ENGINEERING AND CONSTRUCTIBILITY

7

San Antonio International Airport

7.0 INTRODUCTION

This chapter presents the results of the evaluation of the feasibility of extending Runway 12L at San Antonio International Airport (SAT or Airport) from an engineering, construction and operational standpoint. The following elements are discussed in this section:

- Potential land use restrictions, necessary land acquisition areas, estimated appraised values and potential avigation easements
- Potential environmental impacts and preliminary examinations of the environmental impact categories associated with FAA Order 5050.4B, *Airport Environmental Handbook*, and all current applicable federal, state, and local regulations
- 3D airspace models of the Airport's Obstacle Clearance Surfaces (OCS) for each alternative including: Federal Aviation Regulations (FAR) Part 77 *Objects Affecting Navigable Airspace;* Federal Aviation Administration (FAA) Order 8260-3B *Terminal Instrument Procedures* (TERPS); FAA AC 150/5300-13, *Airport Design* Appendix-2 Surfaces and Navigational Aid Critical Areas
- Air Traffic Control Tower (ATCT) line-of-sight (LOS) analysis
- Review of construction and impacts

7.1 RUNWAY 12L–30R ALTERNATIVES

Two alternatives for the enhancement of Runway 12L–30R were analyzed as part of this task. They include the following:

- Recommended capacity enhancement from Chapter 6 Runway Capacity Analysis- runway extension to provide a length of 8,250 feet, and upgrade the design category from B-III to C-III.
- Recommended development alternative from the *San Antonio International Airport Master Plan Study, January 1998* - upgrade facilities to accommodate increasing the FAA design criteria from B-III to D-IV, and extend the runway to provide a length of 8,250 feet.

Both of the alternatives involve extending Runway 12L–30R by 2,732 feet to achieve the recommended runway length of 8,250 feet, determined in the 1998 Master Plan Study. Both expansion alternatives also consider the addition of a precision instrument landing system (ILS) to each runway end, thereby providing precision instrument approaches to Runways 12L and 30R. These alternatives do not include an analysis of taxiway exits or improvements as well as taxiways and taxilanes controlled by tenants. The alternatives are described in the following sections.

7.1.1 Universal Upgrades to Both Alternatives

Installing ILS systems to provide precision instrument approaches to both runway ends is proposed for both alternatives. Similarly, medium intensity approach lighting systems with runway alignment (MALSRs) are proposed for each runway end, which would allow for lower approach minima.

Upgrading from the current visual only approaches to precision approaches with less than ¾ mile visibility minima would require the runway protection zone (RPZ) on each end being upgraded to increase from 500 feet inner width, 1,000 feet long, and 700 feet outer width, to 1,000 feet inner width, 2,500 feet long, and 1,750 feet outer width. Such an enlargement would extend the RPZs onto land not currently owned by the Airport.

According to AC 150/5300-13, *Airport Design*, the function of a RPZ is to *"enhance the protection of people and property on the ground"* and is usually achieved through airport ownership of the property comprising the RPZ. In order for the RPZ to perform its function, land uses are restricted within its confines. Residences and places of public assembly are specifically mentioned in the FAA criteria as being incompatible land use within an RPZ. Examples include aircraft parking aprons, terminal buildings, hangars, houses, churches, schools, hospitals, office buildings, and shopping centers.

The enlarged RPZ off of the approach end of 12L would envelop more than 20 buildings not currently located in an RPZ. The RPZ off of the approach end of 30R would envelop approximately 20 buildings not currently located in an RPZ. Additionally, the MALSRs are 2,400 feet long extending from the runway end into the RPZ. Each MALSR system would require the purchase of property, the removal of structures, and the proposed 12L MALSR would have to cross over US Highway 281.

7.1.2 Upgrading from ARC B-III to C-III Standards

Airfield improvements are implemented according to the established ARC for the critical or most demanding aircraft expected to utilize an airport or particular runway, as was discussed in the previous Chapter 6 Runway Capacity. The current ARC for Runway 12L–30R is B-III. Some typical B-III aircraft are depicted in the following figure and include: the ATR-72, British Aerospace BAe 146 Avro RJ, and Douglas DC-6.

Figure 7-1. Typical ARC B-III Aircraft

ATR-72

BAe Avro RJ

DC-6

Both expansion alternatives involve upgrading the Runway's ARC. The recommended alternative reported in Chapter 6 Runway Capacity involves upgrading Runway 12L-30R from B-III to C-III. Typical C-III aircraft are depicted in the following figure and include: the Airbus A-320, Boeing 727, and Boeing 737-700.

Figure 7-2. Typical ARC C-III Aircraft

Airbus A-320

Boeing 727

Boeing 737-700

The following table compares the existing conditions of Runway 12L-30R to the FAA's ARC C-III standards.

Table 7-1. Existing Conditions of Runway 12L-30R Compared to ARC C-III Standards

Characteristic	Existing [1]	ARC B-III [2]	ARC C-III [3]
Rwy Width	100 feet	100 feet	100 feet [7]
Rwy Shoulder Width	0 feet	20 feet	20 feet [7]
Rwy Blast Pad Width	100 feet [4]	140 feet	140 feet [4]
Rwy Blast Pad Length	150 feet [4]	200 feet	200 feet
Twy Width	50 to 75 feet	50 feet	50 feet [5]
Twy Shoulder Width	0 feet	20 feet	20 feet
Rwy Safety Area Width	300 feet	300 feet	500 feet
Rwy Safety Area Length Beyond Rwy End	600 feet	600 feet	1,000 feet
Rwy Object Free Area Width	800 feet	800 feet	800 feet
Rwy Object Free Area Length Beyond the Rwy End	600 feet	600 feet	1,000 feet
Rwy Centerline to Parallel Rwy Centerline Separation for Simultaneous VFR	990 feet	700 feet [6]	700 feet [6]
Rwy Centerline to Parallel Rwy Centerline Separation for Simultaneous IFR	990 feet	≥ 5,000 feet	≥ 5,000 feet
Rwy Centerline to Parallel Twy Centerline Separation	410 feet	300 feet	400 feet
Twy Safety Area Width	171 feet	118 feet	118 feet
Twy Object Free Area Width	186 feet	186 feet	186 feet
Runway Protection Zone			
Inner Width	500 feet	500 feet	1,000 feet
Length	1,000 feet	1,000 feet	2,500 feet
Outer Width	700 feet	700 feet	1,750 feet

Notes:

[1] Data Source: 2009 ALP.

[2] These standards assume that the instrument approach visibility minimums are not lower than ¾ mile.

[3] These standards assume that the instrument approach visibility minimums are lower than ¾ mile.

[4] The approach end to Runway 30L is not equipped with a Runway Blast Pad.

[5] The standard taxiway width is 60 feet for Group-III aircraft with a wheelbase ≥ 60 feet.

[6] Runways with centerline spacing under 2,500 feet are treated as a single runway by ATC when wake turbulence is a factor.

[7] For Group-III runways serving airplanes with a maximum certificated takeoff weight greater than 150,000 pounds, the standard runway width is 150 feet, the shoulder width is 25 feet, and the runway blast pad width is 200 feet.

Source: AC 150/5300-13, *Airport Design.*

According to the FAA's Airport Design AC, upgrading a runway from an ARC B-III to C-III requires the following:

- Increase in runway separation standards
- Increase in RPZ dimensions
- Increase in runway design standards
- Increase in surface gradient standards

As shown in Table 7-1, the majority of existing facilities associated with Runway 12L-30R meet or exceeds FAA ARC B-III design standards and recommendations.

Upgrading Runway 12L-30R to ARC C-III standards, while extending the runway to a length of 8,250 feet and equipping both ends with precision ILS approaches would require the following facility enhancements (see **Figure 7-3**):

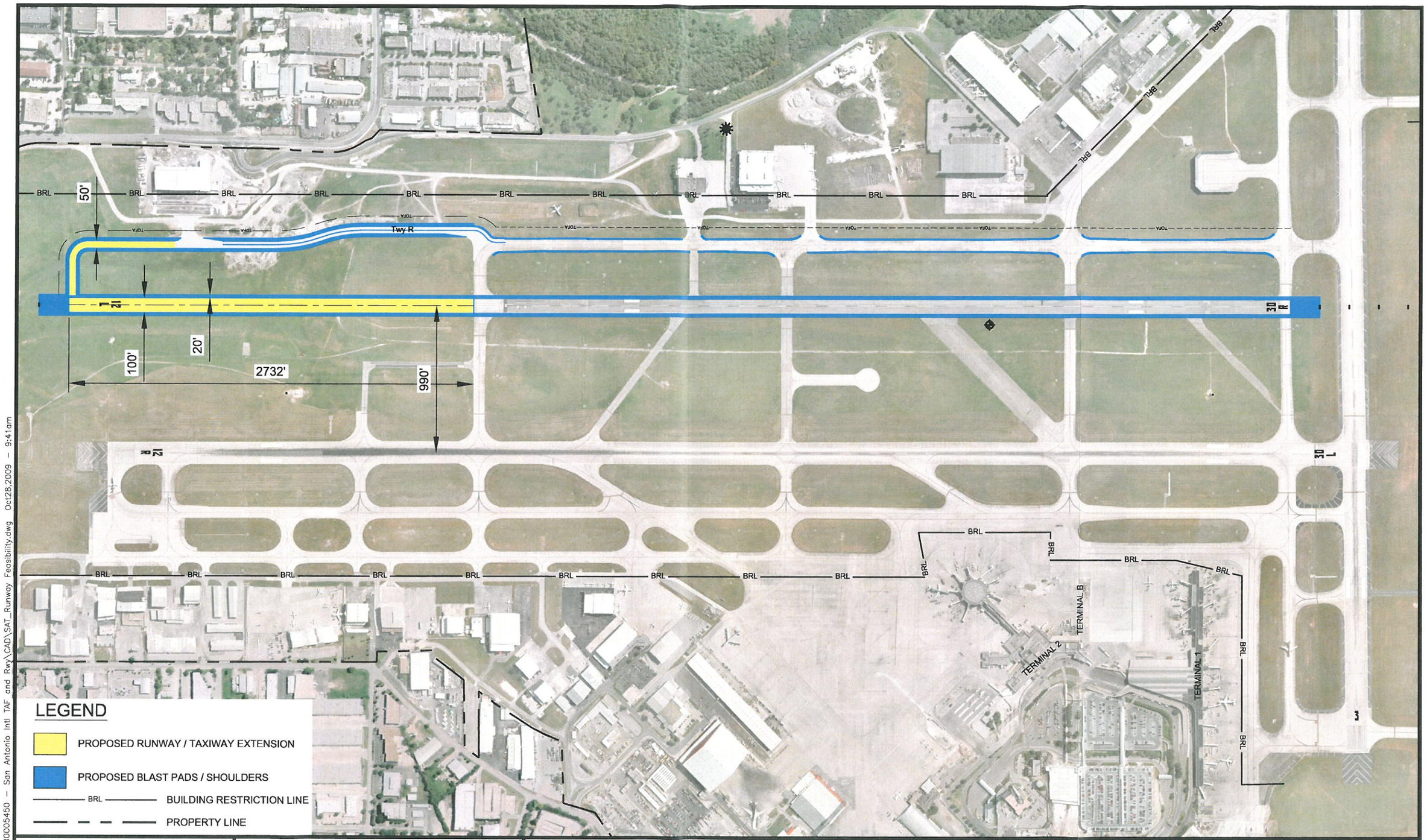
- Runway extension of 2,732 feet, maintaining a width of 100 feet to establish a runway length of 8,250 feet. This entails adding approximately 30,351 square yards of full strength runway pavement.
- Although not a requirement, an option is to add 20-foot paved runway shoulders to the full 8,250-foot runway length. This would entail adding approximately 36,667 square yards of pavement. A second option could be to provide non-standard paved shoulders of 12 feet in width to protect the edge lights from mowers.
- In order to connect to the extended runway end, Taxiway "Romeo-Charlie" (RC) would need to be extended by approximately 714 linear feet to the northwest, maintaining a width of 50 feet. Such an extension would involve adding approximately 5,464 square yards of pavement. There are significant grading issues associated with the Taxiway RC and it is recommended that the profile grade on Taxiway RC be approximately 0.8 percent from the existing Taxiway RC to the first connector taxiway. Then a grade of 0.3 or 0.4 percent from the connector to the end of Taxiway RC at the third apron would be used. This would reduce the fill required on the first part of Taxiway RC and make the profile more consistent for the entire taxiway extension.
- Although not a requirement, taxiway shoulders, 20 feet wide, could be added to the 50-foot wide Taxiway RC, and 7.5 feet wide shoulders to the full length of parallel Taxiway R as that taxiway is 25 feet wider than minimum standards. Those enhancements equate to adding approximately 20,854 square yards of pavement.
- Runway blast pads are also recommended in this option. Each blast pad would need to be 200 feet long and 140 feet wide, encompassing 3,111 square yards; a total addition of 6,222 square yards of pavement.

The total additional pavement required as part of this alternative is approximately 99,557 square yards.

7.1.3 Upgrading from ARC B-III to D-IV Standards

The recommended alternative from the 1998 Master Plan entails upgrading the Runway from B-III to D-IV. That alternative also proposed a shift of the Runway 12L-30R centerline by 10 feet to the northeast, thereby achieving 1,000 feet of separation between the two parallel runway's centerlines. According to the FAA's Airport Design AC, upgrading a runway from an ARC B-III to D-IV requires the following:

- Increase in runway separation standards
- Increase in RPZ dimensions



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SAN ANTONIO AIRPORT SYSTEM

San Antonio International Airport Terminal Area Forecast and Runway Capacity Feasibility Study

N

0 300' 600'

GRAPHIC SCALE IN FEET

Runway 12L-30R ARC C-III Extension

Figure 7-3

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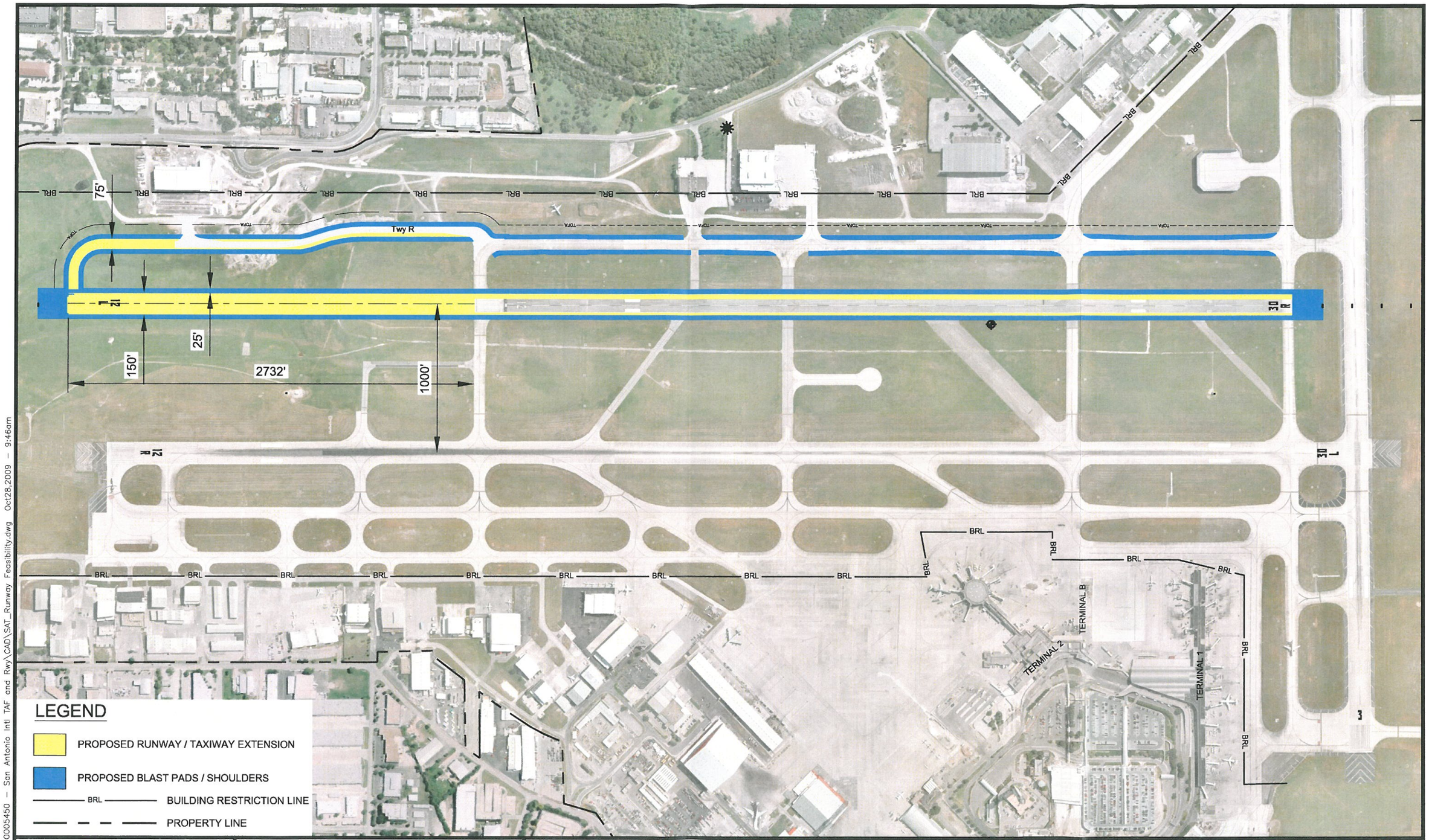

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N

0 300' 600'
GRAPHIC SCALE IN FEET

Runway 12L-30R ARC D-IV
Extension and 10-ft. Center
Line Shift to the North East

Figure
7-5

Plotted By: 23027
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- Increase in runway design standards
- Increase in surface gradient standards

Typical D-IV aircraft are depicted in the following figure and include: the Boeing 757-300, Boeing 767-300, and McDonnell Douglas MD-11.

Figure 7-4. Typical ARC D-IV Aircraft

Boeing 757-300

Boeing 767-300

MD-11

Table 7-2 compares the existing conditions of Runway 12L-30R to the FAA's ARC D-IV standards.

As shown in Table 7-2, few of the existing facilities associated with Runway 12L-30R meet FAA ARC D-IV design standards and recommendations. The existing runway to taxiway centerline separation exceeds the FAA's minimum separation standards. Additionally, parallel Taxiway R meets the required width of a D-IV ARC. Other than those two elements, the associated facilities are sub-standard.

Upgrading Runway 12L-30R to ARC D-IV standards, while extending the runway to a length of 8,250 feet and equipping both ends with precision ILS approaches would require the following facility enhancements (**see Figure 7-5**):

- Runway extension of 2,732 feet to establish a runway length of 8,250 feet, and widening the runway by 50 feet. This entails adding approximately 76,184 square yards of full strength runway pavement.
- Although not a requirement, Runway shoulders, 25 feet wide, could be added to the full 8,250-foot runway length. This would entail adding approximately 45,833 square yards of pavement.
- In order to connect to the extended runway end, Taxiway RC would need to be extended by approximately 714 linear feet to the northwest, and widened by 25 feet. Such an extension would involve adding approximately 12,370 square yards of pavement. There are significant grading issues associated with the Taxiway RC and it is recommended that the profile grade on Taxiway RC be approximately 0.8 percent from the existing Taxiway RC to the first connector taxiway. Then a grade of 0.3 or 0.4 percent from the connector to the end of Taxiway RC at the third apron would be used. This would reduce the fill required on the first part of Taxiway RC and make the profile more consistent for the entire taxiway extension.
- Although not a requirement, taxiway shoulders, 25 feet wide, could be added to the entire parallel taxiway system including Taxiways R and RC. Those enhancements equate to adding approximately 45,162 square yards of pavement.
- Runway blast pads are also recommended in this option. Each blast pad would need to be 200 feet long and 200 feet wide, encompassing 4,444 square yards; a total addition of 8,888 square yards of pavement.

The total additional pavement required as part of this alternative is approximately 188,437 square yards.

Table 7-2. Existing Conditions of Runway 12L-30R Compared to ARC D-IV Standards

Characteristic	Existing [1]	ARC D-IV [2]
Rwy Width	100 feet	150 feet
Rwy Shoulder Width	0 feet	25 feet
Rwy Blast Pad Width	100 feet [3]	200 feet
Rwy Blast Pad Length	150 feet [3]	200 feet
Twy Width	50 to 75 feet	75 feet
Twy Shoulder Width	0 feet	25 feet
Rwy Safety Area Width	300 feet	500 feet
Rwy Safety Area Length Beyond Rwy End	600 feet	1,000 feet
Rwy Object Free Area Width	800 feet	800 feet
Rwy Object Free Area Length Beyond the Rwy End	600 feet	1,000 feet
Rwy Centerline to Parallel Rwy Centerline Separation for Simultaneous VFR	990 feet	700 feet [4]
Rwy Centerline to Parallel Rwy Centerline Separation for Simultaneous IFR	990 feet	≥ 5,000 feet
Rwy Centerline to Parallel Twy Centerline Separation	410 feet	400 feet
Twy Safety Area Width	171 feet	171 feet
Twy Object Free Area Width	186 feet	225 feet
Runway Protection Zone		
Inner Width	500 feet	1,000 feet
Length	1,000 feet	2,500 feet
Outer Width	700 feet	1,750 feet

Notes:

[1] Data Source: 2009 ALP.

[2] These standards assume that the instrument approach visibility minimums are lower than ¾ mile.

[3] The approach end to Runway 30L is not equipped with a Runway Blast Pad.

[4] Two parallel runways with centerline separations under 2,500 feet are treated as a single runway by ATC when wake turbulence is a factor.

Source: AC 150/5300-13, *Airport Design*.

7.2 ENVIRONMENTAL IMPACTS

This section presents an overview of the existing environmental conditions at the SAT due to the proposed extension to Runway 12L-30R. Such an overview does not constitute an Environmental Assessment (EA), as defined by the Federal Aviation Administration (FAA) Order 5050.4B, *National Environmental Policy Act (NEPA)*

Implementing Instructions for Airport Actions, and 1050.1E *Environmental Impacts: Policies and Procedures*; however, the analyses in this section were conducted in accordance with the guidelines set forth in the aforementioned FAA Orders.

According to the FAA Orders, nineteen (19) categories have been determined as possible areas of impact and must be addressed. These categories include:

1. Air Quality
2. Coastal Barriers
3. Coastal Zone Management
4. Compatible Land Use
5. Construction Impacts
6. Section 4(f) Lands
7. Prime and Unique Farmland
8. Fish, Wildlife and Plants
9. Floodplains
10. Hazardous Materials
11. Historical, Architectural, Archeological, and Cultural Resources
12. Light Emissions and Visual Impacts
13. Natural Resources and Energy Supply
14. Airport Noise
15. Socioeconomic Environmental Justice, and Children's Health and Safety Risks
16. Solid Waste
17. Water Quality
18. Wetlands
19. Wild and Scenic Rivers

For the purposes of this study, the above-mentioned environmental categories will be discussed but addressed only as they apply specifically to SAT and will otherwise be noted as not applicable to the Airport.

7.2.1 Air Quality

Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The levels of pollutants are generally expressed on a concentration basis in units of part per million (ppm) or micrograms per cubic meter (µg/m3).

The baseline standards to determine potential effects for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS). These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare, with a reasonable margin of safety. The NAAQS identify maximum allowable concentrations for the following criteria pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns in diameter (PM10), and lead (40 CFR 50).

Guidelines for regulating air quality have been established by the Federal Clean Air Act and all implementation and enforcement of these guidelines are the responsibility of the Environmental Protection Agency (EPA). Section 110 of the Act requires that states develop a State Implementation Plan (SIP) in an effort to comply with Federal air quality standards. National ambient air quality standards have been established under Section

109 of the Act to protect public health. The FAA must ensure that all Federal airport actions, such as financial awards and grants, conform to the State plan for controlling air pollution impacts.

The *Final Environmental Assessment for the Extension of Runway 3-21 and Lease of Airport Property for Commercial Development at San Antonio International Airport*, September 2007 utilized the Emissions and Dispersion Modeling System (EDMS) Version 4.2 to quantify existing emissions from airport sources. This analysis obtained data from numerous air quality receptor locations surrounding the airport, and revealed that pollutants resulting from airport operations fall well below the NAAQS.

Temporary impacts from construction-related activities and their associated vehicles are expected during development initiatives at SAT. These impacts are anticipated to be minimal and could be mitigated by use of best management practices. Temporary air quality impacts during these periods are likely to include, but not limited to, wind-blown dust and equipment exhaust.

7.2.2 Coastal Barriers

The Coastal Barriers Resource Act (COBRA) of 1982 prohibits the Federal government from financial involvement associated with building and development in undeveloped portions of designated coastal barrier, which consists of undeveloped coastal barriers along the Atlantic and Gulf coasts. These areas were mapped and designated as Coastal Barrier Resources System units or "otherwise" protected areas. They are commonly referred to as COBRA zones. COBRA banned the sale of NFIP flood insurance for structures built or substantially improved on or after a specified date. COBRA zones and their identification dates are shown on Flood Insurance Rate Maps (FIRMs). Those maps identify lands included in the Coastal Barrier Resource System (CBRS) and are available for inspection in the offices of the U.S. Fish and Wildlife Service. SAT is not situated within any federally assigned units included in the CBRS.

7.2.3 Coastal Zone Management

The Coastal Zone Management Act (CZMA) requires that all Federal projects occurring in applicable coastal zone areas comply with management guidelines established in the Coastal Zone Management Program. Procedures for determining consistency with approved coastal zone management programs are contained in the National Oceanic and Atmospheric Administration (NOAA) Regulations (15 CFR Part 930).

The term "coastal zone" is defined as coastal waters and adjacent shorelands strongly influenced by each other and in proximity to the several coastal states, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. "Coastal Waters" refers to any water adjacent to the shoreline that contain a measurable amount of sea water, including but not limited to sounds, bays, lagoons, bayous, ponds, and estuaries. SAT is not located within a defined coastal zone.

7.2.4 Compatible Land Use

A key goal of the planning process is to ensure compatible land uses between the airport and the surrounding community. The purpose of this is to ensure that the land usage near airports do not pose risks to the safety of aircraft operations at those airports. It is recommended that prospective city land use policies consider existing as well as future Airport activities over the course of the planning period, including compatibility issues such as development on- and off-Airport property, aircraft operations, or other activities.

According to the property data published on the 2009 Airport Layout Plan, the bounds of the Airport envelop approximately 2,374 acres divided into five property groups (see **Figure 7-6**) that are separated by US Highway 281, Nakoma Street, Wetmore Road, and the Union Pacific Railroad tracks. Runway 12L–30R and its associated safety areas and protection zones are currently located on Airport property. However, the proposed runway extension and ILS implementation cause the portions of the RPZs and MALSRs to encroach upon off-airport property.

As mentioned previously, the RPZ is a trapezoidal area centered about the extended runway centerline for the purpose of enhancing the protection of people and property on the ground. The RPZ consists of the runway object-free area (ROFA) and the controlled activity area. The RPZ begins 200 feet beyond the runway end of the runway. It is recommended to clear all objects from the RPZ, however some uses are permitted as long as they are not wildlife attractants, do not interfere with NAVAIDS, and are outside of the ROFA. It should be noted that the FAA highly recommends that airports own the area contained within the RPZ. This area should be free of land uses that create glare, smoke, or other hazards to air navigation. Also, the construction of residences, fuel-handling facilities, churches, schools, and offices is not recommended in the RPZ. Generally, if ownership of the full RPZ area is unobtainable the area is protected through the use of easements or other land use controls.

With the proposed extension of Runway 12L-30R and implementation of a precision approaches allowing for operations when visibility conditions are less than ¾ of a statute mile, the required RPZ for both ends would encompass an area of 78.914 acres. As shown in **Figures 7-7 and 7-8**, some of the land area lying under the proposed RPZ would be on airport property, while approximately 32 acres would not be owned or controlled by the Airport on the end of Runway 12L and approximately 32 acres on the end of Runway 30R. It must be noted that the current RPZs for Runway 12R and 30L have portions not on airport property. Based on information obtained from the Bexar County Property Appraiser website, the property located in both RPZs is classified as commercial and industrial property with an estimated appraised value of $21 million dollars.

Portions of the off-airport property are roadways and easements would be sought. Approximately 20 acres on the end of Runway 12L and 6 acres on the end of 30R would be considered easements. The other off-airport property located within the RPZs of Runway 12L and 30R are classified as commercial (Figure 7-6).

Also reflected on Figures 7-7 and 7-8 are RPZs for non-precision and visual approaches for Category C and D aircraft. The RPZs would encompass 29.465 acres and would require minimal property acquisition on Runway 30L in comparison to the RPZ associated with a precision approach.