

## Section 6

### SITE SELECTION

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Aviation demand forecasts and facility requirements were initially prepared as inputs to the site selection process. The forecasts and facility requirements presented in the preceding sections of this report were prepared for a facility located at the existing and recommended site for Window Rock Airport. This section documents the site selection process and the comparative evaluation of alternatives which culminated in the recommendation for retaining the existing airport.

#### 6.1 SITE SELECTION SUMMARY

##### FINDINGS

The results of the forecasting and airport capacity studies revealed that, in order to meet the projected Window Rock aeronautical demands, a single general aviation runway will continue to be required through the year 2000. Three sites were identified for consideration as an airport site. These included the following:

- I Retain existing Window Rock Airport
- II Construct Site A and close Window Rock Airport
- III Construct Site B and close Window Rock Airport

These alternatives were evaluated based on costs, property considerations, accessibility, environmental considerations, and aeronautical considerations. Results of these evaluations are summarized in the following paragraphs.

### Comparative Costs

- o Costs were evaluated for those items required for each alternative. Specific cost items included land, airfield improvements, navigational aids, utilities and drainage, and terminal site improvements. Retaining the existing site provides the lowest cost option. Additionally, although the Navajo Tribe "owns" all the land within the reservation, there are long-established traditions and customs affecting the ability of the Tribe, as a whole, to secure land from individuals for Tribal development projects. The difficulties associated with obtaining land also suggest that retaining the existing site provides the best opportunity for continued development of a general aviation facility to serve Window Rock.

### Accessibility

- o The alternative providing the best access to Window Rock is Alternative I. Recognizing that the airport serving Window Rock is also used for aeromedical transportation to and from the hospital in Fort Defiance, Alternative III provides the best access to both Window Rock and Fort Defiance.

### Environmental Considerations

- o Continued use of the existing airport (Alternative I) will not require relocating any existing residences as the result of continued development; development of any of the other sites will require relocating from two to four residences.
- o While forecasted aircraft operations are not sufficient to define any significant noise impact, Alternatives I and II result in aircraft overflights of residential areas. Alternative III would result in no residential overflights.

- o Alternatives II and III require removal of useable grazing land from the available inventory. Alternative I would require limited expansion of an area already sufficiently disrupted as to eliminate its utility for grazing.

#### Aeronautical Considerations

- o Recognizing that surrounding topography places limitations on potential instrument approach procedures to any site within Black Creek Valley, each site was examined in order to determine its ability to achieve FAR Part 77 criteria for non-precision airports. Only Alternatives I and III allow establishment of desired approach surface criteria of 34:1. The remaining site allows provision of a Visual Flight Rule (VFR) capability only.

Of the three alternatives considered, Alternative I - retain existing Window Rock Airport, was selected as the most favorable option based on the above-mentioned evaluation criteria. In particular, it is suggested that, given the relatively low forecasted activity level for Window Rock and the suitability of the existing site for expanded development, movement to a new site would not be cost-effective.

#### RECOMMENDATIONS

- o It was recommended that the Division of Economic Development pursue continued development of the existing airport.
- o An airport master plan should be prepared for the Window Rock Airport. This plan will include economic feasibility and implementation studies.

#### 6.2 IDENTIFICATION OF ALTERNATIVES

Identification of alternative airport sites was constrained significantly by topography, prevailing winds, and existing roads. Window Rock lies on the west slope of the Chuska Mountains in the Black Creek Valley. The

valley is approximately two miles across at its widest point with the slopes of the Defiance Plateau defining its western flank. The orientation of these geographic formations is north to south. Identification of potential airport sites to the east or west would, therefore, have required searching for a site on the east side of the mountains or on top of the plateau. Given the distances involved, neither alternative was considered viable.

Within the Black Creek Valley itself, both topography and the direction of the prevailing winds placed constraints on the identification of potential sites. The valley is cut by numerous streambeds or "washes" running down from the mountain range and plateau into Black Creek. Additionally, the valley has a rolling topography with several hills rising as much as eighty feet above the valley floor.

Recognizing that the runway orientation should be parallel to prevailing wind directions, available wind data was examined. The closest weather station recording wind data is located at Gallup, New Mexico, approximately twenty miles to the southeast. Based on that data, the desired true runway heading is approximately 064/244, or east-northeast by west-southwest. However, placing a runway along this heading would result in the approaches to the runway being almost perpendicular to the orientation of the valley or directly over the mountains. Conversely, placing the runway on a north-south orientation would result in inadequate wind coverage plus potentially cutting any one of the several washes.

Lastly, there are a limited number of improved roads on the reservation. Within Black Creek Valley, Indian Road 12 runs north-south through the valley, with the east-west roads limited to locations where a significant settlement or mountain pass exist. Thus, the combination of topography, prevailing winds, limited roads, and the need to remain in close proximity to Window Rock, or at a minimum, Fort Defiance, resulted in only two new possible airport sites being identified. The forecast of aircraft operations suggested the need for only one runway. Therefore, at each

new site, the runway orientation closest to 064/244, yet allowing NPI obstacle clearance, was sought. At the existing airport, the existing runway orientation was retained. Therefore, three alternatives were identified. These are listed below.

- I Retain existing Window Rock Airport
- II Construct Site A and close Window Rock Airport
- III Construct Site B and close Window Rock Airport

### 6.3 DESCRIPTION OF ALTERNATIVES

A detailed description of the alternatives follows; Exhibit 6-1 is provided to graphically illustrate the new site locations.

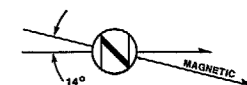
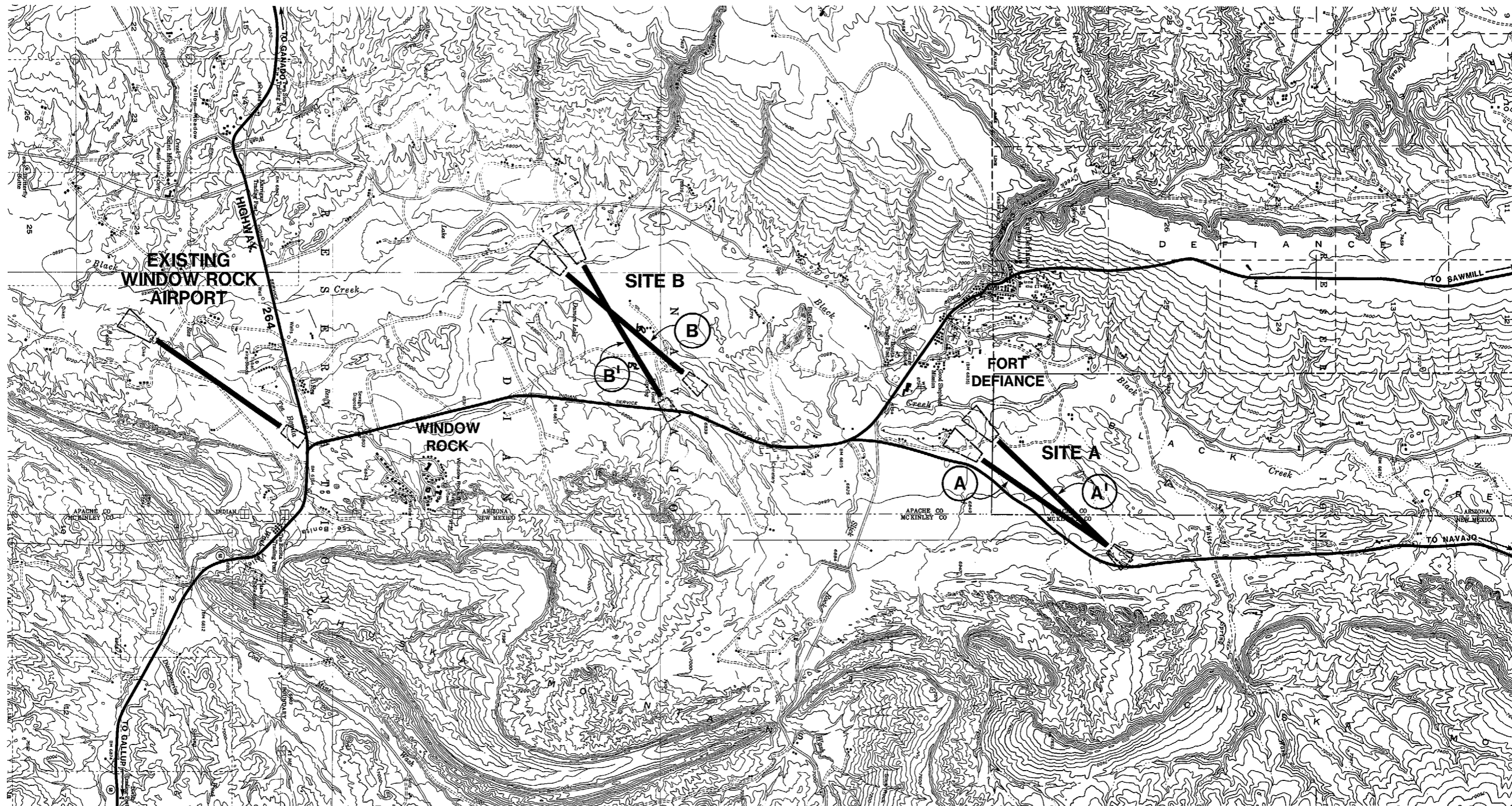
#### ALTERNATIVE I - Retaining Existing Window Rock Airport

Alternative I assumes that the existing airport will be retained and expanded as necessary to meet aviation demand. Forecasted aviation demand suggests that such expansion would be limited to rehabilitating the existing runway, construction of a parallel taxiway and improvements in the terminal area. Additional improvements would include security fencing, a new runway lighting system, beacon, and other runway identification/navigational aids.

#### ALTERNATIVE II - Construct Site A

This alternative assumes that a new airport will be constructed in the area approximately 1.5 miles east of Fort Defiance and 6 miles from Window Rock. The site is east of Black Creek and west of Indian Road 12. Under this alternative a runway orientation of 03/21 and 04/22 (magnetic) were examined. The site currently is used as grazing land.

This alternative would require the development of a new airport built for general utility use but to basic transport standards. Proposed airside improvements include a 6,750 foot runway (required for PV-2 aircraft), a



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AIRPORT MASTER PLAN  
**WINDOW ROCK AIRPORT**

**ALTERNATE AIRPORT SITES**

DRAWING NO.  
**WRA- 1**

parallel taxiway, marking and lighting, lighted wind cone and segmented circle, rotating beacon, VASI's, a non-directional beacon (NDB) and perimeter fencing. Required landside improvements include aircraft parking aprons and hangers, a terminal building, and an access road off Indian Road 12. Two homes will have to be relocated. Utility lines would also have to be brought to the site for water and power.

Finally, under this alternative, the existing airport would be closed.

#### ALTERNATIVE III - Construct Site B

This alternative assumes that a new airport will be constructed in the area approximately 2.5 miles north of Window Rock and 3 miles south of Fort Defiance. The site is on the west side of Indian Road 12. Under this alternative, the runway orientation of 04/22 and 06/24 (magnetic) were examined. The site is currently used as grazing land.

This alternative would require the development of a new airport built for general utility use but to basic transport standards. Proposed airside and landside improvements are consistent with those of Alternative II. As with Site A, a new access road would need to be provided. Additionally, approximately four homes would need to be relocated. Utility lines would also have to be brought to the site for water and power. As with Alternative II, it is assumed that the existing airport would be closed.

#### 6.4 COMPARATIVE EVALUATION OF ALTERNATIVES

Four primary considerations were analyzed in the site evaluation. These were: Comparative Costs and Property Considerations, Accessibility, and Environmental and Aeronautical Considerations. Exhibit 6-2 is a summary of the evaluation by each criteria.

Exhibit 6-2

EVALUATION MATRIX

	<u>Alternative I</u>	<u>Alternative II</u>	<u>Alternative III</u>
<u>COMPARATIVE COSTS</u>			
Land	\$ 27,300	\$ 176,800	\$ 246,800
Airfield Improvements	1,657,125	2,941,025	2,941,025
Navigational Aids	124,000	15,000	124,000
Utilities/Drainage	10,000	30,000	150,000
Terminal Site Improvements	<u>377,470</u>	<u>506,400</u>	<u>570,400</u>
Estimated Cost	\$2,195,895	\$3,669,225	\$4,032,225
Contingency (10%)	<u>219,590</u>	<u>366,923</u>	<u>403,223</u>
<u>TOTAL ESTIMATED COST</u>	<u>\$2,415,485</u>	<u>\$4,036,148</u>	<u>\$4,435,448</u>

ACCESSIBILITY

Major Access Route	SH 264/ Indian Route 12	Indian Route 12	Indian Route 12
<u>Miles to:</u>			
Window Rock	0.5	6.0	2.5
Fort Defiance	5.5	1.5	3.0

ENVIRONMENTAL

Dwellings Requiring Relocation	0	2	4
Proximity of Flights Paths to Urban Areas	Overhead	Overhead	None
Compatibility with Existing Land Use	Good	Good	Excellent
Compatibility with Forecast Land Use	Good	Good	Excellent
Acres Removed from Grazing	91	356	356

AIRSPACE AND AVIATION

Part 77 Penetrations	1	1	0
Opportunities for Non- Precision Approach	Fair	None	Fair



#### 6.4.1 Comparative Costs and Property Considerations

Development costs were estimated for each alternative. Categories for which costs were estimated include land, airfield improvements, navigational aids, utilities and drainage, and terminal site improvements.

It was not possible to develop estimates of land costs associated with each alternative. The Navajo Tribe "owns" all the land within the reservation. However, individuals and families have long-standing rights to the use of specific parcels, rights which must be voluntarily released. Therefore, as a proxy for land costs, a figure of \$300 per acre was assumed for purposes of measuring the economic value of the land to its current user. The administrative costs to relocate families from airport sites were estimated at \$35,000 per family.

Airfield improvement estimates include construction costs for a Basic Transport runway and taxiway, grading, runway and taxiway lighting, pavement marking, a lighted wind cone, beacon, and segmented circle. Utility and drainage estimates include the cost to bring water and power to the site and provide a septic field.

Terminal site improvement estimates include the cost to provide access to each site, the cost of a new terminal, fencing the airport site, and providing automobile and aircraft (apron) parking areas. An estimated ten percent contingency was added to the estimated site costs to provide an estimated total cost.

As might be expected, the costs associated with improving the existing airport site are substantially less than the costs associated with developing a new site. Developing Site B presented the greatest costs (\$4.44 million) with Site A having a comparative development cost (\$4.04 million). Improving the existing site, which is the preferred alternative from the standpoint of comparative costs, is estimated at approximately \$2.42 million.

#### 6.4.2 Accessibility

Comparative evaluation of accessibility focused on an analysis of access routes and user mileage requirements. The analysis of access routes evaluated the existing and planned road improvements, plus possible alternative access routes. User requirements were measured by estimating mileage between demand centers and alternative sites.

Alternative I, the existing site, is located in Window Rock on the south end of town. It has direct access off State Highway 264 via an improved road and is approximately one mile from the Tribal governmental center. Alternative II is located approximately 1.5 miles east of Fort Defiance and six miles from Window Rock. Access to the site would have to be provided off Indian Road 12. Alternative III is approximately 2.5 miles north of Window Rock and three miles south of Fort Defiance. Access would have to be provided off Indian Road 12.

Recognizing that the Window Rock Airport also provides access to Fort Defiance, Alternative III is more centrally located. However, the majority of the transient and itinerant traffic at the airport is associated with activities of the Tribal governmental center. Therefore, from a user standpoint, the existing site (Alternative I) is more accessible for the majority of users.

#### 6.4.3 Environmental Considerations

After reviewing the forecast of aviation activity, the alternative airport sites and all available information on the environmental characteristics of Apache County, four of the nineteen environmental categories identified in FAA Order 5050.4, "Airport Environmental Handbook," were considered the most important criteria for comparatively evaluating the three sites. These include noise, land use, social, and farmland impacts.

## Noise

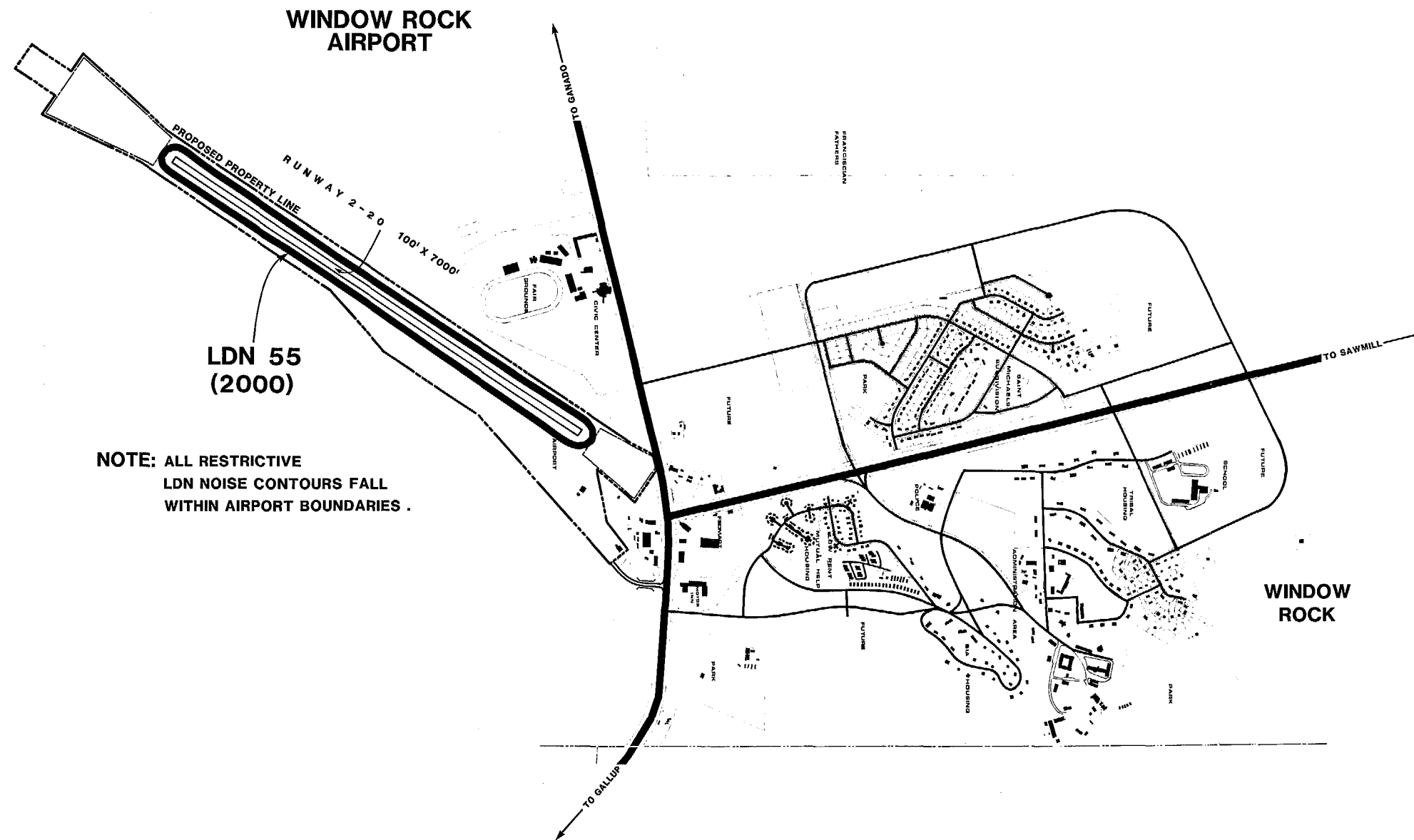
Noise from airport activity can be defined in two ways. First, maximum noise exposure from single events can be defined at specific sites. Secondly, the cumulative 24-hour noise impact of airport operations can also be defined, typically through the production of a noise exposure contour map. For this study, a computerized noise exposure map was produced, based on the aviation forecasts for the year 2000. The map generated (Exhibit 6-3) indicated no significant cumulative noise impact as a result of aviation activity extending off potential airport property. As a result, the focus of the noise analysis became the existence or potential existence of noise-sensitive land uses subject to direct aircraft flyovers.

## Land Use

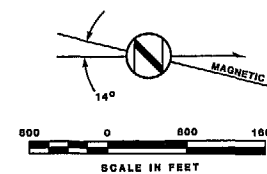
Under Alternative I, retain the existing airport, the northern approach to the airport is over the southern portion of the Window Rock community. There currently is a mix of residential and commercial uses in the approach area with additional residential land uses proposed. The south approach includes predominantly open land. Immediately to the west of the airport is the Tribal fairgrounds.

The southern approach to Alternative II (Site A) is over the southern portion of Fort Defiance. There are a number of residences and a school in the area. The northern approach is clear of potentially incompatible land development. The approaches to Alternative III (Site B) are clear of any potentially incompatible land development.

From the standpoint of existing or potentially incompatible land development, Alternative III provides the best opportunity for minimizing potential airport-land use conflicts. However, the level of forecasted general aviation activity is not sufficient to indicate a significant conflict at any of the three sites.



NOTE: ALL RESTRICTIVE  
LDN NOISE CONTOURS FALL  
WITHIN AIRPORT BOUNDARIES .



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## Social

The principal concern addressed here is the relocation of families from existing homes in order to pursue airport development at any of the sites. Under Alternative I, no relocations are required. Alternative II requires a minimum of two relocations and Alternative III requires a minimum of four relocations. Relocations must be considered a major deterrent for airport development for this project.

## Farmland

While none of the airport sites are in areas designated as prime and unique farmland by the U.S. Department of Agriculture, Navajo Tribal customs and traditions regarding the use of land are important considerations in selecting a site for successful development of an airport. In this regard, both Alternatives II and III require the removal of over 350 acres of land from the grazing inventory. Under Alternative I, an additional 91 acres are required to support airport development; however, some 56 acres have previously been disturbed and are not suitable for grazing and other agricultural uses. The remaining 35 acres are in the southern clear zone and can remain in the grazing inventory. These factors suggest that Alternative I provides the best opportunity for continued airport development without conflicting with current agricultural and grazing activities.

### 6.4.4 Aeronautical Considerations

The basic criteria for evaluating aeronautical considerations are: the capability of each alternative to accommodate demand; the effect of each alternative on the distribution of demand; and airspace limitations. As forecasted activity indicates a single runway can provide sufficient capacity to meet demand, any alternative will accommodate demand. Similarly, the effects of each alternative on the distribution of demand are expected to be comparable. As such, the principle focus is on airspace limitations.

As described previously, Window Rock and Fort Defiance are in the Black Creek Valley. The narrowness of the valley and the rapidly rising mountains on either side, combined with the direction of the prevailing wind, make the identification of alternative airport sites particularly difficult. In fact, the two principal factors used to locate possible alternative sites were a relatively flat site and an ability at a minimum to meet obstruction clearance requirements of FAR Part 77.

At each of the alternative sites, two possible runway alignments were examined. An attempt was initially made to achieve the 95 percent crosswind coverage required by FAA criteria. Each alignment was then examined relative to FAA obstruction clearance requirements. These initial alignments were found to create significant conflicts with these requirements and were subsequently dropped from further consideration. They are labelled Alignment A<sup>1</sup> and B<sup>1</sup>. At the existing airport, rotation of the runway was also rejected based on the airport's proximity to the Chuska Mountains.

Recognizing that the preferred runway orientation (relative to the prevailing wind) could not be achieved at any site, an examination of alternative alignments was performed at Site A and Site B, which attempted to maximize both wind orientation and obstruction clearance criteria. The existing alignment was retained at Window Rock Airport; the new alignments at the alternate sites were designated A and B respectively.

Under Alternative II, an alignment could not be achieved which allowed a FAR Part 77 non-precision approach surface which was clear of obstructions. A visual approach surface, however, could be achieved for both ends of the runway. For both Alternatives I and III, an obstruction-free non-precision surface could be achieved for at least one runway approach. For Alternative I, there are obstructions in the VFR approach area on the north end of the runway; Alternative III appears free of any obstructions.

With respect to the U.S. Standard for Terminal Instrument Procedures (TERPS), topography currently precludes opportunities for a precision approach procedure at any site. Similarly, topography places constraints on opportunities for a non-precision approach for Alternatives I and III while precluding opportunities of Alternative II.

In summary, Alternative III, Alignment B, appears to provide the best opportunity of achieving required criteria under FAR Part 77. Alternatives I and III appear comparable in their capability of accepting a constrained non-precision instrument procedure. Alternative II provides no opportunity for a non-precision approach.