

SAN DIEGO

International Airport



AIRPORT MASTER PLAN
SAN DIEGO INTERNATIONAL AIRPORT

SECTION 7.1

Airfield

7. FACILITY REQUIREMENTS ANALYSIS

This chapter describes the facility improvements required to accommodate the forecast demand for air service at San Diego International Airport (SDIA). Improvements to airport facilities would allow the airport to accommodate the forecast demand for air service safely and efficiently. This analysis is based on the facilities inventory presented in Chapter 3, Inventory. Like the inventory, the facility requirements are presented in four categories:

- Airfield
- Terminal
- Ground Transportation
- Airport Support Facilities

The inventory of airport facilities allowed for the calculation of the existing capacity of the Airport, as a whole, and of each facility. The completed aviation demand forecast allows for an assumed level of activity at the Airport, in terms of annual passengers and annual aircraft operations, at a given date in the future. The aviation demand forecast predicts activity levels through 2030. An interim year of 2015 was selected for measuring an incremental facility requirement during the planning period.

7.1 Airfield

The following section describes the airfield facilities required to better accommodate future demand and improve airfield safety at San Diego International Airport (SDIA). The airfield facility requirements are based on the operations forecast relative to the capacity of the existing airfield facilities.

The safety and capacity of the existing airfield facilities was determined through the facility inventory and assessment of the existing conditions presented in Chapter 3, Inventory of Existing Conditions, of this document. Additionally, the Master Plan Technical Committee and FAA Air Traffic Control Tower staff provided key insight into airfield facility deficiencies. Airfield facility improvements would provide enhancements in capacity, efficiency, and safety.

SDIA is the busiest single runway airport in the United States, and as operations continue to increase, the airfield will become increasingly congested. According to the most recent forecast, the existing airfield will become constrained beginning at approximately 260,000 annual operations and delay would exceed established thresholds of tolerance at approximately 300,000 annual operations. The 300,000 annual operations threshold would be reached between approximately 2021 or 2022 with the high forecast and 2030 with the low forecast (refer to **Figure 7.1-1**).

Operations

SDIA operates with a single east-west air carrier runway 200 feet wide and 9,401 feet long. The Airport operates in west flow 97 percent of the time. The Airport operates in east flow the remaining 3 percent of the time. Though most airports change their operational pattern to accommodate wind conditions, SDIA typically switches from west flow to east flow due to weather conditions. For example, because Runway 27 does not have a precision approach utilizing a glide slope, when the cloud ceiling falls below 1,200 feet and the visual range falls below three miles, Runway 9 must be used.

According to the most recent activity forecast, the capacity of the runway during west flow ranges from 49 operations per hour during instrument conditions to 55 operations per hour during visual conditions. During east flow, the runway capacity is reduced to 36 operations per hour during instrument conditions to 40 operations per hour during visual conditions. East flow capacity is lower due to several factors. The components of the airfield do not work as efficiently in east flow.

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As an example, there are four high speed exit taxiways for Runway 27 arrivals, while there are no high-speed exit taxiways for Runway 9 arrivals. There is a single departure route for Runway 9 departures, resulting in increased departure hold times for aircraft separation. Runway 27 departures have two diverging departure routes allowing aircraft to depart in more rapid succession. Lastly, because east flow is typically used due to weather and not wind (Runway 9 has a precision approach with vertical guidance), east-bound departures typically have a tailwind with the region's prevailing westerly winds. While operating in east flow, there is typically a departure queue that builds at the Runway 27 end for pilots requesting a west-bound departure with the headwind. The resulting mixed flow (east flow arrivals, west flow departures) reduces efficiency and results in a greater than 25 percent reduction in airport capacity.

At the current activity level, delay remains tolerable (within acceptable levels according to industry standards) during mixed flow. However, as the activity level increases, delay will reach intolerable levels without improvements to the airfield. Based on forecasts, this intolerable level of delay is expected to occur in 2020.

Airport Site Constraints

The airport site is also characterized by the following physical constraints:

- To the South: N. Harbor Drive and San Diego Bay
- To the North: Marine Corps Recruit Depot
- To the West: Navy Lagoon
- To the East: Pacific Highway

These constraints limit the feasibility of airport expansion to service the increased demand for airfield capacity driven by the forecasted growth in air transportation. However, there are a series of airfield facility improvements needed to improve safety, help control increases in delay, and allow for improvements in levels of service.

The existing constrained airport site also does not allow for an increase in runway length or safety area length beyond the existing runway ends without the acquisition of additional property. The east end of the runway pavement is adjacent to the intersection of Pacific Highway and Laurel Street while the west end of the runway is adjacent to property not owned by the Authority and is within 750 feet of the Navy Lagoon.

Capital Improvement Program

The Authority's existing Capital Improvement Program (CIP) provides for several airfield facility improvements. Each CIP item is either a part of the overall maintenance program of the Airport (i.e., pavement rehabilitation or replacement), or is intended to improve airport safety and operational efficiency (i.e., an upgrade to the ILS). The airfield facility requirements described in this chapter of the Master Plan document assume that implementation of the CIP projects listed below would occur as scheduled.

As of February 2006, the following airfield safety and efficiency enhancements are earmarked as components of the CIP:

- Installation of Engineered Material Arresting System (EMAS) at west end of Runway 9-27
- Runway 9-27 Pavement Resurface
- Taxiway B Pavement Resurface
- Taxiway C Rehabilitation
- Airfield Lighting Improvements including installation of Runway End Identifier Lights (REIL)
- Improve Instrument Approach Capabilities

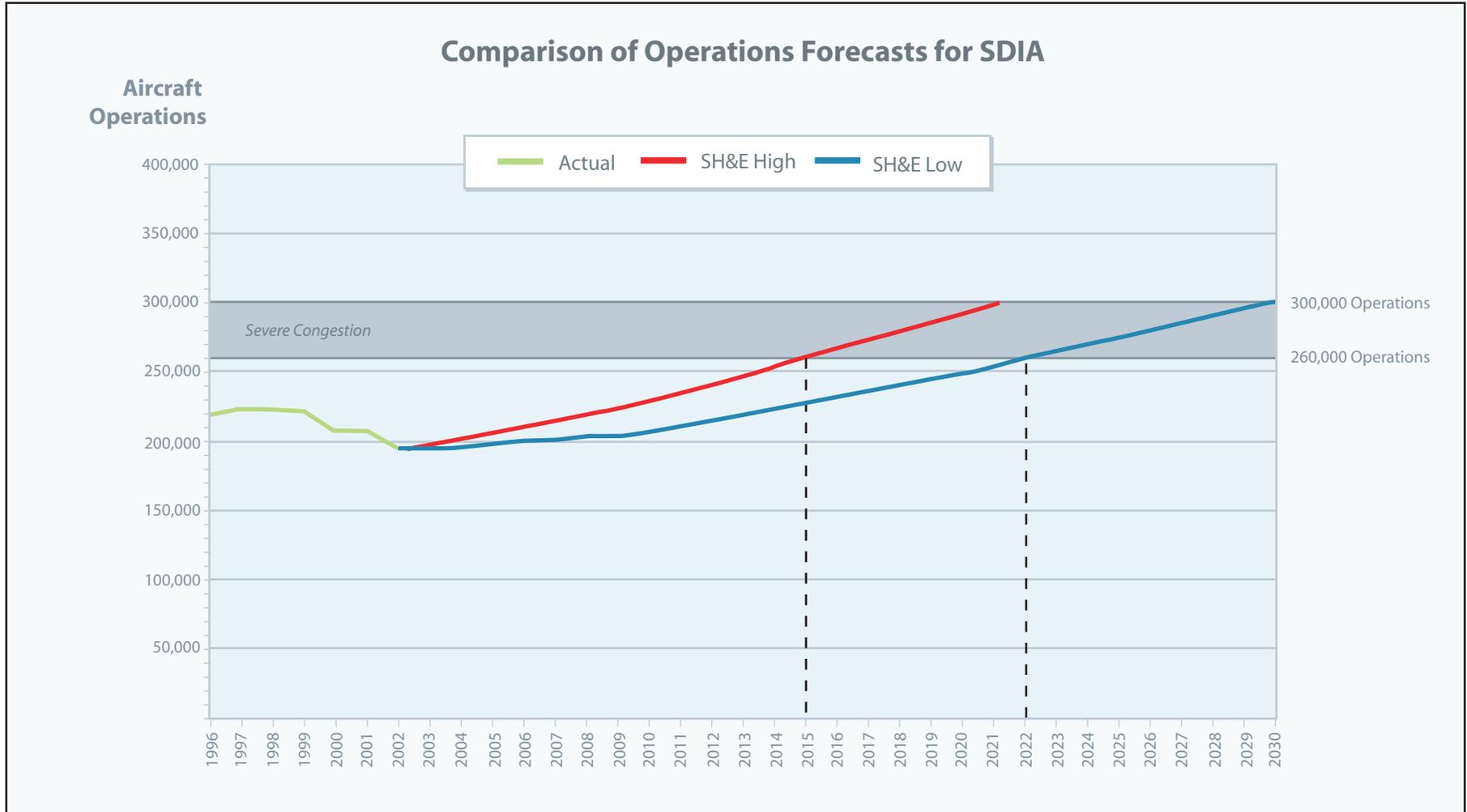


Figure 7.1-1

SDIA Annual Operations Forecast

7. Facility Requirements Analysis

The airfield improvements that are part of the existing CIP could be implemented to enhance runway safety and improve efficiency. CIP Project Number 3053 is described as "improvement to airport instrument approach capabilities" and includes: a new Runway 9 glide slope antenna, a new antenna array and associated localizer equipment to signal over the EMAS for the west end of Runway 9-27, and a new antenna array and associated localizer equipment for Runway 27.

Further improvements to develop at the existing runway include a Runway 27 glide slope antenna providing vertical guidance for approaching aircraft. Though there are complications associated with implementation of a Runway 27 glide slope antenna, such as the surrounding terrain, alternate applications of existing ILS technology, such as an offset localizer, could allow for the reduction of Runway 27 approach minima and should be analyzed. Further, evaluation and analysis of new and emerging navigational aid technology should be prioritized. The emergence of GPS based navigational aids has shown to provide substantial improvements in approach precision, even in locations that have been historically unsuitable for precision approaches. This technology may present an opportunity to establish a precision instrument approach to Runway 27 in spite of the terrain and structural obstructions in the approach area. These improvements would allow the Airport to further reduce the time it operates in east flow by lowering the approach minima for Runway 27 arrivals.

An EMAS or other means of meeting FAA requirements of Runway Safety Area (RSA) standards should be explored for the east end of Runway 9-27 in addition to the west end. The Runway 27 RSA ends at the runway pavement end. Though the Runway 27 threshold is displaced 1,810 feet, the RSA must also provide overrun protection for aircraft departing the opposite runway end. Declared distances, which would establish operational procedures accommodating non-standard RSAs, are not in use at SDIA. Aircraft departing Runway 9 are currently able to use the full runway length for calculation of available take-off distance, though the final 1,000 feet of pavement are within the RSA.

According to the June 2004 forecast, existing unconstrained runway capacity would be reached between 2015 (low activity forecast) and 2022 (high activity forecast). The existing airport property boundary prevents any realistic opportunity for construction of a second air carrier runway. However, the location and size of the Marine Corps Recruit Depot (MCRD) property combined with the potential for acquisition of this land could allow a reasonable future planning boundary accommodating a second air carrier runway as outlined in the 2001 Master Plan.

The federal government's Base Realignment and Closure (BRAC) committee released a preliminary list of facilities for closure in May 2005. MCRD was not recommended for closure during this round. However, it is anticipated that the United States Department of Defense will continue to analyze military installations for possible closure in the future. Should MCRD ever be considered for closure, the Authority may have an opportunity to acquire all or portions of the property. Even with addition of the MCRD property to the airport, there remains insufficient area to construct an additional runway that would allow two fully independent instrument approaches. Thus, operations capacity enhancements within the constrained site would be limited to approximately 30 percent as outlined in the 2001 Master Plan. Additional land acquisition beyond the existing airport property boundary combined with the MCRD property would be required to consider alternatives consisting of two fully independent, parallel, instrument runways.

Taxiways

There are three types of taxiways present at SDIA. Exit taxiways lead from the runway to the parallel taxiways. Parallel taxiways are parallel to the runway and lead to remote taxiways. Remote taxiways provide routes to the various terminal, cargo, and ancillary facilities at the airport.

Improvements to three existing exit taxiways were made in 2001. Taxiways B4, B7, and D were repaved with new fillet angles to ease the transition from the runway to the taxiway system for arriving aircraft. Improvements to Taxiways B4 and B7 improved west flow efficiency, providing two additional high speed exits for Runway 27 arrivals on to Taxiway B. Improvements to Taxiway D allow efficient access to the

7. Facility Requirements Analysis

north airfield for Runway 9 arrivals. There are no existing high speed exits for Runway 9 arrivals. With the terminal area located at the west end of the airfield, aircraft arriving Runway 9 must turn 180 degrees on to Taxiway B to reach the terminal area. To execute such a turn, aircraft must slow to a lower taxi speed prior to exiting the runway, regardless of the exit taxiway angle.

There are two parallel taxiways at SDIA. Taxiway B is parallel to and south of Runway 9-27 and extends along the full length of the runway. Taxiway C is parallel to and north of Runway 9-27 and extends along the eastern half of the runway.

FAA specifies that a critical aircraft or class of aircraft must be established for an airport. The critical aircraft determines specific separation and dimensional standards that should be applied to airport facility design, such as runway/taxiway separation, runway/taxiway widths, and building setbacks. The appropriate Airport Reference Code (ARC) for the airport is established based on the critical aircraft. The ARC is comprised of two components – 1) the aircraft approach category, which represents the approach speed of the aircraft and 2) the aircraft design group, which is based on the wingspan of the aircraft. The ARC, which takes into account both the aircraft's approach speed and wingspan, determines specific FAA design criteria. The Airport Reference Code (ARC) for SDIA is D-V. As such, FAA recommends 400 feet of separation from the centerline of the runway to the centerline of the parallel taxiways. Currently, the entire length of the Taxiway B centerline is non-standard with a separation of 362.5 feet from the runway centerline. The portion of Taxiway C east of Taxiway C2 is non-standard with a separation of 362.5 feet from the runway centerline. Taxiway C west of Taxiway C2 has a standard separation of 400 feet from Runway 9-27.

Taxiway B

There are two key separation deficiencies associated with existing Taxiway B at SDIA. The first is that there is insufficient separation between the taxiway and the parallel runway, as noted above. The second is that there is insufficient separation between the taxiway centerline and the taxiway's object free area boundary.

To meet design criteria at a D-V airport, FAA recommends 160 feet of separation from a taxiway centerline to a fixed or moveable object. The service road south of, and parallel to, Taxiway B has a separation of approximately 110 feet from the taxiway centerline east of Taxiway B4. The Authority maintains an FAA waiver allowing Group IV aircraft to taxi along Taxiway B east of Taxiway B4, though it does not meet the recommended separation for Group IV aircraft of 124 feet.

Group V aircraft are, however, restricted from operating on Taxiway B east of Taxiway B4 and west of Taxiway D. The prohibition of Group V aircraft operations on this portion of Taxiway B, on Taxiway C east of Taxiway D, as well as on Taxiway D south of Taxiway B complicates taxi procedures for Group V aircraft when they are present at SDIA. The existing procedure for Group V aircraft to taxi from the terminal area to the Runway 27 departure end is outlined here (and illustrated in **Figure 7.1-1**):

1. Taxi east via Taxiway B
2. Cross Runway 27 at Taxiway B4
3. Taxi east via Taxiway C
4. Cross Runway 27 at Taxiway D
5. Taxi east via Taxiway B to the Runway 27 departure queue

In addition to being complicated and inefficient, this procedure involves two potentially hazardous runway crossings. FAA recommends reducing or eliminating runway crossings to the greatest practical degree in order to maximize airfield safety.

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Relocating the existing service road outside of the Taxiway B OFA would allow the airfield to accommodate Group V aircraft more safely and efficiently.

The Authority has negotiated the final terms of a long term lease of the former Teledyne-Ryan (TDY) Aeronautical Industries property. The approximately 47-acre parcel is adjacent to the southeast portion of the existing airfield. The property line between the existing airport property and the TDY parcel prevented the relocation of the existing service road south of its existing location and out of the Taxiway B Group V OFA. Demolition of ten buildings and two utility structures on the TDY Parcel and relocation of the security fence will provide sufficient area for the relocation of the service road approximately 88 feet south (refer to **Figure 7.1-2**). It is recommended that the northern edge of the service road be relocated a minimum of 197.5 feet south of the existing Taxiway B centerline (refer to **Figure 7.1-2**). This will allow an additional 37.5 feet of separation between Taxiway B and the parallel service road so that the taxiway may eventually be relocated 37.5 feet south of its existing location, providing the recommended separation between the runway and the parallel taxiway.

Relocation of the service road out of the Taxiway B Group V OFA would allow Group V aircraft to taxi from the terminal area to the Runway 27 end without having to cross the runway. This would improve efficiency by preventing air traffic control from having to coordinate aircraft runway crossings with other taxiway and runway traffic. Safety would be improved through the elimination of runway crossings for Group V taxi operations.

As operations continue to increase at SDIA, the existing taxiway infrastructure will become increasingly congested. Additional airfield taxiway capacity will be required to maintain an efficient operating environment. The lack of dual parallel taxiways south of Runway 9-27, adjacent to both the runway and the terminal area, leads to conflict when two aircraft simultaneously taxi in opposite directions.

The airport Terminal Area is located in the southwestern quadrant of the airfield. During west flow, which occurs more than 97 percent of the time, departing aircraft must taxi from the terminal area to the east end of the runway to join the Runway 27 departure queue, creating an easterly flow on Taxiway B. Simultaneously, Runway 27 arrivals typically exit the runway at Taxiways B4, B5, and B6 and taxi west to reach their assigned gates. Presently, operations levels allow for air traffic controllers to plan for and work within the constraints of a single south taxiway. However, as operations continue to increase in future years, controllers and pilots will have greater time constraints and increased congestion.

In order to accommodate increasing operations levels and maintain the greatest practical levels of efficiency, an additional taxiway should be constructed parallel to and south of Taxiway B.

The first phase should be constructed along with any additional gate or aircraft parking facilities (RON Positions) west of existing Terminal 2 West. The parallel taxiway could be constructed to accommodate Aircraft Design Group IV aircraft (Boeing 767 and smaller) without relocating the existing Taxiway B centerline (refer to **Figure 7.1-4**). The proposed parallel taxiway would provide an additional lane of flow between any development west of Terminal 2 West and existing Taxiway B.

Full construction of a new south taxiway parallel to Taxiway B would occur along with the proposed development of a new linear aircraft concourse (refer to **Figure 7.1-5**). Construction of a full parallel taxiway would require demolition of both rotundas at Terminal One and would impact the northernmost gates at Terminal 2 East and Terminal 2 West. The full-length parallel taxiway should be constructed in such a manner so as to allow the eventual relocation of existing Taxiway B 37.5 feet south of its existing location while still maintaining the FAA recommended taxiway to taxiway separation of 267 feet for Group V aircraft (Boeing 747 and smaller). This would provide the FAA recommended runway to parallel taxiway separation of 400 feet between Runway 9-27 and Taxiway B.

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Taxiway C

The reconstruction of Taxiway C, east of Taxiway C2 is currently planned for in the airport's Capital Improvement Program budget. However, this Master Plan recommends a more ambitious taxiway construction program in the vicinity of the east end of Taxiway C.

Like Taxiway B to the south of Runway 9-27, the portion of Taxiway C east of Taxiway C2, currently is non-standard with a separation of only 362.5 feet from the runway centerline. The existing CIP Taxiway C reconstruction project would reconstruct this portion of the taxiway and relocate the taxiway centerline to meet the FAA recommended 400 foot centerline separation from Runway 9-27. This project will require that the existing service road, which is parallel to Taxiway C, also be relocated such that it is 160 feet north of the relocated Taxiway C centerline. The existing FBO currently leases approximately 11.4 acres of land adjacent to the east end of Taxiway C and the parallel service road. The relocation of the Taxiway C centerline and parallel service road will impact the area leased by the FBO. The acquisition of the former GD property, discussed in Chapter 3.6, Developable Property, presents an opportunity to relocate the general aviation facility from its current location and provide critical airfield facilities required in the north including:

- Parallel Taxiway with Standard Separation
- A Departure Hold Pad at the Runway 27 End
- A Second, Standard Taxiway
- Sufficient Clearance from the Taxiway to the General Aviation Apron Area

Relocation of the existing GA facilities would allow for the development of critical taxiway and apron infrastructure adjacent to the Runway 27 end. At the current time, there is no hold pad at the east end of the runway where more than 95 percent of all SDIA departures take place. As aircraft operations continue to grow at SDIA, an efficient hold pad where delayed aircraft can wait without obstructing the flow of taxiway traffic will become critical.

Developing this hold pad on the south side of the runway would be preferred. However, the existing California Least Tern habitat in the ovals south of the runway, at the east end of Taxiway B, presents an obstacle to the reconfiguration of the pavement in that vicinity.

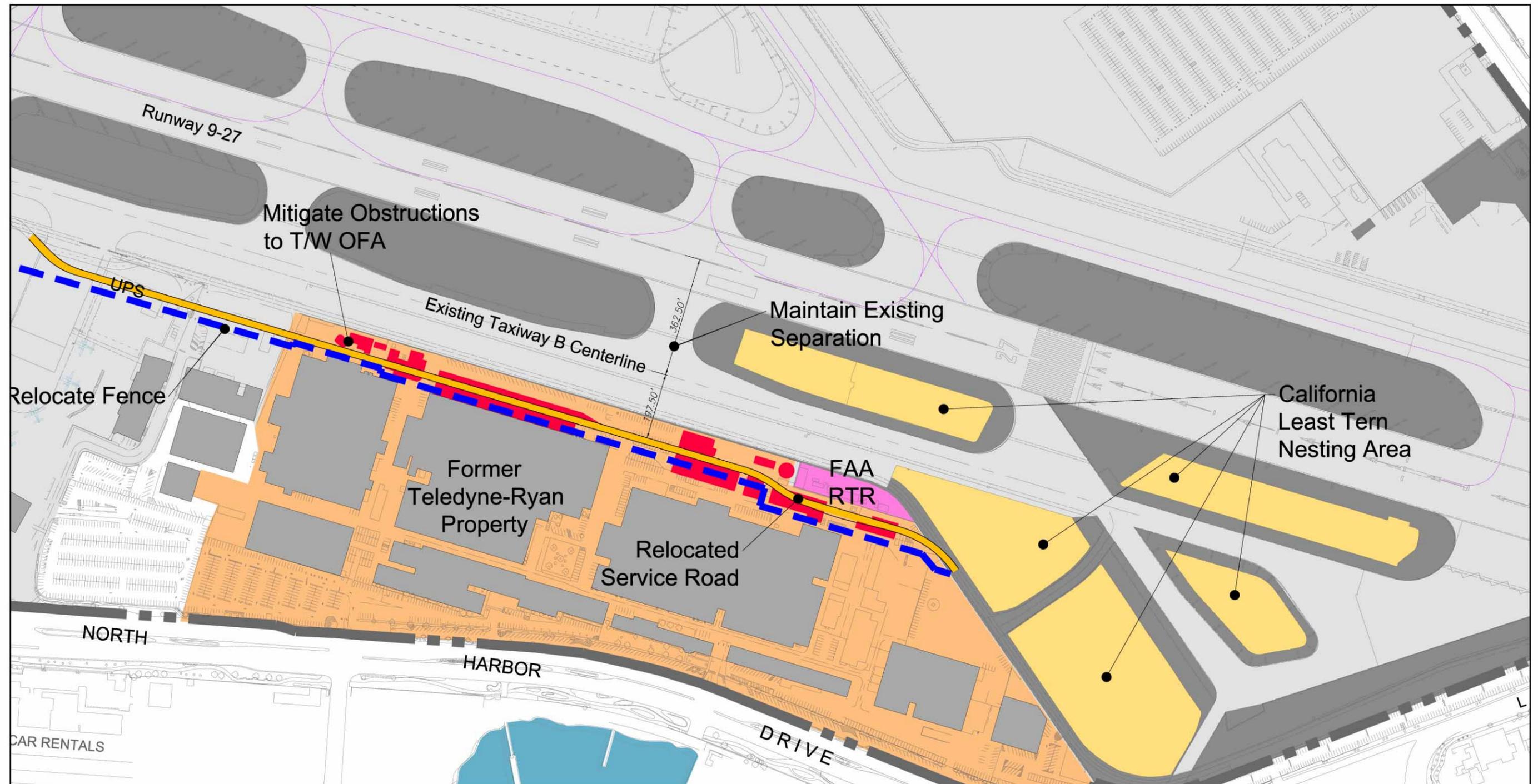
It is recommended that a new hold pad be constructed north of the reconstructed Taxiway C as depicted in **Figure 7.1-6**. The proposed hold pad would be designed to accommodate aircraft as large as the Boeing 747-400 though the suggested layout is optimized for the expected narrow-body fleet that dominates SDIA's air traffic.

A second parallel Group V taxiway is suggested for construction north of the hold pad providing access to the airport support facilities, or other facilities, that would be developed in the north.

These facilities would also eliminate the existing conflict between the east end of Taxiway C and the GA facility. At the present time, the GA apron is insufficiently separated from Taxiway C and is located adjacent to the east end of Taxiway C where aircraft turn on to Runway 27. The jet blast from turning aircraft is directed at the GA apron where workers are tending aircraft and GA passengers are boarding and deplaning aircraft.

A westward extension of Taxiway C (refer to **Figure 7.1-3**) to the Runway 9 end would also reduce the need for runway crossings.

Currently, aircraft arriving Runway 27 that are destined for the north complex must either exit the runway at or east of Taxiway B4. If they are unable to slow and turn from the runway before crossing Taxiway B4, they must exit the runway on to Taxiway B and head east. Air traffic control will then instruct the pilots where and when to cross the runway to reach the north complex.

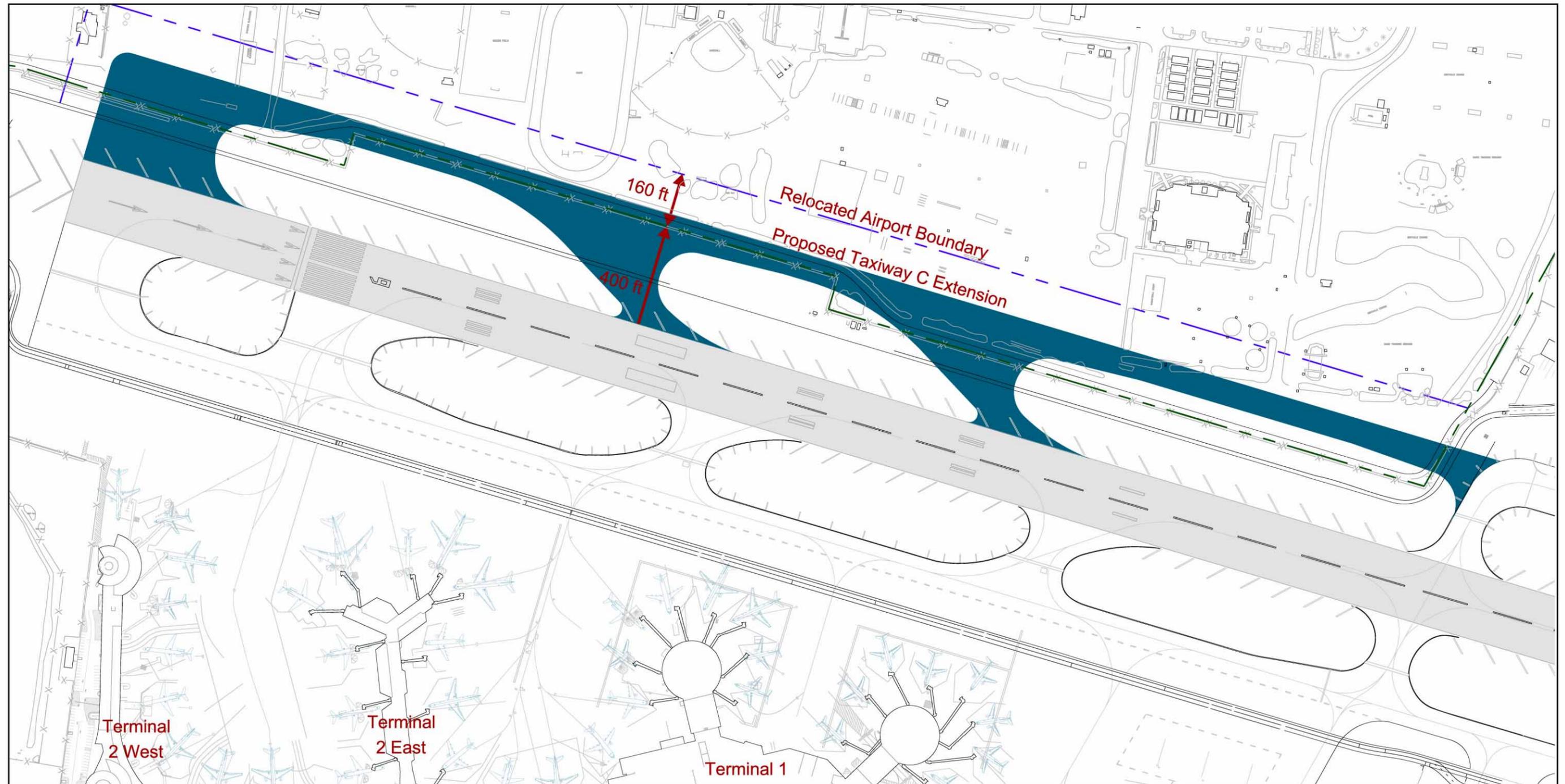


- Legend**
- Existing Facilities - Removal Required
 - - - Proposed Fence
 - Relocated Service Road



Figure 7.1-2

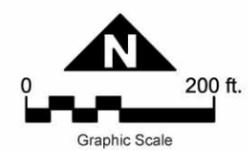
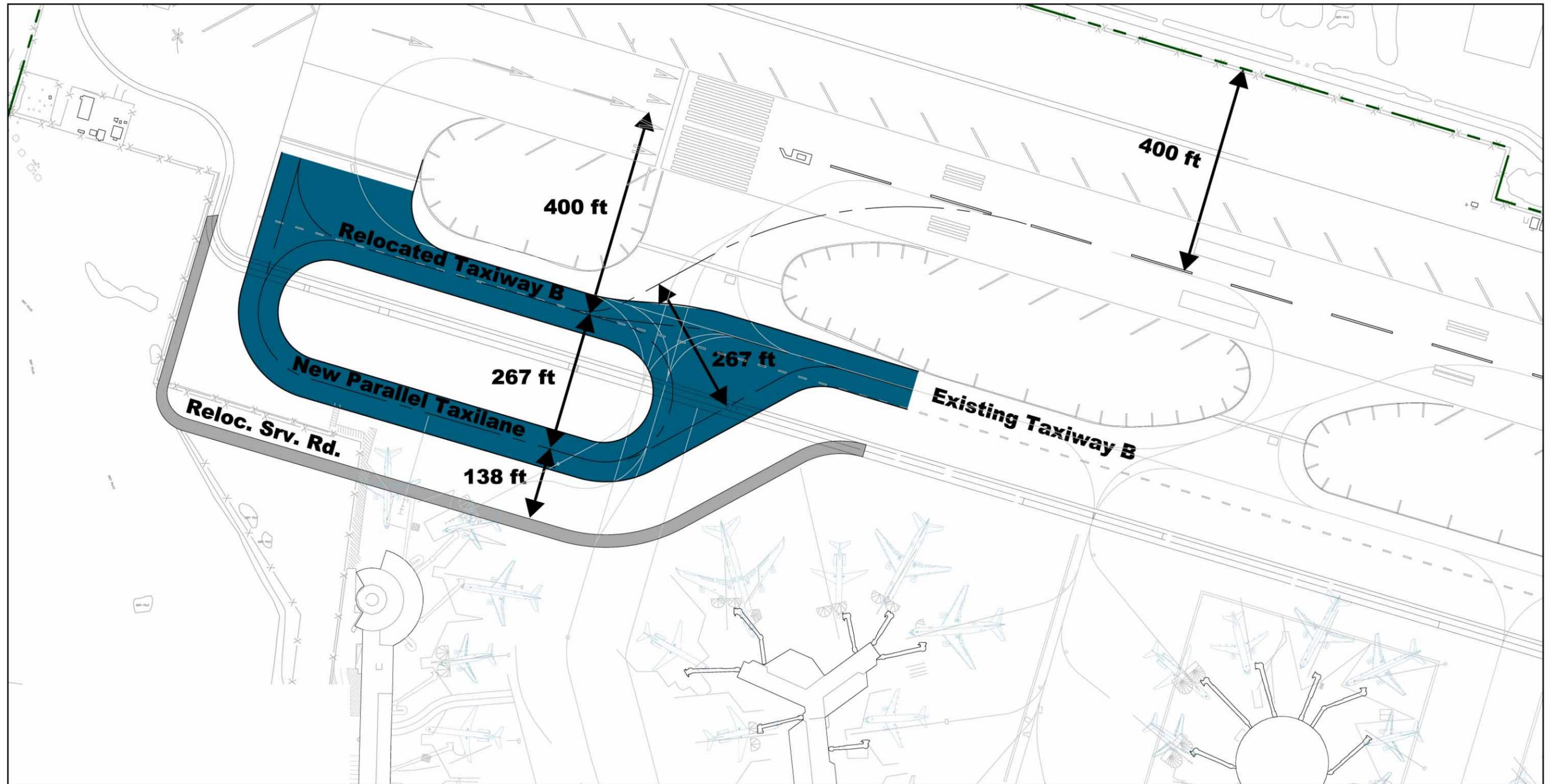
Proposed Taxiway B Group V Upgrade



- Legend
- Future Taxiway
 - Future Airport Property Line
 - Existing Airport Property Line

Figure 7.1-3

Proposed Taxiway C Extension



LEGEND	
	Future Taxiway
	Relocated Service Road
	Existing Airport Property Line

Figure 7.1-4

Dual South Parallel Taxiway - Phase 1

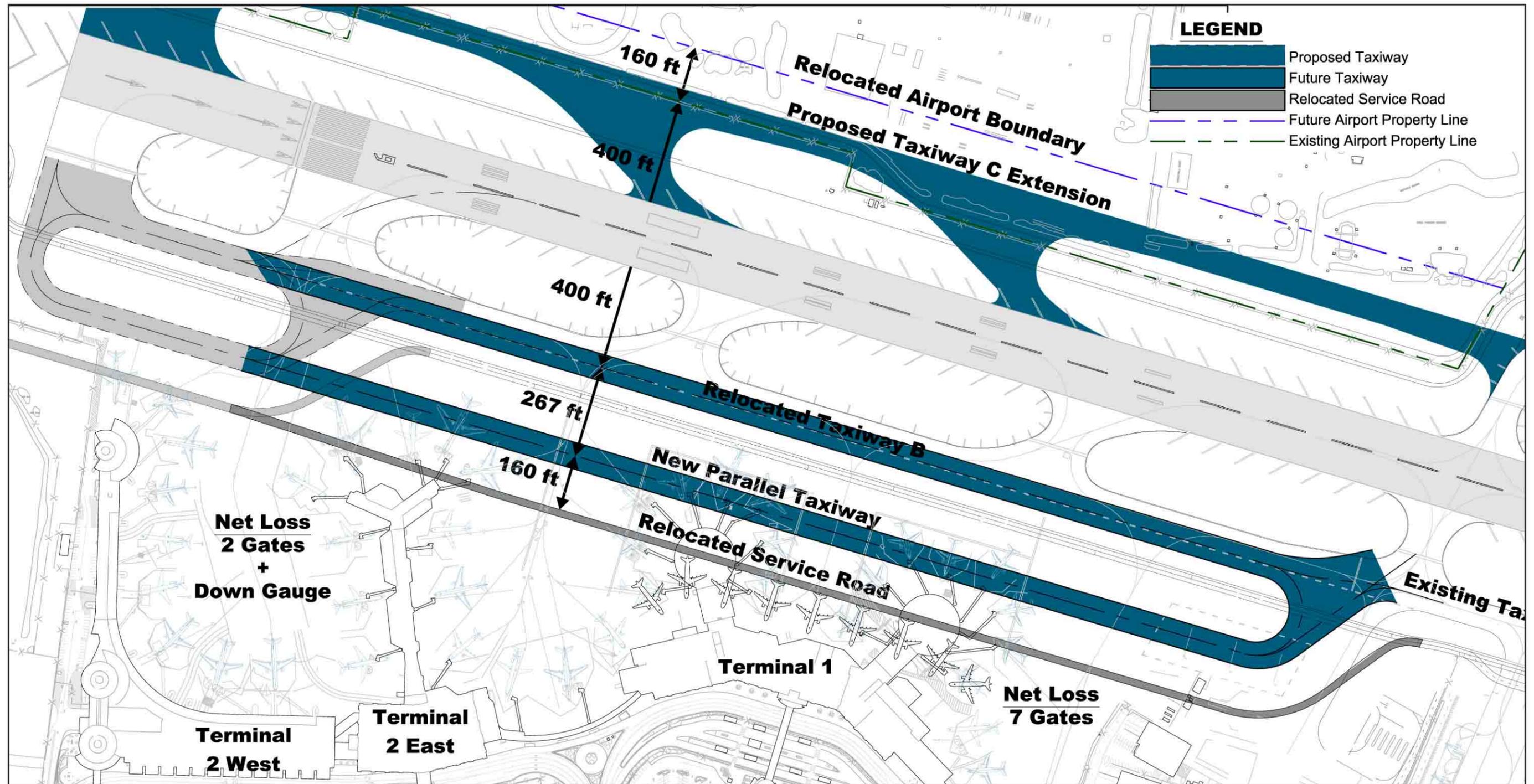
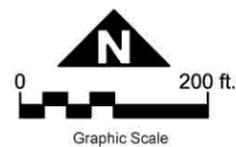


Figure 7.1-5



Dual South Parallel Taxiway - Phase 2

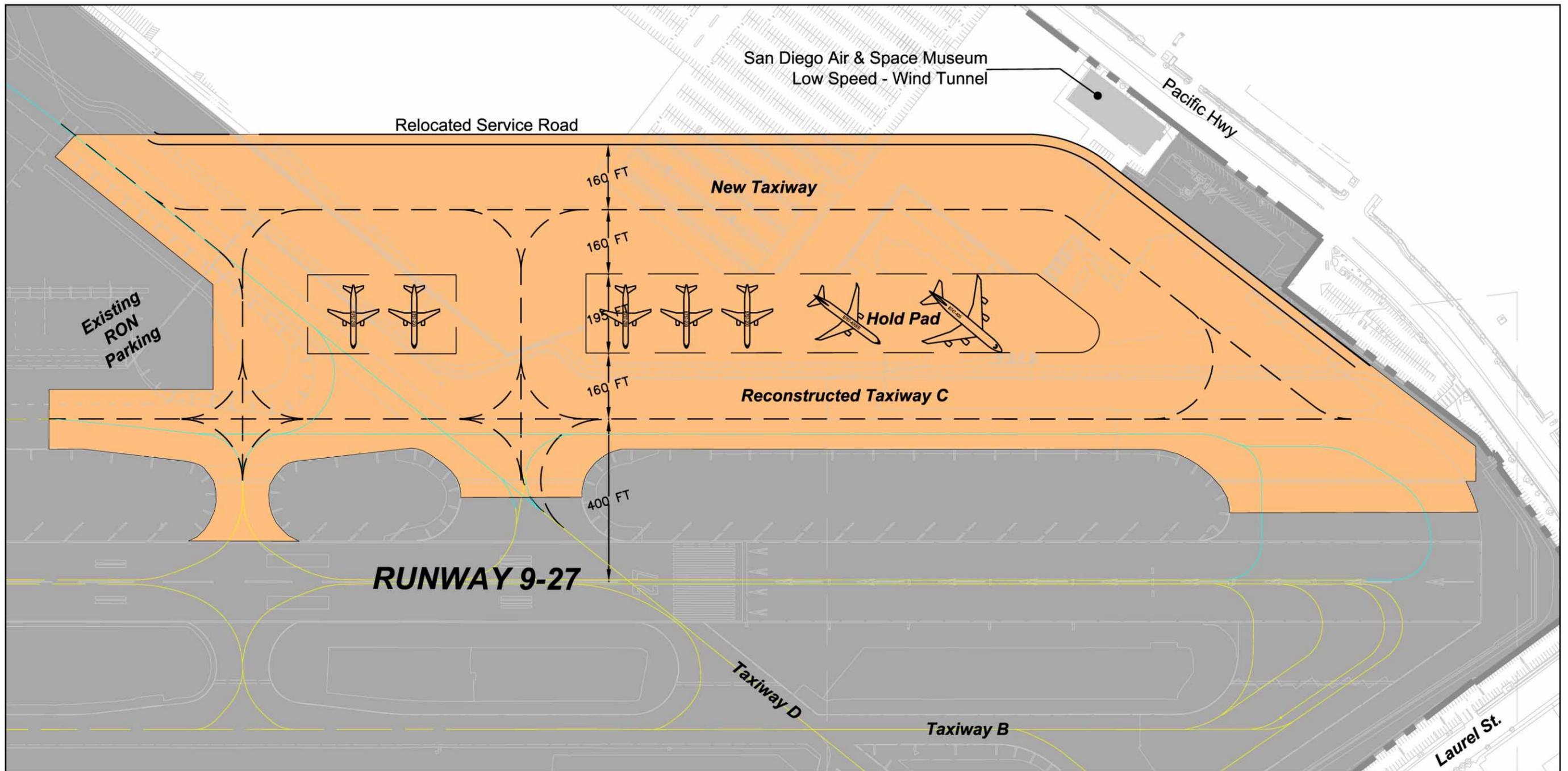


Figure 7.1-6



Proposed Taxiway C Reconstruction and North Area Hold Pad

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During east flow, departing aircraft leaving from the north complex must first cross the runway to reach Taxiway B and then continue west to the Runway 9 end.

The previous airport operator, the San Diego Unified Port District, prepared a Draft Environmental Assessment (EA) in April 2001 for the extension of Taxiway C to the Runway 9 end. However, the property required to construct the taxiway is currently owned by the United States Marine Corps (USMC) as part of the Marine Corps Recruit Depot (MCRD). A transfer and lease cancellation of several parcels owned by the USMC to the Authority was negotiated. An earlier study projected the proposed extension would reduce delay by two minutes to 14 minutes, during visual conditions, and reduce delay by eight minutes to 24 minutes during instrument conditions. The study's conclusion (in 2001) estimated \$18.2 million (net present value over a 20-year period) in savings could be realized with the Taxiway C extension.

The construction of a full-length taxiway north of the airfield would negate the need for Runway 27 arrivals, headed to the north field, to exit the runway to the south and cross the runway to reach the north area facilities. Likewise, Runway 9 departures originating on the north field would not be required to cross the runway to taxi to the Runway 9 departure queue. As stated previously, minimizing runway crossings improves overall levels of airfield safety.

Negotiations with the United States Marine Corps to acquire a portion of the MCRD property in order to construct the Taxiway C extension concluded in 2001. The Authority has not, at this time, chosen to move forward with transfer of the identified parcels that would allow the extension of Taxiway C. It is recommended the Authority move forward with the parcel transfer and construction of the Taxiway C extension under the following circumstances:

- All or portions of the MCRD property become readily available at some point in the future.
- Significant ancillary development occurs on the north portion of the airfield increasing operations originating or terminating in that portion of the airfield concurrent with overall operations growth, which will lead to problematic levels of delay for aircraft attempting to cross the runway to reach the north complex.
- Airport operations levels reach the constraint threshold of 260,000 annually, further congesting Taxiway B.

Taxiway D

Taxiway D is the former crosswind runway (Runway 13-31) which closed in 1992. It is the only remote taxiway at SDIA bisecting the north airfield and providing access to the north cargo ramp from Taxiways B and C. Taxiway D is not in need of further improvement at the current time.

Remain Over Night (RON) Parking

In addition, SDIA has a high demand for overnight aircraft parking. The location of the Airport in the southwestern corner of the United States contributes to its role as a "spoke" airport. As a spoke airport, no airline utilizes the Airport as a hub for connecting through passengers. Spoke airports are typically characterized by a need for "Remain Overnight" (RON) parking. Airlines leave aircraft at spoke airports overnight because of airline hubbing characteristics. Generally, the first round of flights each day is inbound to the hubs from the spoke airports, while the last round of flights is outbound to the spoke airports. Because SDIA is a relatively large airport without hubbing activity, there is a relatively high demand for RON parking. There are approximately 15 existing non-conflicting RON positions. There are three additional RON positions that obstruct aircraft gates. Three additional RON positions will be required by 2015, according to the gated design day schedule.

7. Facility Requirements Analysis

Up to eight new RON positions would be required west of existing Terminal 2 West by 2015. The requirement for eight new RON positions is based on the following criteria:

- Three new positions to fulfill the forecast schedule.
- Two positions to replace the existing Delta Airlines and Continental Airlines RON positions at the west end of Taxiway B.
- Three positions to relieve the existing Delta Airlines and American Airlines RON positions that obstruct Terminal 2 aircraft gates.

The aforementioned airfield improvement would improve efficiency and safety at SDIA. It is a key program objective to provide a safer and more efficient operating environment for air traffic, especially as operations levels rise and congestion ensues.