS 109°) radial, where they transition to the enroute phase of flight.

After reaching the SXC VORTAC, aircraft flying the Shafter transition turn right and fly north via the SXC 344° (LAX 164°) radial to the Los Angeles VORTAC (LAX). Aircraft then fly the LAX 337° radial to the LANDO intersection, they then turn left and fly the Shafter VORTAC (EHF) 306° radial to EHF, where they transition to the enroute phase of flight.

2.8.2 Charted Terminal Instrument Arrivals

There are two charted arrivals published for SNA; the KAYOH FOUR and the TANDY THREE. The KAYOH FOUR is used by aircraft approaching from the southwest and the TANDY THREE is used by aircraft approaching from the northeast. Arrival plates for these procedures can be found in **Appendix B**.

2.8.2.1 KAYOH FOUR Arrival

The KAYOH FOUR arrival includes two transitions, wherein aircraft transition from the enroute phase of flight into the arrival procedure. The two transitions associated with the KAYOH FOUR arrival are the Hector and the Palm Springs transitions.

Aircraft arriving via the Hector transition enter the transition over the Hector VORTAC (HEC). Aircraft fly southwest on a HEC 211° (PDZ 030°) radial to the DAWNA intersection, then south via the Homeland VOR (HDF) 353° radial to HDF. At HDF aircraft turn right and fly the HDF 257° radial (SLI 075°) west to the KAYOH intersection. Aircraft then continue on the Seal Beach VORTAC (SLI) 075° radial to SLI, where they receive radar vectors to the final approach course.

Aircraft arriving via the Palm Springs transition enter the transition over the Palm Springs VORTAC (PSP). Aircraft fly west on a PSP 260° radial to the BANDS intersection, then continue southwest on a HDF 054° radial to HDF. At HDF aircraft turn right and fly west via the HDF 257° (SLI 075°) radial to the KAYOH intersection. Aircraft then continue on the SLI 075° radial to SLI, where they receive radar vectors to the final approach course.

2.8.2.2 TANDY THREE Arrival

The TANDY THREE arrival includes two transitions, wherein aircraft transition from the enroute phase of flight into the arrival procedure. The two transitions associated with the TANDY THREE arrival are the Fellows and the Fillmore transitions.

Aircraft arriving via the Fellows transition enter the transition over the Fellows VORTAC (FLW). Aircraft fly southeast on a FLW 123° radial to the SADDE intersection, then south via the Fillmore VORTAC (FIM) 148° radial to the PAROL intersection. At PAROL aircraft fly the

Santa Catalina VORTAC (SXC) 310° radial to SXC. Aircraft then turn left over SXC and fly the SXC 037° radial northeast to the ALBAS intersection, then follow the SLI 351° radial to SLI.

Aircraft arriving via the Fillmore transition enter the transition over the Fillmore VORTAC (FIM) and fly the FIM 148° radial south to the SADDE intersection, and continue south via the FIM 148° radial to the PAROL intersection. At PAROL aircraft fly the Santa Catalina VORTAC (SXC) 310° radial to SXC. Aircraft then turn left over SXC and fly the SXC 037° radial northeast to the ALBAS intersection, then follow the SLI 351° radial to SLI.

2.8.3 Charted Instrument Approach Procedures

The John Wayne airport has six charted instrument approach procedures; an ILS approach to Runway 19R, an RNAV (GPS) approach to Runway 01L, an RNAV (GPS) approach to 19R, a Localizer Back-Course approach to 01L, an LDA approach to Runway 19R, and an NDB approach to 19R. John Wayne Airport uses 19R as its primary runway. Published approach plates for each of these procedures can be found in **Appendix C**.

2.8.3.1 ILS RWY 19R

There is an Instrument Landing System (ILS) in place at SNA for Runway 19R. The approach course of the localizer is 194° and the transmitted glide slope is 3°, with a threshold crossing height of 50 feet. The straight-in descent minimums for the precision approach associated with the ILS are 255 feet MSL (200 feet HAT) at RVR 2,400 feet visibility, applicable to aircraft approach Categories A, B, C, and D. This approach also includes localizer minimums. These minimums apply to aircraft that are essentially executing an ILS approach without the glide slope, and therefore a non-precision approach. This approach would typically be used if the glide slope is inoperative. Localizer descent minimums associated with the RWY 19R approach are 760 feet MSL (705 feet HAT) at RVR 2,400 feet visibility for Categories A and B aircraft; 760 feet MSL (705 feet HAT) at 1 ½ mile visibility for Category C aircraft; and 760 feet MSL (705 feet HAT) at 1 ¾ mile visibility for Category D aircraft. Published circling minimums for the ILS approach are 760 feet MSL (704 feet HAA) at 1 mile visibility for Categories A and B aircraft; 760 feet MSL (704 feet HAA) at 2 miles visibility for Category C aircraft; and 760 feet MSL (704 feet HAA) at 2 ¼ miles visibility for Category D aircraft. In addition, this approach incorporates a step-down fix at the DYERS intersection. An additional set of localizer and circling minimums are published for aircraft with the capability to receive the DYERS step-down. The DYERS Fix localizer minimums are 440 feet MSL (385 feet HAT) at RVR 2,400 feet visibility for Categories A, B, and C aircraft; and 440 MSL (385 feet HAT) at RVR 4,000 feet visibility for Category D aircraft.

2.8.3.2 RNAV (GPS) RWY 01L

Area Navigation (RNAV) can be defined as a method of navigation that permits aircraft operation on any desired course within the coverage of station-referenced navigation signals or within the limits of a self contained system capability, or a combination of these. An RNAV approach is one that utilizes one of several types of Area Navigation (RNAV) technology such as the Global Positioning System (GPS). The RNAV (GPS) approach to RWY 01L offers straight-in minimums for aircraft approaching from the south. The published LNAV straight-in descent minimums for this approach are 520 feet MSL (466 feet HAT) with visibilities of 1, 1 ¼ and 1 ½ miles for Categories A and B; Category C; and Category D aircraft respectively. The published circling minimums for this approach are 640 feet MSL (586 feet HAA) with visibilities of 1, 1 ½ and 2 miles for Categories A and B; Category C; and Category D aircraft respectively.

2.8.3.3 RNAV (GPS) RWY 19R

The RNAV (GPS) approach to RWY 19R provides straight-in minimums for aircraft utilizing LPV, LNAV/VNAV and LNAV only, as well as circling minimums. The published LPV for this approach are 338 feet MSL (283 feet HAT) at RVR 2,400 feet visibility, applicable to aircraft approach Categories A, B, C, and D. The LNAV/VNAV minimums associated with this procedure are 565 feet MSL (510 feet HAT) at RVR 6,000 feet visibility, for aircraft approach Categories A, B, C, and D. The LNAV minimums are 600 feet MSL (545 feet HAT) with visibilities of RVR 2,400 feet, RVR 5,000 feet, and RVR 6,000 feet for Categories A and B; Category C; and Category D aircraft respectively. The published circling minimums for this approach are 640 feet MSL (584 feet HAT) with visibilities of 1 ¾ miles for Categories A, B and C aircraft and 2 miles for Category D aircraft.

2.8.3.4 LOC BC RWY 01L

The Localizer Back-Course approach to Runway 01L uses the 014° back-course of the RWY 19R localizer. This is a non-precision approach with straight-in minimums of 480 feet MSL (426 feet HAT) and visibilities of 1 mile for Categories A and B; and 1 ¼ miles for Categories C and D. Published circling minimums for this approach are 660 feet MSL (606 feet HAT) with visibilities of 1 mile for Categories A and B aircraft, 1 ¾ miles for Category C aircraft, and 2 miles for Category D aircraft.

2.8.3.5 LDA RWY 19R

An LDA approach is one that uses a Localizer Directional Aid (LDA) that is typically offset from the runway alignment. There is an LDA approached published for Runway 19R having an approach course of 181°. This is a non-precision approach with straight-in minimums of 880 feet MSL (828 feet HAT) and visibilities of RVR 2,400 feet mile for Category A, RVR 4,000 feet for Category B, 2 miles for Category C, and 2 ¼ miles for Category D. This approach incorporates a step-down fix at the GAUER intersection Lower minimums are provided for aircraft with the capability to receive the GAUER step-down. The GAUER Fix straight-in minimums are 480 feet MSL (428 feet HAT) with visibilities of RVR 2,400 feet for Categories A and B, RVR 4,000 feet for Category C aircraft, and RVR 5,000 feet for Category D aircraft. Circling minimums associated with the GAUER step-down are 660 feet MSL (606 feet HAA) with visibilities of 1 mile for Categories A and B aircraft, 1 ¾ miles for Category C aircraft, and 2 miles for Category D aircraft.

2.8.3.6 NDB RWY 19R

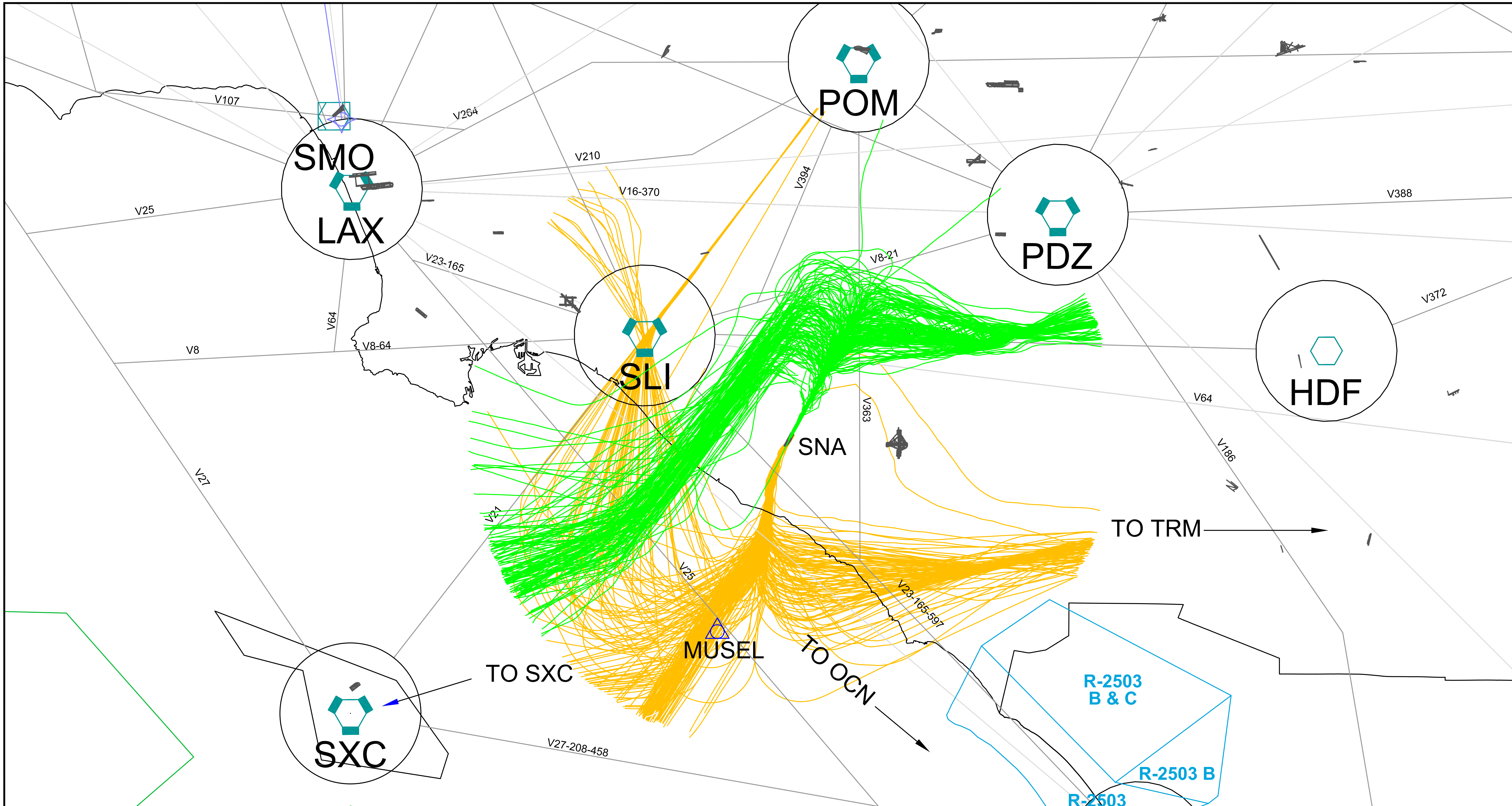
The final instrument approach procedure published for SNA is an approach to 19R utilizing the guidance of a Non-Directional Beacon (NDB). The straight-in minimums associated with this approach are 640 feet MSL (588 feet HAT) with visibilities of RVR 4,000 feet for Categories A and B aircraft, RVR 5,000 feet for Category C aircraft, and 1 ½ miles for Category D aircraft. Published circling minimums for this approach are 640 feet MSL (586 feet HAA) with visibilities of 1 mile for Categories A and B aircraft, 1 ½ miles for Category C aircraft, and 2 miles for Category D aircraft.

2.9 Commercial Air Traffic Flow

Published flight procedures combined with aircraft approach and departure vectoring, and Air Traffic Control Tower (ATCT) Standard Operating Procedure (SOP), result in distinct air traffic flow patterns at airports. As discussed previously, John Wayne Airport uses 19R and 19L as the primary runways. The SNA ATCT SOP also states that 19R and 19L are the preferred runways for noise abatement. Therefore, as discussed in Section 2.4, the south-flow air traffic pattern is used predominately. The ATCT SOP dictates that the airport only switches to North Operations (01L and 01R) if the winds are blowing consistently from the north at or above ten knots.

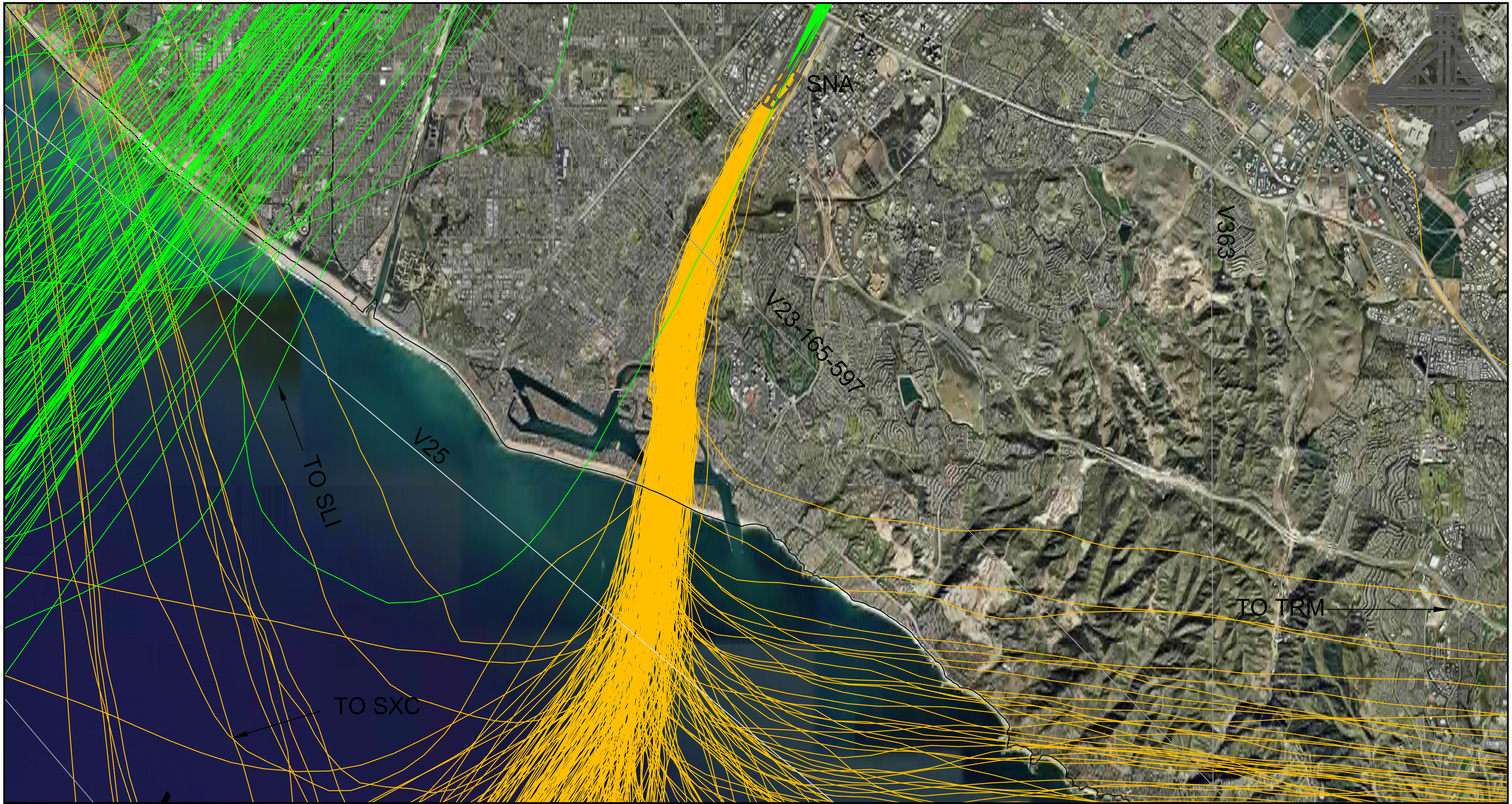
In the south-flow configuration, commercial aircraft primarily depart Runway 19R and fly the routes described in Section 2.7.1 associated with the MUSEL SIX and CHANEL ONE departures. Essentially, aircraft fly runway heading for approximately 1 NM where they turn to the left and fly directly over Balboa Island and Balboa Pier. Aircraft are then either vectored to the MUSEL fix where they fly their transition or assigned route, or they turn right and proceed to the SXC VORTAC where they pick-up their transition or assigned route. **Exhibit 2-3** depicts the flight tracks used by commercial aircraft in a south-flow departure configuration, based on data acquired from SNA. **Exhibit 2-4** depicts a close-in view of these same flight tracks as aircraft fly over Balboa Island and Balboa Pier superimposed over an aerial photograph.

In the north-flow configuration, commercial aircraft primarily depart Runway 01L. Flight track data reveals that commercial aircraft do not typically follow the routes associated with the ANAHEIM THREE departure described in Section 2.7.1 of this document. Based on the flight track data provided by SNA, the vast majority of commercial aircraft departing to the north typically fly runway heading for approximately 5 NM and then turn right and fly toward either the Thermal VORTAC or the Santa Catalina VORTAC. **Exhibit 2-5** depicts the flight tracks used by commercial aircraft in a north-flow departure configuration, based on data acquired from SNA. **Exhibit 2-6** depicts a close-in view of these same flight tracks as aircraft fly runway heading for approximately 5 NM and turn right towards TRM and SXC.



1. SOURCE: ORANGE COUNTY JOHN WAYNE AIRPORT ANOMS FLIGHT TRACK DATA
2. ARRIVAL TRACK
3. DEPARTURE TRACK

DWN BY:	RMV	DATE:	1/17/08	N 3 NM 0 3 NM	ARTS ASRC Research and Technology Solutions	CITY OF NEWPORT BEACH RUNWAY 19R DEPARTURES (SOUTH FLOW) EXPANDED VIEW - COMMERCIAL TRAFFIC ONLY	EXHIBIT 2-3
CHK BY:		DATE:					



1. SOURCE: ORANGE COUNTY JOHN WAYNE AIRPORT ANOMS FLIGHT TRACK DATA
2. ARRIVAL TRACK
3. DEPARTURE TRACK

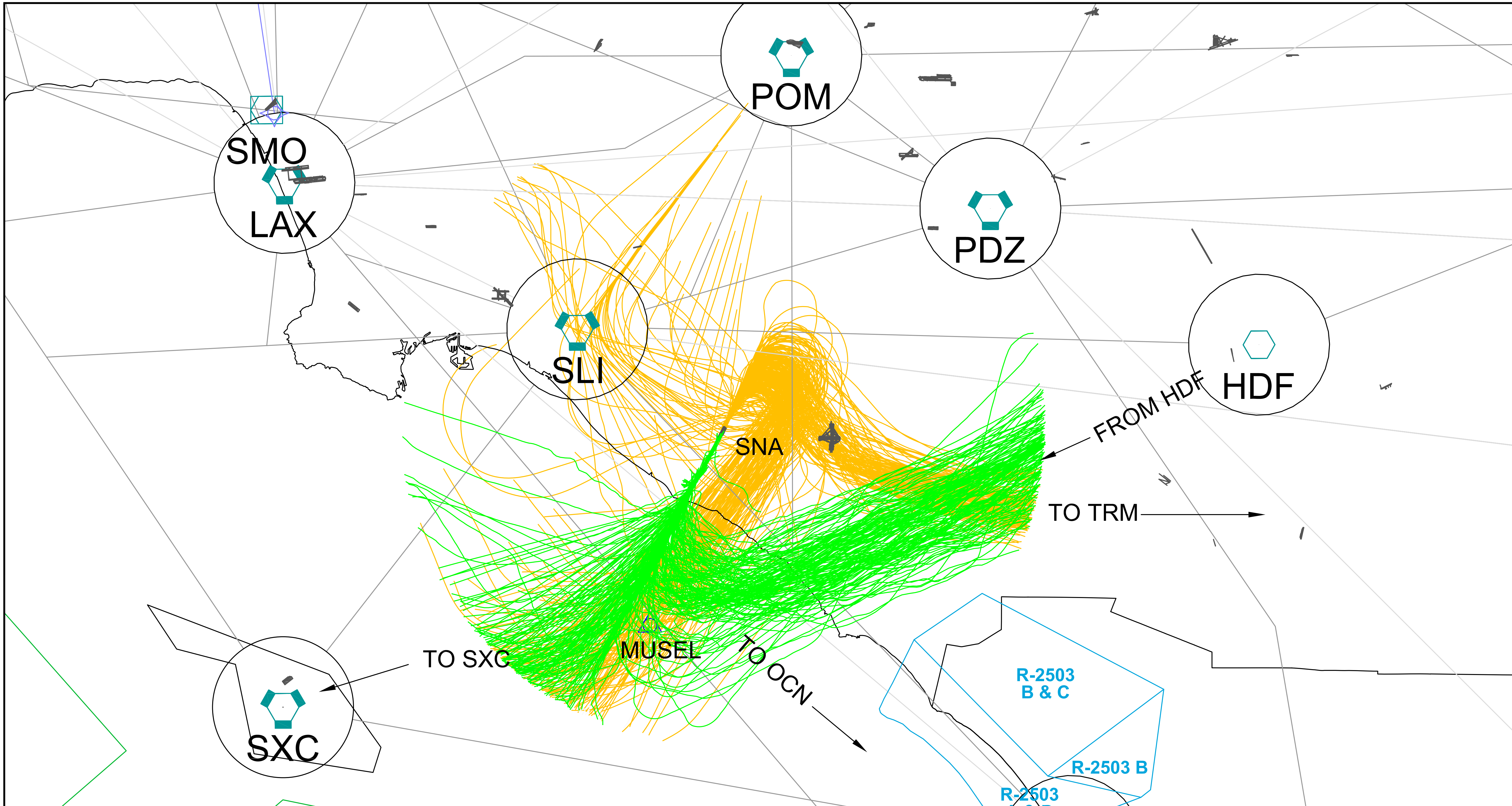
DWN BY:	RMV	DATE:	1/17/08
CHK BY:		DATE:	

1 NM 0 1 NM

ASRC Research and Technology Solutions

CITY OF NEWPORT BEACH
RUNWAY 19R DEPARTURES (SOUTH FLOW)
CLOSE IN VIEW - COMMERCIAL TRAFFIC ONLY

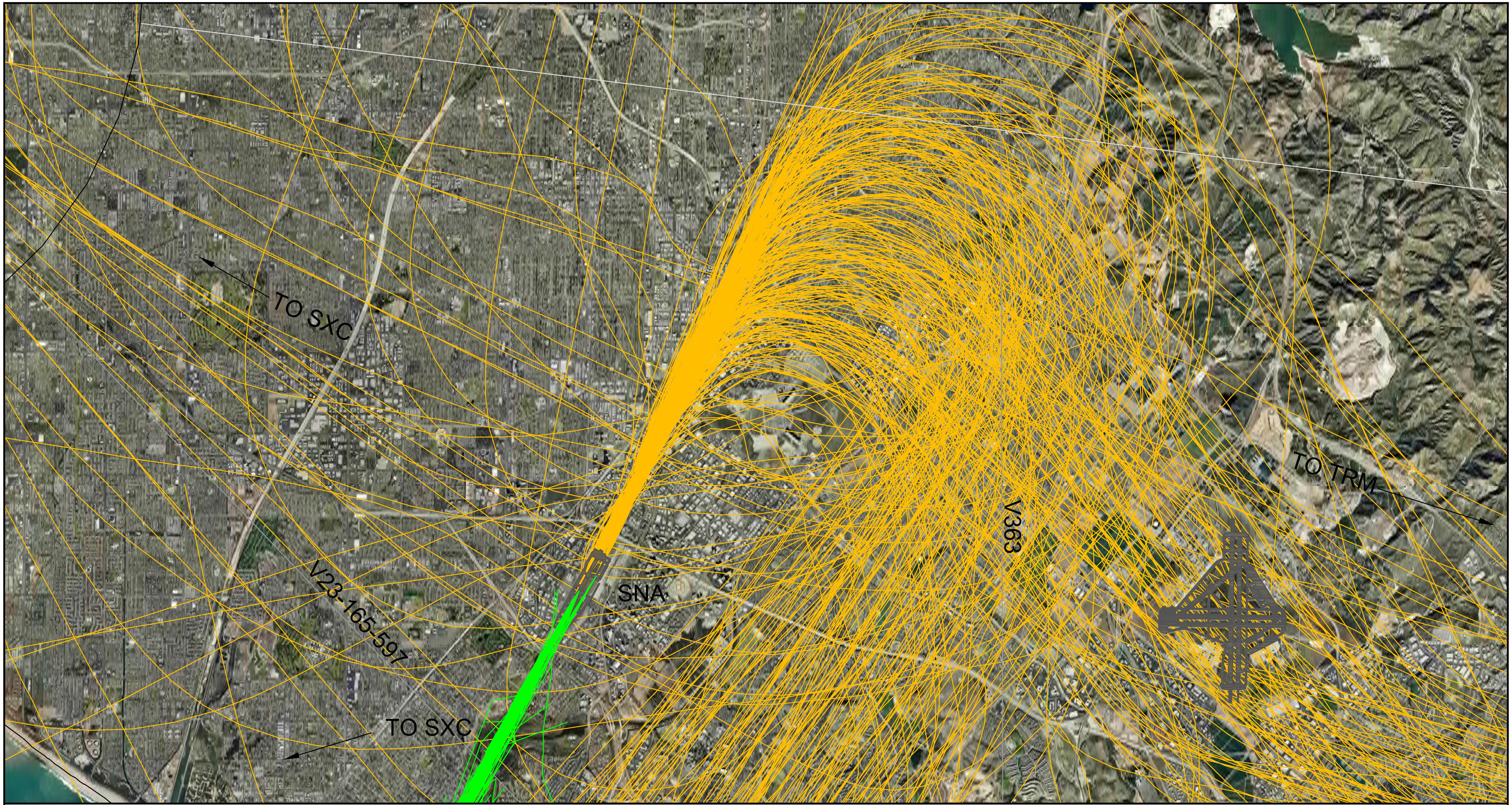
EXHIBIT 2-4



1. SOURCE: ORANGE COUNTY JOHN WAYNE AIRPORT ANOMS FLIGHT TRACK DATA
2. ARRIVAL TRACK
3. DEPARTURE TRACK

DWN BY:	RMV	DATE:	1/17/08	3 NM 0 3 NM	CITY OF NEWPORT BEACH RUNWAY 01L DEPARTURES (NORTH FLOW) EXPANDED VIEW - COMMERCIAL TRAFFIC
CHK BY:		DATE:			EXHIBIT 2-5

ASRC Research and Technology Solutions



1. SOURCE: ORANGE COUNTY JOHN WAYNE AIRPORT ANOMS FLIGHT TRACK DATA
2. ARRIVAL TRACK
3. DEPARTURE TRACK

DWN BY:	RMV	DATE:	1/17/08	N 1 NM 0 1 NM	ARTS ASRC Research and Technology Solutions	CITY OF NEWPORT BEACH RUNWAY 01L DEPARTURES (NORTH FLOW) CLOSE IN VIEW - COMMERCIAL TRAFFIC	EXHIBIT 2-6
CHK BY:		DATE:					

2.10 Noise Abatement Program

The noise abatement program and SNA is comprised of several components including a cap on departures, single event noise level requirements, and preferred arrival and departure routes. The following sections detail these components.

2.10.1 Average Daily Departure Settlement agreements and Amendments since 1985

Many readers of this report are most likely aware of the chronology of the various agreements and amendments that address the Average Daily Departures (ADD) and million annual passengers (MAP) issues at JWA.

The following was extracted from the "Newport Beach City Council Airport Policy". It is included here for the convenience of the reader. The footnotes added were not part of the original policy statement, but were included in this report to expand on the substance of the initial policy statement.

"In 1985, the City, County, SPON, and AWG[1] entered into a stipulation and agreement (1985 Settlement Agreement) to resolve Federal Court litigation initiated by the County seeking judicial approval of the Master Plan. The 1985 Settlement Agreement required the Board to modify resolutions approving the Master Plan to reduce the size of the terminal and limit the number of parking spaces. The 1985 Settlement Agreement also: (a) established three "classes" of commercial aircraft (Class A, AA, and E) based on the noise generated by the aircraft (operating with known gross takeoff weights) at the departure noise monitoring stations. (b) limited the number of "average daily departures" (ADD) of Class A and AA departures before and after construction of a new terminal to 73 ADD (c) limited the number of passengers served each year at JWA (expressed in terms of "million annual passengers" or "MAP") to 8.4 MAP[2] after construction of the new terminal and (d) required the County to maintain the curfew then in effect at JWA and enforce the General Aviation Noise Ordinance.

Between 1985 and 2002, the County, City, SPON and AWG each collectively agreed, on seven separate occasions, to amend the 1985 Settlement Agreement. These amendments responded, among other things, to: (a) a new FAA Advisory Circular (AC 91-53A) that established specific criteria for close-in and distant noise abatement departure procedures; (b) changes in the location and/ or type of equipment used to monitor commercial air carrier noise levels on departure; (c) air cargo carrier requests for access; and (d) changes in passenger, facility and baggage security requirements brought about by the events of September 11, 2001.

In 1990, Congress adopted the Airport Noise and Capacity Act (ANCA) which, in relevant part, requires FAA "review and approval of proposed noise or access restrictions" on Stage 3 aircraft. The City and County successfully lobbied Congress to "grandfather" (exempt from the FAA

[1] Airport Working Group
[2] This was an increase from 4.75 MAP. JWA Noise & Access indicates this same value.

"review and approval" requirements of ANCA): (a) the 1985 Settlement Agreement; (b) amendments to the 1985 Settlement Agreement that do not adversely impact airport capacity or airport safety; and (c) the then current County noise "curfew" ordinance.

In August of 2000, the City Council asked the Board to consider extending the term of the 1985 Settlement Agreement. During the next two years, the City and County, with input from SPON and AWG, engaged in discussions regarding the appropriate terms and conditions of the extension. During this period, the City engaged in an extensive public information program with the assistance of other communities impacted by airport noise including Newport Beach, Costa Mesa, Orange, Santa Ana, Tustin and Anaheim (known collectively, together with Newport Beach, as the "Corridor Cities"). This process culminated in City, County, SPON and AWG approval of amendments to the 1985 Settlement Agreement (2002 Amendments - Exhibit A-3 that: (a) eliminated the "AA" class of aircraft; (b) increased the maximum number of noise regulated air carrier ADD from 73 to 85; (c) increased the maximum number of air cargo ADD from 2 to 4 (the County is authorized to allocate two air cargo ADD to air carriers pending requests for use of those ADD by air cargo carriers); (d) increased the service level from 8.4 to 10.3 MAP through December 31, 2010 and to 10.8 MAP through December 31, 2015 (with 500,000 passengers allocated to commuter carriers); and (e) increased the maximum number of passenger loading bridges from 14 to 20. The 2002 Amendments also eliminated the floor area restrictions on the size of the terminal and the "cap" on public parking spaces.

City Council, SPON and AWG approval of the 2002 Amendments was contingent on receipt of a letter from the FAA confirming that the 2002 Amendments were consistent with ANCA, other relevant laws and regulations and grant assurances made by the County. In December 2002, the FAA sent a letter confirming compliance (FAA letter - Exhibit B). In January 2003, the Honorable Terry Hatter (the Federal District Court Judge who entered the stipulated judgment implementing the 1985 Settlement Agreement stipulation) also approved the stipulation of the parties implementing the 2002 Amendments.

The 2002 Amendments allowed the County to offer additional air transportation service without any significant increase in noise impacts on Newport Beach residents. The flight and service level restrictions remain in effect through December 31, 2015 and provisions related to the curfew remain in effect through December 1, 2020. The FAA letter confirming the validity of the 2002 Amendments is a precedent for future amendments that do not adversely impact airport capacity or airport safety."

2.10.2 Noise Monitoring Stations

Guidelines have been established in the California State Noise Standard, to control noise levels in residential areas produced by aircraft operations using the State's airports. These guidelines establish that residential areas exposed to an average Community Noise Equivalent Level (CNEL) in excess of 65 dB comprise the airport Noise Impact Area. Ten permanent remote noise monitoring stations (NMS) located in noise sensitive areas in the vicinity of the airport are used by SNA to assess noise levels. **Table 2-3** lists each of the ten NMS and their locations.

[3] The exhibit was part of the original document and not included here.

Table 2-3 Noise Monitoring Stations

Noise Monitoring Station	Location
NMS-1S	Golf Course, 3100 Irvine Avenue, Newport Beach
NMS-2S	20152 Birch Street, Newport Beach
NMS-3S	2139 Anniversary Lane, Newport Beach
NMS-4S	2338 Tustin Avenue, Newport Beach
NMS-5S	324 ½ Vista Madera, Newport Beach
NMS-6S	1912 Santiago, Newport Beach
NMS-7S	1311 Back Bay Drive, Newport Beach
NMS-8N	17372 Eastman Street, Irvine
NMS-9N	1300 S Grand Avenue, Santa Ana
NMS-10N	17952 Beneta Way, Tustin

Prepared by: ASRC Research & Technology Solution
Source: SNA Noise Abatement Program Quarterly Report

The map in **Exhibit 2-7** shows the approximate location of each of the ten permanent remote noise monitoring stations as depicted in the SNA Noise Abatement Quarterly Reports. **Exhibit 2-8** depicts the 2006 CNEL noise contours, and **Exhibit 2-9** is a close-in view of the 65dB "Noise Impact Area" associated with John Wayne Airport for the most recent documented year (January 2007 – December 2007) as depicted in the SNA Noise Abatement Quarterly Report. The information in Exhibit 2-8 was developed by Mestre-Greve Associates, Inc. in consultation with John Wayne Airport. CNEL values measured for the period, and current digitized land use information was used to calculate the land area acreages, number of residences and estimated population within the Noise Impact Area.

Exhibit 2-7 Noise Monitoring Station Locations

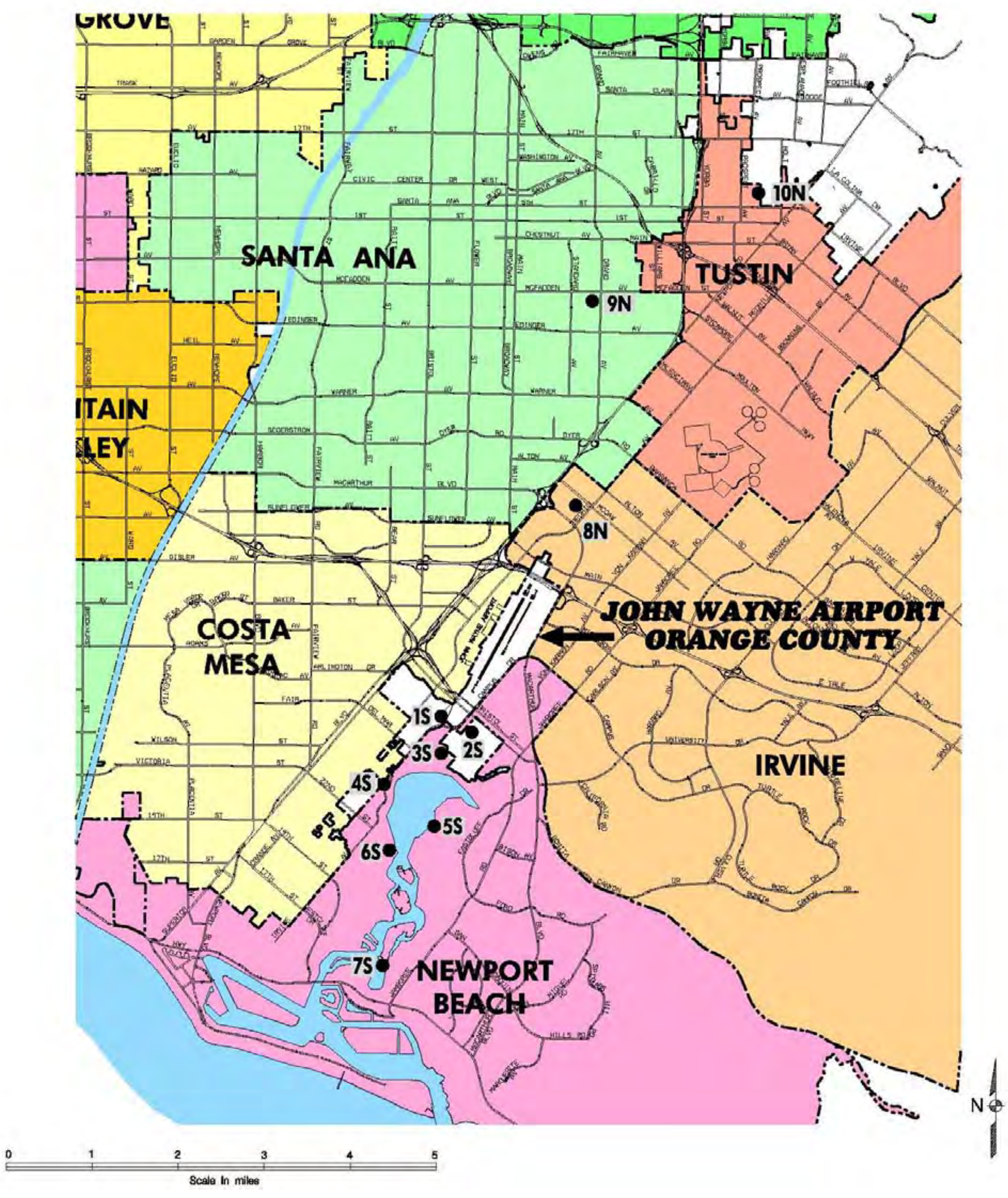
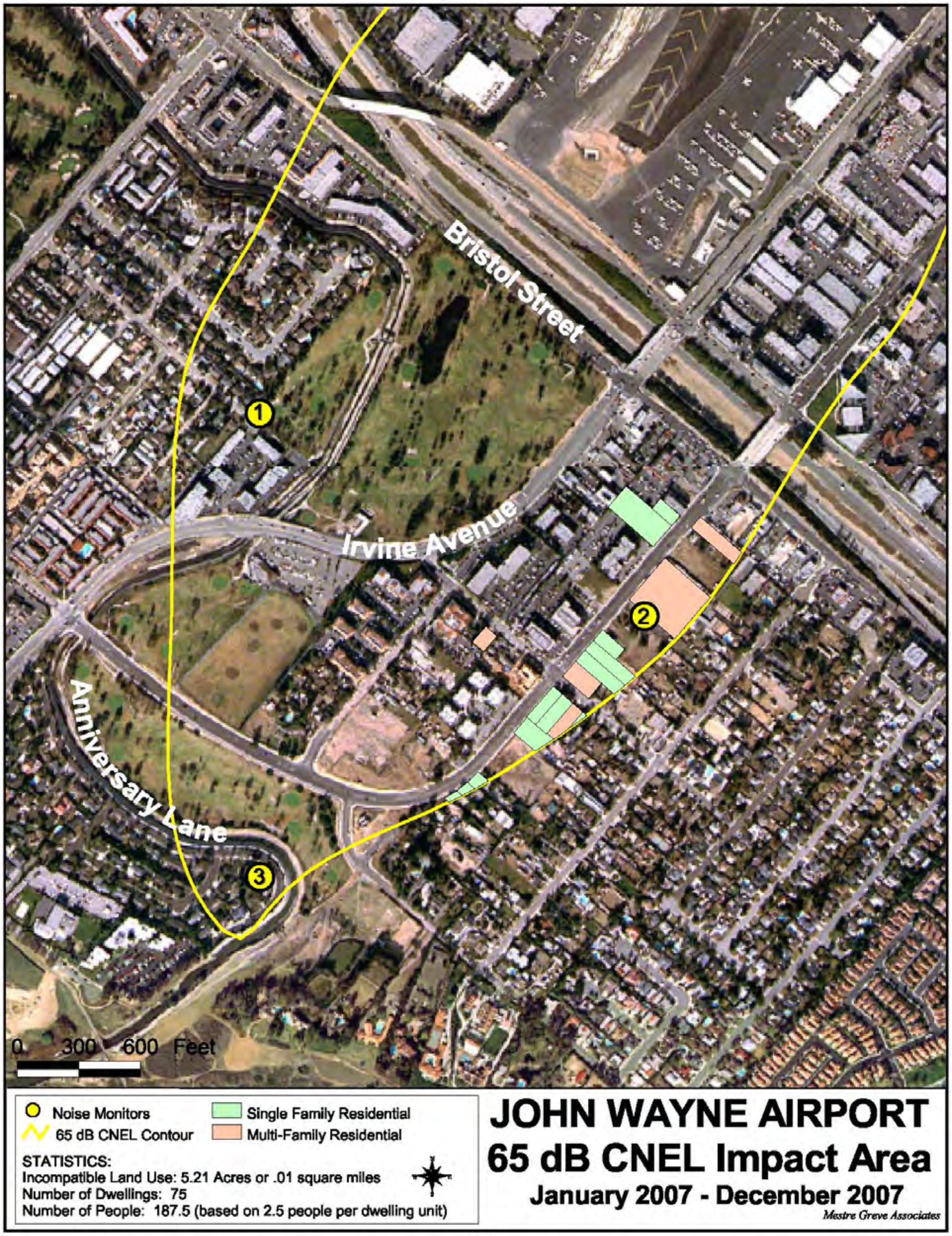


Exhibit 2-8 2006 CNEL Noise Contours

Exhibit 2-9 65dB Noise Impact Area – Close-in



2.10.3 General Aviation Noise Ordinance

John Wayne Airport is a very noise sensitive and busy airport. The airport is located just north of the City of Newport Beach, west of Irvine, east of Costa Mesa, and south of Tustin and Santa Ana. These residential areas are situated in very close proximity to the airport. In an effort to diminish potential noise impacts from aircraft operations, and to enhance the airport's compatibility with surrounding communities, SNA has established some of the most rigorous noise rules in the United States. The General Aviation Noise Ordinance (GANO) has been implemented by the County of Orange in order to regulate the hours of operation and the maximum permitted noise levels associated with commercial and general aviation operations. The rules and regulations implemented by the GANO were originally established in the Phase 2 Commercial Aircraft Access Plan.

One of the principle components of the GANO is the implementation of maximum "Single Event Noise Exposure Level" (SENEL) values for commercial aircraft, as established by the Phase 2 Commercial Aircraft Access Plan, associated with seven of the ten noise monitoring stations listed in Table 2-2. It is not permissible for any commercial airline operating at SNA to generate a SENEL that, when logarithmically averaged over each three-month (quarterly) noise compliance period, exceeds the maximum value indicated in the GANO at any of the seven respective noise monitoring stations.

Maximum SENEL values are implemented by the GANO for two classes of commercial aircraft; Class A and Class E. Specific aircraft noise characteristics defined by the GANO dictate whether an aircraft is considered Class A, or Class E. The GANO states: "In determining whether an aircraft is a Class A or Class E aircraft, its noise performance at the noise monitoring stations shall be determined at each individual noise monitoring station and the aircraft must meet each of the noise monitoring station criteria without "trade-offs", in order to qualify as Class A or Class E aircraft". **Table 2-4** lists the maximum SENEL values for Class A and Class E commercial airline operations at each of the seven noise monitoring stations as dictated by the GANO.

Table 2-4 Maximum SENEL Values – Commercial Airline Operations

Noise Monitoring Station	Max. SENEL Value - Class A	Max. SENEL Value - Class E
NMS 1S	101.8 dB	93.5 dB
NMS 2S	101.1 dB	93.0 dB
NMS 3S	100.7 dB	89.7 dB
NMS 4S	94.1 dB	86.0 dB
NMS 5S	94.6 dB	86.6 dB
NMS 6S	96.1 dB	86.6 dB
NMS 7S	93.0 dB	86.0 dB

Source: General Aviation Noise Ordinance, Sec. 2-1-30.4

The GANO also implements curfews and scheduled departure time prohibitions for commercial operations. The ordinance states that no commercial aircraft may engage in regularly scheduled commercial operations at SNA between the hours of 10:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) for departures or between the hours of 11:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) for arrivals. Commercial airlines are prohibited to schedule departure times for any flight originating at SNA prior to 6:45 a.m. or after 9:45 p.m. Monday through Saturday; or before 7:45 a.m. or after 9:45 p.m. on Sunday.

In addition to the regulations involving commercial aircraft operations, the GANO establishes separate noise restrictions for general aviation (GA) aircraft. The GANO provides maximum SENEL values for GA aircraft at three of the ten noise monitoring stations listed in Table 2-2. It is not permissible for any GA operation at SNA to generate a SENEL in excess of the maximum value specified by the GANO at any of the three respective noise monitoring stations. **Table 2-5** lists the maximum SENEL values for GA operations at each of the three noise monitoring stations as dictated by the GANO.

Table 2-5 Maximum SENEL Values – GA Operations

Noise Monitoring Station	Max. SENEL Value
NMS 1S	101.8 dB
NMS 2S	101.1 dB
NMS 3S	100.7 dB

Source: General Aviation Noise Ordinance, Sec. 2-1-30.5

The GANO establishes curfews for GA operations as it does for commercial operations. The ordinance states that no GA aircraft may engage in nighttime operations that exceed the SENEL values specified in **Table 2-6** at any of the ten respective noise monitoring stations. Nighttime operations, for the purposes of this section of the GANO, are considered to be between the hours of 10:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) for departures and between the hours of 11:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) for arrivals.

Table 2-6 Maximum SENEL Values – Nighttime GA Operations

Noise Monitoring Station	Max. SENEL Value
NMS 1S	86.8 dB
NMS 2S	86.9 dB
NMS 3S	86.0 dB
NMS 4S	86.0 dB
NMS 5S	86.0 dB
NMS 6S	86.0 dB
NMS 7S	86.0 dB
NMS 8N	86.0 dB
NMS 9N	86.0 dB
NMS 10N	86.0 dB

Source: General Aviation Noise Ordinance, Sec. 2-1-30.5

In addition to establishing the above noise regulations, the GANO institutes penalties for aircraft operators that violate the ordinances, establishes enforcement procedures. Compliance with the regulations implemented by the GANO is mandatory unless deviations are required by air traffic control instructions, medical emergencies, in-flight emergencies or other safety considerations. Essentially, in the event that an aircraft exceeds the noise limits specified by the GANO at any one or more of the NMS locations, a "Notice of Violation" is issued to the registered owner of the aircraft. The Notice of Violation applies to the aircraft owner, the aircraft operator, and the aircraft itself. Notices of Violation remain in effect for three years after the violation date. If three GANO violations occur within a three-year period, the aircraft owner, the aircraft operator and the aircraft are subject to denial of use of John Wayne Airport for a period of three years. A copy of the GANO can be found in **Appendix D** of this document.

The GANO also identifies the following as aircraft that are exempt from these noise and curfew provisions:

a) Aircraft operated by the United States of America or the State of California;
b) Law enforcement, emergency, fire or rescue aircraft operated by any county or city of said State;
c) Aircraft used for emergency purposes during an emergency which has been officially proclaimed by competent authority pursuant to the laws of the United States, said State, or the County;
d) Civil Air Patrol aircraft when engaged in actual search and rescue missions;
e) Aircraft engaged in arrival(s) or departure(s) while conducting tests under the direction of the Airport Director in an attempt to rebut the presumption of aircraft noise violation pursuant to the provisions of Section 2-1-30.7 or 2-1-30.9 (of the GANO);
f) Emergency aircraft flights for medical purposes by persons who provide emergency medical care, provided written information concerning dire emergency is submitted to Airport Director for all emergency aircraft flights within seventy-two (72) hours prior to or subsequent to the departure or arrival of the aircraft. It is intended that the exemption provided for in this subparagraph shall have the same meaning and be interpreted consistent with, and to the same extent as Public Utilities Code Section 21662.4 as enacted or as it may be amended.

2.10.4 Recommended Departure and Arrival Procedures

In addition to the noise regulations defined by the GANO, John Wayne Airport has published recommended approach and departure procedures with which pilots are requested to comply.

2.10.4.1 Recommended Departure Procedures

In general, pilots are expected to comply with the manufacturer's noise abatement procedures pertaining to the aircraft they are operating. In addition, SNA establishes the following general points regarding departure procedures without manufacturer's guidance:

- Runways 19L and 19R are the preferred runways
- Avoid high power setting at low altitude over noise sensitive areas

Table 2-7 lists the DME distance to of each of the ten Noise Monitoring Stations as measured from the ISNA localizer.

Table 2-7 Approximate DME Distance from ISNA Localizer to NMS

Noise Monitoring Station	DME Distance to Noise Monitor
NMS 1S	0.4 NM
NMS 2S	0.4 NM
NMS 3S	0.7 NM
NMS 4S	1.3 NM
NMS 5S	1.3 NM
NMS 6S	1.8 NM
NMS 7S	2.9 NM
NMS 8N	2.1 NM
NMS 9N	4.2 NM
NMS 10N	5.8 NM

Source: http://www.ocair.com/generalaviation/ganoise.htm

2.10.4.2 Recommended Arrival Procedures

Pilots are encouraged to use minimum certificated landing flap setting in accordance with FAR 91.126c. If permitted by weather conditions and Air Traffic Control, pilots are requested to make visual straight-in approach.

2.10.4.3 Aircraft Presumed Incapable of Meeting Noise Limitations

Based on all of the available historical noise data that has been gathered by the John Wayne Airport Access and Noise Office, and as determined by the Airport Director, SNA has developed a list of aircraft that are presumed incapable of meeting the noise limitations specified by the GANO. Three lists have been developed; one specifying aircraft that are presumed to be incapable of nighttime departure operations, one specifying aircraft that are presumed to be incapable of nighttime arrival operations and a third list specifying aircraft that are presumed to be incapable of operating at the airport at any time. **Tables 2-8 through 2-10** list the aircraft included in each of these three categories respectively.

Table 2-8 Aircraft Presumptively Incapable of Nighttime Departure Operations

HS125-1A-600 (Rolls Royce Viper engines)
Learjet 23, 24, 25, 28, 29
Gulfstream II, IIB, III
Jetstar II
Shooting Star T33/F80
Sabreliner 40, 60, 65, 70, 75

Source: http://www.ocair.com/generalaviation/ganoise.htm

Table 2-9 Aircraft Presumptively Incapable of Nighttime Arrival Operations

HS125-1A-600 (Rolls Royce Viper engines)
Gulfstream II, IIB, III
Shooting Star T33/F80
Sabreliner 40, 60, 65, 70, 75

Source: http://www.ocair.com/generalaviation/ganoise.htm

Table 2-10 Aircraft Presumptively Incapable of Any Operations at Any Time

BAC 111
Westwind 1123
Paris Jet
Jet Commander

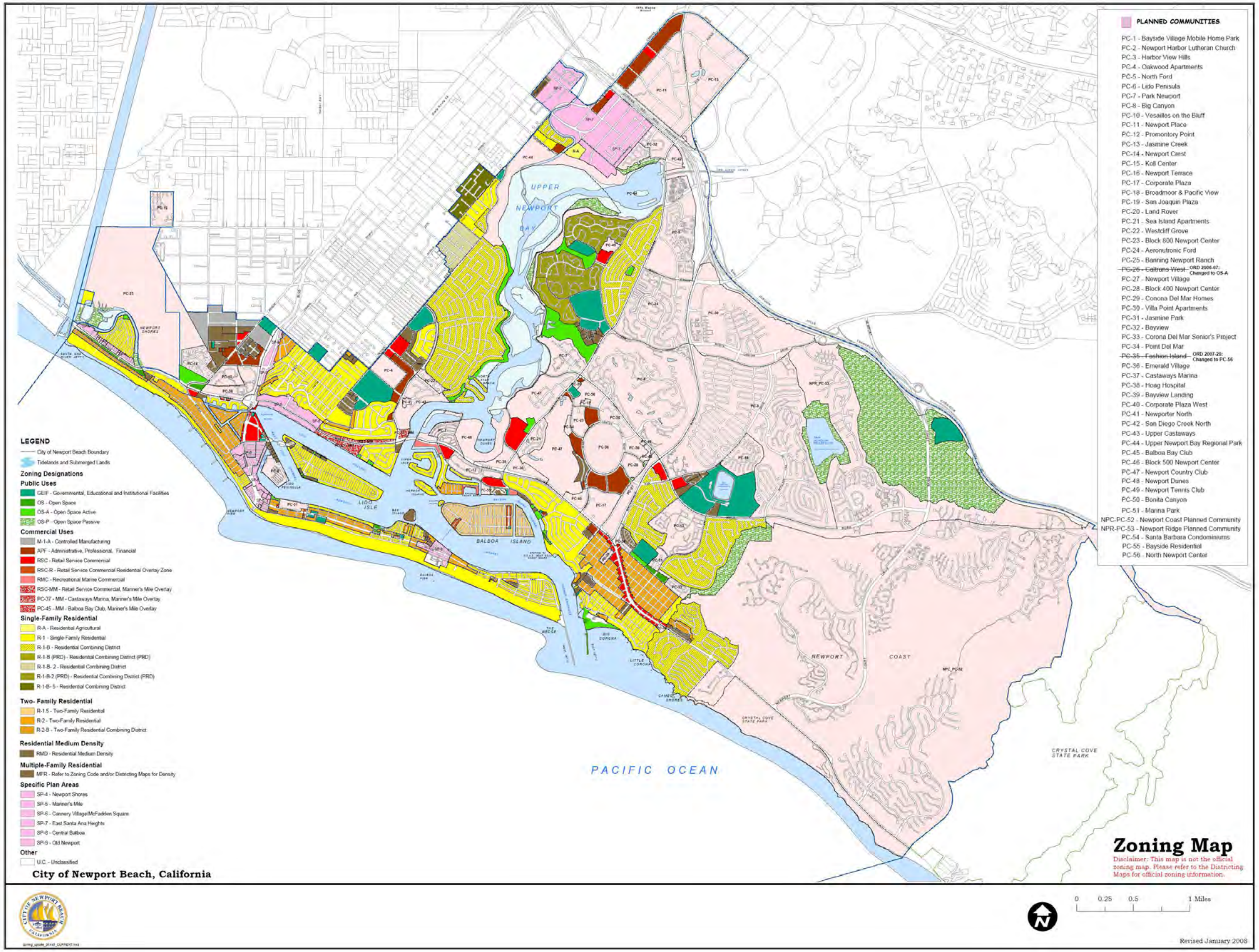
Source: http://www.ocair.com/generalaviation/ganoise.htm

2.11 Land Use

Land use surrounding SNA is primarily residential. As discussed previously, the airport is surrounded by the communities of Newport Beach, Irvine, Costa Mesa, Tustin and Santa Ana. These communities are zoned primarily residential but also include public and commercial use parcels. Zoning maps for the cities of Newport Beach, Irvine, Costa Mesa and Tustin have been included in this report for the convenience of the reader. At the time of the writing of this report, the City of Santa Ana was in the process of developing a new zoning map and a zoning map was unavailable. Therefore, a general plan map for the City of Santa Ana has been included in lieu of a zoning map. **Exhibit 2-9** is the City of Newport Beach zoning map, **Exhibit 2-10** is the City of Irvine zoning map, **Exhibit 2-11** is the City of Costa Mesa zoning map, **Exhibit 2-12** is the City of Tustin Zoning map, and **Exhibit 2-13** is the City of Santa Ana general plan overview map.

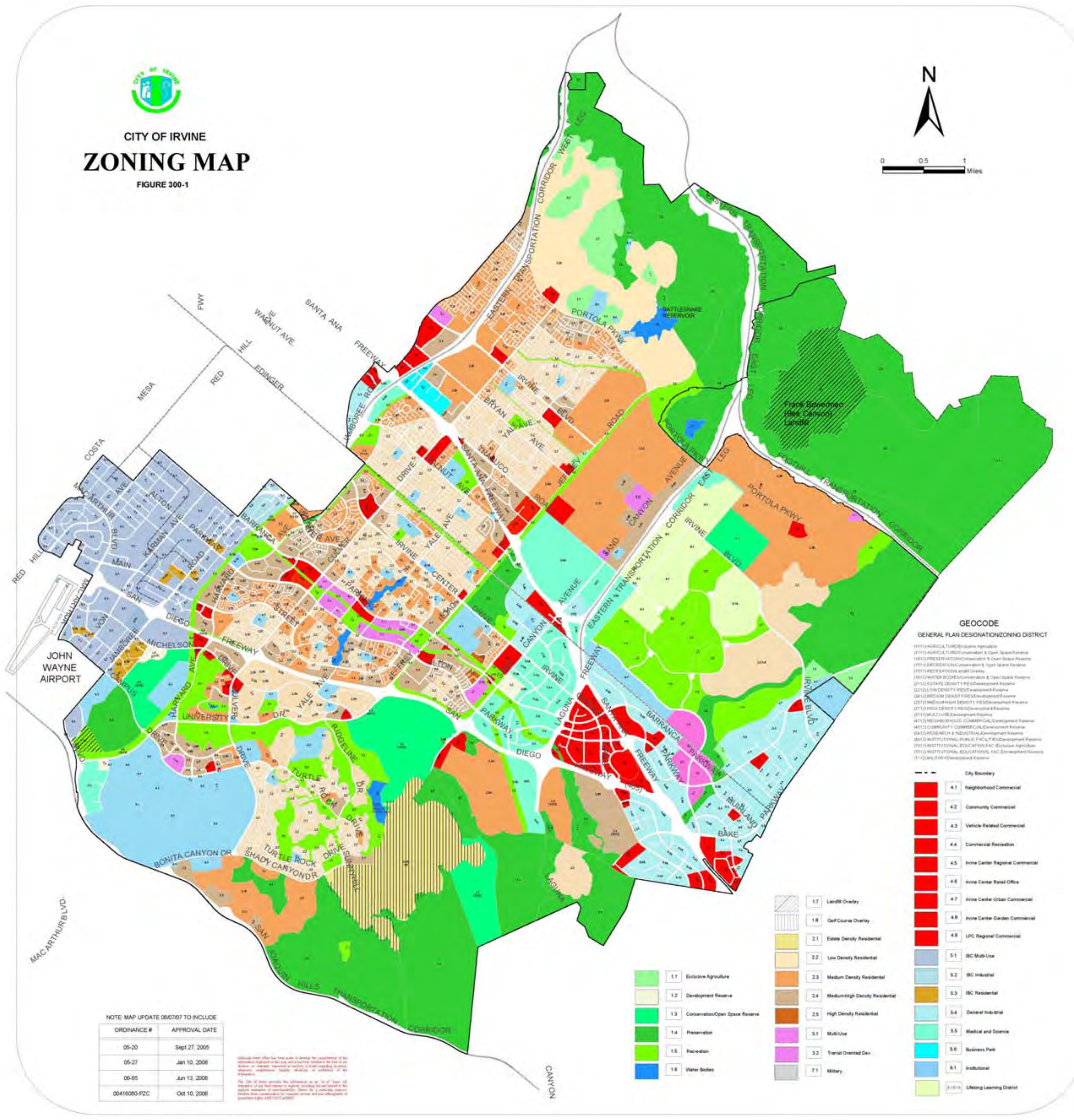
The County of Orange has a seven member Airport Land Use Commission (ALUC). The membership consists of two Commissioners appointed by the Orange County Board of Supervisors, two appointed by the League of California Cities and two appointed by the public airports. The seventh member is appointed by the other Commissioners to represent the general public. The Airport Land Use Commission, which is governed by the Public Utilities Code, Section 21670 has a basic responsibility to assist local agencies in ensuring compatible land uses in the vicinity of all airports in Orange County. The ALUC reviews land use proposals near civilian and military airports in the County and other land uses issues, which have a potential impact on airport operations. One of the primary responsibilities of the ALUC is to protect the public from the adverse effects of aircraft noise.

Exhibit 2-9 City of Newport Beach Zoning Map



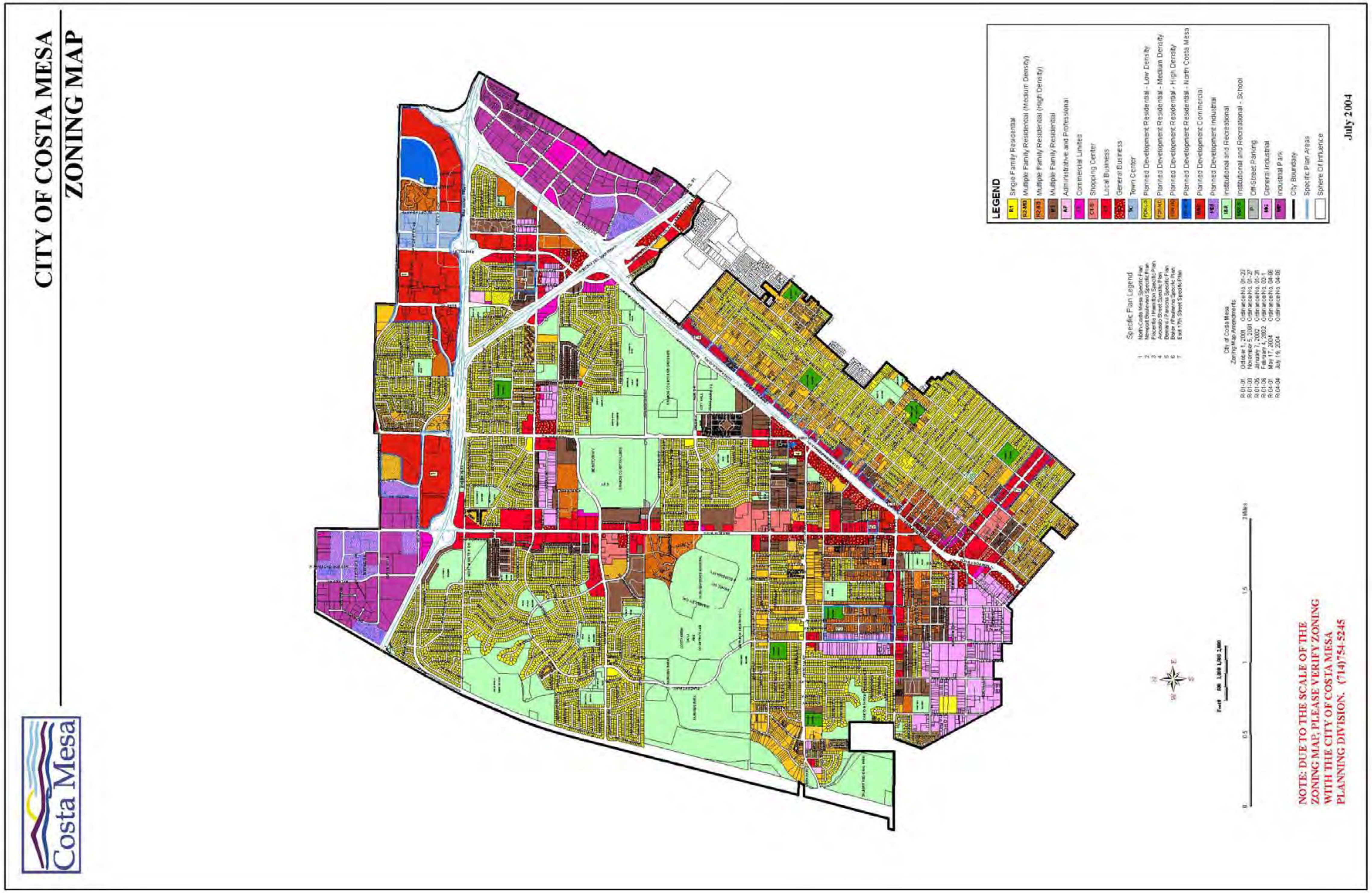
Source: *http://www.city.newport-beach.ca.us/PLN/Planning.html*

Exhibit 2-10 City of Irvine Zoning Map



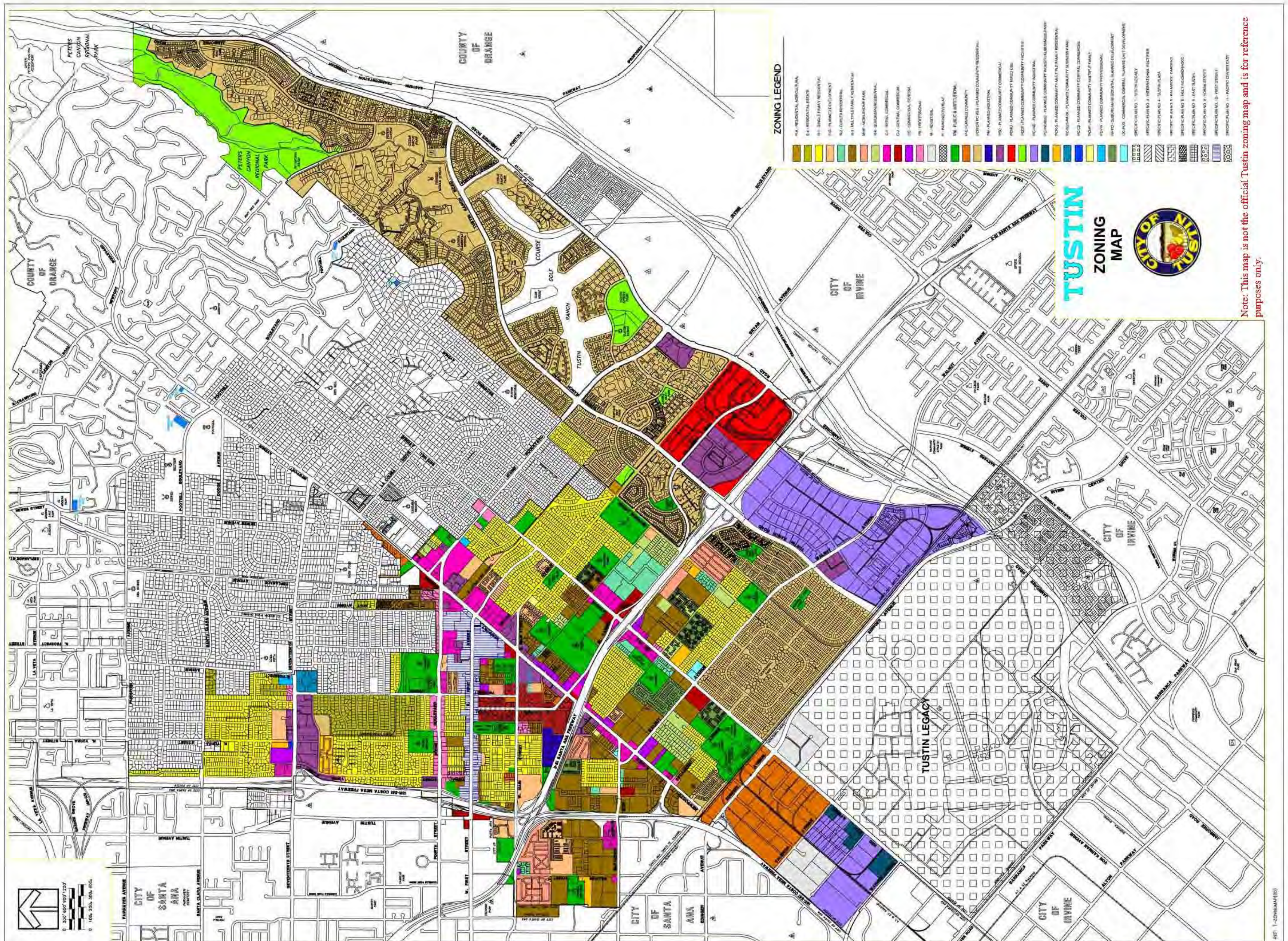
Source: *http://www.cityofirvine.org/depts/cd/planningactivities/planning_n_zoning_counter.asp*

Exhibit 2-11 City of Costa Mesa Zoning Map



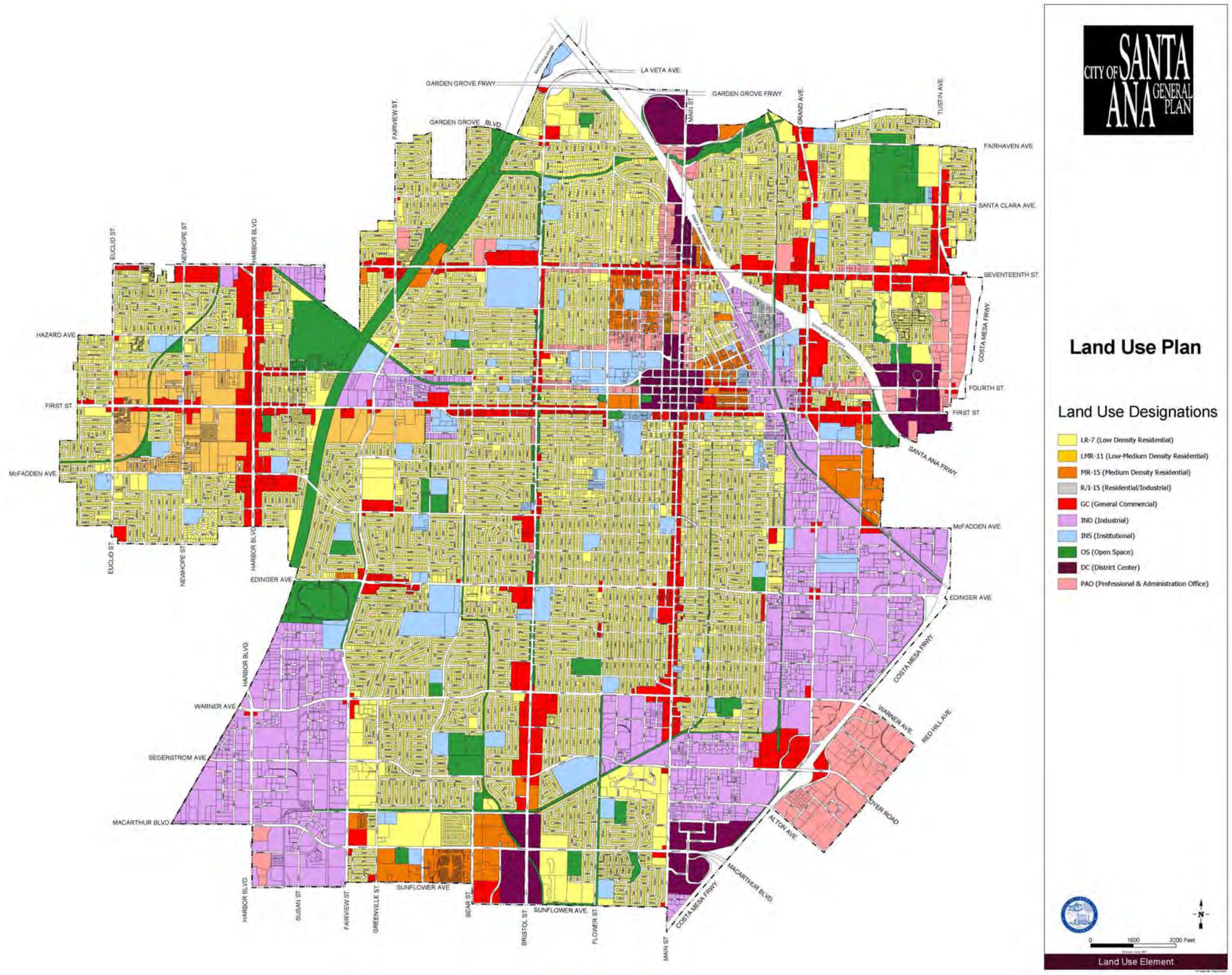
Source: *http://www.ci.costa-mesa.ca.us/departments/plangweb.htm*

Exhibit 2-12 City of Tustin Zoning Map



Source: *http://www.tustinca.org/citydept/CommDev/TustinZoningMap.pdf*

Exhibit 2-13 City of Santa Ana General Plan



Source: *http://www.ci.santa-ana.ca.us/pba/planning/Planning_Home_Page.asp*

III. Relevant Factors Pertaining to Aircraft Noise

There are various relevant factors impacting the noise levels of aircraft including: aircraft type, aircraft performance, aircraft weight, phase of flight, airport facilities, airspace and Air Traffic control requirements, air carrier operational specifications and policies, FAA operating requirements, meteorological conditions, and geographical and topographical factors. The following sections discuss these factors as they pertain to operations at SNA.

3.1 Aircraft Types and Sources of Aircraft Noise

Each aircraft produces a different noise foot print based on the various engine/airframe configurations associated with their design. Therefore, noise will vary based on the type of aircraft operating. The biggest source of aircraft noise is the engine or the power plant. The major source of engine noise comes from the region behind the engine where the high-velocity exhaust mixes with the lower velocity surrounding air.

3.1.1 Aircraft Categories

Large aircraft over 75,000lbs are categorized by "Stages" based on the amount of noise produced. Currently Stages 1 – 4 are defined, with 1 being the noisiest and 4 being the quietest. Noise levels for each Stage are based on weight and number of engines and are measured at three different points: takeoff, approach, and sideline (or flyover).

Stage 1 is an airplane that has noise levels during takeoff, sideline, or approach that are greater than Stage 2 limits. Aircraft within this category typically have direct thrust engines. Representative aircraft include the B-707, B-737-100, and the DC-8.

Stage 2 is an airplane that complies with the noise levels that are prescribed in FAR 36 section C36.5 (a) (2) of appendix C but are higher than the noise limits that are required by the Stage 3 aircraft. Stage 2 aircraft utilize a high-bypass turbofan in front of the central turbine drive that passes a large volume of air around the turbine (hence the term "bypass"). The high bypass fan produces less noise per pound of thrust and mixes the cooler bypassed air with the hot jet exhaust and acts as a muffler. Representative aircraft in the Stage 2 category include: B-727, B-737-200, B-747-200, and the DC-9.

Stage 3 is an airplane that complies with the noise levels that are prescribed in FAR 36 section C36.5 (a) (3) of appendix C. Stage 3 aircraft utilize engines with more refined high bypass turbo fan engines. These engines bypass a higher ratio of air than Stage 2 aircraft engines resulting in lower noise. Aircraft in this category typically have bypass ratios of 4 or greater. Representative aircraft in the Stage 3 category include: B-757, B-737-800, B-747-400, B-757, MD-80, and the MD-90.

Stage 4 requirements were established by the International Civil Aviation Organization (ICAO) in 2002. FAA adopted a Notice of Proposed Rulemaking in 2004 reflecting the ICAO requirements. These new requirements apply to all new aircraft built after January 1, 2006 and impose a requirement for aircraft to be 10 decibels lower than Stage 3 aircraft. These new rules are not aimed at phasing out the other categories of aircraft but are meant to provide standards for the future. Newly emerging Stage 4 aircraft include the Boeing 787 with a bypass ratio of over 7:1.

All Stage 2 aircraft have been phased out in the continental United States. Stage 3 only operations have occurred at SNA since 1985. The current fleet includes aircraft that were originally designed as Stage 2 aircraft (eg MD 80) and have been retrofitted, and aircraft that were designed to be Stage 3 (A320, B-757) as depicted in **Table 2-2**. All Stage 3 operations are subject to the previously discussed noise ordinances and limitations at SNA. No Stage 4 aircraft are currently operating at SNA.

Although not designated Stage 4, many of the newer aircraft operating at John Wayne Airport already meet Stage 4 noise requirements. Many airplanes manufactured prior to 2006 were quieter than they were required to be. Their noise levels at certification were well below Stage 3 but they were not allowed to be called anything other than Stage 3.

The FAA stated all but four currently produced aircraft types meet the proposed Stage 4 standards. The FAA found that under current industry practice of the four that do not meet Stage 4 standards, three can be configured to meet the proposed Stage 4 noise standards. The remaining airplane type for which no Stage 4 configuration exists was type certified in 1981.

3.1.2 Sources of Aircraft Noise

In order to better understand the purpose of the noise abatement procedures in effect at John Wayne airport for various aircraft, it is necessary that the sources of aircraft noise are better understood. The following paragraphs describe some of the principle contributors to aircraft noise.

3.1.2.1 Flaps

The aircraft's flaps are located on the aft or "trailing edge" of the wing and increase both lift and drag. Because of the increased drag, flaps are generally only partially extended on takeoff, and fully extended on landing. The added drag created by "full flaps" on landing allows the aircraft to approach at a steeper angle without excessive air speed. When flaps are partially extended for takeoff it is to give the aircraft a slower stalling speed but with little increase in drag. A slower stalling speed allows the aircraft to take off in a shorter runway distance. **Exhibit 3-1** depicts a typical flap extended downward.

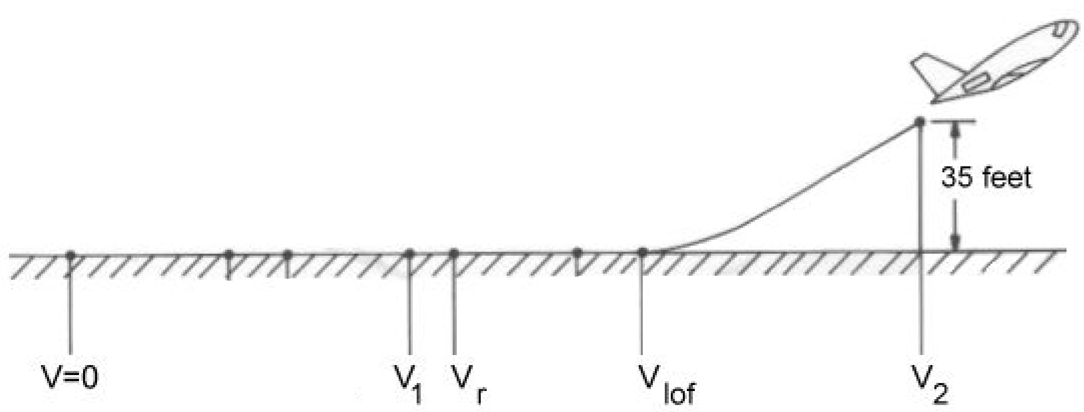
Exhibit 3-1 Aircraft Flap

The greater the wing's camber, or curvature, the better the wing will perform at slow airspeeds. Flaps extend downward and rearward, thereby increasing both camber and wing area. On the leading edge of the wing are the slats. These extend forward and along with the flaps create an airfoil of significant camber for low speed operations.

3.1.2.2 V Speeds

V Speeds are referred to in AC 91-53 and other various aircraft noise abatement procedures. Aircraft V speeds are speeds that define certain performance and limiting characteristics of an aircraft and the V stands for velocity. They are established by the manufacturer during the design and testing, and are specific to the particular aircraft model. V speeds are stated in knots. A Knot is a unit of speed, equal to one nautical mile (NM) per hour. One nautical mile is greater than one statute mile which in the normal measurement in the U.S. One NM equals approximately 6,076 feet whereas one statute mile equals 5,280 feet. The diagram in **Exhibit 3-2** shows the critical velocities experience by an aircraft during takeoff.

Exhibit 3-2 Aircraft Takeoff Velocities



This diagram starts with the plane at rest, indicated by V=0. To provide the pilot with some definite criteria on which to make a decision, the FAR Part 25 specifies a critical engine-failure speed, V1. Below this speed, the pilot should abort and bring the plane to a stop if an engine fails. If the engine fails after the aircraft has exceeded V1, he should continue the takeoff using the remaining engines. The critical engine speed therefore defines the point on the runway at which the distance needed to stop is exactly the same as that required to reach takeoff speed. The resulting total takeoff distance is correspondingly known as the balanced field length.

The next velocity of interest to us is that at which the aircraft can begin to rotate its nose into the air, conveniently called the rotation speed, Vr. At Vlof the aircraft has left the runway. Now that the aircraft has finally become airborne, it accelerates into takeoff climb speed, V2, which must be reached at an altitude high enough to clear a given obstacle.

Table 3-1 lists the various takeoff speeds for specific aircraft.

Table 3-1 Sample Aircraft Takeoff Speeds

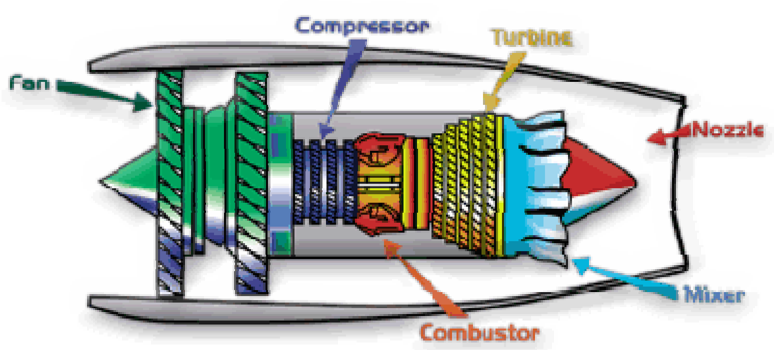
Aircraft	Takeoff Weight	Takeoff Speed
Boeing 737	100,000 lbs. 45,360 kg	150 mph 250 km/h 130 kts
Boeing 757	240,000 lbs. 108,860 kg	160 mph 260 km/h 140 kts
Airbus A320	155,000 lbs. 70,305 kg	170 mph 275 km/h 150 kts
Airbus A340	571,000 lbs. 259,000 kg	180 mph 290 km/h 155 kts
Boeing 747	800,000 lbs. 362,870 kg	180 mph 290 km/h 155 kts

Prepared by: ASRC Research and Technology Solutions

3.1.2.3 EPR (Engine Pressure Ratio)

A few of the noise abatement procedures at John Wayne use the term EPR. The engine pressure ratio (EPR) is defined to be the total pressure ratio across the engine. EPR can be easily measured on an operating engine and displayed to the pilot on a cockpit dial. An engine pressure ratio (EPR) gauge is used to indicate the power output of a turbojet/turbofan engine. **Exhibit 3-3** depicts a cross-section of a typical turbojet engine.

Exhibit 3-2 Turbojet Engine Cross-Section



A turbofan engine has a large fan at the front, which sucks in air. Most of the air flows around the outside of the engine, making it quieter and giving more thrust at low speeds. Most of today's airliners are powered by turbofans. In a turbojet all the air entering the intake passes through the gas generator, which is composed of the compressor, combustion chamber, and turbine. In a turbofan engine only a portion of the incoming air goes into the combustion chamber. The remainder passes through a fan, or low-pressure compressor, and is ejected directly as a "cold" jet or mixed with the gas-generator exhaust to produce a "hot" jet. The objective of this sort of bypass system is to increase thrust without increasing fuel consumption. It achieves this by increasing the total air-mass flow and reducing the velocity within the same total energy supply.

3.2 Aircraft Phase of Flight

As mentioned previously, the major source of aircraft noise is the jet engine. The noise produced from the jet engine is a function of power setting required for the phase of flight in which the aircraft is operating. The operational phases of flight relavent to this study include run-up, taxi, takeoff, and landing.

3.2.1 Run Ups

Run-up operations are performed for pre-flight engine checks and for aircraft maintenance. A pre-flight engine check is typically conducted by pilots as a safety measure to determine the aircraft systems are operating normally. A pre-flight run up may include an advancement of power for a short period of time (usually less than 1 minute) to determine aircraft engines are capable of producing take off power.

Run up operations are also conducted for maintenance purposes. A maintenance run-up involves testing an aircraft at high power settings for several minutes. These operations can be noisy in areas adjacent to the field due to the high power engine settings and because noise emanates from a stationary position as opposed to an aircraft operation that is moving.

Pre-flight engine check run-ups at SNA are conducted at four defined areas on the airfield: the southwest, southeast, tower, and midfield run-up areas. The southwest run-up area is located west of Runway 01L off Taxiway B, the tower run-up area is located in front of the Air Traffic Control Tower off Taxiway B, the southeast run-up area is located east of Runway 01L off Taxiway A, and the midfield run-up area is located east of Runway 01R adjacent to Taxiway A and H.

Run-ups for maintenance purposes at SNA are conducted in an isolation area adjacent to Runway 19R. Maintenance run-ups are restricted and shall not be performed in the isolation area without prior permission from Airport Operations or Airport Police Services personnel. Maintenance run-ups may only occur during a south flow operation and the tail of the aircraft must face north directing the sound energy to the north.

3.2.2 Taxi

Taxi operations are associated with the movement of aircraft to and from parking, gate, or maintenance areas. Taxi operations require moderate power settings to get the aircraft moving.

However, once the aircraft is rolling, power settings can be reduced. These power settings do produce moderate noise levels. However, the noise typically stays within the airport boundary.

The most significant noise associated with a taxi operation occurs during a power back operation. A power back is an operation where an aircraft uses reverse thrust mode to back away from a gate. The operation utilizes high engine power, is fuel inefficient, and can be extremely noisy. Many airlines do not use these operations due to the potential for damaging debris. Many airports across the country have restricted push-backs and reverse thrust mode due to excessive noise and emissions. All push-backs at SNA are performed using tugs, therefore power back operations are not a source of noise at the airport.

3.2.3 Take Off

The takeoff phase of flight is the loudest type of aircraft operation and causes the greatest amount of community disturbance. Noise on departure can vary based on the take off climb profile used, the rate of climb of an aircraft, and the ground track flown.

3.2.3.1 Departure Climb Profiles

A normal operating departure profile is designed to ensure aircraft safely exit the runway environment and climb up and out of the terminal area as efficiently as possible. In the early 1990s, the Federal Aviation Administration responded to numerous requests for unique noise abatement departure profile procedures by studying the viability of using different procedures off different ends of runways at the same airport. This testing was conducted at SNA and resulted in development of FAA Advisory Circular 91-53A, *Noise Abatement Departure Profiles*.

AC 91-53A describes acceptable criteria for safe Noise Abatement Departure Profiles (NADP) for subsonic turbojet-powered airplanes with a maximum certificated gross takeoff weight of more than 75,000 pounds. These procedures provide the user with one means, although not the only means, of establishing acceptable NADP's. For several years, the FAA worked to develop and standardize profiles to minimize airplane noise. As part of that commitment, the FAA worked with airport managers, airplane operators, pilots, special interest groups, and Federal, State, and local agencies in numerous programs for evaluating noise levels in the airport environment. John Wayne Airport was instrumental in the early Stages of the development of AC 91-53. The research considered a variety of departure flight tracks and profiles at John Wayne.

The Advisory Circular recommended two specific departure profiles, the Close-in Community departure profile and the Distant Community departure profile. The airport operators then specify to the air carriers serving their facility, which departure profile should be flown off each end of the airport.

Close-in Community NADPs are used for individual airplane types, and are intended to provide noise reduction for noise sensitive areas located in close proximity to the departure end of an airport runway. Distant Community NADPs are used for individual airplane types intended to provide noise reduction for all other noise sensitive areas. These two types of profiles are described below.

- Close-in NADP.
    - Initiate thrust cutback at an altitude of no less than 800 feet AFE and prior to initiation of flaps or slats retraction.
    - The thrust cutback may be made by manual throttle reduction or by approved automatic means. The automatic means may be armed prior to takeoff for cutback at or above 800 feet AFE or may be pilot initiated at or above 800 feet AFE.
    - For airplanes without an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, the takeoff path engine-inoperative climb gradients specified in FAR Section 25.111(c)(3) in the event of an engine failure.
    - For airplanes with an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, a takeoff path engine-inoperative climb gradient of zero percent, provided that the automatic thrust restoration system will, at a minimum, restore sufficient thrust to maintain the takeoff path engine-inoperative climb gradients specified in FAR Section 25.111(c)(3) in the event of an engine failure.
    - During the thrust reduction, coordinate the pitchover rate and thrust reduction to provide a decrease in pitch consistent with allowing indicated airspeed to decay to no more than 5 knots below the all-engine target climb speed and, in no case to less than V2 for the airplane configuration. For automated throttle systems, acceptable speed tolerances can be found in AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes.
    - Maintain the speed and thrust criteria as described in subparagraph 6 a(3) through 6 a(5) to 3,000 feet AFE or above, or until the airplane has been fully transitioned to the en route climb configuration (whichever occurs first), then transition to normal en route climb procedures.

- Distant NADP
    - Initiate flaps/slats retraction prior to thrust cutback initiation. Thrust cutback is initiated at an altitude no less than 800 feet AFE.
    - The thrust cutback may be made by manual throttle reduction or by approved automatic means. The automatic means may be armed prior to takeoff for cutback at or above 800 feet AFE or may be pilot initiated at or above 800 feet AFE.
    - For airplanes without an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, the takeoff path engine-inoperative climb gradients specified in FAR Section 25.111(c)(3) in the event of an engine failure.

- For airplanes with an operational automatic thrust restoration system, achieve and maintain no less than the thrust level necessary after thrust reduction to maintain, for the flaps/slats configuration of the airplane, a takeoff path engine-inoperative climb gradient of zero percent, provided that the automatic thrust restoration system will, at a minimum, restore sufficient thrust to maintain the takeoff path engine-inoperative climb gradients specified in FAR Section 25.111(c)(3) in the event of an engine failure.
- During the thrust reduction, coordinate the pitchover rate and thrust reduction to provide a decrease in pitch consistent with allowing indicated airspeed to decay to no more than 5 knots below the all-engine target climb speed and, in no case to less than V2 for the airplane configuration. For automated throttle systems, acceptable speed tolerances can be found in AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes.
- Maintain the speed and thrust criteria as described in subparagraph 6 b(3) through 6 b(5) to 3,000 feet AFE or above, or until the airplane has been fully transitioned to the en route climb configuration (whichever occurs first), then transition to normal en route climb procedures.

The main difference between the two procedures is the point of power reduction and flap retraction. The Close in procedure calls for thrust reduction followed by flap retraction allowing for an initial faster climb in close proximity to the runway environment. The Distant procedure calls for flap reduction followed by thrust reduction. Aircraft are lower in the initial portion of the procedure, but are higher in the distant portion of the procedure as compared to aircraft using the Close In procedure. The Close In procedure has been adopted as the recommended method of departures at SNA.

AC 91-53A provides general guidance for these two procedures. Ultimately, airlines develop their own procedures according to their operations specifications for each individual aircraft. This is especially true at SNA since airlines have to adhere to the single event noise restrictions at the various monitors in the areas. Several airlines were contacted regarding the departure profiles including Southwest Airlines, Northwest Airlines, Delta Airlines, United Airlines, and Aloha Airlines. All of the airlines use the Close In procedure tailored to their individual aircraft type.

Some airline representatives have indicated that they are studying the adjustment of the thrust reduction point from 800 feet to a higher altitude for some of their higher performance aircraft. This is due to the fact that many of the new higher performance aircraft can climb to altitudes higher than 1000 feet soon after takeoff. Climbing higher sooner will allow the aircraft to meet the SNA noise requirements, fly at higher altitudes outside the airport environment, and reach 3000 feet sooner ultimately saving time exiting the terminal environment.

3.2.3.2 Aircraft Performance/Climb Rates

Aircraft performance is another factor pertaining to noise. The climb rate and flight profile of departing aircraft will vary considerably based on aircraft type and the other factors identified in this section. New, modern aircraft (e.g. Airbus A320, Boeing 737-800, 757) have higher-thrust engines and improved wing designs compared with older aircraft (e.g. Boeing 727, DC-9, MD-80), which results in a superior climb rate. The new aircraft also have much quieter engines than older aircraft. In general, the higher the altitude, the less noise will likely be perceived by the receiver on the ground.

As previously mentioned, all new aircraft produced after January 1, 2006 must meet Stage 4 requirements. For example, Boeing is currently developing the new 787 meeting these requirements. This aircraft is scheduled for delivery next year and will be likely operating in the NAS within the next 5 to 10 years. The 787 is designed with new quiet technology, high thrust engines. During a recent industry briefing, Boeing representatives indicated that the noise foot print produced by the new 787 will likely remain in the airport environment due to climb performance of the high thrust quiet engines being used.

3.2.3.3 Departure Ground Tracks

The paths over the ground where aircraft departures fly are a significant factor on the effects of noise on a community. All commercial operations in the National Airspace System (NAS) are conducted under Instrument Flight Rules (IFR). Thousands of IFR takeoffs or departures occur daily. In order to accommodate this volume of IFR traffic, Air Traffic Control (ATC) must rely on pilots to use charted airport sketches and diagrams as well as standard instrument departures (SIDs) and obstacle departure procedures (ODPs). While many charted (and uncharted) departures are based on radar vectors, the bulk of IFR departures in the NAS require pilots to navigate out of the terminal environment to the en route phase.

IFR takeoffs and departures are fast-paced phases of flight, and pilots often are overloaded with critical flight information. During takeoff, pilots are busy requesting and receiving clearances, preparing their aircraft for departure, and taxiing to the active runway. During IFR conditions, they are doing this with minimal visibility.

Departure procedures are preplanned routes that provide transitions from the departure airport to the en route structure. Primarily, these procedures are designed to provide obstacle protection for departing aircraft. They also allow for efficient routing of traffic and reductions in pilot/controller workloads. These procedures come in many forms, but they are all based on the design criteria outlined in FAA Order 8260.3b *United States Standards for Terminal Instrument Procedures* (TERPS) and other FAA orders. The Airport/Facility Directory (abbreviated A/FD), in the U.S., is a pilot’s manual that provides comprehensive information on airports, large and small, and other aviation facilities and procedures.

There are two types of Departure Procedures: those developed to assist pilots in obstruction avoidance (an ODP), and those developed to communicate air traffic control clearances (SIDs). Departure procedures are developed by the FAA and are categorized by navigational equipment requirements as follows:

- Non-RNAV departure procedures are established for aircraft equipped with conventional avionics using ground-based NAVAIDs such as the SLI VORTAC used for the AHAHEIM THREE and the CHANNEL ONE departures. These DPs may also be designed using dead reckoning navigation. Dead reckoning (DR) is the process of estimating one's current position based upon a previously determined position, or fix, and advancing that position based upon known speed, elapsed time, and course. A portion of the CHANNEL ONE departure involves dead reckoning. A flight management system (FMS) may be used to fly a non-RNAV DP if the FMS unit accepts inputs from conventional avionics sources such as Distance Measuring Equipment (DME), VOR, and Localizer (LOC). The Channel One departure can be flown independent of radar vectors.

• RNAV departure procedures are established for aircraft equipped with RNAV avionics; e.g., GPS, VOR/DME, DME/DME, etc. Automated vertical navigation is not required, and all RNAV procedures not requiring GPS must be annotated with the note: "RADAR REQUIRED." John Wayne Airport does not currently have any RNAV departure procedures. However, RNAV departures are being developed rapidly by the FAA to provide this capability to all IFR airports.

• Radar departure procedures may be used for navigation guidance for SID design. Radar SIDs are established when ATC has a need to vector aircraft on departure to a particular ATS Route, NAVAID, or Fix. A fix may be a ground-based NAVAID, a way-point, or defined by reference to one or more radio NAVAIDS. Not all fixes are waypoints since a fix could be a VOR or VOR/DME, but all waypoints are fixes. Radar vectors may also be used to join conventional or RNAV navigation SIDs. SIDs requiring radar vectors must be annotated "RADAR REQUIRED." Radar is a requirement for all three of John Wayne's SIDs. In addition, departures to the North are primarily RADAR, there are not any published SIDs to the North. The ANAHEIM THREE departure and the MUSEL SIX departure are both strictly radar departures. The CHANNEL ONE departure may use radar vectors in accordance with the Note on the plate, but otherwise can be flown with conventional navigation.

Ground tracks of all departures will vary based on the type of procedure being flown, air traffic control, aircraft performance, avionics, and navigational capabilities, pilot reaction times, and ground based navigation systems accuracies.

For example, aircraft departing from Runways 19L or 19R via the CHANNEL ONE departure are to make the first turn to heading 175° when passing the SLI VORTAC 118° radial at a point 1 DME south of the Localizer. This first turn will vary between the actual radial or DME fix and a point that takes into account the crossing course accuracy of the particular NAVAID. DME accuracies are typically ½ nautical miles, where VOR radials vary in accuracy based on plus or minus 3.6°. Aircraft performance, navigation capability, pilot reaction time, and crosswinds may also cause course deviation and dispersion of the ground track.

Continuing the example, the second turn of the CHANNEL ONE occurs at SLI VORTAC 132° radial and identifies a turn to a heading of 200°. The actual track at this turn point may vary due to deviations from the first turn combined with the NAVAID accuracies associated with the turn point (assuming plus or minus 3.6° of accuracy for the VOR radial). These accuracies contribute to the reasons why aircraft may overfly Balboa Island on different ground tracks.

The MUSEL SIX Departure utilizes the same first turn heading of 175° but maintains this heading until receiving radar vectors from ATC. Track deviations would then become a result of the fix errors as previously discussed and would also be a function of air traffic control vectors.

Commercial departures to the north from Runways 01L and 01R are not served by a charted departure procedure. All commercial operations departing Runways 01L and 01R fly assigned heading from SNA ATCT and are then vectored to the en route fix by SoCal TRACON. Commercial operations typically turn right and proceed to TRM to the east, MUSEL to the southwest, or SLI to the northwest. Since this is a vector operation only, the flight track dispersion varies. A sample of actual departure tracks is depicted in **Exhibits 2-3** through **2-6.**

3.2.4 Arrivals and Landing

Arrivals and landing operations produce noise, but not as significant as the other phases of flight. This is primarily due to the fact that the aircraft is being slowed and operated in a lower thrust setting. Noise on arrival can vary based on the descent profile used and the ground track flown.

As previously mentioned, SNA operates in two air traffic flows: arrivals and departures to the north and arrivals and departures to the south. In a north flow arriving aircraft enter the terminal area from HDF tracking south of the airfield across the coastline and from SXC. Commercial aircraft on approach to Runway 01L will fly either the LOC BC or RNAV (GPS) approach to the airport based on the navigational capabilities of their aircraft. The Final Approach Fix (FAF) for both procedures is located just beyond the coast approximately 4.7 NM from the approach end of Runway 01L. Based on the available flight track data, it appears as though most aircraft are vectored from the en route environment to the FAF and turned on to the final approach as opposed to following the initial segments of the procedures. Aircraft using the LOC BC will cross the FAF at 1700 feet MSL and descend at a rate of 3.21° to the runway. Aircraft using the RNAV GPS procedure will cross the FAF at 1600 feet MSL and will descend at a rate of 3.01° to the runway.

In a south flow arriving aircraft from the west enter the terminal area from over the Pacific Ocean in the proximity of SXC tracking north of the airfield on a downwind leg and from HDF entering the final approach from the east. Commercial aircraft on approach to Runway 19R will fly either the ILS, LDA, RNAV (GPS), or NDB approach based the navigational equipage of the aircraft and the airline operations specification. Of these approaches, the majority of the aircraft will fly the ILS. The ILS provides lateral and vertical guidance for aircraft on approach and offers the lowest landing minimums available. The glide slope is intercepted at approximately 10 NM from the approach end of the runway at 3300 feet MSL. Aircraft will descend to the runway on a 3° glide slope angle.

Dispersion on arrivals is not as great as departure primarily due to the guidance available for the (ILS, LOC, GPS) approach and the straight in nature of the procedure. The descent profiles are a function of the design criteria used to develop the procedures and obstacles in the vicinity of the approach.

3.3 Airport Facilities

The facilities available for aircraft operations play a role in the amount of noise that is generated over a community. The major factors of an airport design which impacts the amount of noise over a community is the amount of property separating the runways from the noise sensitive areas in a community and runway length.

Many older airports are located on smaller parcels of land and have experienced development right to the airport boundaries. Newer airports are located on larger parcels of land with increased distance between development and the runway facilities. SNA is an older airport and has development up to the airport boundaries.

Runway length at an airport plays a significant role in the amount of noise that is generated from an airport. Many aircraft departing on longer runways typically are at higher altitudes when crossing the departure end of the runway as compared to shorter runways. The higher altitudes simply put the noise source farther away from the receiver. The longest runway at SNA is 5,700 feet in length. This is considered a short runway for commercial operations as compared to other Air Carrier airports across the Nation. Aircraft departing this runway will likely be using higher power settings to depart since the runway is short, and the aircraft will likely be lower at the departure end of the runway. These two factors may result in a larger noise footprint.

3.4 Airspace and Air Traffic Control Requirements

The FAA Air Traffic Organization has the sole authority and responsibility for routing and separating aircraft through the National Airspace System (NAS). The first priority of Air Traffic Control is always safe and efficient separation of aircraft. The SNA terminal is in the jurisdiction of SNA Air Traffic Control Tower and the Southern California TRACON.

The SNA ATCT provides ground, approach, and departure service for aircraft operating in the terminal area. The SoCal TRACON provides terminal IFR departure and approach services.

Departing aircraft are provided clearance and initial departure headings and altitude clearances from SNA ATCT. Aircraft are “handed off” to SoCal TRACON approximately 1NM from the runway end upon radar coverage identification. At that point aircraft, fly the remainder of the assigned SID and are then vectored to the en route environment. Initial departure clearances for commercial aircraft are to fly the MUSEL or CHANNEL departure procedures and are assigned an altitude clearance of 5,000 feet MSL.

Arriving aircraft are provided radar vectoring from the en route handoff to a point at which an approach can be made to the airport (via an instrument approach). Aircraft are typically handed off after the last vector assigned and prior to intercepting the assigned or requested approach.

3.5 Airline Operations Specifications

Airline Operations specifications (OpsSpecs) are required by FAR Part 119.5 to be issued to commercial operators in order to define the appropriate authorizations, limitations, and procedures based on their type of operation, equipment, and qualifications. The OpsSpecs can be adjusted to accommodate the many variables in the air transportation industry, including aircraft and aircraft equipment, operator capabilities, and changes in aviation technology. The OpsSpecs are an extension of the Code of Federal Regulations (CFR); therefore, they are legal, binding contracts between a properly certificated air transportation organization and the FAA for compliance with the CFR's applicable to their operation. OpsSpecs are designed to provide specific operational limitations and procedures tailored to a specific operator's class and size of aircraft and types of operation, thereby meeting individual operator needs.

FAR Part 121 and 135 operators have the ability, through the use of approved OpsSpecs, to use lower-than-standard takeoff minimums. Depending on the equipment installed in a specific type of aircraft, the crew training, and the type of equipment installed at a particular airport, these operators can depart from appropriately equipped runways with less than standard visibility and ceiling minimums.

3.6 Meteorological Conditions

The propagation of aircraft noise is dependent on meteorological conditions including temperature, humidity, and wind. During warm temperatures, the air density (air molecules per cubic foot) decreases significantly, thereby reducing aircraft performance and lift. (Aircraft performance is dependent upon the number of molecules in the atmosphere. The fewer number of air molecules, the lesser the engine and airframe performance.) Consequently air density decreases as airport altitude increases. When the temperature rises above the standard temperature at SNA (STD Temp is approximately 59° F), the density of the air is reduced and the density altitude increases. This affects the aircraft aerodynamic performance.

Air Density can be a single most important factor affecting airplane performance. It has a direct bearing on the lift produced by the aircraft’s wings whereby a reduction in air density reduces the wings lift. The power output of the engine depends on oxygen intake, so the engine output is reduced as the equivalent “dry air” density decreases and produces even less power as moisture displaces oxygen in more humid conditions.

For example, on an 80° day at SNA an aircraft could have close to a 25% increase in takeoff roll, and up to a 20% decrease in climb performance due to a higher density altitude. Therefore the aircraft can be at lower altitudes over various areas of the departure tracks than on a cooler day.

Aircraft noise is also more noticeable on cloudy days. Low ceiling cloud cover tends to refract aircraft noise downward off the clouds, thus confining it. Atmospheric temperature gradients also affect aircraft noise propagation. When there is not an inversion and the air temperature slowly decreases with increasing altitude, aircraft noise is, for the most part, deflected upward and away from most ground-based listeners. However, when there is a temperature inversion with a layer of cool air trapped near the surface, the reverse situation is true and aircraft noise tends to be deflected downward, creating increased sound levels over a longer distance.

A temperature inversion is a thin layer of the atmosphere where the decrease in temperature with height is much less than normal (or in extreme cases, the temperature increases with height). An inversion, also called a "stable" air layer, acts like a lid, keeping normal convective overturning of the atmosphere from penetrating through the inversion. This can cause several weather-related effects. One is the trapping of pollutants below the inversion, allowing them to build up. If the sky is very hazy, or is sunsets are very red, there is likely an inversion somewhere in the lower atmosphere.

Under certain conditions, the normal vertical temperature gradient is inverted such that the air is colder near the surface of the Earth. This can occur when, for example, a warmer, less dense air mass moves over a cooler, denser air mass. This type of inversion occurs in the vicinity of warm fronts, and also in areas of oceanic upwelling such as along the California coast.

Water vapor in the atmosphere is also relatively effective at absorbing noise. On many of the nights with an inversion layer, the high humidity's will reduce the noise levels. Rain, snow, fog, or haze have a very small effect on noise (but they can have a large effect on the number of flights flying over a particular area). Clouds also seem to increase the noise levels on the ground as sound waves are actually refracted off the clouds and back to the surface of the earth.

As sound travels through the air, some of the sound is absorbed by the air. The amount of sound absorbed by the air depends on the frequency of the sound, the air temperature, and the relative humidity. Under some temperature and humidity conditions, the air can actually "bend" sound and redirect it to a different location.

Wind direction and speed also has an impact on noise and aircraft performance. Wind can scatter or redirect noise to other areas. When the wind is a headwind aircraft are able to climb faster, and subsequent noise is moved more downwind.

SNA airport changes runway departure use from Runway 19R to Runway 01L when the tailwind component is 10 KTS or more. An aircraft departing Runway 19R with a tailwind component will have a longer takeoff roll and a slower climb rate than with a headwind. This in turn will tend to increase noise along its flight path.

3.7 Geographic and Topographic Conditions

As sound energy spreads out over an increasingly larger area, the amount of noise decreases. Additionally, the noise from low-level aircraft operations are affected by absorption and deflection from the Earth's surface as well as by intervening objects like hills and buildings. In addition, areas located in canyons or with prevalent high terrain features create areas in which noise can echo.

In a south flow, departing aircraft follow the Upper Newport Bay to the Pacific Ocean. The bay is located in a canyon and is several hundred feet lower than the airport elevation. Noise from departing aircraft may possibly echo in this area.

In a north flow, departing aircraft at SNA must climb in an efficient manner to clear high terrain features. These climb profiles usually require higher power settings and/or a circling maneuver for altitude gain. The higher power settings result in more aircraft noise whereas the circling maneuver spreads noise over a larger area. This concept is highlighted in **Exhibit 2-4** and **2-5** in section I for aircraft departing Runway 01L. Departures climb straight for approximately 5 miles then turn right circling to gain altitude to cross the mountain range via SLI thence POM and/or LAX airspace.

IV. Noise Reduction Technology Improvements

Various technological improvements in the area of navigation and aircraft performance are emerging or are being studied with the potential of reducing aircraft noise emission in the future. The following sections discuss these advances and identify potential applications to SNA.

4.1 Air Navigation Advancements

Air Navigation refers to any aid that allows a pilot to navigate an aircraft. Traditionally, ground based Navigational Aids (NAVAIDs) have served pilots and aircraft operating in the NAS. However, with the introduction of the Global Positioning System (GPS), improvements in aircraft Flight Management Systems (FMS) and avionics suites, and the establishment of aircraft certification by the FAA, Area Navigation (RNAV) and Required Navigational Performance (RNP) are becoming the navigational means of the future.

4.1.1 Area Navigation (RNAV)

RNAV is a method of lateral and vertical navigation that permits aircraft to operate on any course within the coverage of ground-based navigational aids or within the limits of a self contained aircraft navigational system, or a combination of these. RNAV navigational systems include Flight Management System (FMS), Inertial Reference Units, Inertial Navigation Systems, Heading Reference Systems, GPS, WAAS, and multimode receivers.

RNAV routes and terminal procedures include departures, arrivals and approaches and are designed considering the performance capability of current RNAV aircraft systems operating in the NAS. RNAV navigation utilizes a series of points in space called waypoints with specific leg designs to define a route.

Waypoints are predetermined geographical positions defined in terms of latitude and longitude coordinates most commonly used to indicate a change in speed or direction. RNAV makes use of Fly By and Fly Over waypoints. Fly By waypoints are used when an aircraft should turn to the next course prior to reaching the waypoint separating the two legs. Fly Over waypoints are used when aircraft should fly over the point prior to starting the turn.

An individual segment, waypoint to waypoint, is commonly referred to as a leg. RNAV utilizes various leg types to define the desired path proceeding, following or between waypoints on an RNAV procedure. There are many leg types that have been developed by avionics manufactures. However, ones currently approved for use include Track to a Fix, Direction to a Fix, Course to a Fix, Radius to a Fix, heading to an altitude, heading to a DME, and heading to a manual termination.

4.1.2 Required Navigational Performance (RNP)

RNP is intended to provide a single performance standard for aircraft manufacturers, airspace designers, pilots, controllers, and international aviation authorities. RNP is a statement of the navigational performance necessary for operation within a defined airspace area. RNP provides aircraft operators a means to gain access to airspace not available via conventional means and provides both lateral and vertical guidance. RNP applications are similar to RNAV but typically are more flexible due to the more advanced navigation systems required to gain certification.

RNP certifications and requirements are typically expressed as a value in terms of nautical miles (e.g. RNP 1.0). In order to utilize RNP, aircraft must meet certification criteria. Typically, aircraft with RNAV installations with Aircraft Flight Manual (AFM) RNP certifications based on GPS or system integrating GPS are considered to meet United States standards. Aircraft with AFM/RNP certifications without GPS may be limited to certain RNP levels. Aircraft navigational systems eligible for RNP airspace are typically listed on charts or announced through NOTAMS.

4.1.3 RNAV/RNP Aircraft Systems

Examples of typical systems that provide RNAV/RNP capability include FMS IRU DME/DME, FMS GPS, and stand alone GPS systems. Not all aircraft are equipped to perform every type of RNAV or RNP procedure. For example an aircraft equipped with a FMS using DME/DME position updating may not be eligible to use certain types of RNAV procedures due to the lack of availability of DME coverage in a given airspace area. The accuracy and integrity of the system may also preclude it from lower RNP levels that may be required for an operation. Some aircraft FMS systems may not be able to fly certain leg types precluding them from some procedures. Some aircraft are Non-RNAV, and cannot perform any type of RNAV procedure.

The Equipment Suffix filed by an aircraft on an IFR flight plan, denotes whether or not the aircraft is RNAV capable and its equipage level to Air Traffic Controllers. The Equipment Suffix is expressed as a letter preceded by a forward slant. For example, an Equipment Suffix of /E indicates that the aircraft is equipped with an FMS capable of DME/DME and IRU position updating. **Table 4-1** lists the various Equipment Suffixes and their associated capabilities.

Table 4-1 Aircraft Equipment Capability Suffix Codes

Suffix	NO DME
/X	No transponder
/T	Transponder with no Mode C
/U	Transponder with Mode C
Suffix	**DME**
/D	No transponder
/B	Transponder with no Mode C
/A	Transponder with Mode C
Suffix	**TACAN ONLY**
/M	No transponder
/N	Transponder with no Mode C
/P	Transponder with Mode C
Suffix	**AREA NAVIGATION (RNAV)**
/Y	LORAN, VOR/DME, or INS with no transponder
/C	LORAN, VOR/DME, or INS, transponder with no Mode C
/I	LORAN, VOR/DME, or INS, transponder with Mode C
Suffix	**ADVANCED RNAV WITH TRANSPONDER AND MODE C** (If an aircraft is unable to operate with a transponder and/or Mode C, it will revert to the appropriate code listed above under Area Navigation)
/E	FMS with DME/DME and IRU position updating
/F	FMS with DME/DME position updating
/G	Global Navigation Satellite System (GNSS), including GPS or WAAS, with enroute and terminal capability
/R	Required Navigational Performance. The aircraft meets the RNP type prescribed for the route segment(s), route(s), and/or area concerned.
Suffix	**Reduced Vertical Separation Minimum (RVSM)** Prior to conducting RVSM operations within the U.S., the operator must obtain authorization from the FAA or from the responsible authority as appropriate.
/J	/E with RVSM
/K	/F with RVSM
/L	/G with RVSM
/Q	/R with RVSM
/W	RVSM

Source: *2007 Federal Aviation Regulations / Aeronautical Information Manual (FAR/AIM)*
Prepared by: ASRC Research and Technology Solutions

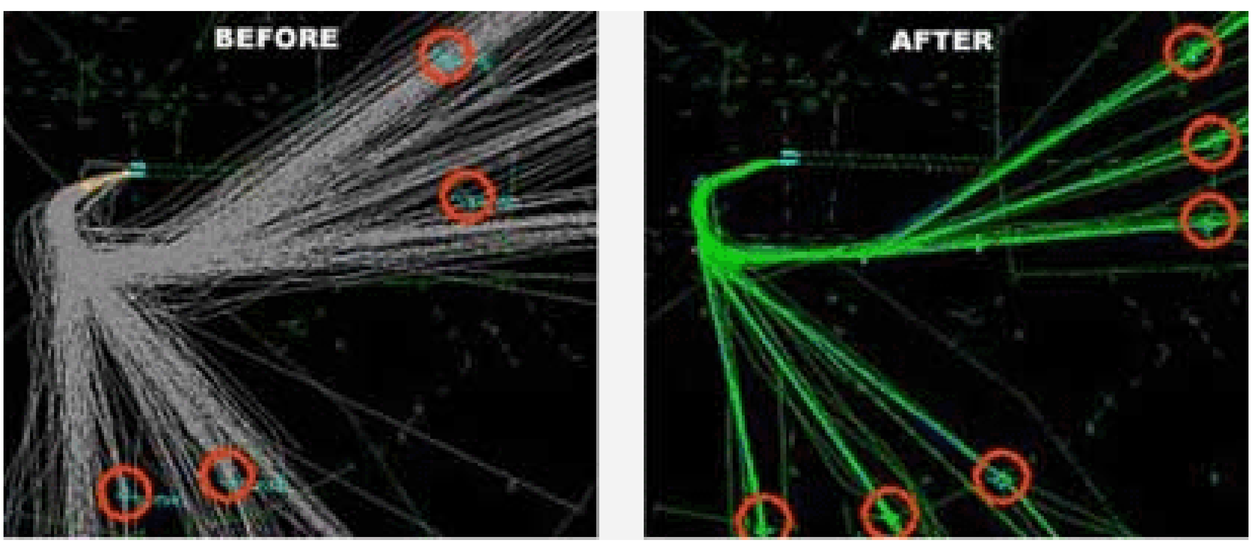
In general, aircraft can be classified into one of three basic categories based on the level of navigational equipment. These categories are: RNAV GPS, RNAV DME/DME, and Non-RNAV. Aircraft are classified RNAV GPS when they are; equipped with an FMS, the FMS is GPS equipped, or if the aircraft is equipped with a stand alone GPS system, and the appropriate slant code is filed. Aircraft are classified as RNAV DME/DME when they are; equipped with an FMS, are equipped with additional equipment required for RNAV, are not GPS equipped, and when the appropriate slant code is filed. Finally, a Non-RNAV aircraft is one that does not have an FMS, or does not file an appropriate slant code.

4.1.4 Impacts of RNAV and RNP on Flight Track Dispersion

The development of RNAV/RNP procedures has been evolving since the late 1990s through efforts of the Terminal Area Operations Rulemaking Committee and the Performance based Aircraft Aviation Rulemaking Committee (PAARC). Many new procedures are now being developed and implemented at airports throughout the County, allowing equipped aircraft to fly direct from one destination to another, saving valuable time and costs.

Ground tracks associated with RNAV/RNP procedures are predictable and repeatable than those associated with conventional navigation aids. This is a result of the accuracies of GPS and the ability of the FMS, which has the route loaded into a database and displays it on a screen for pilots, to be coupled with an Auto Pilot. The Auto Pilot can fly the routes much like a highway in the sky. Arrival and departure routes can be designed to avoid environmental sensitive areas more efficiently as compared to routes based on ground based navigation aids. RNAV/RNP will also narrow the dispersion of aircraft ground tracks flying these routes. Exhibit 3-1 depicts a comparison of departure track dispersion at the Atlanta Hartsfield Airport (ATL) before and after the implementation of RNAV departure procedures. As can be seen, the dispersion of traffic is confined tightly to a predetermined route with the use of RNAV departure procedures.

Exhibit 3-1 RNAV Flight Track Dispersion Comparison



Source: FAA RNAV/RNP Office

Air Traffic Dispersion Comparison Before and After the Implementation of RNAV Procedures

4.1.5 Use of RNAV and RNP at John Wayne Airport

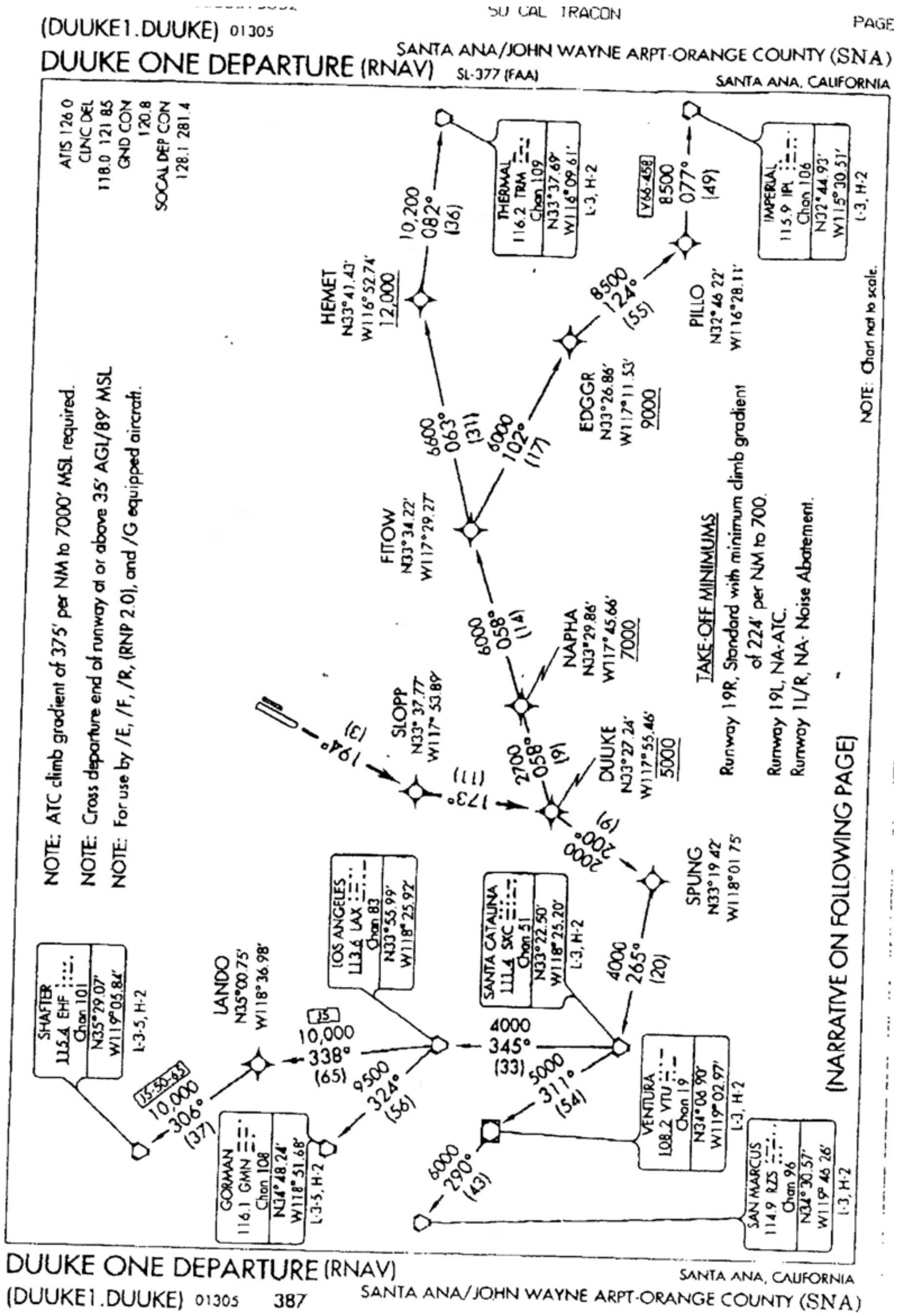
Currently, there are no public RNAV departure procedures serving SNA. However, according to airport and FAA personnel, Alaska Airlines currently utilizes a proprietary or "Special" procedure for CHANNEL ONE and MUSEL SIX departure procedures. At the writing of this document this procedure was not available.

There have been efforts to develop FMS/RNAV based departures by American Airlines and FAA. The American Airlines procedure was found in a letter of agreement document dated December 3, 1996 and was called the Back Bay Two departure. The procedure path mimicked the initial flight track of the CHANNEL and MUSEL departures transitioning to the TRM and IPL en route fixes. The most recent letter of agreement documents do not reference this procedure, therefore it is assumed to have been abandoned.

The FAA developed a public RNAV departure in 2005 called the DUUKE ONE. The procedure, depicted in **Exhibit 3-2**, required the aircraft to climb via the 194° course to the SLOPP WP, and then via 173° course to DUUKE WP. The intent of the procedure was to create an RNAV procedure based on the CHANNEL ONE and MUSEL SIX departure route. However, the design of the DUUKE ONE Departure placed the initial turn point (SLOPP) approximately 3 NM from the departure end of the runway, further south of the runway than the MUSEL or CHANNEL departure procedures. The reason for this placement is thought to be a function of the RNAV design requirements at the time. Aircraft flying this procedure would over-fly the Newport Heights area due to the delayed turn. Since the departure route was not consistent with noise compatible areas or the current noise abatement corridor and would likely cause noise impacts, it was retracted.

RNAV design criteria has evolved over the past several years and now includes techniques to allow the placement of a waypoint closer to the runway end resulting in a ground track that is consistent with the established noise corridor and requirements for departures. The redesign and implementation of the DUUKE ONE departure would provide tighter dispersion of aircraft ground tracks through the Newport Bay corridor and over the area as compared to today, potentially providing noise reduction in areas to the east and west.

Exhibit 3-2 DUUKE ONE RNAV Departure Procedure



4.2 Aircraft Advancements

The FAA is adopting a new noise standard for subsonic jet airplanes and subsonic transport category large airplanes. This noise standard ensures that the latest available noise reduction technology is incorporated into new aircraft designs. This noise standard, Stage 4, applies to any person submitting an application for a new airplane type design on and after January 1, 2006. The standard may be chosen voluntarily prior to that date. This noise standard is intended to provide uniform noise certification standards for Stage 4 airplanes, certificated in the United States, and those airplanes that meet the new International Civil Aviation Organization Annex 16 Chapter 4 noise standard.

Negative community impacts due to noise have resulted in increased restrictions to airport capacity. Restrictions like curfews, prohibited overflight of noise sensitive areas, slot restrictions, and implementation of special noise abatement procedures all limit capacity by dictating when and where airplanes are allowed to fly. In an effort to preserve and expand capacity, new quiet technologies are being researched and developed. These technologies are being developed by the FAA, NASA, Industry, and academic sources.

4.2.1 Aircraft Performance

Engine noise is responsible for a large portion of cumulative noise impacts caused by aircraft. One advancement in engine technology leading to quieter engines is the advent of the Ultra High Bypass Ratio engine (UHB). To allow for higher bypass ratios, different designs being studied include technologies like geared fans, smaller multiple fans, and a cowling that is integrated with the fuselage/wing.

A major source of engine noise is the high velocity jet exhaust mixing with lower speed fan exhaust. A UHB successfully reduces noise by allowing for a lower fan tip speed and lower jet exhaust velocities. These lower jet exhaust velocities along with jet nozzle mixing devices allow the two airflows to be mixed more easily, lowering emitted noise.

Some of the noise produced by an aircraft's engines can be suppressed through advancements in nacelle lining. A nacelle is simply the engine housing. It forms the intake area in front of the engine, and directs airflow from the fan to the rear of the engine. An acoustic nacelle liner effectively reduces noise by absorbing it before it is released to the environment. Nacelle shape is also being studied as a way to limit noise. Curved ducts, and extended and variable nozzles at the rear of the nacelle may also help in curtailing noise.

A technology being developed by NASA to further quiet engines is Active Noise Control. Active Noise Control works by using sensors detect the noise being produced by the engine. Actuators then produce the negative noise necessary to effectively cancel out engine noises. This system works in the same way as noise canceling headphones, but on a much larger scale. This technology is still being developed, but could one day be extremely effective at curtailing engine noise.

Airframe noise is caused by the physical design of the aircraft. The level of noise is highly variable based on the configuration, or position of the flaps, slats, and landing gear. Airframe noise is at its peak under approach conditions when the flaps and landing gear are fully extended. This configuration causes further impacts due to the aircraft's close proximity to the ground when landing. The amount of noise impact on approach can be equal to that caused by the engines. Much of this noise is generated when the air flowing over the surfaces of the aircraft is disrupted from its regular smooth path. This turbulence, and the noise associated with it, can be effectively reduced through changes to the offending airframe components. Currently under study are fairings and plasma actuators for landing gear which minimize the flow separation or air passing over them.

The sharp, 90° corners on flaps are also a generator of noise. Modifications to flap edge design are being studied to reduce this source of noise. Modifications like rounded edges, flaplets (similar to winglets), and other technologies developed using flow-physics models.

Slats pose a similar problem to flaps, but the source of the noise is different. For slats, noise is produced when there is a separation of flow over the slat's gap. Technologies being tested for the suppression of slat noise include serrated edges of slats, and filler material to reduce the separation of air flow.

Electric alternatives are also being explored as an alternative to traditional turbine engines. Electric nose gear are being developed to limit turbine use on taxiways. This would benefit airlines in less fuel consumption and less time spent running engines. It would also reduce noise affecting communities very close to the airport. Wholly electric aircraft are also in the works. Boeing and others are studying technologies like fuel-cells in small aircraft which could someday be scaled into transport sized aircraft.

Each manufacturer will apply these techniques and changes independently based on economic and business models. However, it is likely some of these conceptual designs and changes will be implemented on aircraft within the next 20 years.

V. Newport Beach Noise Issues

During the scoping of the statement of work for this study, representatives from the City of Newport Beach provided several issues and questions to be addressed. These issues/questions are as follows.

- Why do the airplanes fly where they do?
- Can the flight paths be moved?
- Why is there dispersion of flight tracks over Balboa Island?
- Why are aircraft turning prior to the Pacific coast line?

These topics are addressed in the following sections.

5.1 Why Do the Airplanes Fly Where They Do?

As described in Chapter 2 of this report, commercial operation operate under Instrument Flight Rules and follow Standard Instrument Departure Procedures, Standard Terminal Arrival, and Standard Instrument Approach Procedures at SNA.

All of these procedures have been developed to provide aircraft operators' efficient access into and out of the airport while minimizing impacts to local communities. The airfield is operated in two flow configurations: landing and departing to the north and landing and departing to the south. Aircraft land and depart into the wind. Since the wind primarily originates from the south and west, the south flow is primarily used.

In a south flow configuration, the City of Newport Beach is subject primarily to departures from Runway 19R. Runway 19R commercial departures use either the CHANNEL ONE or MUSEL SIX SID or a "special" proprietary procedure. All of the departure procedures are similar in design with a route following the Newport Bay corridor to the Pacific Ocean, avoiding residential developments close to the airport. The Newport Bay area is not populated and provides a natural corridor for aircraft operations.

Commercial arrivals in the south flow configuration, enter the area from the Pacific Ocean on a downwind approximately 5NM north of the airfield or from the north and east of the airport. The flight paths of arriving commercial aircraft do not fly over the City in a south flow configuration.

In a north flow configuration, Newport Beach is subject to arrivals to Runway 01L and departures from Runway 01L. Arrivals to Runway 01L primarily follow the runway extended centerline. Arrivals are vectored to the Final Approach Fix, located approximately 4.7 NM from the end of runway and descend on a 3.01° or 3.21° glide path angle. The arrival path of the aircraft crosses the northwest areas of the city. This path is set due to the physical location of the runways at SNA. Aircraft along this path are on the final phase of flight with engines in reduced power modes.

Newport Beach does have some Runway 01L commercial departures overflights in a north flow configuration that proceed to the north, south, and west of the airport. These departures fly the runway heading until they reach the Minimum Vectoring Altitude in the area (approximately 3 to 5 NM to the northeast) and then are vectored to the right on a downwind approximately 2 to 4 NM south of the airport over the Fashion Island area. The aircraft crossing the Fashion Island areas are at altitudes higher than 4000 feet MSL. The aircraft vectored in this area are typically north bound and are required to be established at altitudes compatible with airspace associated with the Los Angeles terminal area.

5.2 Can the Flight Paths Be Moved?

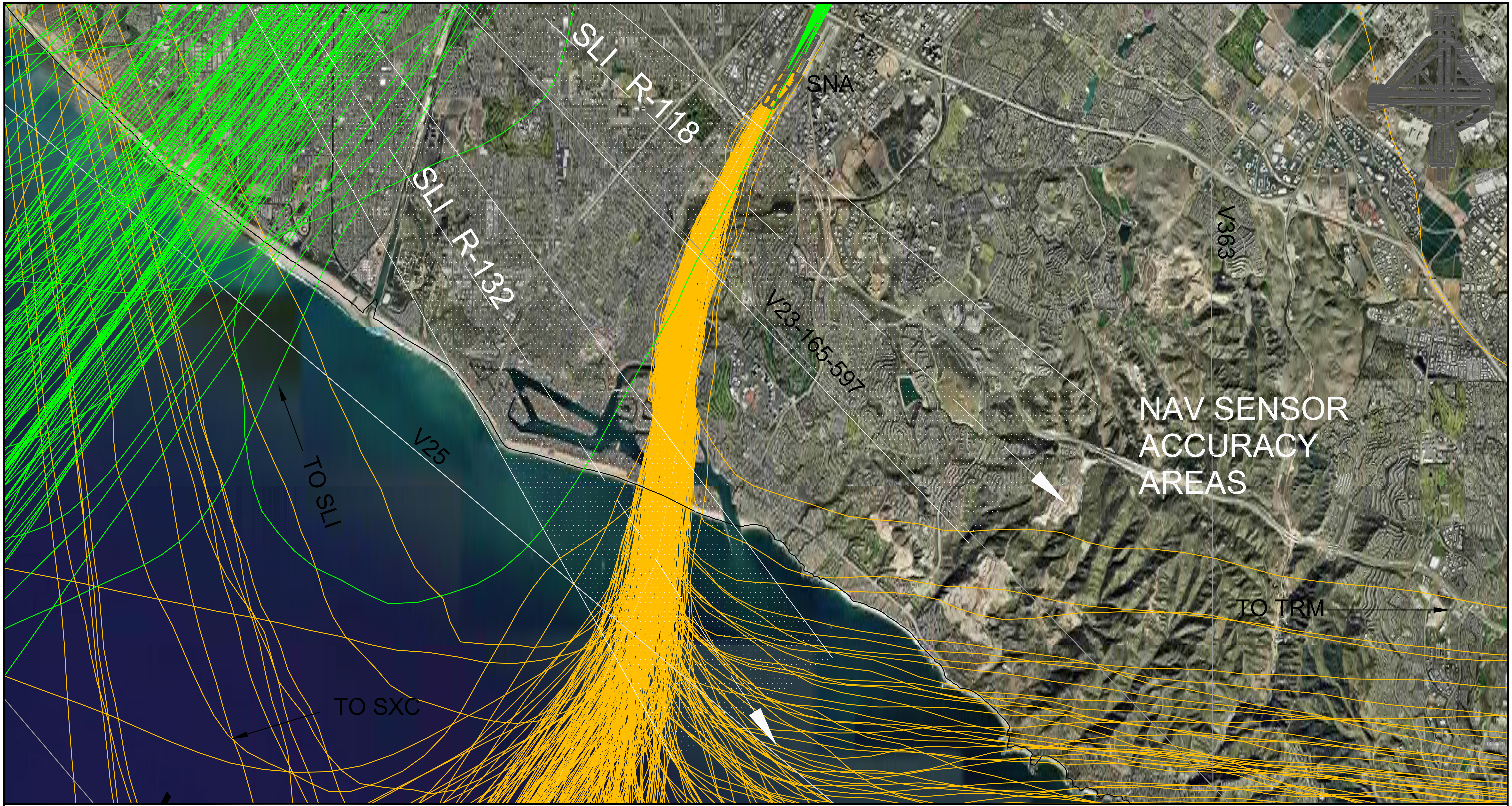
Moving flight tracks is subject to stringent air traffic, flight standards and safety, and environmental requirements. Assuming air traffic and flight safety issues are addressed, if movement of a flight track results in an increase in noise in another area of more than 3 decibels, an Environmental Assessment (EA) is required. An EA would assess the effects of a procedural or flight track change and study impacts associated with the proposed changes or action. If significant impacts are identified with the proposed action in the EA an Environmental Impact Statement would likely be required. In general an action that simply redistributes noise from one impact area to another will not be approved.

The flight paths over Newport Beach are well established and are associated with either the final segment of an approach or a departure procedure designed to keep aircraft in an established noise corridor. **Exhibit 2-4** depicts a sample of Runway 19R departure tracks at SNA. The tracks in the figure follow the Newport Bay from the end of the runway to the Coast Highway and crosses over Balboa Island and the peninsula northwest of the Newport Channel. According to the land use and zoning maps previously discussed in this document, the majority of the area is Single Family Residential. Moving the flight path anywhere northwest or southeast of the Coast Highway would only spread noise from one residential area to another and would likely result in a 3db increase in noise in new areas thereby requiring an EA or EIS and would likely not be approved because it would provide no total net gain in noise abatement.

5.3 Why is there Dispersion of flight tracks over Balboa Island?

Exhibit 5-1 depicts a sample of Runway 19R departure tracks at SNA in comparison to the designed flight path of the CHANNEL ONE and the MUSEL SIX departure procedures. As the figure depicts, these procedures are designed to track aircraft directly over Balboa Island.

Flight track dispersion can be caused by many factors including NAVAID accuracies, wind, navigation, pilot techniques, and air traffic control. The procedures indicate the first turn to heading 175° when passing the SLI VORTAC 118° radial at a point 1 DME south of the Localizer. This first turn will vary between the actual radial or DME fix and a point that takes into account the crossing course accuracy of the particular NAVAID being used. DME accuracies are typically ½ nautical miles, where VOR radials vary in accuracy based on plus or minus 3.6° when using a crossing radial. Aircraft performance, navigation capability, pilot reaction time, and crosswinds may also cause course deviation and dispersion of the ground track.



1. SOURCE: ORANGE COUNTY JOHN WAYNE AIRPORT ANOMS FLIGHT TRACK DATA
2. ARRIVAL TRACK
3. DEPARTURE TRACK

DWN BY:	RMV	DATE:	1/17/08
CHK BY:		DATE:	

1 NM 0 1 NM

ASRC Research and Technology Solutions

CITY OF NEWPORT BEACH
RUNWAY 19R DEPARTURES (SOUTH FLOW)
CLOSE IN VIEW - COMMERCIAL TRAFFIC ONLY

EXHIBIT 5-1

The flight tracks depicted show less than a 1 NM dispersion over Balboa Island. This dispersion is considered normal considering the operations are conducted based on ground based NAVAIDs or ATC vectors to fly the two departures. Implementation of an RNAV departure based on GPS navigation would likely serve to tighten the dispersion of the tracks.

5.4 Why are aircraft turning prior to the Pacific coast line?

The departure procedures provide paths for aircraft to follow that extend past the Pacific coastline followed by turns to the enroute fixes. It has been reported that many aircraft turn early prior to the coast, flying over residential areas. It is likely that many of these instances are turbo-prop aircraft, which are permitted to turn before reaching the coast. In other instances, this phenomenon likely occurs where air traffic separation is required or in the case of non-commercial VFR operations.

There is no documentation on any of the departure procedures identifying the coast or restricting aircraft from turning early. Through discussions with SNA ATCT and SoCal TRACON personnel it was indicated that early turns are not permitted. However, a review of the SNA Tower order and Letters of Agreements between the SNA ACTC and SoCal TRACON revealed no formal policy regarding early turns.

5.5 Why are aircraft adding power in the vicinity of the Coast Highway, prior to reaching the coastline?

A phenomenon has been observed where aircraft are adding power in the vicinity of the Coast Highway and Balboa Island. This results in an increase in the amount of noise being generated in this area. This phenomenon is most likely occurring due to the fact that many aircraft are reaching an altitude of 3,000 feet in this vicinity. The noise abatement procedure ends at 3,000 feet. Therefore, when aircraft attain an altitude of 3,000 feet, they retract flaps and apply full takeoff power in order to clean-up and depart from the airport vicinity.

A presentation by the Airport Director entitled Aircraft Departure Tracks, given to the Newport Beach Aviation Committee dated October 22, 2007 corroborates this hypothesis. The analysis performed for this presentation tracked all aircraft departures over Balboa Island for a period of 24 hours and aircraft departures in the same vicinity by type and weight for a period of one week. The results of this analysis indicate that most aircraft reach an altitude of 3,000 feet in the vicinity of Balboa Island and the Coast Highway.

VI. Noise Mitigation Alternatives

The purpose of this section is to suggest possible noise abatement techniques for the City of Newport Beach to consider or pursue with the airport and FAA. The alternatives presented in this report are a result of analysis of existing conditions at SNA, review of the air traffic flows, and discussions with airport and Air Traffic Control representatives. It is important to note that the alternatives presented in this section are merely suggestions and will likely warrant further study well beyond the scope of services identified for this report. The following noise abatement suggestions are as follows:

- Redesign and implementation of the DUUKE ONE RNAV departure.
- Modify existing departure procedures to ensure operations fly over the Pacific coast line prior to turning.
- Reverse flow during calm wind conditions.
- Evaluate the use of the Distant departure profile instead of Close In departure profile.
- Support research of Continuous Descent Arrivals (CDA).
- Provide incentives for the use of Stage 4 aircraft at SNA.

6.1 Redesign and Implement the DUUKE One RNAV Departure

As previously mentioned, the FAA originally prepared the DUUKE One departure procedure in 2005 but the procedure was abandoned because the initial segment was not consistent with the noise abatement departure corridor over the Newport Bay. At that time criteria did not exist to allow for aircraft to make a turn at 1 DME from the departure end of the runway. Since 2005, new RNAV TERPS criteria have become available and the procedure could be designed to follow the channel.

The refinement and implementation of the DUUKE ONE departure would provide tighter dispersion of aircraft ground tracks through the Newport Bay corridor and over the area as compared to the existing procedures published, potentially providing noise reduction in areas to the east and west.

6.2 Modify Departure Procedures to Ensure Commercial Aircraft Fly Over the Coast Prior to Turning

This alternative was suggested based on the complaint that aircraft are turning early over the Newport Channel prior to crossing the coast line of the Pacific Ocean. Each of the published departure procedures could have an additional fix added prior to MUSEL approximately 1NM beyond the coast. The instructions on the procedure could require aircraft to cross the new fix prior to any turns toward the en route fix. The new fix could be included on the RADAR display of the TRACON to aid controllers in defining the turn point of the procedure.

In order to ensure this change would be followed, coordination would be required to establish a formal written policy with the FAA (SoCal TRACON) of no turns prior to the fix. This formal policy should then be written into the Standard Operating Procedures for the TRACON to ensure it is followed.
flow.

6.3 Evaluate Departure Procedures As New Technology Aircraft Enter the Fleet

The analysis and development of AC 91-53A was done in 1993. The aircraft operating at that time included most of the aircraft operating today, except for the Boeing 737-700 and 737-800 aircraft and the Airbus 318 aircraft. These newer aircraft climb faster and reach higher altitudes sooner. There are emerging technologies that will continue to provide improved noise characteristics and improved aircraft performance. These may change the conclusions drawn in 1993 with regard to the best departure procedures for John Wayne Airport.

The noise abatement departure procedures described in AC 91-53A involve trading noise levels close to the airport for noise levels more distant from the airport. In 2003 Minneapolis studied departure procedures and concluded that a 'distant' departure procedure was optimum as compared to the 'close-in' procedure described in AC 91-53A. However, the geometry at each airport is unique and must be carefully considered on a case by case basis. At John Wayne Airport, the homes closest to the south end of the main runway are about 8,000 feet from where the aircraft begin their takeoff roll. Most airports have runways that are longer than that. This close distance is major constraint on which departure procedure will work best. With the distant procedure, the cutback from full takeoff power to climb power takes place after the flaps are retracted. This is well past those closest homes. With the close-in procedure, the cutback occurs as early as 800 feet altitude which is generally reached at about the time the aircraft are approaching these closest homes. This cutback is key to the noise reduction that is achieved by the current procedures.

In order to ensure that a change in procedure does not result in higher noise levels at these closest homes, any change in procedure will require aircraft that have a higher climb rate than those aircraft operating at John Wayne Airport today. As newer aircraft enter the fleet, the departure procedures should be reviewed to ensure that the procedures in use represent the optimum procedure for operations at SNA.

6.4 Support Research for Continuous Descent Approaches

Continuous Descent Approaches involve the continuous gradual descent of an aircraft on a constant slope with engines at idle speed without the deployment of flaps or landing gear to reduce the airframe noise on approach. Regular approach procedures involve the deployment of flaps and landing gear on a step down basis some times referred to as “dive and drive”.

Benefits of CDA include less noise and engine emissions and better fuel economy. FAA, NASA, UPS and Boeing have been involved in the study of CDA approaches at various airports across the country including SNA. Contact was made with Boeing through the research phase of this report, however no data was available regarding the studies conducted at SNA. It is recommended that this research effort be monitored and ultimately included as a noise abatement alternative.

6.5 Provide Incentives for the use of Stage 4 Aircraft at SNA

As indicated throughout this report, all new aircraft produced after 2006 must meet Stage 4 noise requirements. Stage 4 aircraft are emerging today and will replace the Stage 3 fleet over the course of the next 5 to10 years. It is not possible to predict the phase out schedule of Stage 3 aircraft in the NAS or at a particular airport at this time. However, it is possible to recognize that these aircraft are coming and to promote their use at SNA by offering incentives, such as reduced landing fees.

6.6 Work with Airlines to revise Operational Specifications to Require Aircraft to Fly to 6NM DME before Adding Power

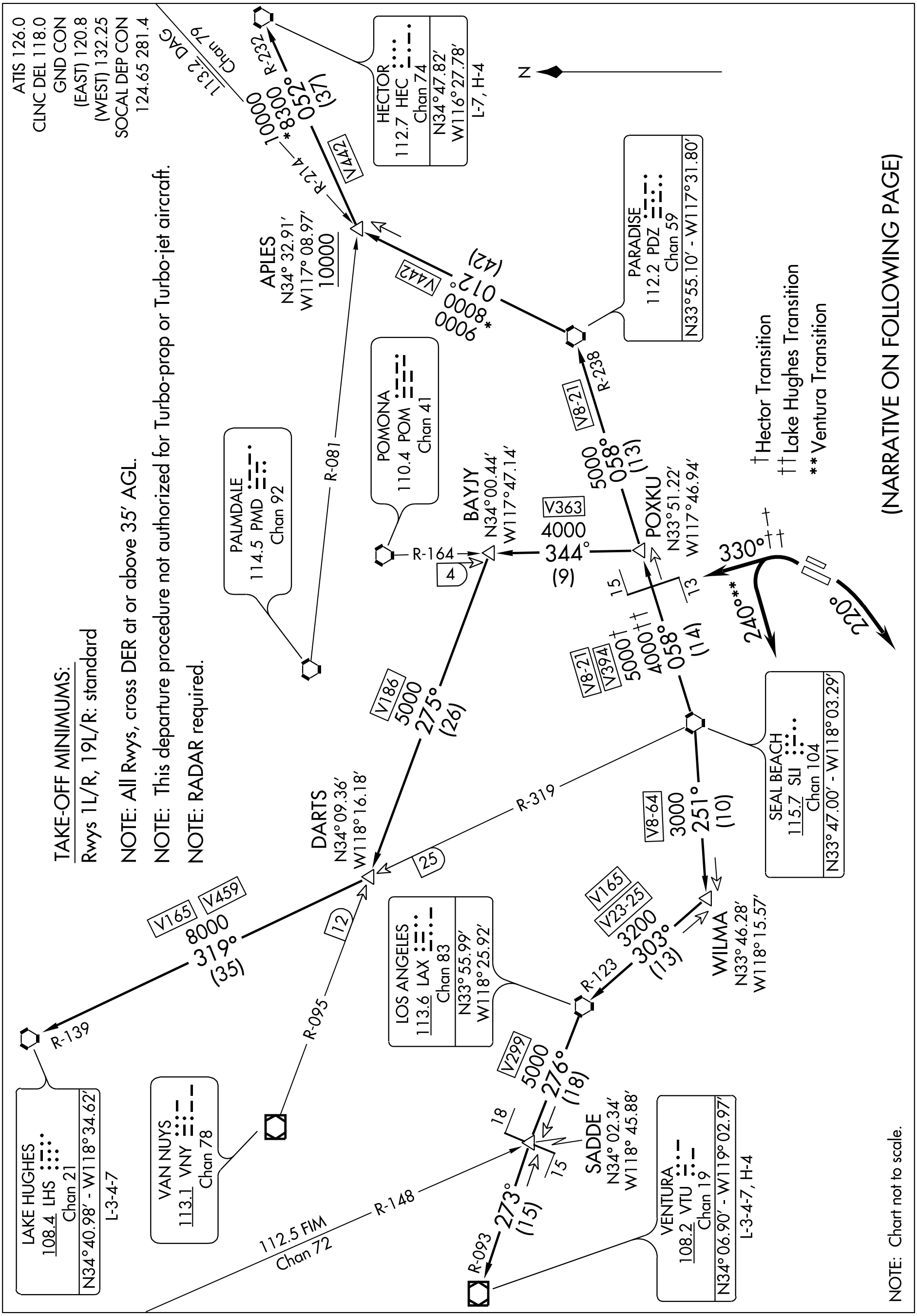
In an effort to diminish or eliminate the instances of aircraft adding power prior to reaching the coastline, it is suggested that the City of Newport Beach work with the airport and the airlines to have their Operational Specifications revised. This would work in conjunction with the procedure modification discussed in section 6.2 of this document. If aircraft were required to fly to the newly established fix (prior to MUSEL and approximately 1 NM beyond the coastline) this would prevent them from applying power in the vicinity of Balboa Island and the coast highway. Essentially airlines should be asked to revise their Ops Specs to require aircraft to fly to approximately 6 NM DME, or to the newly established fix, before retracting flaps and applying full takeoff power.

APPENDIX A – Standard Instrument Departure Plates

ANAHEIM THREE DEPARTURE

SL-377 (FAA)

SANTA ANA, CALIFORNIA



DEPARTURE ROUTE DESCRIPTION

TAKE-OFF RUNWAYS 19L/R: Turn right heading 220° for radar vectors to SLI VORTAC. Thence....

TAKE-OFF RUNWAYS 1L/R:

HECTOR or LAKE HUGHES TRANSITION: Turn left heading 330° for radar vectors to SLI VORTAC. Thence....

VENTURA TRANSITION: Turn left heading 240° for radar vectors to LAX VORTAC. Thence....

....via (transition) or (assigned route). Maintain 2000 feet. Expect clearance to filed altitude 10 minutes after departure.

HECTOR TRANSITION (ANAHM3.HEC): From over SLI VORTAC via SLI R-058 and PDZ R-238 to PDZ VORTAC, then via PDZ R-012 and HEC R-232 to HEC VORTAC.

LAKE HUGHES TRANSITION (ANAHM3.LHS): From over SLI VORTAC via SLI R-058 and PDZ R-238 to POXKU INT, then via POM R-164 to BAYJY INT, then via VNY R-095 to DARTS INT. Thence via SLI R-319 and LHS R-139 to LHS VORTAC.

VENTURA TRANSITION (ANAHM3.VTU): From over SLI VORTAC via SLI R-251 to WILMA INT, then via LAX R-123 to LAX VORTAC, then via LAX R-276 and VTU R-093 to VTU VOR/DME.

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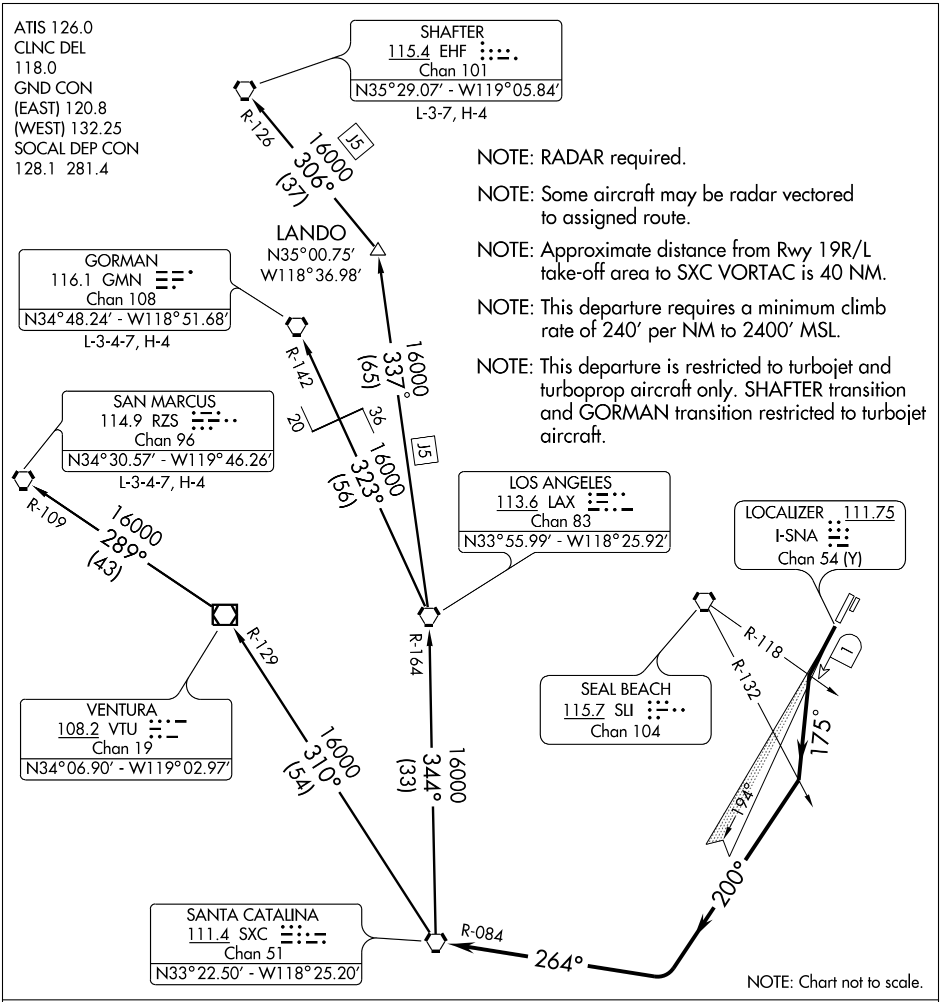


DEPARTURE ROUTE DESCRIPTION

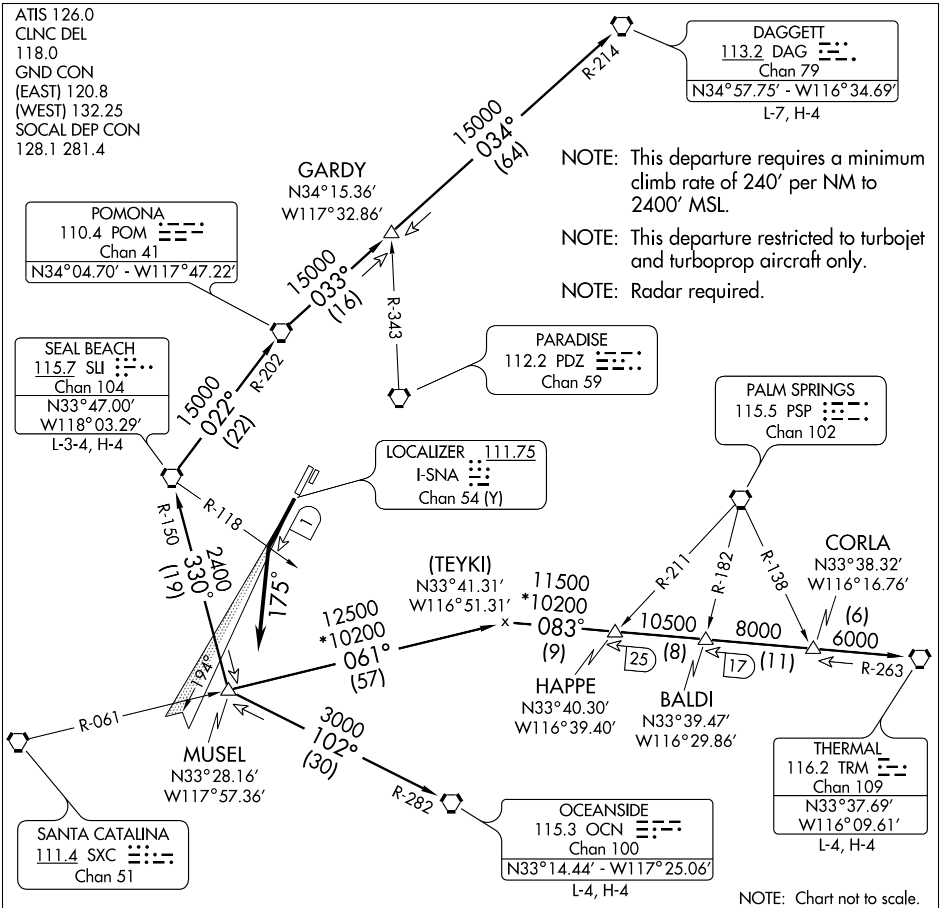
TAKE-OFF RUNWAY 19L/R: Maintain runway heading or I-SNA localizer south course to I-SNA 1 DME fix or SLI R-118, turn left heading 175°, cross SLI R-132 then turn right heading 200°, intercept and proceed via SXC R-084 to SXC VORTAC, thence via (transition) or (assigned route). Expect filed altitude ten minutes after departure.

GORMAN TRANSITION (CHANL1.GMN): From over SXC VORTAC via SXC R-344 and LAX R-164 to LAX VORTAC, then via LAX R-323 and GMN R-142 to GMN VORTAC.

SAN MARCUS TRANSITION (CHANL1.RZS): From over SXC VORTAC via SXC R-310 and VTU R-129 to VTU VOR/DME, then via VTU R-289 and RZS R-109 to RZS VORTAC.

SHAFTER TRANSITION (CHANL1.EHF): From over SXC VORTAC via SXC R-344 and LAX R-164 to LAX VORTAC, then via LAX R-337 to LANDO INT and EHF R-126 to EHF VORTAC.

MUSEL SIX DEPARTURE



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DEPARTURE ROUTE DESCRIPTION

TAKE-OFF RUNWAY 19L/R: Maintain runway heading or I-SNA localizer south course to I-SNA 1 DME fix or SLI R-118, turn left heading 175° for radar vectors to MUSEL INT, then via (transition) or (assigned route). Expect filed altitude ten minutes after departure.

DAGGETT TRANSITION (MUSEL6.DAG): From over MUSEL INT via SLI R-150 to SLI VORTAC, then via SLI R-022 and POM R-202 to POM VORTAC, then via POM R-033 and DAG R-214 to DAG VORTAC.

OCEANSIDE TRANSITION (MUSEL6.OCN): From over MUSEL INT via OCN R-282 to OCN VORTAC.

SEAL BEACH TRANSITION (MUSEL6.SLI): From over MUSEL INT via SLI R-150 to SLI VORTAC.

THERMAL TRANSITION (MUSEL6.TRM): From over MUSEL INT via SXC R-061 and TRM R-263 to TRM VORTAC.

APPENDIX B – Standard Terminal Arrival Route Plates

KAYOH FOUR ARRIVAL

ST-236 (FAA)

LONG BEACH, CALIFORNIA

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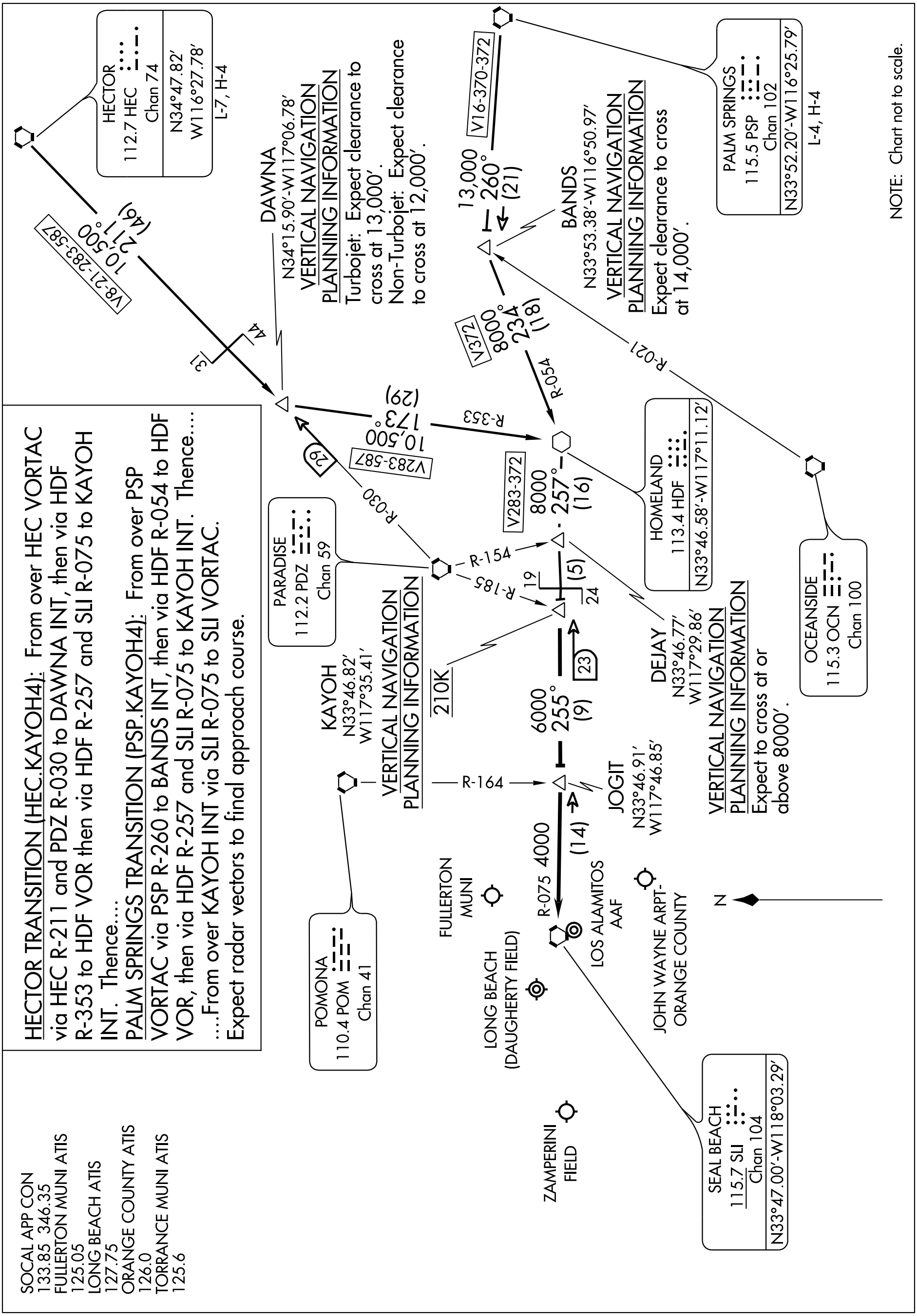

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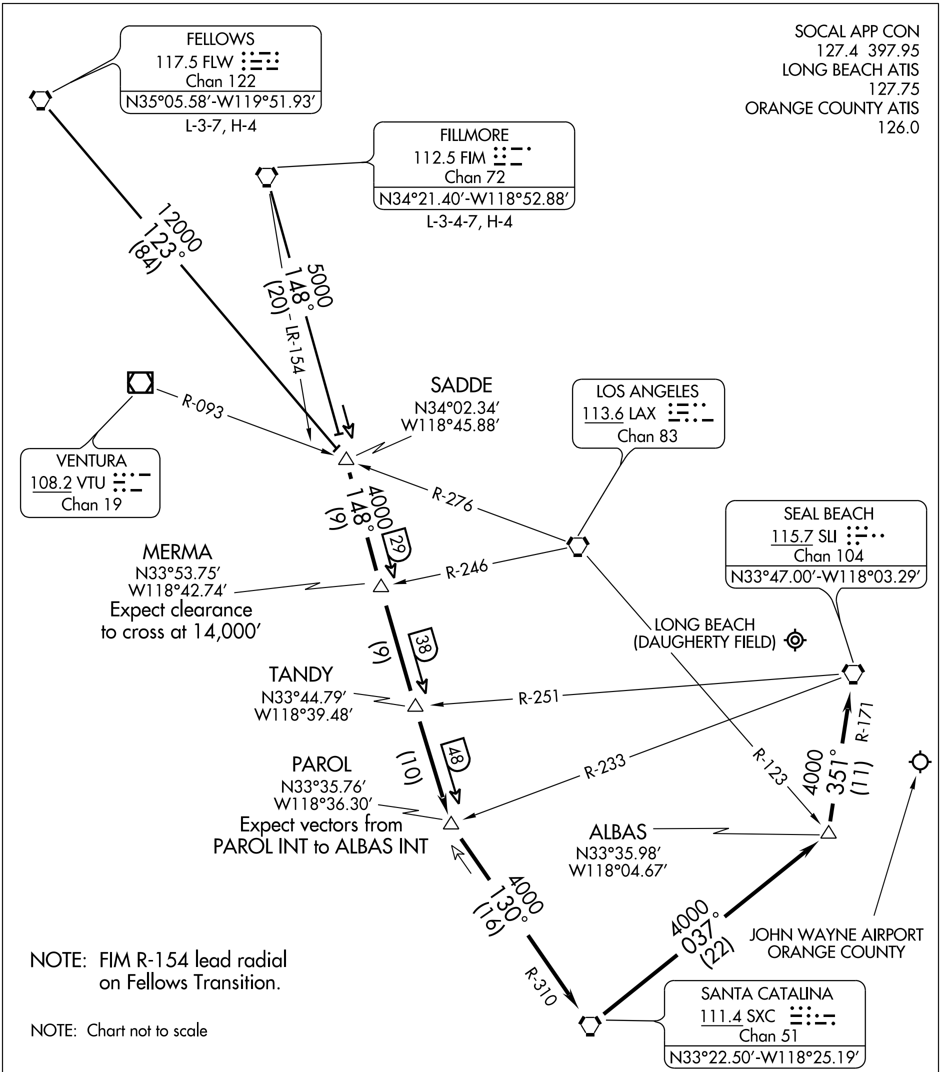
KAYOH FOUR ARRIVAL

LONG BEACH, CALIFORNIA

TANDY THREE ARRIVAL

ST-236 (FAA)

LONG BEACH, CALIFORNIA



<u>FELLOWS TRANSITION (FLW.TANDY3):</u> From over FLW VORTAC via FLW R-123 to SADDE INT. Thence....

<u>FILLMORE TRANSITION (FIM.TANDY3):</u> From over FIM VORTAC via FIM R-148 to SADDE INT. Thence....

....From over SADDE INT via FIM R-148 to PAROL INT. From over PAROL INT via SXC R-310 to SXC VORTAC. Then from over SXC VORTAC via SXC R-037 and SLI R-171 to SLI VORTAC.

APPENDIX C – Instrument Approach Procedure Plates

LOC/DME I-SNA 111.75 Chan 54(Y)	APP CRS 194°	Rwy ldg 5700 TDZE 55 Apt Elev 56

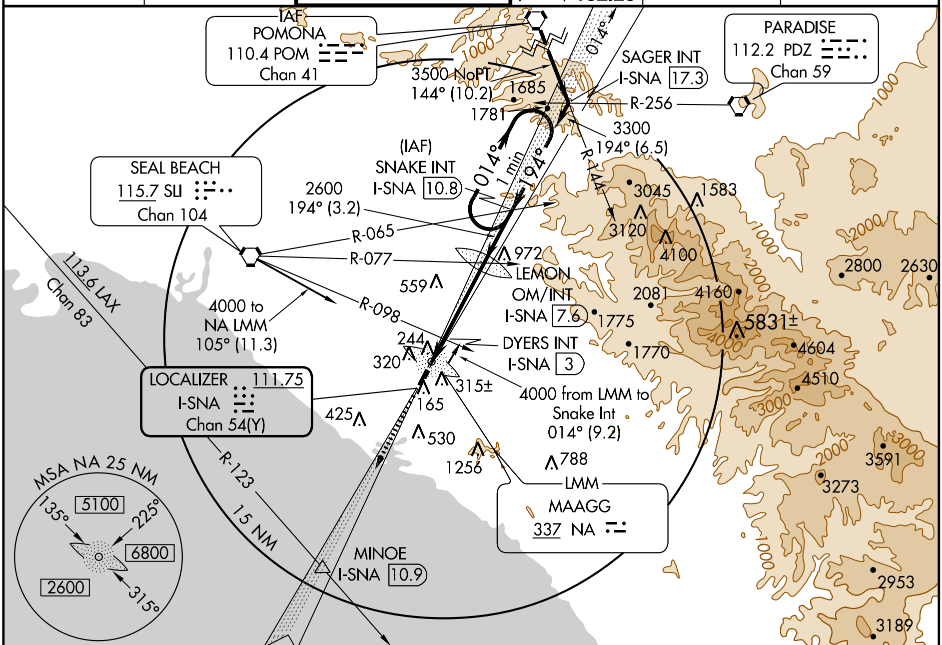
ILS RWY 19R

SANTA ANA/JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

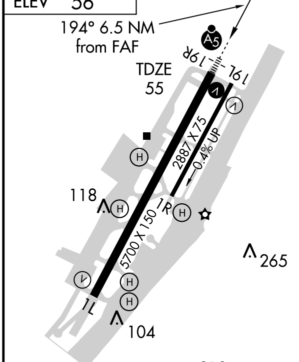
MALSR

MISSED APPROACH: Climb to 3000 via I-SNA south course to MINOE Int/I-SNA 10.9 DME.

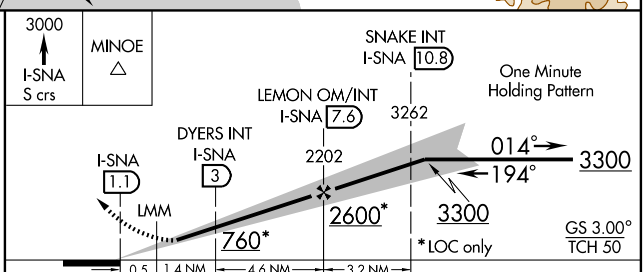
ATIS	SOCAL APP CON	JOHN WAYNE TOWER★	GND CON	CLNC DEL	UNICOM
126.0	121.3 263.1	126.8 (CTAF) Ⓛ 379.9	(EAST) 120.8 (WEST) 132.25	118.0 121.85	122.95



ELEV 56



REIL Rwy 19L
MIRL Rwy 1R-19L
HIRL Rwy 1L-19R



CATEGORY	A	B	C	D
S-ILS 19R	255/24 200 (200-½)			
S-LOC 19R	760/24 705 (800-½)		760-1½ 705 (800-1½)	760-1¾ 705 (800-1¾)
CIRCLING	760-1 704 (800-1)		760-2 704 (800-2)	760-2¼ 704 (800-2¼)
DYERS FIX MINIMUMS				
S-LOC 19R	440/24 385 (400-½)			440/40 385 (400-¾)
CIRCLING	660-1 604 (700-1)		660-1¾ 604 (700-1¾)	660-2 604 (700-2)

FAF to MAP 6.5 NM

Knots	60	90	120	150	180
Min:Sec	6:30	4:20	3:15	2:36	2:10

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RNAV (GPS) RWY 1L

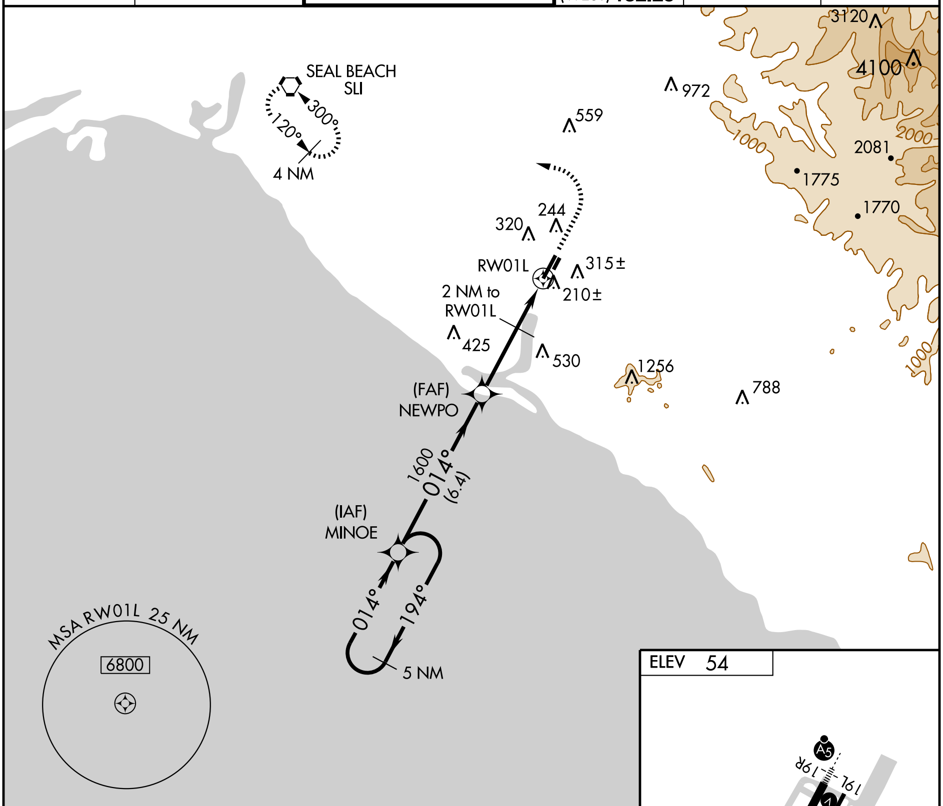
SANTA ANA/JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

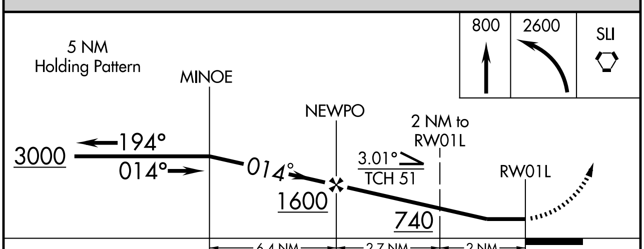
APP CRS	Rwy ldg	5700
014°	TDZE	54
	Apt Elev	54

T A NA — GPS or RNP- 0.3 required. DME/DME RNP- 0.3 NA.

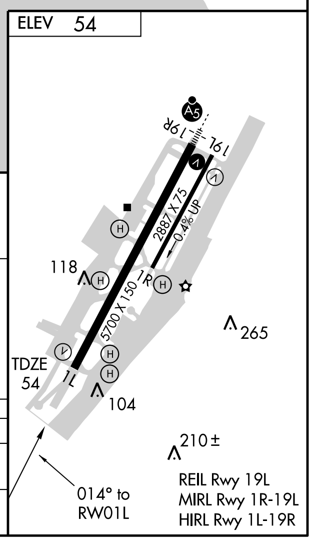
MISSED APPROACH: Climb to 800 then climbing left turn to 2600 direct SLI VORTAC and hold.

ATIS	SOCAL APP CON	JOHN WAYNE TOWER ★	GND CON	CLNC DEL	UNICOM
126.0	121.3 263.1	126.8 (CTAF) L 379.9	(EAST) 120.8 (WEST) 132.25	118.0 121.85	122.95





CATEGORY	A	B	C	D
LNAV MDA	520-1 466 (500-1)		520-1¼ 466 (500-1¼)	520-1½ 466 (500-1½)
CIRCLING	640-1 586 (600-1)		640-1½ 586 (600-1½)	640-2 586 (600-2)



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RNAV (GPS) RWY 19R

SANTA ANA/JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

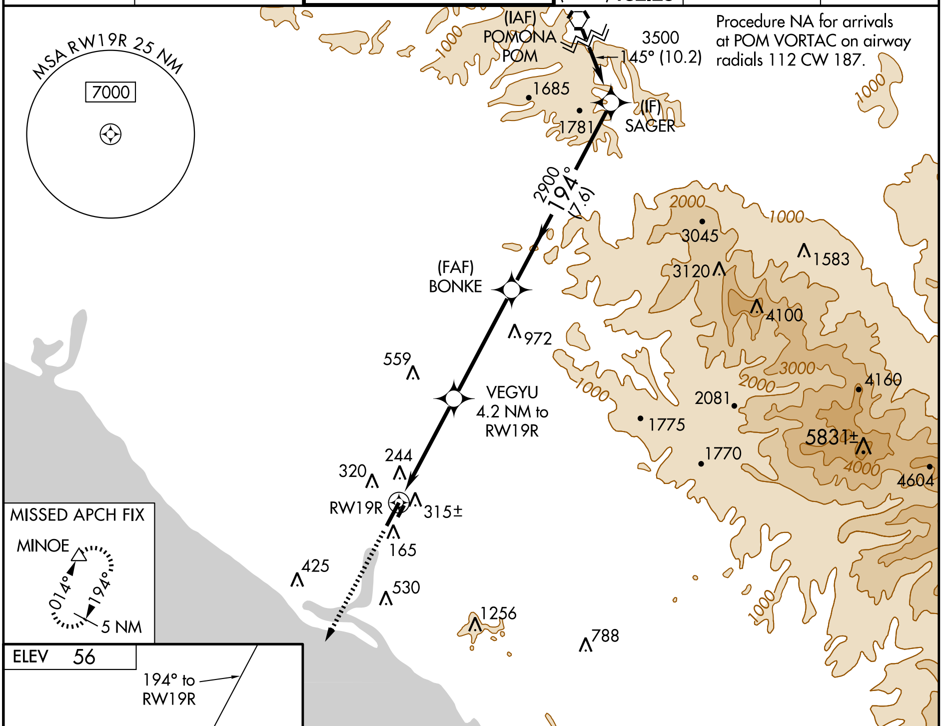
WAAS CH 99502 W19A	APP CRS 194°	Rwy Idg 5700 TDZE 55 Apt Elev 56

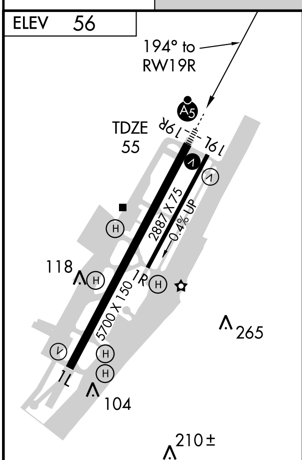
For inoperative MALSR, increase LPV all Cats. to RVR 5000.
For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 49°C (121°F).
DME/DME RNP- 0.3 NA.

MALSR A5

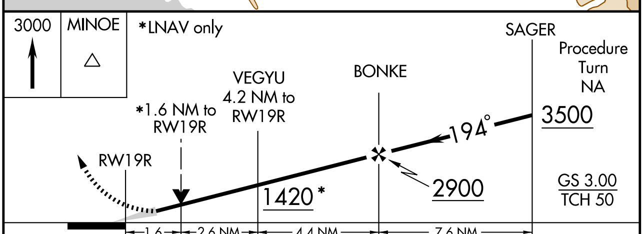
MISSED APPROACH: Climb to 3000 direct MINOE and hold.

ATIS	SOCAL APP CON	JOHN WAYNE TOWER★	GND CON	CLNC DEL	UNICOM
126.0	121.3 263.1	126.8 (CTAF) L 379.9	(EAST) 120.8 (WEST) 132.25	118.0 121.85	122.95





REIL Rwy 19L
MIRL Rwy 1R-19L
HIRL Rwy 1L-19R



CATEGORY	A	B	C	D
LPV DA	338/24 283 (300-½)			
LNAV/VNAV DA	565/60 510 (600-1¼)			
LNAV MDA	600/24 545 (600-½)		600/50 545 (600-1)	600/60 545 (600-1¼)
CIRCLING	640-1¾ 584 (600-1¾)			640-2 584 (600-2)

SW-3, 13 MAR 2008 to 10 APR 2008
SW-3, 13 MAR 2008 to 10 APR 2008

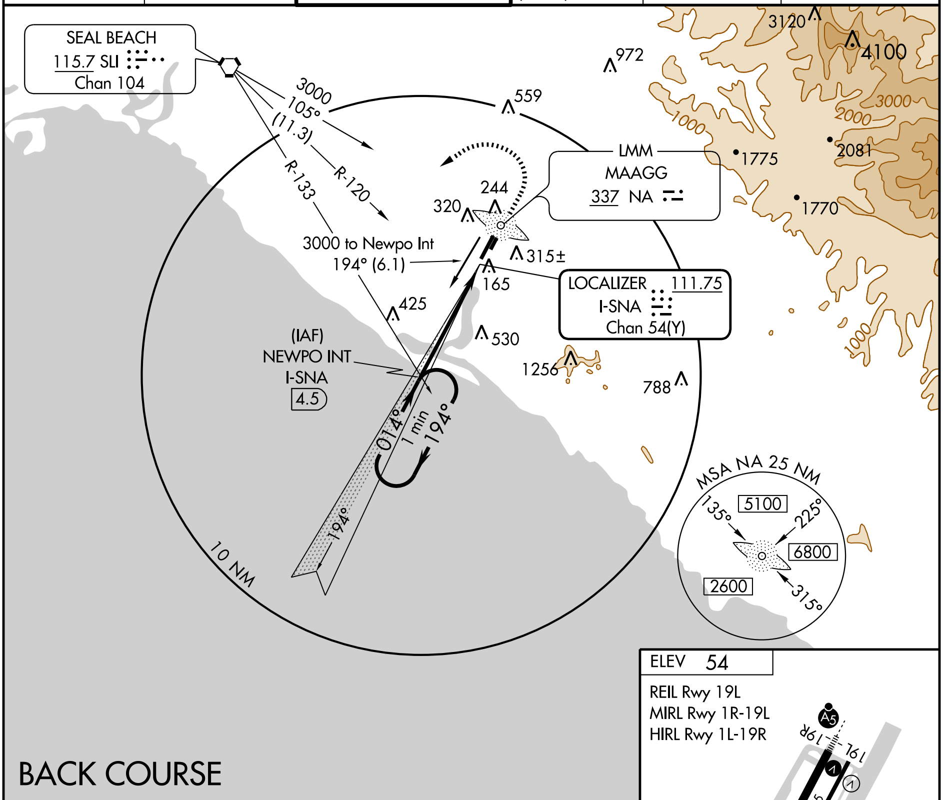
LOC BC RWY 1L
SANTA ANA/JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

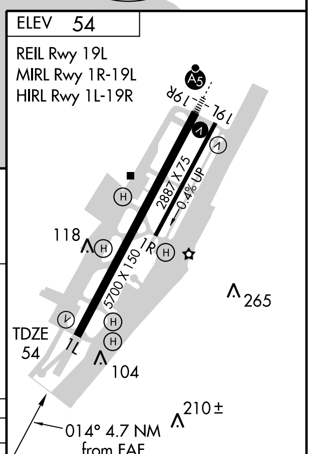
LOC/DME I-SNA	APP CRS	Rwy ldg	5700
111.75	014°	TDZE	54
Chan **54** (Y)		Apt Elev	54

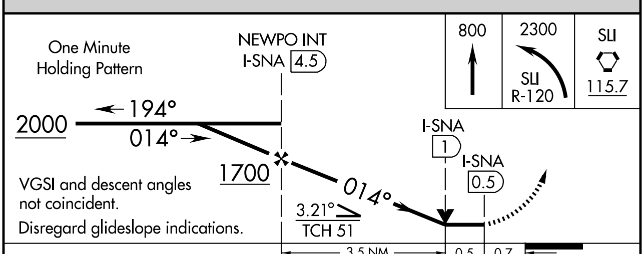
T A

MISSED APPROACH: Climb to 800, then climbing left turn to 2300 via SLI R-120 to SLI VORTAC.

ATIS	SOCAL APP CON	JOHN WAYNE TOWER★	GND CON	CLNC DEL	UNICOM
126.0	**121.3 263.1**	**126.8** (CTAF) L **379.9**	(EAST) **120.8** (WEST) **132.25**	**118.0 121.85**	**122.95**







CATEGORY	A	B	C	D
S-1L	480-1 426 (500-1)		480-1¼ 426 (500-1¼)	
CIRCLING	660-1 606 (700-1)		660-1¾ 606 (700-1¾)	660-2 606 (700-2)

FAF to MAP 4 NM

Knots	60	90	120	150	180
Min:Sec	4:00	2:40	2:00	1:36	1:20

SW-3, 13 MAR 2008 to 10 APR 2008

SW-3, 13 MAR 2008 to 10 APR 2008

LDA RWY 19R
SANTA ANA/JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

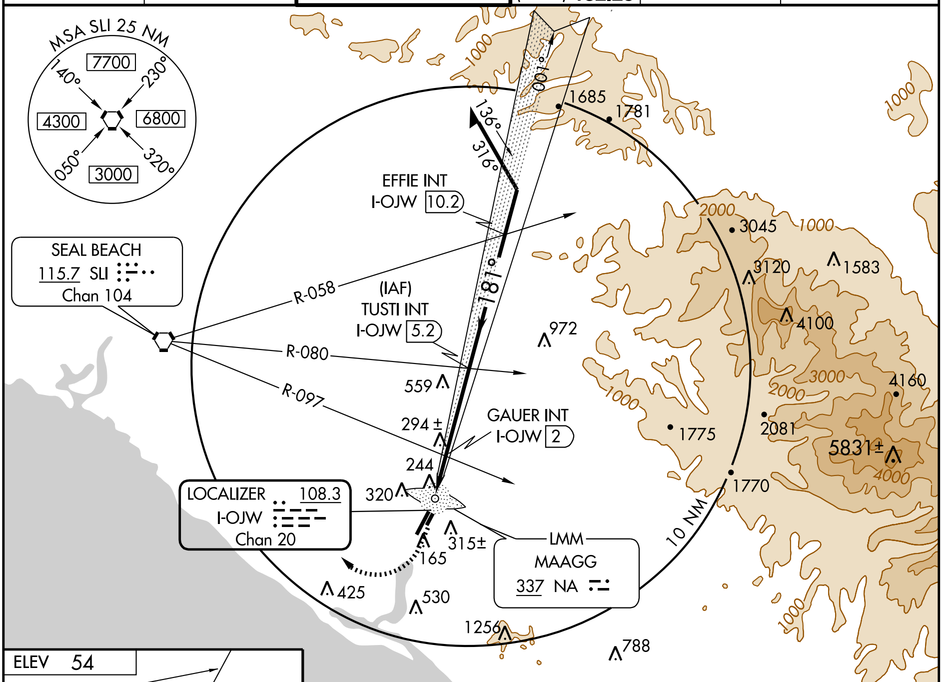
LOC/DME I-OJW	APP CRS	Rwy ldg	TDZE	Apt Elev
108.3 Chan 20	181°	5700	52	54

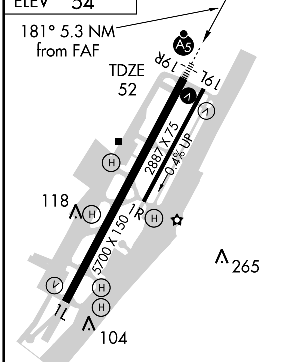
T A

MALSR A5

MISSED APPROACH: Climb to 1000 then climbing right turn to 3000 direct SLI VORTAC.

ATIS	SOCAL APP CON	JOHN WAYNE TOWER★	GND CON	CLNC DEL	UNICOM
126.0	121.3 263.1	126.8 (CTAF) L 379.9	(EAST) 120.8 (WEST) 132.25	118.0 121.85	122.95

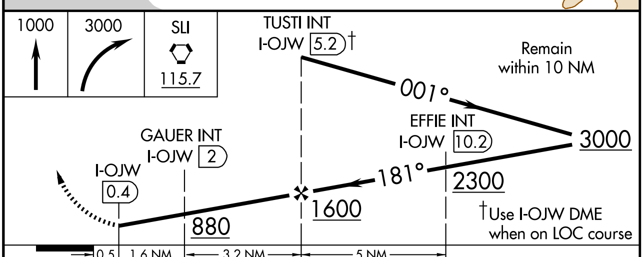




REIL Rwy 19L
MIRL Rwy 1R-19L
HIRL Rwy 1L-19R

FAF to MAP 4.8 NM

Knots	60	90	120	150	180
Min:Sec	4:48	3:12	2:24	1:55	1:36



CATEGORY	A	B	C	D
S-19R	880/24 828 (900-½)	880/40 828 (900-¾)	880-2 828 (900-2)	880-2¼ 828 (900-2¼)
CIRCLING	880-1 826 (900-1)	880-1¼ 826 (900-1¼)	880-2½ 826 (900-2½)	880-2¾ 826 (900-2¾)
GAUER FIX MINIMUMS				
S-19R	480/24 428 (500-½)		480/40 428 (500-¾)	480/50 428 (500-1)
CIRCLING	660-1 606 (700-1)		660-1¾ 606 (700-1¾)	660-2 606 (700-2)

SW-3, 13 MAR 2008 to 10 APR 2008

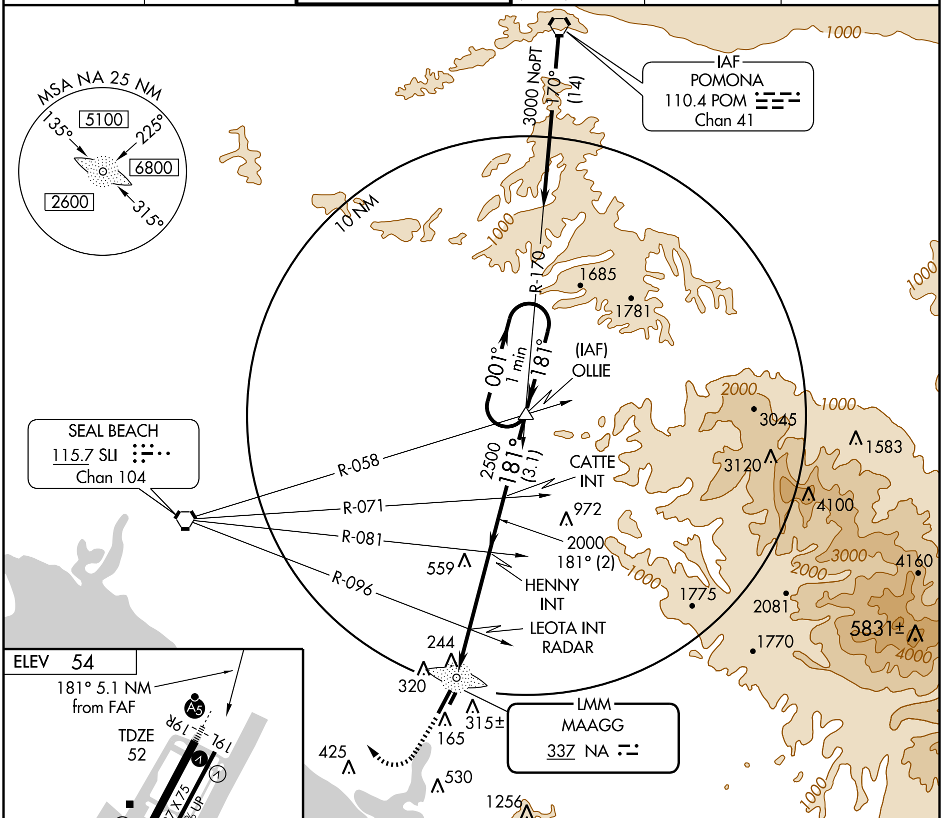
LMM NA	APP CRS	Rwy ldg	5700
337	**181°**	TDZE	52
		Apt Elev	54

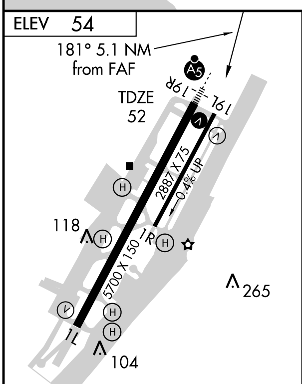
NDB RWY 19R

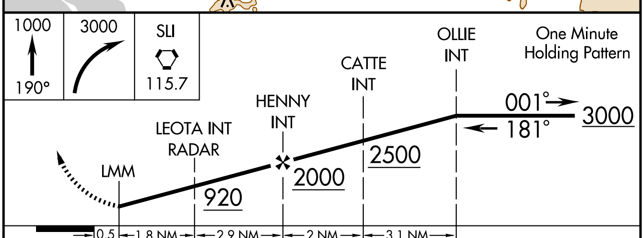
SANTA ANA/ JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)

	MALSR	MISSED APPROACH: Climb to 1000 via heading 190°, then climbing right turn to 3000 direct SLI VORTAC.

ATIS	SOCAL APP CON	JOHN WAYNE TOWER★	GND CON	CLNC DEL	UNICOM
126.0	**121.3 263.1**	**126.8** (CTAF) Ⓛ **379.9**	(EAST) **120.8** (WEST) **132.25**	**118.0 121.85**	**122.95**







CATEGORY	A	B	C	D
S-19R	640/40 588 (600-¾)		640/50 588 (600-1)	640-1½ 588 (600-1½)
CIRCLING	640-1 586 (600-1)		640-1½ 586 (600-1½)	640-2 586 (600-2)

Knots	60	90	120	150	180
Min:Sec					

SW-3, 13 MAR 2008 to 10 APR 2008

SW-3, 13 MAR 2008 to 10 APR 2008

SANTA ANA/ JOHN WAYNE AIRPORT-ORANGE COUNTY (SNA)
33°41'N-117°52'W

APPENDIX D – General Aviation Noise Ordinance

ARTICLE 3. NOISE

Sec. 2-1-30.1. Policy.

(a) As proprietor of John Wayne Airport, the County of Orange, by its Board of Supervisors, is empowered to restrict or deny the use of its Airport based upon noise considerations and finds it is in the public interest to minimize any risk of potential liability to the County of Orange for claims of damage caused by noise associated with aircraft operations at John Wayne Airport. This article reflects the intent of the Board of Supervisors of Orange County to enact a reasonable regulatory scheme, using the legislative process, to minimize noise and any potential for damage liability, which does not unjustly discriminate between types, kinds or classes of aeronautical uses.

(b) Any aircraft operator or person desiring to use John Wayne Airport for the purpose of commercial airline or general aviation operations shall be authorized, pursuant to this article, to engage in such use provided that all aircraft operations are in compliance with noise standards as set forth in this article and as set forth in the Phase 2 Commercial Airline Access Plan and Regulation. Consistent with the noise standards as enumerated in this article, the Board of Supervisors of Orange County does hereby grant a revocable license to use John Wayne Airport by commercial airline and general aviation aircraft as such are defined in this article.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 04-016, § 16, 9-9-04)

Sec. 2-1-30.2. Reserved.

Sec. 2-1-30.3. Definitions.

(a) *Class A and Class E Aircraft*, for the purposes of this Division, shall mean aircraft which: (i) operate at maximum permitted gross takeoff weights at John Wayne Airport not greater than the maximum permitted gross takeoff weight for the individual aircraft main landing gear configuration, of 140,000 pounds for dual gear and 300,000 pounds for dual tandem gear; and which (ii) generate actual energy average SENEL levels during takeoff, averaged during each noise compliance period, as measured at the John Wayne Airport noise monitoring stations ("NMS"), which are not greater than the SENEL values specified in Section 2-1-30.4. In determining whether an aircraft is a Class A or Class E Aircraft, its noise performance at the noise monitoring stations shall be determined at each individual noise monitoring station and the aircraft must meet each of the noise monitoring station criteria, without "trade-offs," in order to qualify as Class A or Class E Aircraft.

(b) *Commercial Air Carrier Aircraft*, for the purposes of this Division, shall mean those aircraft operated as a federally certificated air carrier at John Wayne Airport under a current Certificated Passenger Airline Lease or Operating Agreement granted by the Orange County Board of Supervisors.

(c) *dB*: A-weighted sound pressure level or A-level shall mean, for the purposes of this Division, the sound pressure level as measured using the slow dynamic characteristic for sound level meters specified in American National Standard Specification for Sound Level Meters, (ANSI S 1.4-1983, Type 1 for Aircraft Noise Measurement), which is hereby incorporated by reference. The A-weighting characteristic modifies the frequency response of the measuring instrument to account approximately for the frequency characteristics of the human ear. The reference pressure is 20 micronewtons/square meter (2×10^{-4} microbar).

(e) *General Aviation Aircraft,* for the purposes of this article, shall mean all other aircraft operated at John Wayne Airport, except those as defined in Section 2-1-30.3(b) or exempted under Section 2-1-30.6.

(f) *Arrival,* for the purposes of this Division, shall mean the flight of an aircraft from the time it descends for its approach on Runway 19L/R or Runway 01L/R until it is taxied from the runway.

(g) *Noise Compliance Period,* for the purposes of this Division, shall mean each calendar quarter (successive three-month periods) occurring at regular intervals four (4) times a year, the first quarter of any given year beginning on the first day of April, the last quarter of any given year ending on the thirty-first day of March of the succeeding calendar year.

(h) *Regularly Scheduled Commercial User*, for the purposes of this Division, shall mean any person conducting aircraft operations at John Wayne Airport for the purpose of carrying passengers, freight, or cargo where such operations: (i) are operated in support of, advertised, or otherwise made available to members of the public by any means for commercial air transportation purposes, and members of the public may travel or ship commercial cargo on the flights; (ii) the flights are scheduled to occur, or are represented as occurring (or available) at specified times and days; and (iii) the person conducts, or proposes to operate, departures at John Wayne Airport at a frequency greater than two (2) times per week during any consecutive three (3) week period.

(i) *Single Event Noise Exposure Level ("SENEL"):* The single event noise exposure level, in decibels, for the purposes of this Division, shall mean the noise exposure level of a single event, such as an aircraft fly-by, measured over the time interval between the initial and final times for which the noise level of a single event exceeds a predetermined threshold noise level. For implementation of this Section, the threshold noise level shall be at least ten (10) decibels below the numerical value of the single event noise exposure level limits specified in Sections 2-1-30.4(a), 2-1-30.5 or 2-1-30.6, as the case may be. Specific SENEL limitations, for purposes of this article, shall be determined at each noise monitoring station without "trade-offs" between noise monitoring stations.

(j) *Departure,* for the purposes of this Division, shall mean the flight of an aircraft from the time it commences its departure on Runway 19L/R or Runway 01L/R.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 00-1, § 2, 2-1-00; Ord. No. 04-016, § 17, 9-9-04)

Sec. 2-1-30.4. Commercial airline operations.

(a) No person may engage in commercial airline operations at John Wayne Airport if such aircraft generate a SENEL level at any of the following respective noise monitoring stations ("NMS"), averaged over each noise compliance period, which is greater than the following SENEL values for Class A aircraft when operating as a Class A operation and for Class E aircraft when operating as a Class E operation:

	Class A	Class E
NMS 1S	101.8 dB	93.5 dB
NMS 2S	101.1 dB	93.0 dB
NMS 3S	100.7 dB	89.7 dB
NMS 4S	94.1 dB	86.0 dB
NMS 5S	94.6 dB	86.6 dB
NMS 6S	96.1 dB	86.6 dB
NMS 7S	93.0 dB	86.0 dB

(b) The location of the noise monitoring stations shall be as set forth in the John Wayne Airport Regulations.

(c) *Curfew.* No aircraft may engage in regularly scheduled commercial operations at John Wayne Airport as follows: (i) for departures between the hours of 10:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) (local time), as measured at any John Wayne Airport noise monitoring

Editor's note: Ord. No. 00-1, § 1, adopted February 1, 2000, amended the Code by repealing former § 2-1-30.2 in its entirety. Former § 2-1-30.2 pertained to remedies for violation, and derived from Ord. No. 3642, adopted June 16, 1987; and Ord. No. 3793, adopted September 11, 1990.

station; or (ii) arrivals between the hours of 11:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) (local time), as measured at any John Wayne Airport noise monitoring station.

(d) *Scheduled Departure Time Prohibition.* No commercial airline aircraft shall publish or advertise a scheduled departure time for any flight originating from John Wayne Airport which is: (i) prior to 6:45 a.m. or after 9:45 p.m. (local time) Monday through Saturday; or (ii) before 7:45 a.m. or after 9:45 p.m. (local time) Sunday. For purposes of this subsection, "scheduled departure time" shall mean the time at which a commercial aircraft is scheduled by its operator to depart from the passenger terminal gate. If the operator is a commuter carrier which has been authorized by the Airport Director to conduct operations from a fixed base operator ("FBO"), scheduled departure time shall mean the time when the aircraft is scheduled to depart the FBO location for departure operations. In light of current passenger airline practices, it is presumed, for the purposes of this Division, that the scheduled departure time is the departure time published by the operator in the Official Airline Guide and computer reservation databases.

(e) Any person conducting air service at John Wayne Airport is deemed conclusively to have accepted all terms and conditions of this Division of the County's Ordinances and of the terms and conditions of the Phase 2 Commercial Airline Access Plan and Regulation. In addition, the terms of any lease or operating agreement with an airline require the airline to conduct all operations and activities at John Wayne Airport in strict compliance with this Division and with the Phase 2 Commercial Airline Access Plan and Regulation. In addition to the enforcement remedies provided for in Section 2-1-30.14, violation of the noise or operating limitations of this Section shall be cause for termination of the passenger airline lease or operating agreement by the County of Orange against such operator and shall be subject to the penalties and/or fines set forth in Section 8 of the Phase 2 Commercial Airline Access Plan and Regulation.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 00-1, § 3, 2-1-00; Ord. No. 04-016, § 18, 9-9-04)

Sec. 2-1-30.5. General aviation operations.

(a) No person shall operate any general aviation aircraft at John Wayne Airport if it generates a SENEL level, as measured at John Wayne Airport NMS 1S, NMS 2S, or NMS 3S, on takeoff or landing, which is greater than the following SENEL values:

NMS 1S	101.8 dB
NMS 2S	101.1 dB
NMS 3S	100.7 dB

(b) *Curfew.*

(1) No person shall operate any general aviation aircraft at night at John Wayne Airport if it generates a SENEL level at any of the following respective noise monitoring stations, either on takeoff or landing, which is greater than the following SENEL values:

NMS 1S	86.8 dB
NMS 2S	86.9 dB
NMS 3S	86.0 dB
NMS 4S	86.0 dB
NMS 5S	86.0 dB
NMS 6S	86.0 dB
NMS 7S	86.0 dB
NMS 8N	86.0 dB
NMS 9N	86.0 dB
NMS 10N	86.0 dB

(2) For purposes of this Section, general aviation aircraft operations at night shall mean departures between the hours of 10:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) (local time), as measured at any John Wayne Airport noise monitoring station, and arrivals between the hours of 11:00 p.m. and 7:00 a.m. (8:00 a.m. on Sundays) (local time), as measured at any John Wayne Airport noise monitoring station.

(c) The location of the noise monitoring stations shall be as set forth in the John Wayne Airport Regulations.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 00-1, § 4, 2-1-00; Ord. No. 04-016, § 19, 9-9-04)

Sec. 2-1-30.6. General exemption.

The following categories of aircraft shall be exempt from the provisions of Sections 2-1-30.4 and 2-1-30.5:

(a) Aircraft operated by the United States of America or the State of California;

(b) Law enforcement, emergency, fire or rescue aircraft operated by any county or city of said state;

(c) Aircraft used for emergency purposes during an emergency which has been officially proclaimed by competent authority pursuant to the laws of the United States, said State, or the County;

(d) Civil Air Patrol aircraft when engaged in actual search and rescue missions;

(e) Aircraft engaged in arrival(s) or departure(s) while conducting tests under the direction of the Airport Director in an attempt to rebut the presumption of aircraft noise violation pursuant to the provisions of Section 2-1-30.7 or 2-1-30.9;

(f) Emergency aircraft flights for medical purposes by persons who provide emergency medical care, provided written information concerning dire emergency is submitted to the Airport Director for all emergency aircraft flights within seventy-two (72) hours prior to or subsequent to the departure or arrival of the aircraft. It is intended that the exemption provided for in this subparagraph shall have the same meaning and be interpreted consistent with, and to the same extent as Public Utilities Code Section 21662.4 as enacted or as it may be amended.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 04-016, § 20, 9-9-04)

Sec. 2-1-30.7. Presumption of aircraft noise violation.

(a) In the event that the Airport Director determines in his reasonable discretion that available published noise measurements or historical noise data gathered and maintained by John Wayne Airport, for a particular type or class of aircraft, indicate that it cannot meet the noise levels set forth in Section 2-1-30.4 or 2-1-30.5, it shall be presumed that operation of such aircraft will result in a continued violation of the provisions of Section 2-1-30.4 or 2-1-30.5, and any aircraft of such particular type or class will not be permitted to arrive at, tie down on, be based at or depart from John Wayne Airport, except in dire emergencies for the preservation of life or property; provided, however, that the owner or operator of such aircraft shall be entitled to rebut such presumption to the reasonable satisfaction of the Airport Director by furnishing evidence to the contrary.

(b) The Airport Director shall attempt to notify all aeronautical users of the list of aircraft not permitted to operate at John Wayne Airport by means including, but not limited to, notification to the Federal Aviation Administration, business and general aviation organizations and John Wayne Airport fixed base operators.

(c) In the event any specific aircraft of the type or class of aircraft not excluded at John Wayne Airport under subsection (a) generates SENEL levels in violation of the levels set forth in Section 2-1-30.4 or 2-1-30.5 of this article, it shall be presumed that operation of such aircraft will result in a continued violation of the provisions of Section 2-1-30.4 or 2-1-30.5 and such aircraft will not be permitted to arrive at, tie-down, be based at, or depart from John Wayne Airport; provided, however, that the owner or operator of such aircraft shall be entitled to rebut such presumption to the reasonable satisfaction of the

Airport Director under procedures and limitations specified in Section 8.9.3 and Section 11 of the Phase 2 Commercial Airline Access Plan and Regulation if a commercial aircraft, or if a general aviation aircraft by furnishing contrary evidence, including but not limited to, any change in operating personnel, any retro-fitting measure, any change in engine or of maintenance or performance of a noise qualification test.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 04-016, § 21, 9-9-04)

Sec. 2-1-30.8. Denial of use of airport.

(a) In the event that any aircraft owner or operator has three (3) or more violations of Section 2-1-30.4 or 2-1-30.5 of this article within any three-year period, then for a period of three (3) years after the date of the third, or most recent, violation, such aircraft owner and/or operator shall be denied the right to arrive at or depart from John Wayne Airport, except in dire emergencies for the preservation of life or property as reasonably determined by the Airport Director, and, except for when otherwise modified, shall be denied the right to lease, rent or use space for aircraft (including tie-down) at the Airport insofar as the County has the right to deny such use of John Wayne Airport.

(b) In the event any aircraft owner or operator referred to in subsection (a) of this Section is a corporation or partnership which is owned, controlled or succeeded by another person, corporation or partnership which either operates at the Airport, or which owns or controls aircraft which could operate at the Airport (affiliated person or entity), the Airport Director may also deny the use of the Airport for a like period to: (1) the affiliated person or entity; and (2) any persons, owners or operators which are owned or controlled by the affiliated person or entity, if the Airport Director determines that such disqualification is necessary or appropriate to permit effective enforcement of the prohibitions and penalties established by this Ordinance.

(c) For purposes of subsection (b) of this Section, a person, owner or operator owned or controlled by an affiliated person or entity shall be deemed to include: (1) any aircraft owner or operator in which the affiliated person or entity owns or controls ten percent or more of the equity or voting rights; and (2) any aircraft owner or operator operating aircraft at the Airport which are leased or licensed from the disqualified owner or operator, or any affiliated person or entity of the disqualified owner or operator.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 04-016, § 22, 9-9-04)

Sec. 2-1-30.9. Exclusion of violation-prone aircraft.

In the event that any aircraft is operated by any aircraft owner or operator who has three (3) or more violations of Section 2-1-30.4 or 2-1-30.5 of this article within a three-year period then it shall be presumed that operation of such aircraft will result in a continued violation of the provisions of Section 2-1-30.4 or 2-1-30.5 of this article and such aircraft will not be permitted to arrive at, tie down, be based at or depart from the Airport except in dire emergencies for the preservation of life or property; provided, however, any new owner or operator of such aircraft not denied the right to use JWA pursuant to Section 2-1-30.8 shall be entitled to rebut such presumption to the reasonable satisfaction of the Airport Director under procedures and limitations specified in Section 8.9.3 and Section 11 of the Phase 2 Commercial Airline Access Plan and Regulation if a commercial aircraft, or if a general aviation aircraft by furnishing contrary evidence, including, but not limited to, any change of operating personnel, any retro-fitting measure, any change in engine or of maintenance or performance of a noise qualification test.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 04-016, § 23, 9-9-04)

Sec. 2-1-30.10. Unlawful to use Airport after use denied.

(a) It shall be unlawful for any aircraft owner or operator to arrive at or depart from the Airport or to lease or rent space (including tie-down) for aircraft at the Airport after such owner and/or operator has been denied use of the Airport in accordance with the provisions of Section 2-1-30.8.

(b) It shall be unlawful for any aircraft owner and/or operator to arrive at or depart from the Airport after such aircraft has been excluded from the Airport pursuant to the provisions of Section 2-1-30.7 or 2-1-30.9.

(c) Violations of Section 2-1-30.10(a), (b) shall be a misdemeanor and shall be punishable as set forth in Section 1-1-34 of the Codified Ordinances of the County of Orange.
(See excerpt of Section 1-1-34 provided on Page 4)

(d) In the event that any aircraft owner or/operator arrives at or departs from the Airport after use has been denied, then for an additional period of three (3) years after the date of such violation and for each and every violation thereafter, such aircraft owner or operator shall be denied the right to land or take off from John Wayne Airport, except in bona fide emergencies for the preservation of life or property as is reasonably determined by the Airport Director, and for that period of time shall be denied the right to lease, rent, or use space for aircraft (including tie-down) at the Airport insofar as the County has the right to deny such use of John Wayne Airport.

(e) Within thirty (30) days after receipt of a Notice of Violation of Denial of Use, that violation may be appealed by sending a Notice of Appeal and Request for Hearing by regular U.S. mail to the attention of the Airport Director. The procedures set forth in section 2-1-30.14 of the Codified Ordinances of the County of Orange shall apply to the adjudication of such Notices of Appeal.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 00-1, § 5, 2-1-00; Ord. No. 04-016, § 24, 9-9-04)

Sec. 2-1-30.11. Culpability of instructor pilot.

In the case of any training flight in which both an instructor pilot and a student pilot are in the aircraft which is flown in violation of any of the provisions of this article, the instructor pilot shall be presumed to have caused such violation. The instructor pilot shall be entitled to rebut such presumption to the reasonable satisfaction of the Airport Director by furnishing evidence to the contrary.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90)

Sec. 2-1-30.12. Culpability of aircraft owner or lessee.

For purposes of this article, if the actual pilot or lessee of an aircraft cannot be identified, the owner and/or owners of an aircraft shall be presumed to be the pilot of the aircraft with authority to control the aircraft's operations, or presumed to have authorized or assisted the operation; except that where the aircraft is leased, the lessee shall be presumed to be the pilot, or to have authorized or assisted in the aircraft's operation. Such presumption may be rebutted only if the owner or lessee identifies the person who in fact was the pilot or aircraft operator at the time of the violation.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 04-016, § 25, 9-9-04)

Sec. 2-1-30.13. Enforcement officials.

The Airport Director, and such other Airport employees as are designated by the Airport Director and who are acting under the direction and control of the Airport Director, as well as personnel from an authorized law enforcement agency pursuant to the provisions of Penal Code Section 836.5, are authorized to enforce the provisions of this Division.
(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 00-1, § 6, 2-1-00; Ord. No. 04-016, § 26, 9-9-04)

Sec. 2-1-30.14. Enforcement procedures.

(a) Violation of Section 2-1-30.4 or 2-1-30.5 of this Division shall be a misdemeanor, punishable as set forth in Section 1-1-34 of the Codified Ordinances of the County of Orange.
(See excerpt of Section 1-1-34 provided on Page 4)

(b) As an alternative, the Airport Director is authorized to issue a Notice of Noise Violation to any aircraft, aircraft owner, aircraft operator, and/or any other responsible person for any violations of Section 2-1-30.4 or 2-1-30.5. The determination of whether to issue a Notice of Noise Violation shall be within the sole discretion of the Airport Director.

(c) *Notice Of Noise Violation.*

(1) A Notice of Noise Violation shall include a citation of the section violated, the noise readings at John Wayne Airport noise monitoring stations, the time and date of the violation, the type and registration number of the aircraft, the name of the aircraft owner, and/or the aircraft operator, if known, and any other pertinent information.

(2) A Notice of Noise Violation shall be sent by certified mail to the aircraft owner and/or aircraft operator, if known, within forty-five (45) days of the date of violation. If the aircraft operator is not known, and the aircraft owner identifies the person who in fact was the aircraft operator at the time of the violation and a current address for that person, a Notice of Noise Violation shall also be sent by certified mail to the aircraft operator within forty-five (45) days of the date the Airport is notified of the identity of the aircraft operator.

(d) *Right to Appeal the Notice of Noise Violation.*

(1) Within thirty (30) days after receipt of a Notice of Noise Violation, the aircraft owner and/or operator may appeal the Notice of Noise Violation by sending a Notice of Appeal by regular U.S. mail to the Airport Director.

(2) The Notice of Appeal shall be in writing and shall set forth a concise statement of: (i) each factual issue relevant to the violation; (ii) each legal issue relevant to the violation; (iii) the relief requested by the aircraft owner and/or operator; and (iv) whether a hearing is requested in connection with the Notice of Appeal. The Notice of Appeal shall include attachments of all documents relevant to the factual or legal issues raised and relied on in filing the Notice of Appeal. The Notice of Appeal shall further contain appropriate and full citation to any relevant legal authorities.

(3) It is the basic purpose of these rules to provide a reasonable, fair, constitutionally appropriate, and expeditious means by which persons contesting a Notice of Noise Violation imposed by the Airport Director can obtain review of the violation decision by administrative means.

To the extent this Section provides procedural processes and safeguards in excess of the minimum requirements of the United States and California Constitutions, those procedures are a courtesy only, and not an acknowledgement of any claim that this Division creates any "vested" right.

(4) Upon receipt of the Notice of Appeal, the Airport Director shall promptly take the following actions:

(i) The Airport Director shall review the Notice of Appeal and its contents and determine whether to (a) grant the relief requested in the Notice of Appeal; (b) modify the violation; or (c) uphold the violation and refer the matter to the Airport Noise Violation Committee for hearing, if a hearing has been requested on the matter; and

(ii) The Airport Director shall give written notice to the person requesting review of his decisions and determinations not later than forty-five (45) days after his receipt of the Notice of Appeal.

(e) *Referral To The Airport Noise Violation Committee.* If the Airport Director determines that the County should refer the Notice of Appeal, in whole or in part, to the Airport Noise Violation Committee, pursuant to Section 2-1-30.13(d)(4)(i)(c), then, within thirty (30) days of the Committee's receipt of the Notice of Appeal, the Committee shall give written notice to the party requesting review of the date of the hearing at which the matter will be heard. In selecting the date for the hearing by the Airport Noise Violation Committee, the Committee shall seek to obtain the most expeditious review of the issues possible, taking into consideration the rights of the parties to a fair adjudication of the issues.

(f) *Hearing.*

(1) *Rules of evidence.* The hearing need not be conducted according to the technical rules relating to evidence set forth in the California Evidence Code. Any relevant evidence shall be admitted if it is the sort of evidence on which responsible persons are accustomed to rely in the conduct of serious affairs, regardless of the existence of any common law or statutory rule which might make improper the admission of such evidence over objection in civil actions. The rules of privilege shall be effective to the same extent that they are recognized in civil actions and irrelevant and unduly repetitious evidence may be excluded by the Airport Noise Violation Committee.

(2) *Determination.* The Airport Noise Violation Committee shall determine, based upon all the evidence presented, whether said Notice of Violation and/or the penalty or sanction imposed should be upheld or revoked. The decision shall be supported by appropriate findings on all material issues raised at the hearing.

(g) *Decision.*

(1) Written notice of the Airport Noise Violation Committee's decision on the Notice of Appeal shall be given to the party filing the Notice and all other interested parties within thirty (30) days after the date of the hearing.

(2) The decision of the Airport Noise Violation Committee is final and binding on all parties.

(Ord. No. 3642, § 1, 6-16-87; Ord. No. 3793, § 2, 9-11-90; Ord. No. 00-1, § 7, 2-1-00; Ord. No. 04-016, § 27, 9-9-04)

Sec. 2-1-30.15, 2-1-30.16. Reserved.

Sec. 2-1-31 -- 2-1-39. Reserved.

Excerpt from Orange County Codified Ordinances: Title 1 – Government and Administration, Division 1 – General Provisions, Article 2 – Violations and Use of Citation.

Sec. 1-1-34. General penalty for violations.

(a) Any person violating any of the provisions of this Code shall, unless otherwise specifically provided in this Code or by statute, be guilty of a misdemeanor.

(b) Any person convicted of a misdemeanor for a violation of any of the provisions of this Code shall, unless otherwise specifically provided in this Code or by statute, be punishable by a fine of not more than one thousand dollars ($1,000.00) or by imprisonment in the County Jail for a period of not more than six (6) months or by both such fine and imprisonment.

(Code 1961, §§ 11.021; Ord. No. 3001, § 1, 8-30-77; Ord. No. 3032, § 1, 1-17-78; Ord. No. 3985, § 1, 7-22-97)

Editor's note: Ord. No. 00-1, §§ 8 and 9, adopted February 1, 2000, amended the Code by repealing former §§ 2-1-30.15 and 2-1-30.16 in their entirety. Former § 2-1-30.15 pertained to enforcement, and former § 2-1-30.16 pertained to education, transition or modification periods. Both sections derived from Ord. No. 3642, adopted June 16, 1987.