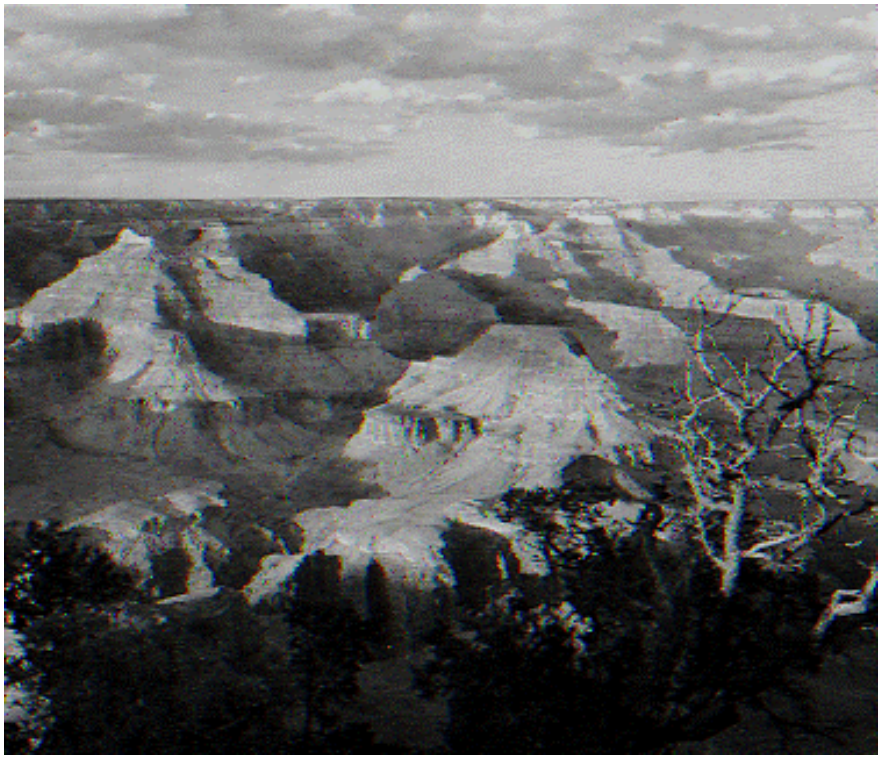
Final Supplemental
Environmental Assessment
February 2000

Special Flight Rules in the Vicinity of Grand Canyon National Park



Prepared For

U. S. Department of Transportation
Federal Aviation Administration

Final Environmental Assessment
Special Flight Rules in the Vicinity of Grand Canyon National Park

Foreword

The Draft Supplemental Environmental Assessment (SEA) was published in June 1999. Since the document was published, parts of the proposed rule have been altered in response to public and agency comments. The major changes between the Draft SEA and Final SEA are as follows:

- The operations in support of the Hualapai Tribe's economic development at Grand Canyon West are exempted from the proposed operations limitation rule.
- A turnaround has been added in the Zuni Point Corridor in the vicinity of Gunthers Castle.
- Operational counts have been modified based on more up to date information.
- The Desert View FFZ has been modified to extend eastward only to the GCNP boundary.
- The SFRA boundary has been modified on the southeast corner in response to comments from the general aviation community regarding the Sunny Military Operating Area, and latitude and longitude dimensions within the proposed final rule have been corrected.
- The description of the future Bright Angel Incentive Corridor has been corrected.
- The Toroweap/Shinumo FFZ has been modified to not include any Hualapai reservation lands.
- The wording in the document has been clarified based on agency and public comments.

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Chapter One
BACKGROUND AND PROPOSED ACTION

This chapter provides a brief background of the Proposed Actions previously analyzed and environmental documentation that has been accomplished by the Federal Aviation Administration (FAA) in cooperation with the Department of the Interior (DOI) concerning rulemaking and commercial air tour route modifications proposed as next steps to substantially restore natural quiet to the Grand Canyon National Park (GCNP) as mandated by Pub. L. 100-91. A complete regulatory history of the need for restoration of natural quiet to GCNP is found in the December 1996 Environmental Assessment Special Flight Rules in the Vicinity of Grand Canyon National Park (Final EA). Additionally, this chapter summarizes the purpose and need for substantial restoration of natural quiet to the GCNP and the federal actions being proposed at this time. This environmental assessment supplements the Environmental Assessment prepared for the December 1996 final rule and the Written Reevaluation prepared for the May 1997 Notice of Proposed Rulemaking for Flight Corridors and the October 1997 Notice of Clarification.

Appendices A through I provide detailed technical background and results, as well as a record of consultation with Native American Tribes and the contact list for this document. Endnotes are provided before the appendices. Figures are placed at the end of each chapter.

1.1 BACKGROUND

On December 31, 1996, the FAA published a final rule amending Part 93 of the Federal Aviation Regulations by adding a new subpart to codify the provisions of Special Federal Aviation Regulation (SFAR) No. 50-2, Special Flight Rules in the vicinity of GCNP. This new subpart modified the dimension of the GCNP Special Flight Rules Area (SFRA); established new and modified flight free zones; established new and modified existing flight corridors; established reporting requirements for commercial air tour operators in the SFRA; established fixed flight free time periods for commercial sightseeing operations in Zuni Point and Dragon Corridors during certain time periods (curfews); and limited the number of aircraft that could be used for commercial sightseeing operations in the GCNP SFRA. Each operator was limited to the highest number it used between July 31 and December 31, 1996 (61 FR 69302). The provisions contained in the final rule were to become effective on May 1, 1997.

Published concurrently with the final rule on December 31, 1996, were a Notice of Proposed Rulemaking (NPRM) on noise limitations for aircraft operations in the vicinity of GCNP (Noise Limitations/Quiet Technology NPRM) and Notice of Availability of Proposed Commercial Air Tour Routes. The Noise Limitations/Quiet Technology NPRM was a transition to quiet

air tour aircraft technology. It proposed to define air tour aircraft in terms of "noise efficiency" or noise per passenger seat; rank aircraft in noise efficiency categories; phase out operations over time, beginning with the noisiest; and provide for incentives for the use of the most noise-efficient aircraft. It also proposed to lift the temporary cap for the most noise-efficient aircraft, and a "National Canyon Corridor" for such aircraft on an altered proposed route, Blue 1A. A Draft Environmental Assessment was issued for public comment until March 31, 1997, along with the Noise Limitations NPRM. All three of the above-referenced actions comprised an overall strategy to assist the National Park service (NPS) in achieving its statutory mandate, imposed by Public Law 100-91, to provide for substantial restoration of natural quiet and enhance the visitor experience in GCNP. The FAA estimated that, if the Noise Limitations rule were adopted, 57.4 percent of the Park would experience substantial restoration of natural quiet by the year 2008.

During the comment period on the Notice of Availability of Proposed Commercial Air Tour Routes, the FAA received valuable information from comments, as well as suggestions for alterations and refinements of the route structure, from officials of the GCNP and NPS that could potentially produce noise reduction benefits and also address other related impacts. Both the FAA and the DOI concluded that a number of the suggested changes could produce a significantly better rule for GCNP users, the aviation operators, and interested Native American tribes. The FAA determined that permitting the complete final rule to become effective on May 1, 1997, would be contrary to the public interest.

On February 21, 1997, the FAA published another final rule that delayed the implementation of certain sections of the final rule. Specifically, the effective date of the Flight Free Zones (FFZ), flight corridors, and Special Flight Rules Area was delayed until January 31, 1998. FAA also reinstated and extended the expiration date of certain portions of SFAR 50-2 (62 FR 8861; February 26, 1997). The curfew on operations in Dragon and Zuni Corridors on the east end of the GCNP, the cap on the number of aircraft, and the reporting requirements were not affected. These actions were implemented on May 1, 1997.

May 1997 Corridors NPRM and Revised Air Tour Routes

On May 12, 1997 (62 FR 38233; May 15, 1997), the FAA issued a Notice proposing to modify two FFZs within GCNP by establishing two corridors through the FFZ. The FAA also issued a revised Notice of Availability of Proposed Commercial Air Tour Routes. The first corridor, through the Bright Angel flight free zone, would be used for the most noise-efficient aircraft only. The second corridor, through the Toroweap/Shinumo flight free zone over the National Canyon area of the GCNP, would be for the most noise-efficient aircraft for westbound traffic after December 31, 2001. This second corridor was developed to address the concerns of the Havasupai Tribe regarding potential impacts on cultural sites. The revised National Canyon corridor was designed to continue to provide a viable air tour route through the center of the Canyon (Blue 1A), yet in a location and manner that would minimize potential impacts on Supai Village and Havasupai cultural sites.

To evaluate the potential impacts of the NPRM, FAA prepared a Written Reevaluation of the December 1996 Final EA. Based upon this Reevaluation, the conclusions of the Finding of No Significant Impact (FONSI) were found to be substantially valid, and no EA supplementation was required.

On July 10, 1998 (63 FR 38233; July 15, 1998), the FAA, in consultation with NPS, withdrew this NPRM because the agencies determined not to proceed with a commercial air tour route in the vicinity of National Canyon and to consider other alternatives. This was due, in part, to concerns about substantial restoration of natural quiet. In addition, the FAA amended the Noise Limitations NPRM to withdraw the portions in which the FAA had first proposed a National Canyon Corridor (63 FR 38232; July 10, 1998).

October 1997 Notice of Clarification

Based on initial surveys of air tour operators as well as operations specifications, the FAA determined that the cap on aircraft in the December 1996 final rule would permit approximately 136 aircraft to operate within the area covered by flight restrictions.

After the final rule was published, however, the FAA obtained additional data showing that it had underestimated the number of eligible air tour aircraft. Therefore, during May 1997, the FAA, conducted a survey of air tour operators and visited sites to identify in detail the number and type of aircraft engaged in GCNP air tours in 1996.

To confirm the May 1997 survey aircraft count, reconcile the May survey results with the 1995 survey, and obtain more comprehensive data about numbers of air tours conducted in 1995, the FAA conducted follow-up site visits with each GCNP air tour operator in July 1997.

The FAA then re-evaluated the economic analysis and, for a second time, re-evaluated the environmental analysis completed for the final rule and published its results in a notice of clarification and request for comments (62 Fed. Reg. 58, 898; October 31, 1997). Incorporating the newly obtained information, the FAA estimated that in 1995, the same 31 GCNP air tour operators flew nearly 103,000 air tours, utilizing at least 260 aircraft and carrying over 821,000 passengers. By comparison, the estimates originally reported in the regulatory evaluation of the final rule were 70,000 air tours, 136 aircraft, and approximately 655,600 passengers. The new data increased the estimated costs of the final rule from $42 to 47 million and reduced the estimated benefits from $172 to 144 million over the period 1997-2008.

The new data led the FAA to reconsider its assumptions about the effectiveness of the cap on aircraft to limit growth by most air tour operators to meet demand. The new data did not otherwise affect the validity of the noise and air quality analyses in the December 1996 Final EA. The analyses depended on the number of flights, not aircraft. The 1997 surveys also revealed the potential for five daily operations on the Black 4 route and six daily operations on the Black 5 route in the Marble Canyon area. The October 1997 Written Reevaluation of environmental impacts indicated that, even after considering the revised estimate of the number of aircraft operating in the Park, the final rule would substantially restore natural quiet in 41.7

percent of the Park. With unconstrained growth, the area of the Park to which natural quiet has been substantially restored would decrease to 34.2 percent in 2008. The FAA determined that, although the new information changed the environmental analysis, the changes did not warrant modification of the final rule. Although the eligibility of a greater number of aircraft, 260 aircraft rather than 136, to operate would cause the final rule to be less effective in achieving substantial restoration of natural quiet over time, the final rule still represented progress toward that end. The FAA concluded that the Noise Limitations rulemaking and finalization of the air tour routes, when completed, would result in attainment of the statutory goal (62 Fr 58900-58905). However, FAA and NPS agreed to delay the final route selection so that further review and discussions could be undertaken on the route through the proposed National Canyon Corridor.

Public Meeting in Flagstaff, AZ

On April 28, 1998, the FAA met with a panel comprised of representatives of affected parties to attempt to recommend and further define the routes and corresponding airspace before FAA proceeded with rulemaking. The FAA presented a tentative route through the Sanup FFZ for consideration (63 FR 18964; April 16, 1998). The affected parties, however, were unwilling to consider the routes as distinct from other actions, particularly prior to a ruling by the court in Grand Canyon Air Tour Coalition v. FAA.

Grand Canyon Air Tour Coalition v. FAA

In early 1997, seven environmental groups led by the Grand Canyon Trust, air tour operators, local government entities, and the Hualapai Tribe filed a lawsuit challenging the December 1996 final rule in the U.S. Circuit Court for the District of Columbia. The case was argued on November 6, 1997. During oral argument, the Court suggested that air tour operators might be willing to comply in good faith with a limitation on the number of air tour operations. In a decision dated September 4, 1998, the U.S. Circuit Court of Appeals for the District of Columbia deferred to the judgment and technical expertise of the FAA in certain areas and determined that the challenges in other areas were not ripe in light of the phased nature of FAA's proposed solution to the problem of aircraft noise (Grand Canyon Air Tour Association v. FAA, 154 F.3d 455 (DC Cir. 1998)).

The Court held that the agencies' definition of the terms *natural quiet* and *substantial restoration of natural quiet* satisfied the National Park Overflights Act. The Court specifically relied upon FAA's assurances in rejecting the argument of the Grand Canyon Trust that issuing a rule that does not contemplate achievement of Congress' goal for ten years was inherently unreasonable. The Court indicated that it would take the Federal Government at its word that it still anticipates meeting the goal of substantial restoration by 2008 by using the Noise Limitations rule and the route structure to make up the gap in 2008 that results from the new data on number of aircraft. FAA also advised the Court that it would consider a cap on overflights.

Effective Date of Certain Portions of the Final Rule Delayed Until January 31, 2000

On December 17, 1997, pending finalization of new routes, FAA took action to delay implementation of the FFZs, flight corridors, and SFRA and to extend portions of SFAR 50-2 until January 31, 1999 (62 FR 66248). On December 7, 1998, the FAA again took action to delay implementation of the above-mentioned sections and to extend certain portions of SFAR 50-2 until January 31, 2000 (63 FR 67544).

Effective Date of Certain Portions of the Final Rule Delayed Until January 31, 2001

On January 28, 2000, FAA again took action to delay implementation of the above mentioned sections and to extend certain portions of SFAR 50-2 until January 31, 2001 (65 FR 5396, dated February 3, 2000).

1.2 PURPOSE AND NEED

The purpose and need of this action is to assist NPS in achieving the statutory mandate imposed by Pub. L. 100-91 to provide for the substantial restoration of natural quiet and to enhance the visitor experience in GCNP. The FAA recognizes the need to accommodate air tours to the extent that such operations are consistent with the essential values of the GCNP. The study area relating to this objective is shown in **Figure 1-1.**

"[S]ubstantial restoration of natural quiet" has been defined by the NPS to mean "that 50 percent or more of the park achieve 'natural quiet' (i.e., no aircraft audible) for 75 to 100 percent of the day."[1] Natural quiet refers to the natural ambient sound conditions found in parks, referring to the absence of mechanical noise but accepting the non-mechanical "self-noise" of visitors (i.e., talking, walking, etc.). Using this definition, the NPS concluded that substantial restoration of natural quiet could not be achieved with provisions of the May 1988 SFAR 50-2. The revisions to SFAR 50-2 thus far have not achieved substantial restoration of natural quiet to GCNP. Although improvements have been made, they have been eroded by the growth of the air tour industry over time. **Figure 1-2** illustrates the projected increase in aircraft noise levels through the year 2008 without additional revisions to SFAR 50-2, as amended in December 1996.

1.3 CONSULTATION AND SCOPING

On February 3, 1999, the FAA initiated scoping for this Supplemental EA (FR 6131, February 8, 1999). The comment period ended March 5, 1999. The FAA received 20 comments during the comment period, which are summarized in **Appendix G**. The major comments included concern regarding the viability of air tour routes through the center of the Canyon, proposed commercial air tour limitations, the air tour routes proposed, ability to achieve substantial restoration of natural quiet, and the implementation of quiet technology aircraft. The Havasupai Tribe commented that all commercial fixed wing tour flights should be removed from the Havasupai Reservation. The comments were considered in the development of this Supplemental EA.

The NPS is a cooperating agency in preparing this Supplemental EA. In addition, the FAA invited Native American Tribes with adjacent reservations and ancestral ties to the Grand Canyon to participate as cooperating agencies. The Hualapai Tribe expressed an interest and has provided comments. A Cooperating Agency Agreement with the Hualapai Tribe was signed on July 26, 1999.

In their comments the Hualapai Tribe defined protection of the resources of the Grand Canyon from adverse impacts of aircraft overflights for the purpose of Pub. L. 100-91 as the absence of significant impact on or impairment of the environment and uses of the Grand Canyon extending outside of the GCNP from aircraft overflights. The Hualapai Tribe relies on Section 3(b)(1) of Pub.L 100-91 that states, "the Secretary shall submit to the Administrator recommendations regarding actions necessary for the protection of resources in the Grand Canyon from adverse impacts associated with overflights. The recommendations shall provide for substantial restoration of the natural quiet and experience of the park and protection of public health and safety from adverse effects associated with aircraft overflight."

As the proposed and alternative commercial air tour routes overfly Tribal lands adjacent to and outside the GCNP, the study area for this Supplemental EA includes the entire SFAR 50-2. The study area is shown in Figure 1-2.

The mandate of the Overflights Act does not extend to areas of the Grand Canyon located outside the boundaries of the GCNP. Although the scope of the mandate is limited to the GCNP, the FAA recognizes its responsibility under applicable environmental laws to consider impacts on potentially affected resources outside the GCNP.

1.4 PROPOSED ACTION

The Proposed Action is the same as described in the 1996 Final EA and amended in the May 1997 Reevaluation and the October 1997 Notice of Clarification. However, it has been further refined to consider concerns expressed by interested parties. The Final EA Proposed Action modified the dimension of the GCNP SFRA, established new and modified existing flight free zones, established new and modified existing flight corridors, established reporting requirements for commercial air tour companies operating in the SFRA, established a curfew, and limited the number of aircraft that can be used in commercial air tour operations in the GCNP SFRA. The May 1997 Reevaluation analyzed the development of two corridors through established FFZs (National Canyon and Bright Angel Corridors) and the commercial air tour routes as described in the 1996 Notice of Availability of Proposed Commercial Air Tour Routes and modified in May 1997. The Notice of Clarification evaluated further minor modifications in the commercial air tour routes considered in May 1997, and differences between the numbers of operations modeled in the Final EA and May 1997 Reevaluation and the operations surveyed at the GCNP in July 1997. This Supplemental EA will consider the December 1996 final rule, and the following proposed additional actions: February 2000 proposed Notice of Availability of Commercial Air Tour Routes; the February 2000 proposed final rule, Modification of the Dimensions of the GCNP SFRA Airspace and FFZs; and the

proposed final rule to limit commercial air tour operations. These actions provide for:

- Modification of the eastern portion of the SFRA and the Desert View FFZ to address concerns raised by Native Americans. The modifications proposed in the NPRM (Notice 99-11) have been revised in the proposed final rule based on comments received. The Desert View's eastern boundary has been moved westward to the GCNP boundary and the southeastern portion of the SFRA has been modified to allow a 3.5-mile separation from the Sunny Military Operating Area.

- Modification of the Sanup FFZ to provide for a planned revision to a commercial air tour route over the northwestern section of the GCNP.

- Provision of an additional commercial air tour route (Blue Direct North) over the northern section of the Sanup Plateau for those aircraft transiting between Las Vegas, Nevada, and Tusayan, Arizona. This route is identical to the existing Blue Direct route. The altitudes available for use range from 7,500 feet mean sea level (MSL) to 10,500 feet MSL (see Notice of Route Availability).

- Relocation of Blue Direct South approximately one mile to the north. The number of altitudes available for use on the route has been modified from that shown in the Draft SEA. The altitudes available have been reduced from two to one eastbound at 9,500 feet MSL. All of the traffic that would have utilized the altitude of 8,500 feet MSL would either move to the new Blue Direct North or remain outside of SFRA airspace.

- Limitation on the number of commercial air tour operations in the SFRA. The limitations in the proposed final rule are modified from those specified in the NPRM (Notice 99-12) based on comments received on the NPRM. Commercial air tour operators complying with specific conditions will be excepted from the allocation process. The conditions relate to support of the Hualapai Tribe and require the operator to have executed a written contract with the Tribe. The exception was developed pursuant to the federal government's trust responsibility to the Hualapai Tribe. The limitation on operations would have significantly, adversely impacted the Hualapai Tribe's economic development efforts at Grand Canyon West.

- Revision of the reporting requirements to require operators to file flight plans for commercial SFRA operations.

The proposed action in this Supplemental EA is similar to the Proposed Action analyzed in the December 1996 Final EA, as re-evaluated in May 1997 and October 1997. However, proposed changes include the following areas: the air tour routes eastward from Las Vegas to Tusayan and around the Desert View FFZ, expansion of the Desert View FFZ, modification of the SFRA boundary on the east, and the elimination of incentive corridors through National Canyon.

2

Chapter Two
ALTERNATIVES

Since 1995, the FAA and NPS, in consultation with Native American tribes living in or associated with the Grand Canyon and other interested parties, have been working to develop and refine alternatives that meet the statutory mandate to substantially restore natural quiet to the GCNP. This chapter summarizes previously studied alternatives as identified in the December 1996 final rule and Final EA, the May 1997 Written Reevaluation and the October 1997 Notice of Clarification, and provides a history of route alternatives considered since May 1997. Lastly, this chapter sets forth a description of the alternatives recommended for consideration within this document.

This Supplemental EA evaluates the environmental effects of maintaining the current airspace structure with the existing commercial air tour routes (No Action alternative) and three potential alternatives. These alternatives include modification to the Special Flight Rules Area (SFRA) boundary, modification to flight corridors and flight-free zones (FFZ), and three differing commercial air tour route alternatives. The alternatives are considered with or without implementing a limitation on the number of commercial air tours operating in the study area. A detailed description of the alternatives considered in this document is contained in Section 2.3. FAA Order 1050.1D, Policies and Procedures for Considering Environmental Impacts,[2] provides guidance in assessing alternatives per the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations. Based on this Supplemental EA, the FAA will determine whether a finding of no significant impact may be issued or that an environmental impact statement is required.

2.1 PREVIOUSLY CONSIDERED ALTERNATIVES

This section provides descriptions of the alternatives considered within three progressive environmental documents that analyzed the potential environmental impacts associated with modifying SFAR 50-2 as established in 1988 (53 FR 20264, June 2, 1988). All previously proposed alternatives were compared to the existing airspace regulations over the Grand Canyon, as described in SFAR 50-2.

Final Rule and Final EA December 1996

The Proposed Action alternative amended Part 93 of the Federal Aviation Regulations by adding a new Subpart U that codified and amended the provisions of SFAR 50-2 as follows:

- Modified the dimensions of the Grand Canyon National Park SFRA and raised the altitude of this controlled airspace to 17,999 feet MSL.

- Established new and modified existing FFZs by expanding the Bright Angel and

Desert View FFZs, merging the Shinumo and Toroweap/Thunder River FFZs into one FFZ, and creating a new Sanup FFZ.

- Established new and modified existing flight corridors, by modifying the Zuni Point and Dragon Corridors, and eliminating the Fossil Canyon Corridor.

- Established fixed flight-free periods (curfews) for commercial sightseeing operations departing from Grand Canyon Airport as follows:

  1. Summer season (May 1-September 30) 6 p.m. to 8 a.m. daily.

  2. Winter season (October 1-April 30) 5 p.m. to 9 a.m. daily.

- Established minimum sector altitudes as follows:

  1. Commercial sightseeing flights.

     (a) North Canyon Sector. Lees Ferry to North Canyon: 5,000 feet MSL.

     (b) Marble Canyon Sector. North Canyon to Boundary Ridge: 6,000 feet MSL.

     (c) Supai Sector. Boundary Ridge to Supai Point: 7,500 feet MSL.

     (d) Diamond Creek Sector. Supai Point to Diamond Creek: 6,500 feet MSL.

     (e) Pearce Ferry Sector. Diamond Creek to the Grand Wash Cliffs: 5,000 feet MSL.

  2. Transient and general aviation operations.

     (a) North Canyon Sector. Lees Ferry to North Canyon: 8,000 feet MSL.

     (b) Marble Canyon Sector. North Canyon to Boundary Ridge: 8,000 feet MSL.

     (c) Supai Sector. Boundary Ridge to Supai Point: 10,000 feet MSL.

     (d) Diamond Creek Sector. Supai Point to Diamond Creek: 9,000 feet MSL.

     (e) Pearce Ferry Sector. Diamond Creek to the Grand Wash Cliffs: 8,000 feet MSL.

- Established minimum corridor altitudes as follows:

  1. Commercial sightseeing flights.

     (a) Zuni Point Corridor. 7,500 feet MSL.

     (b) Dragon Corridor. 7,500 feet MSL.

  2. Transient and general aviation operations.

     (a) Zuni Point Corridor. 10,500 feet MSL.

     (b) Dragon Corridor. 10,500 feet MSL.

     (c) Tuckup Corridor. 10,500 feet MSL.

- Capped aircraft used for sightseeing operations to those aircraft that were eligible to operate in the SFRA from July 31, 1996, through December 31, 1996.

On February 21, 1997, the FAA issued a final rule that delayed the implementation of certain sections of the December 31, 1996, final rule (62 FR 8862; February 26, 1997). Specifically, this action delayed the effective date, until January 31, 1998, of those sections for the rule that address the SFRA, FFZs, and flight corridors, respectively (§§ 93.301, 93.305, and 93.307). In addition, certain portions of SFAR No. 50-2 were reinstated and the expiration date extended. With the goal to produce the best commercial air tour routes possible, implementation was delayed to allow the FAA and the DOI to consider comments and suggestions to improve the proposed route structure. The curfew, aircraft cap, and reporting requirements of the final rule went into effect on May 1, 1997.

May 1997 Written Reevaluation

Comments received on the Notice of Availability of Proposed Commercial Air Tour Routes (December 1996) and the NPRM on Noise Limitations for Aircraft Operations in the Vicinity of the Grand Canyon National Park prompted the FAA to amend two of the FFZs within the GCNP. The FAA proposed the establishment of two corridors and the modification of some routes (also referred to as the 1997 Proposed Action commercial air tour routes). The incentive corridors in the Noise Limitations NPRM were the subject of the May 1997 Written Reevaluation of the Final EA.

Descriptions of the proposed corridor and commercial air tour routes that modify or differ from the Final EA Proposed Action alternative which were analyzed in the Written Reevaluation follow:

Bright Angel FFZ. The first corridor, through the Bright Angel FFZ, would be an incentive corridor to be used only by the most noise-efficient aircraft. For purposes of the May 1997 Written Reevaluation, the noise efficient aircraft were defined in the December 1996 NPRM. The most noise-efficient aircraft are identified as Category C. This proposed corridor would pass through the Bright Angel FFZ along the northern boundary of the current Bright Angel FFZ, as defined in SFAR 50-2. The proposed Bright Angel Corridor would have a threefold benefit. First, fewer aircraft would be flying over the northern rim of the Canyon along Saddle Mountain, where the NPS has pointed out some noise sensitivity. Second, noise from air tour aircraft would be dispersed between the northern boundary of the new Bright Angel FFZ and the proposed corridor, thereby reducing the level of concentrated aircraft noise along any one route. Third, opening this corridor to only the most noise-efficient aircraft would provide a valuable and tangible incentive for air tour operators to convert to quieter aircraft well before they would be required to do so. The GCNP could thereby experience the benefit of an earlier reduction in the level of aircraft noise.

Toroweap/Shinumo FFZ. The second corridor, through the Toroweap/Shinumo FFZ and referred to as the National Canyon Corridor, would go through the National Canyon area and would create a viable commercial air tour route through the central section of the Park while addressing concerns of the Native Americans. This corridor was revised from that proposed in the December 1996 NPRM for Noise Limitations for Aircraft Operations in the

Vicinity of Grand Canyon National Park. The proposed corridor would not affect the existing Tuckup Corridor currently used by general aviation. All aircraft would be permitted to use the National Canyon Corridor until December 31, 2001, after which westbound traffic would only be permitted to traverse the corridor in Category C aircraft.

The following summarizes the changes considered to the National Canyon Corridor before the proposal was withdrawn.

- First, the corridor would feed into an altered proposed route that is shorter than that previously proposed in the Notice of Availability of Proposed Air Tour Routes for GCNP in December 1996. By eliminating the portion of the route north of Supai Village, the corridor would eliminate air tour flights around Supai Village, home of the Havasupai Tribe, and minimize and/or avoid increased overflights of the vast majority of their Traditional Cultural Properties (TCPs). It would also minimize socioeconomic impacts to their economy, which is based heavily on tourism, which, in turn, is based on the isolated and natural character of the northern part of the reservation.

- Second, the redefined corridor would traverse a much smaller segment of the Toroweap/Shinumo FFZ than the corridor proposed in the December 1996 Noise Limitations NPRM. The corridor proposed in the May 1997 NPRM would be open to all aircraft until December 31, 2001, rather than only the most noise-efficient aircraft as in the previous proposal. The FAA believed that permitting only the most noise-efficient aircraft to be used in westbound traffic of the National Canyon Corridor after December 31, 2001, would further reduce noise in the corridor.

- Third, this proposal would permit the establishment of a viable commercial air tour route in the central region of the GCNP, which would be available to all aircraft. The operators informed the FAA that the Blue One route, as depicted on the chart referenced in the December 31, 1996, Notice of Route Availability, would not be a viable air tour, and that the proposed Blue One Alpha route was an example of a viable commercial air tour route. This proposal would avoid the economic harm that might accrue to air tour operators should the operations previously on Blue One not shift to other commercial air tour routes.

- In addition, the proposed commercial air tour route over the central region of the GCNP, open to all aircraft, would promote air safety. Subsequent to the December 1996 Notice of Route Availability, air tour operators advised that if there were not a viable commercial air tour route in the central region of the GCNP, they would divert their operations to the routes south of the Sanup FFZ. FAA believed this would result in compression of traffic and potentially unsafe operating conditions. Opening the corridor would enhance air traffic safety by removing a factor that could lead to compression of traffic in the routes south of the Sanup FFZ.

The corridor was considered in response to comments received on the Grand Canyon rulemaking action and the December 1996 Notice of Route Availability, a preliminary FAA evaluation assessing the environmental

merit of such routes pursuant to these comments, and ongoing discussion with Native American tribal government units and their representatives. The 1997 Proposed Action commercial air tour routes were subsequently revised from the routes modeled in the Final EA to accommodate the proposed new corridors and Native American concerns about impacts on cultural resources.

October 1997 Notice of Clarification

The Notice of Clarification Final EA Proposed Action evaluated further minor modifications in the commercial air tour routes considered after the May 1997 Written Reevaluation with operational levels surveyed at the GCNP in July 1997. The Notice of Clarification applied a new annual operational growth and redefined operational levels on several of the commercial air tour routes. Several sensitivity analyses where modeled for changes to operations on individual tracks and an earlier turn was assumed for traffic on two of the return tracks to Las Vegas. Additionally, two route change alternatives were analyzed: (1) a conservative assumption regarding the turn around routes in the Sanup area (turn around at Diamond Creek) and (2) an adjustment to the National Canyon Corridor route in an attempt to further mitigate Native American concerns.

On December 17, 1997, the FAA took action to further delay the implementation of the SFRA, FFZs and flight corridor changes proposed in the December final rule until January 31, 2000 (62 FR 66248). Again, it should be noted that these actions did not affect or delay the implementation of the curfew, aircraft cap, or reporting requirements of the rule, which were effective May 1, 1997.

FAA subsequently delayed implementation of the SFRA, FFZs, and flight corridor changes until January 31, 2001 (65 FR 5396, February 3, 2000).

2.2 COMMERCIAL AIR TOUR ROUTE ALTERNATIVES CONSIDERED

Since May 1997, the FAA and the NPS have considered a number of commercial air tour route proposals through the western portions of the study area. These route proposals would provide air tour operators with a safe air tour route while moving towards the legislatively-mandated goal of substantial restoration of natural quiet and preserving cultural resources. **Figure 2-1** illustrates the commercial air tour routes currently flown at the Grand Canyon for commercial SFRA operations. This figure shows the route names and numbers identified within this section.

The commercial air tour route proposals described in this section were either developed internally by FAA or the NPS or suggested by interested parties. The proposals that were considered by the FAA since May 1997 include the following.

<u>Proposal 1, (Blue-2 and Green-4)</u>. Routes would remain the same as they are today until reaching Separation Canyon. From Separation Canyon to Diamond Creek they would cross the Colorado River and overfly the Hualapai Reservation.

This route was not retained for detailed study because of Hualapai Tribe concerns that it would increase overflights of Hualapai TCPs and NPS concerns about Kelly Point,

the primary destination point in the eastern part of the Lake Mead Recreational Area.

Proposal 2, (Blue-2 and Green-4). Routes would remain the same as they are today except the turn around for Blue-2 would be moved to a location between Merwhitica and Horse Flat Canyons. Blue-2 would then continue north of the Colorado River. The route east of Surprise Canyon would be deleted.

This concept was not retained for detailed study based on operational safety concerns. The turn into the high terrain and the lack of easily identifiable landmarks to enable pilots to remain north of the Colorado River raised safety concerns related to the turn.

Proposal 3, (New Blue-1, Blue-2 and Green-4). The existing Blue-1 route through National Canyon would be eliminated. New Blue-1 would enter at Pearce Canyon and continue along the north side of the Colorado River to Diamond Creek. It would then cross the river and proceed northeast-bound to intersect the current route labeled Blue-2B. New Blue-1 would parallel Blue-2B until approximately two nautical miles (NM) south of Parashant Wash, where it would proceed directly to Grand Canyon Airport. Blue-2 and Green-4 would follow the routes as they are currently flown, except they would turn around at Spencer Canyon.

These route proposals were presented at the Flagstaff meeting in February 1998. These routes were not retained for detailed study because of safety concerns raised by Clark County related to minimal lateral separation of the proposed Blue-1 and existing Blue-2 at the same altitude. A variation of this proposal is part of Alternative 3.

Proposal 4, (Blue-2 and Green-4). The current routes would be moved to overfly the Sanup Plateau side of the Colorado River and would turn around at Surprise Canyon.

The Hualapai Tribe favored this route because it had the least impact on Grand Canyon West and the TCPs on the south side of the Colorado River. However, these routes were not retained for detailed study because of safety concerns related to terrain clearance similar to the preceding proposal. The altitude of the Plateau would not allow flights at 5,500 feet mean sea level (MSL) so they would have to operate at 7,500 feet MSL. This would cause compression with aircraft already operating at that altitude and higher altitudes.

Proposal 5, (New Blue-1 and Blue-2). New Blue-1 and Blue-2 would be consolidated at Pearce Canyon and proceed north of the Colorado River to Burnt Canyon. New Blue-1 would proceed from Burnt Canyon across the Sanup Plateau to Surprise Canyon and continue on to intercept a combination of the existing Blue-2A and -2B routes.

At Burnt Canyon, Blue-2 would again become a separate route and make a right turn crossing the Colorado River. The turn would be completed before Horse Flat Canyon, then continue northwest-bound until Quartermaster Canyon. Blue-2 would then cross back to the north side of the river until it passes Bat Cave, then proceed west out of the SFRA.

New Blue-1 was not retained for detailed study because of environmental concerns. The ethnographic study prepared by the Hualapai Tribe indicates that there are TCPs in the canyons near Diamond Creek, which the New Blue-1 would adversely impact. New Blue-1 was also dismissed in light of

NPS' concern that the additional aircraft noise would interfere with the goal of substantial restoration of natural quiet in the GCNP and Kelly Point, a primary destination point in the eastern part of Lake Mead National Recreational Area. Blue-2 was not retained for detailed study because of the descending 180-degree right turn, which limits the pilot's field of vision. The turn in Blue-2 was rejected for safety concerns.

Proposal 6, (No Fixed Wing Traffic on Blue-2). Blue-2 would be eliminated and a transit route would be established to allow both fixed wing and helicopter operations to land at Grand Canyon West on the Hualapai Reservation. The Hualapai Tribe expressed concern that fixed wing traffic will significantly increase over time and that noise associated with turns in the area inhabited by Desert bighorn sheep will exacerbate the effects of noise from Grand Canyon West and drive away Desert bighorn sheep that graze in the area. Although aircraft may startle or momentarily alter the behavior of individual bighorn sheep, there is no evidence that animal populations or their habitats in the Grand Canyon area have been negatively impacted by air tour operations. Therefore, FAA did not pursue this alternative. This concept would severely impact the viability of operations by air tour operations from the Las Vegas vicinity. Elimination of the tour industry in the western Grand Canyon was considered too drastic a measure at this time, especially since the noise gains would be minimal due to the large number of flights in the same vicinity in support of the Hualapai Tribe. This alternative is not consistent with the purpose and intent of the National Park Overflights Act, which contemplates that air tour operations will be adjusted as necessary to achieve the goal of substantial restoration.

Proposal 7, (Blue-2 and Green-4). Blue-2 would enter at Pearce Canyon and continue north of the River to Surprise Canyon. At Surprise Canyon, Blue-2 would make a right turn and cross the Colorado River. The turn would be completed before Blue-2 reaches Horse Flat Canyon, then Blue-2 would continue northwestbound until reaching Quartermaster Canyon. Blue-2 would then cross back to the north side of the river and continue northwestbound until passing Bat Cave, where it would turn westbound out of the SFRA. This is the same Blue-2 route configuration that was considered in July 1998, except the altitude in this proposal for Blue-2 would enter at 7,500 feet MSL and exit at 6,500 feet MSL. Green-4 would enter and exit at 6,000 feet MSL and would remain on the north side of the Colorado River.

This version of Blue-2 was not retained for detailed study because the volumes of flights are likely to result in compression. There are also safety issues during poor weather because only one altitude would be available for flights in each direction. The Green-4 portion of this proposal was dismissed because of safety concerns related to both the inbound and outbound legs of the route. The proposal had both legs on the same side of the Colorado River at the same altitude.

Proposal 8, (New Blue-2 and Green-4). The configuration of the current Green-4 route would remain the same, but it would become a "stacked" route. The route would be assigned two distinct altitudes separated vertically by 1,000 feet for helicopter operations. Green-4A would enter the SFRA at 5,000 feet MSL and exit at Grand Canyon West Airport, which serves tourists landing on the Hualapai Reservation. Green-4B would enter at 6,000 feet MSL and

follow the current route for Green-4 on the south side of the Colorado River and complete a 180-degree turn prior to Horse Flat Canyon. It would then proceed northwesterly on the north side of the river to exit the SFRA.

New Blue-2 would enter at the same location as the current Blue-2 then turn southwesterly at the Burnt Canyon marker. The route would then turn and cross the Colorado River at Quartermaster Canyon. The turn would be completed prior to Horse Flat Canyon and proceed northwest on the north side of the river to exit via the same route as the current Blue-2. This route was proposed with the turn resembling either a teardrop or horseshoe pattern.

The Green-4A and -4B portions of this proposal were dismissed because of complexity and safety concerns. The proposal negated the use of the 5,500 foot MSL altitude for fixed-wing commercial air tour operations. Approximately 86 percent of the helicopters would use Green-4A since they land on the Hualapai Reservation. Creating a second helicopter altitude for 14 percent of the operations would displace the current fixed-wing aircraft, creating a compression and safety concern.

Proposal 9, (Blue-2, Green-4, and New Blue Direct South). Blue-2 would be the same route as that considered in Proposal 7 with the altitudes of 7,500/5,500 feet MSL eastbound and 8,500/6,500 feet MSL westbound. Green-4 would be changed to move the altitude back to 5,000 feet MSL utilizing both sides of the river. It would be revised to enter the SFRA on the south side of the Colorado River, proceed southeastbound to Horse Flat Canyon, make a left turn to cross the River and proceed to Pearce Ferry on the north side of the river.

The current Blue Direct South route entry point would be moved from abeam Grand Canyon West Airport to coincide with the existing Blue-2 west-end entry point. The New Blue Direct South route would proceed from the entry point directly to a geographical area referred to as “the square” west of the Grand Canyon Airport (GCN). The square is used for air traffic control purposes at GCN.

This tentative air tour route proposal was presented to the Hualapai Tribe at the meeting in Mesa, Arizona, on March 9, 1999 and was modeled using the FAA’s airfield and airspace simulation model, SIMMOD. The SIMMOD identified potential safety concerns where the Blue Direct South traffic at 8,500 feet MSL merged with the existing Blue-2 traffic at the same altitude. This tentative route structure was then revised as follows and included as part of the Proposed Action in this Supplemental EA.

While there are two altitudes available on Blue Direct South, only one altitude would be available for use on New Blue Direct South eastbound (9,500 feet MSL). All of the traffic that would have utilized the altitude of 8,500 feet MSL would either move to the New Blue Direct North route or remain outside of SFRA airspace. Raising the altitude to 9,500 feet MSL would help reduce potential impacts on the area of concern identified by the Hualapai Tribe in its ethnographic study as Hualapai TCP Number 10 (to protect confidential and sensitive cultural information about this TCP and its specific location, it is referred to in this Final SEA by its number on a list of TCPs identified by the Hualapai Tribe). There would be no commercial SFRA operations over flying the TCP below 9,500 feet MSL.

Proposal 10, (Blue 1, Blue Direct, Blue Direct South). This proposal would eliminate existing Blue-1, Blue Direct, and Blue Direct South. Commercial air tours would instead be routed west of Blue-2 and Green-4 and south, around the entire Hualapai Reservation. The tours would then turn at the Peach Springs Very High Frequency Omni-directional Radio Range (VOR) on Victor Airway 208-210 on course to Tusayan. The boundaries of the SFRA would also be expanded to include the new route. This route was not retained for detailed study because of safety and economic concerns. Commercial air tours on such a route would potentially conflict with air carrier and other flights on Victor Airways 208-210 and 562. Such a route would also potentially conflict with operations at two nearby airports (Pearce Ferry and Henderson). The length of the route would appear to increase fuel costs substantially. As part of a Programmatic Agreement entered into between the FAA, NPS, Advisory Council on Historic Preservation, the Hualapai Tribe, and Tribal Historic Preservation Officer, the FAA has agreed to review data to be gathered as part of a monitoring program. FAA will consider detailed study of this alternative if the monitoring program reveals significant new information about the effects of the Preferred Alternative on the setting, feeling, and attributes of Hualapai traditional cultural properties (see Section 4.2 for m0re detail).

2.3 ALTERNATIVES STUDIED IN DETAIL

CEQ regulations and FAA Order 1050.1D state that the evaluation of alternatives should "present the environmental impacts of the proposal and alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options for the decision maker and the public."[3] Accordingly, this section compares the relevant environmental effects of the No Action and the proposed alternatives.

Descriptions of the airspace changes, commercial air tour route changes, and commercial air tour limitations for each alternative follow. These alternatives were developed in cooperation with the NPS and with consideration of concerns expressed by other interested parties.

2.3.1 Alternative 1 – No Action

Consideration of the No Action alternative is required by NEPA. This alternative serves as a basis of comparison for the other alternatives. The No Action alternative assumes that the existing SFAR 50-2 (53 FR 20264, June 2, 1988) remains in place.

Airspace Changes. The No Action alternative would maintain the existing SFAR 50-2 procedures for operations of aircraft in the airspace above the Grand Canyon. The SFRA dimensions would remain from the surface to 14,499 feet MSL in the area of the Grand Canyon. Figure 2-1 illustrates the existing SFRA boundary, FFZs and the existing commercial air tour route locations.

Commercial Air Tour Route Changes. The commercial air tour routes illustrated on Figure 2-1 would remain in place.

Operations Limitation. The No Action alternative would place no additional operations limitation on commercial SFRA operations. It is assumed that the cap on the

number of air tour aircraft implemented as part of the final rule in December 1996 remains in place.

2.3.2 Alternative 2 – Central Route (Preferred Alternative)

Airspace Changes. The airspace changes in the December 31, 1996, final rule, as described in Section 2.1, are assumed to be implemented. Changes from the 1996 final rule are described below.

Figure 2-2 illustrates the airspace changes considered for Alternative 2. The Toroweap/Shinumo FFZ has been changed to accommodate the modified Dragon Corridor. Some of the changes may be difficult to discern due to the color overlays in the figure. The 1996 final rule FFZs shown on the figure include those that will take effect in January 2000 or shortly thereafter, pursuant to the 1996 final rule. Additionally, they represent the changes proposed in this action as described below.

SFRA and Desert View FFZ

In the NPRM (Notice 99-11), the FAA proposed to modify the Grand Canyon SFRA by moving the eastern boundary five nautical miles to the east. The NPRM also included a proposal to move the eastern boundary of the Desert View FFZ five miles to the east. However, the Navajo Nation advised the FAA during the public comment period that certain Chapters of the Nation would be economically impacted by the proposed FFZ expansion. The Navajo Nation expressed concerns that the expansion of the FFZ would prohibit operators from conducting contracted aerial filming over Navajo lands in the vicinity of the Little Colorado River. Additionally, comments were received regarding the extension of the FFZ over non-park land. Therefore, the FAA determined to place the Desert View FFZ boundary at the GCNP boundary. The commercial air tour routes identified as Black-2 and Green-3 would remain as proposed in the July 1999 Notice of Proposed Routes.

The current design of the eastern portion of the SFRA and the Desert View FFZ allows entry and exit as well as travel over several TCPs on the eastern side of GCNP, causing concerns to several Native American tribes. These sites and tribal concerns about these sites were identified through ongoing consultation with affected tribes in accordance with Section 106 of the National Historic Preservation Act (NHPA) and the American Indian Religious Freedom Act. Specific locations of TCPs are not disclosed in accordance with Sec. 304 of the NHPA that provides for confidentiality. The impacts of air tours over these TCPs will be reduced or avoided by modifying the eastern portion of the SFRA and the Desert View FFZ and by adjusting the entry and exit points of the commercial air tour routes accordingly through route redesign.

This modification to the preferred alternative will not affect the Navajo Nation economically and will eliminate most of the overflights over TCPs identified by the Native Americans in the Desert View FFZ.

Bright Angel FFZ

In the NPRM (Notice 99-11), the FAA proposed to modify the Bright Angel FFZ to provide a provisional incentive corridor, one nautical mile in width, through the Bright Angel FFZ to be used at some future date only by aircraft meeting a noise efficiency/quiet technology aircraft standard.

This is identical to the corridor originally proposed in May 1997 and withdrawn in 1998. The FAA acknowledges that rulemaking to establish a standard for noise efficient/quiet technology aircraft is pending. Until such a standard is developed and adopted, the Bright Angel incentive corridor will not be available for commercial operations. The incentive corridor will pass along the northern boundary of the current Bright Angel FFZ (as defined in SFAR 50-2) in the same location as the current route. The written description of the location has been modified slightly since the June NPRM (Notice 99-11) to correct a typographical error.

Even without a standard for noise efficient/quiet technology aircraft it is intuitively clear that the Bright Angel Corridor would have a threefold benefit. First, fewer aircraft would be flying over the northern rim of the canyon along Saddle Mountain, where the NPS has pointed out some noise sensitivity. Second, noise from the air tour aircraft would be dispersed between the northern boundary of the Bright Angel FFZ and the corridor, thereby reducing the level of concentrated aircraft along any one route. Third, opening this corridor only to the most noise-efficient aircraft would provide a valuable and tangible incentive for air tour operators to convert to quieter aircraft. The GCNP could thereby experience the benefit of a reduction in the level of aircraft noise. This incentive route is not modeled for noise impacts within this document; its benefit and/or impact will be analyzed in a forthcoming EA for a supplemental NPRM for Noise Limitations for Aircraft Operations in the Vicinity of the Grand Canyon National Park.

Sanup FFZ

The FAA is modifying the Sanup FFZ because increased aircraft operations on new Blue Direct South (BDS) would be over the northern portion of the newly created Sanup FFZ (December 1996 final rule), at altitudes less than 3,000 feet MSL above the elevation of some areas of the Sanup Plateau. At this altitude, these aircraft operations may have a noise impact. Operations will increase on BDS because existing routes through National Canyon are eliminated. Consequently, the FAA believes that the northern portion of the Sanup FFZ that would lie beneath BDS should be eliminated from the FFZ to accommodate safely an additional route between Tusayan, Arizona, and Las Vegas, Nevada. Therefore, the FAA is proposing to modify the Sanup FFZ by moving the northern portion of the FFZ approximately one mile south of the BDS route.

Additionally, to provide for a revision of the current Blue-2 commercial route over the northwestern portion of the GCNP, the FAA is proposing to modify the Sanup FFZ by moving the northwestern portion of the FFZ east approximately one mile east of the Blue-2 route.

Commercial Air Tour Route Changes. As with the 1996 Proposed Action and 1997 Written Reevaluation, commercial air tour routes are eliminated from the center of GCNP with expansion of the Toroweap/Shinumo FFZ. Similarly to the 1996 Final EA, commercial air tour routes no longer traverse south of the Sanup Plateau. The largest change since the 1996 Final EA and 1997 Written Reevaluation occurs due to the expansion of the Desert View FFZ in response to Native American concerns. Commercial air tour routes are

modified to reflect changes to the Bright Angel and Desert View FFZs and concerns raised by some tour operators regarding flight in the Zuni Corridor. Specifically, Alternative 2 includes the Blue Direct (now renamed Blue Direct North) and the modified Blue Direct South routes. The altitudes available for use on Blue Direct North range from 7,500 feet MSL to 10,500 feet MSL (see Notice of Route Availability). Blue Direct South has been relocated approximately one mile north. In response to comments the number of altitudes available for use on the Blue Direct South has been modified from that shown in the Draft Supplemental EA (SEA). The altitudes available have been reduced from two to one eastbound with a higher minimum altitude of 9,500 feet MSL. All of the traffic that would have utilized the altitude of 8,500 feet MSL will either move to the new Blue Direct North or remain outside of SFRA airspace.

With the exception of the direct routes, all other routes are the same for all of the proposed alternatives. Figure 2-2 illustrates Alternative 2 compared to the No Action alternative.

In response to comments, the forthcoming Notice of Route Availability will permit two-way traffic in the Zuni corridor rather than only one-way as specified in the June Notice. The turnaround in the Zuni Corridor occurs where the routes diverge between Representative Locations 59 and 64 (shown on Figure 2-2).

Operations Limitation. A limitation on the number of commercial air tours in the SFRA would be implemented. Commercial air tours would be limited to the levels reported to the FAA between May 1, 1997, and April 30, 1998. The proposed final rule allows for adjustment from the NPRM proposed limitations in specific circumstances. These adjustments are made where individual operators can document that their limitation should be revised. Adjustments have resulted in the current air tour allocations being increased from the initial 88,000 to 90,000. Operations serving the Hualapai Tribe will be excepted from the Operations Limitation.

A sub alternative to Alternative 2 will also be considered. The sub alternative allows commercial air tours to continue to grow at a predicted rate of 3.3 percent annually. It should be noted that recent forecast information indicates that the national annual growth rate is approximately 2.9 percent. The FAA believes that using the 3.3 percent growth rate for potential impact analysis within this document will provide conservative results.

2.3.3 Alternative 3 – Northern Route

Airspace Changes. The airspace changes for Alternative 3 are the same as those for Alternative 2 (see Section 2.3.2 for a detailed description). **Figure 2-3** illustrates the airspace changes considered for Alternative 3.

Commercial Air Tour Route Changes. Alternative 3 includes the same changes as Alternative 2, except Alternative 3 includes the new Blue Direct North and the modified Blue Direct South routes. Figure 2-3 illustrates Alternative 3 compared to the No Action alternative.

Operations Limitation. Alternative 3 assumes a limitation on the number of commercial air tours in the SFRA will be implemented. Commercial air tours would

be limited to the levels reported for May 1, 1997 through April 30, 1998, with adjustments (explained under Alternative 2).

A sub alternative to Alternative 3 will also be considered. The sub alternative allows commercial air tours to continue to grow at a predicted rate of 3.3 percent annually.

2.3.4 Alternative 4 – Southern Route

Airspace Changes. The airspace changes for Alternatives 4 are the same as those for Alternatives 2 and 3 (see section 2.3.2 for a detailed description). **Figure 2-4** illustrates the airspace changes considered for Alternative 4. The selection of Alternative 4 for implementation may require revisions to the Sanup FFZ, as the FFZ could be expanded in the northerly direction and reduced along the southern edge to allow the transit route to be completely outside of the FFZ regardless of altitude restrictions.

Commercial Air Tour Route Changes. Alternative 4 includes the same changes as Alternative 2, except that Alternative 4 includes the new Blue South Direct and Blue Direct routes. Figure 2-4 illustrates Alternative 4 compared to the No Action alternative.

Operations Limitation. A limitation on the number of commercial air tours in the SFRA would be implemented. Commercial air tours would be limited to the levels reported between May 1, 1997, and April 30, 1998, with adjustments (explained under Alternative 2).

A sub alternative to Alternative 4 will also be considered. The sub alternative allows commercial air tours to continue to grow at a predicted rate of 3.3 percent annually.

2.3.5 Summary Comparison Evaluation of Alternatives

This section presents a summary of the alternatives in comparative format in order to define the issues and identify the appropriate alternative. **Table 2.1** provides a summary comparison of the alternatives to the No Action alternative. The environmental impacts summarized herein are discussed, by impact category, in Chapter Four.

Table 2.1

Summary Comparison of Alternatives

Evaluation Factor	Alt. 1 - No Action	(A) Alt. 2 - Central Route (Preferred Alternative) (B) Alt.2 with Continued Growth	(A) Alt. 3 - Northern Route (B) Alt. 3 with Continued Growth	(A) Alt. 4 - Southern Route (B) Alt. 4 with Continued Growth
Potential for Adverse Noise Impacts [1]	Not Significant	(A) Not Significant (B) Not Significant, noise improvements erode over time	(A) Not Significant (B) Not Significant, noise improvements erode over time	(A) Not Significant (B) Not Significant, noise improvements erode over time
Historic, Archaeological, and Cultural Resources Impacts [2]	Adversely Affects	(A) Adversely Affects (B) Adversely Affects	(A) Adversely Affects (B) Adversely Affects	(A) Adversely Affects (B) Adversely Affects
DOT Section 4(f) Use [2]	No[4]	(A) No (B) No	(A) No (B) No	(A) No (B) No
Visual Impacts [2]	Not Significant	(A) Not Significant (B) Not Significant	(A) Not Significant (B) Not Significant	(A) Potentially Significant (B) Potentially Significant
Socio/Socioeconomic Impacts	No	(A) No (B) No	(A) No (B) No	(A) No (B) No
Environmental Justice Impacts	No	(A) No (B) No	(A) No (B) No	(A) No (B) No
Endangered Species Impacts [3]	No	(A) Likely to adversely affect (B) Likely to adversely affect	(A) Likely to adversely affect (B) Likely to adversely affect	(A) Likely to adversely affect (B) Likely to adversely affect
Purpose of Action: Reduces aircraft noise impact within GCNP	No	(A) Yes (B) No	(A) Yes (B) No	(A) Yes (B) No
Restores Natural Quiet (% of GCNP by 2008)	No (25.3%)	(A) No (43.5%) (B) No (32.7%)	(A) No (44.0%) (B) No (31.9%)	(A) No (43.7%) (B) No (29.5%)

1 Significance defined using Part 150 Land Use Compatibility Standards except for cultural resources.
2 Section 106 consultation completed (see Chapter Four, Section 4.2).
3 Consultation with U.S. Fish and Wildlife completed (see Chapter Four, Section 4.9).
4 "No" indicates no impact for the environmental category considered.

3

Chapter Three
AFFECTED ENVIRONMENT

The description of the affected environment focuses on Grand Canyon characteristics which are relevant to the issue of air tour activity and the anticipated environmental impacts of the alternatives, including the No Action alternative. Noise from aircraft overflights is the primary impact. As discussed in more detail in Chapter Four, noise levels considered here may affect the following other impact categories from FAA Order 1050.1D: historic/archaeological/cultural resources; Department of Transportation Act, Section 4(f); wild and scenic rivers; visual; socioeconomic; environmental justice; and endangered species. In addition, effects on Native American communities and wilderness will be addressed.

The following section updates the 1996 Final EA with information provided by the Hualapai Tribe, Havasupai Tribe and NPS. It also reflects implementation of the General Management Plan for the GCNP.

3.1 REGIONAL CONTEXT

The Grand Canyon is a unique natural and cultural resource. The Grand Canyon includes the GCNP as well as major portions of the reservations of the Hualapai and Havasupai Tribes and Navajo Nation. The Grand Canyon annually attracts more than five million visitors from around the world annually who view the canyon from motor vehicles, riverboats, aircraft and by foot, horse, mule, and bicycle. Within the Grand Canyon, the GCNP is designated as a World Heritage Site, and more than ninety percent of the GCNP is eligible to be designated as a Wilderness Area. The area potentially affected by the alternatives includes lands within the SFRA boundary (as shown in Figure 1-1). The following sections describe the Grand Canyon and its surrounding areas within the potentially affected area.

The 1995 GCNP General Management Plan/Environmental Impact Statement contains detailed information about the GCNP. GCNP lies within Coconino and Mohave Counties in the State of Arizona, and is located close to the States of Utah and Nevada (see Figure 1-1). The park is bounded by Kaibab National Forest and the Bureau of Land Management's Arizona Strip District to the north, by Glen Canyon National Recreational Area to the northeast, by the Navajo Indian Reservation to the east, by Kaibab National Forest and the Hualapai and Havasupai Indian Reservations to the south, and by Lake Mead National Recreation Area to the west.

Coconino County, Arizona, contains the three main entrances to GCNP and the communities most directly affected by the social and economic effects of park operations. Most South Rim visitors spend at least one night in Coconino County. Communities in Coconino County and Utah's Kane and Washington Counties are service areas for visitors to the North Rim and Tuweep. Coconino County is the second largest county in area in the United States. In addition to encompassing much of

the area of GCNP, it contains all or portions of the Navajo, Hopi, Havasupai, Hualapai, and Kaibab Paiute Indian reservations.[4] The Kaibab Paiute Indian reservation, located at the Arizona-Utah border, does not bound any portion of the GCNP and is outside the affected area. However, the tribes maintain an ancestral interest in the Grand Canyon. The San Juan Southern Paiute Tribe resides in Coconino County but does not have reservation lands.

3.2 GRAND CANYON

The canyon itself ranges from 1 to 18 miles wide and is over one mile deep in places. The Grand Canyon lies entirely on the southern portion of the Colorado Plateau. The higher elevations of the plateau are forested, while the lower elevations are a series of desert basins and deeply incised canyons. Elevations range from approximately 1,200 feet on the canyon floor at the western end to over 9,000 feet on the North Rim. On both rims, the topography is generally flat, making land travel relatively easy. In contrast, topography below the rims is characterized by steep talus slopes; precipitous cliffs; crumbly decomposing rock ledges; and long, narrow side canyons.

The Grand Canyon contains significant examples of most of the natural themes represented within the Colorado Plateau physiographic region, including: plains, plateaus, and mesas; work of volcanism; sculpture of the land; river systems and lakes; geologic history; boreal forest; and dry coniferous forest and woodland. The Grand Canyon also offers a geologic record covering the first three eras of geological time (2.5 billion years), making it one of the most complete records of geological history found anywhere in the world.

3.3 NATIVE AMERICAN COMMUNITIES

Six Native American communities, represented by eight separate tribal governments, have ancestral ties to the Grand Canyon. The Colorado River, the canyon, the larger landscape in which these occur, and many of the park resources are considered sacred by many within these Native American communities. Within this larger landscape are sites, locations, and resources that are of traditional significance to all tribes in some cases, and to only some tribes in others. These Native American traditional cultural properties (TCP) are tangible historic properties potentially eligible for listing on the National Register of Historic Places because of their association with cultural practices and beliefs rooted in history and their importance in maintaining the cultural identity of Native American communities.

The following is a summary of each community's interests, including spiritual, traditional and other interests in the Canyon.[5]

Havasupai

The Havasupai are one of 14 bands of Yuman-speaking Pai Indians, and one of two tribes still living within Grand Canyon. They share common ancestry and a similar language with other local Pai tribes, the Hualapai and Yavapai. Their home in Havasu Canyon lies within their reservation, which includes land on the Coconino Plateau, and to the east and west of Havasu Canyon. According to their creation story, this region is the place where they began, and has always been home to their ancestors.

Historically, the Havasupai occupied a territory from the Aubrey Cliffs on the west to the Little Colorado River on the east, and from the Colorado River on the north to the vicinity of Bill Williams Mountain on the south. As one Havasupai tribal member expressed it, "As you drive on U.S. Highway 180, near the town of Valle, all the mountains you see surround Havasupai territory."

Within these boundaries, the Havasupai traditionally subsisted by hunting, gathering, and farming. Much of the native flora and fauna of the Canyon and the adjacent Coconino Plateau have traditionally been important to the Havasupai for both economic and religious purposes.

In the late summer, pinyon nuts were collected. Groups of Havasupai, and sometimes Hopi, Navajo, and Paiute, would gather in the same area to collect the nuts. One favorite Havasupai pinyon camp was located between Moqui Tank and Big Tank. Havasupai camps were also located at cave sites along Coconino Wash and near present-day locations of Moqui Lodge, Hull Tank, Cecil Dodd Tank, and Homestead Tank. Since resources on the Plateau were limited during the winter, the Havasupai organized into family, extended family, or band units, returning to areas known to belong to these groups. Hunting continued through the winter all over Coconino Plateau, while in spring, mescal was collected on the benches of the Canyon. Other locations of seasonal activities on the Plateau included Rain Tank, Pasture Wash, Drift Fence, and the Little Colorado River.

The Havasupai accessed the Plateau through a series of trails that were constructed long before anglos first visited the area. Bright Angel Trail, Mystic Springs Trail, and Hermit Basin Trail were originally Havasupai Trails, rebuilt by anglos in the 1890s. The Moqui Trail was a trade route between Hopi Mesas and Havasupai Canyon; it had been almost completely abandoned, however, by 1910.

Many of the trails that ascended the Plateau ran to water sources. Rain tank, now part of the Grand Canyon Airport, was a water source used by generations of Havasupai for both subsistence camps and as a water stop during long-distance travel. Another route east from Rain Tank passes through Long Jim Canyon. A traditional Havasupai story tells of an old woman who lived in one of the caves along the limestone walls.[6]

Hopi

The Hopi Tribe is a federally recognized Indian Tribe. The Hopi Reservation is surrounded by the Navajo Reservation and is divided by the Dinnebito Wash and Polacca Wash as they drain toward the Little Colorado River. According to Hopi tradition, the Hopi people began their emergence into the present world through the *Sipapu*, a travertine cone in the Little Colorado River gorge outside the boundaries of the GCNP. From that place, they spread throughout the southwestern United States.

The migrations of some of the clans included residence in the Grand Canyon. Archaeological investigations substantiate these claims, indicating they have used the canyon since about 700 A.D.

Hopi people continue to use the Grand Canyon for important ceremonial and ritual purposes. Some of their most sacred sites are inside and immediately adjacent to the GCNP, such as the Hopi Salt Mines on the Colorado River inside the GCNP.

Hualapai

The Hualapai Tribe is a federally recognized Indian Tribe whose ancestral lands cover millions of acres in and around the Grand Canyon. The Hualapai Indian Reservation, established in 1883, is located along the south rim of the Grand Canyon and the Colorado River in northwestern Arizona on a portion of those ancestral lands. The Hualapai Reservation encompasses approximately one million acres of land and extends for 108 miles of the Colorado River, from mile post 165 to mile post 273.

About two-thirds of the Reservation is located on the lower elevation of the Hualapai Plateau, and the eastern third is located on the higher elevation Coconino Plateau. Terrain elevations fluctuate from 2,000 feet at the bottom of the Grand Canyon to 7,000 feet. Vegetation varies widely throughout the Reservation. At the western end, the vegetation in the vicinity of the Grand Canyon rim is primarily desert scrub land, chaparral and desert grassland. "Hualapai" means People of the Tall Pines, and this vegetative cover is found on the central and eastern portions of the Reservation in the vicinity of the Canyon rim. Hardwood trees are found at higher elevations and along streams.

The Hualapai Tribe has an enrolled membership of about 2,200 persons. Approximately 1,800 persons reside on the Hualapai Reservation, including about 1,000 enrolled tribal members. Most of these residents live in Peach Springs, the Tribal capital. Peach Springs is located near the southern edge of the Reservation on Highway 66, approximately 16 miles south of the Canyon rim as the crow flies and 50 miles east of Kingman, Arizona. The tribal economy is based on tourism, river rafting, cattle ranching, hunting expeditions, timber cutting, government services, and traditional crafts.

The vast majority of the Hualapai Reservation is undeveloped. Under Tribal law, development of any kind is prohibited in canyons considered sacred to the Hualapai people. Non-Hualapai may not enter these canyons. The Hualapai Tribe manages its lands for wildlife protection, cultural resources preservation, and forestry. The Tribe has set aside an area along the southern rim of the Grand Canyon for tourism and recreation. This area includes the Grand Canyon West Airport.

Navajo

The Navajo Nation is a federally recognized Indian Tribe. The Navajo Reservation borders GCNP from Lee's Ferry to the confluence of the Little Colorado River. The Navajo tribal government is divided into local governances called Chapters. The Cameron and Gap-Bodaway Chapters border GCNP.

Archaeological and linguistic evidence suggest that the Athapaskan-speaking ancestors of the people now known as the Navajo migrated into the American Southwest sometime between about 1000 A.D. and 1500 A.D. They spread into the area to the east of the Colorado River and north of the Little Colorado River during the 19th century.

The Navajo view the Colorado and the Little Colorado Rivers as sacred beings.

San Juan Southern Paiute, Kaibab Paiute, Shivwits Paiute, and Paiute Tribes of Utah

The Kaibab and San Juan Southern Paiute Tribes are federally recognized Indian Tribes, while the Shivwits are not at this time. Kaibab, Shivwits, and San Juan Southern Paiutes are three separate tribes, however, their beliefs, ties to the Grand Canyon, and concerns are similar. Therefore, they will be discussed as one people, the Southern Paiute. The NPS General Management Plan for the GCNP indicates that the Southern Paiute are located within the Navajo reservations although there is no specific reservation designation shown on standard location maps. Additionally, the Kaibab Reservation (considered Southern Paiute by the General Management Plan for the GCNP) is located on the northern border of Arizona and is approximately 23 miles at its closest point to the GCNP.

Archaeological evidence of Southern Paiute use of the area may be found dating as early as 1150 A.D. The traditional boundary for the Southern Paiute within Grand Canyon extends from the junction of the Paria and Colorado Rivers downstream to Kanab Creek.

Zuni

The Pueblo of Zuni is a federally recognized Indian Tribe. The Zuni, while not residents of the affected environment, have ancestral ties to the Grand Canyon. The traditional area of Zuni land use is bounded by the San Francisco Peaks and portions of the Little Colorado River in the north. Archaeological sites, traditional cultural properties, and other sacred locations along the Colorado River corridor and the Little Colorado River are important to Zuni traditional and cultural values, providing important spiritual linkages to the place of emergence for the Zuni people.

3.4 GRAND CANYON NATIONAL PARK

GCNP encompasses 1.2 million acres of the Grand Canyon in northern Arizona (see Figure 1-1). GCNP, designated a World Heritage Site in 1978, is one of the few areas in the world meeting the selection criteria for both natural and cultural resources. GCNP served 4,928,509 visitors in 1993 and has both undeveloped (natural) and developed areas as defined by the NPS.[7] The majority of the Park is part of the NPS Natural Management Zone, comprised of proposed wilderness areas and non-wilderness areas and trails. Each of the developed areas (South Rim, North Rim, Tuweep, and the corridor trails) tend to have unique characteristics.[8] These characteristics are generally related to the level of development. The major areas most relevant to this study are briefly described in the following sections.

In response to the 1995 General Management Plan for GCNP, the NPS has taken the following major actions to reduce noise from all sources in the park (actions affecting only specific areas of the Park are discussed in the appropriate sections below):

- Since 1997, the NPS at GCNP has contracted for the use of an MD-900 NOTAR (No Tail Rotor) helicopter, one of the quietest helicopters available, to accomplish NPS emergency and administrative needs. The Park has one of the most extensive review and approval processes in the nation to ensure that non-emergency use of NPS

contract aircraft is appropriate and is conducted in a manner that minimizes noise and other impacts on Park resources and visitors.

- In part to reduce noise, motor vehicles were restricted in 1998 on many primitive roads and trails on the North and South Rims, and in proposed wilderness and non-wilderness areas.

- A draft wilderness management plan, which was reviewed by the public in 1998, proposed standards for the park's proposed wilderness areas (over 90 percent of the park) concerning the number of occurrences of human noises per hour or day (e.g., aircraft, motors on the river, other parties on trails or in camps).

- Remote ranger stations in the park are primarily solar-powered, with gasoline or diesel generators rarely used as backup.

- Noise reduction considerations are beginning to be included in equipment selection criteria and facility design and operational practices for NPS and park concessions.

- Buses are prohibited from idling their engines at parking areas and overlooks.

The developed areas in GCNP include the South Rim, the North Rim, Tuweep, and the Cross-canyon Corridor (including Phantom Ranch and Indian Garden).

3.4.1 South Rim

The South Rim developed area, located in the southeastern portion of the park, is by far the most developed and visited area of the park. Grand Canyon Village, located on the South Rim just north of the town of Tusayan and GCNP Airport, is the largest and most visited developed area in the park. The South Rim developed area also includes Hermit's Rest, Desert View, and numerous rim viewpoints. According to the park's General Management Plan, the South Rim developed area will remain the focus of the vast majority of park visitation. However, limits will be placed on the use of private automobiles, primarily by limiting people to transit systems and alternative transportation (e.g., bicycles) in Grand Canyon Village and West Rim Drive.

In addition to the noise reduction actions recently implemented Park-wide, the following actions have been implemented on the South Rim:

- Planning and design efforts are in the final stages for: constructing a light rail system between Tusayan and Grand Canyon Village; constructing a transportation and orientation center at Mather Point; and using electric buses and other alternative transportation systems in the Grand Canyon Village area. All of these will reduce automobile traffic and congestion on the South Rim, thereby presumably reducing noise.

- Procedures have been implemented to limit the use of train whistles to the minimum necessary for safe operation.

The South Rim will also continue to provide diverse opportunities to view the Canyon and to experience solitude in natural settings as well as social exchange in developed areas.[9] The visitor experience on the South Rim is, to a large extent, currently oriented around the automobile. However, the General Management Plan calls for limits on

the number of vehicles parking on the South Rim, restricting private vehicles from many areas, and encouraging visitors to use transit, pedestrian paths, and bicycles for their primary access.[10]

3.4.2 North Rim

The North Rim is located in the northeastern portion of the park, and includes the North Rim Village on Bright Angel Point approximately ten air miles north and across the canyon from Grand Canyon Village. The park's General Management Plan calls for the North Rim to provide a low-key, uncrowded atmosphere that offers visitors opportunities to be intimately involved with the environment. Under the General Management Plan, the North Rim will continue to accommodate less than ten percent of the park's visitors and roads into the North Rim will continue to be closed to vehicles during the winter. Also, more visitors will be encouraged to visit the area between Point Imperial and Cape Royal to relieve congestion in the Bright Angel Point area, and to continue to visit Point Sublime via dirt road (see Figure 1-1).

3.4.3 Marble Canyon

Marble Canyon is a narrow arm of GCNP through which the Colorado River enters GCNP. Marble Canyon extends northward from the North Rim about 40 air miles to Lees Ferry. The GCNP boundary is less than five air miles wide for the length of Marble Canyon (see Figure 1-1).

3.4.4 Tuweep

Tuweep lies approximately 50 air miles to the west and 15 air miles north of and on the opposite side of the canyon from Grand Canyon Village. Tuweep served approximately 11,000 visitors in 1993, and is unique within the Grand Canyon because it is remote yet provides unpaved car access. The NPS goal for this area is that it "continue to provide uncrowded, primitive experiences that are dominated by nature and solitude," including minimal visitor facilities.[11] Toroweap overlook is a prime visitor site in this area. In addition, Tuweep Airstrip, a State-owned strip with an unpaved 3,500-foot runway, is located approximately five air miles north of Toroweap Overlook and immediately adjacent to the park boundary.

3.4.5 Inner Canyon

The Inner Canyon includes about 90 percent of the park area, including most of the backcountry trails and campsites in the park, and the Colorado River. The park's General Management Plan calls for managing almost all of the Inner Canyon as wilderness. Exceptions include the Cross-canyon Corridor that includes Phantom Ranch and the other developed sites below the rim, and possibly the Colorado River (see Figure 1-1).

In addition to the noise reduction actions recently implemented park-wide, commercial river outfitters are voluntarily converting to new low emission, low noise four-stroke outboard motor technology in an effort to reduce motorboat noise concerns on the Colorado River through the park's inner canyon (about one-fifth of the fleet was converted in 1998). NPS motorboats use only the new, low noise motors, however, the NPS has reduced its use of motors on river patrols to about half the time, using oars only for the other patrols. No motors are allowed on the Colorado River at all

from September 16 to December 15 each year.

3.5 CLIMATIC CONDITIONS

The climate at the Grand Canyon is diverse and directly affects flights over the area. This is due to elevation changes and to the unique effect the canyon itself has on weather.

The region experiences weather extremes during both summer and winter. In the context of air tour activity and aircraft overflights, summer conditions (May 1 - September 30) are generally more critical for several reasons. First, more tourist and resultant air tour activity occurs during the warm season. Second, aircraft performance tends to be decreased during hot weather. This makes hot weather aircraft performance parameters critical when evaluating noise abatement options. Hot conditions also tend to require pilots to increase aircraft engine speed to generate the additional thrust needed to offset decreased hot air performance. Increased engine speed generally results in greater noise emissions. Third, the propagation characteristics of noise tend to be affected by hot conditions such that sound travels farther.

In the summer at the North Rim, days are generally clear and crisp with occasional afternoon thunderstorms or heavy rain; evenings are chilly. Average summer high and low temperatures are 75 and 43 degrees Fahrenheit, respectively. The North Rim receives more precipitation than any other location in the park, with an average of 25 inches per year.

During the summer at the South Rim, afternoon thundershowers and occasional heavy rains can be expected. Average summer high and low temperatures are 82 and 51 degrees Fahrenheit, respectively.

At Phantom Ranch (at the bottom of the canyon) daytime temperatures are extremely high during the summer months, with highs and lows averaging 106 and 78 degrees Fahrenheit, respectively.

Summer days in the Grand Canyon region are warm and turbulent. Thunderstorms develop almost daily over some parts of the region from late June through early September as a result of local convectional disturbances due to excessive heating of the ground. These storms can be frequent, heavy and violent, but are usually localized. Turbulence, hail, rain, snow, lighting, severe updrafts and downdrafts, and icing conditions may be associated with these thunderstorms. The storms usually last less than 30 minutes but pilots must modify their flight routes to avoid such weather. The FAA recommends that pilots stay at least 10 to 20 miles away from thunderstorms.

“Density altitude” is also a factor that must be considered in developing management alternatives involving aircraft. It is a measure of air density used by pilots as an index in calculating the performance capability of aircraft. Density altitude becomes a critical factor in all warm-weather and high-altitude flight planning. High-density altitude is a hazard since it reduces all aircraft performance parameters. Elevation (or altitude), humidity, and temperature all determine air density. When all three are high, density altitude is high and normal horsepower output is reduced, propeller and wing efficiency decrease, and an airplane requires a longer takeoff roll before becoming airborne. Additionally, rate-of-climb is decreased and a higher true

airspeed is required. Flights are sometimes planned for the early morning or late afternoon hours to offset the effects of density altitude, as well as to take advantage of decreased turbulence.

Turbulence in the Grand Canyon is usually caused by differential heating of the canyon's surface or by strong winds. Updrafts caused by differential heating are often used by pilots to assist aircraft in climbing, sometimes a difficult task on a hot summer day when an aircraft is fully loaded. Canyon flying is much like mountain flying, and abrupt changes of wind direction and velocity must be anticipated.

Winter conditions are also extreme and vary widely. The North Rim is closed during the winter because it receives as much as ten feet of snow. Average winter high and low temperatures are 39 and 18 degrees Fahrenheit, respectively.

The South Rim is always open, because it generally receives less than three feet of snow. Average winter high and low temperatures are 43 and 20 degrees Fahrenheit, respectively.

Winters at Phantom Ranch are also mild, with maximum temperatures averaging 56 degrees Fahrenheit and the lows rarely dipping below freezing. The canyon below the rims receives about eight inches of precipitation each year.

During winter months, the Grand Canyon region experiences snowstorms and low-level stratus clouds. There are also short periods of temperature inversions when clouds fill the canyon (cold air drains into and is trapped within the canyon) while the rims are being warmed by direct sunshine.

3.6 PHYSICAL RESOURCES

The Grand Canyon is noted for its diverse topographical and geological features. It also holds a historical record dating back millennia. This section describes these physical and cultural resources. These characteristics affect the distribution of visitors and residents and the expectations visitors have for their experience at various sites. Moreover, certain areas tend to be more sensitive to aircraft noise. The difference in elevation may also affect aircraft performance at different park locations.

3.6.1 Popular Trails and Sights at GCNP

Most visitors to GCNP arrive at the South Rim. The majority of visitors view the canyon from the rim but do not explore the canyon below the rim. Of those that venture onto the corridor trails (the trails which provide main visitor access to destinations below the rim and connect the North and South Rims), most are day-hikers. Day-hikers hike a short enough distance to allow their return to the canyon rim before sunset. The primary trails are the North and South Kaibab Trails and the Bright Angel Trail.[12] In addition, the inner canyon trails which receive the most use outside the corridor include the Hermit, Grandview, Tanner, South Bass, Hance/Red Canyon, and Thunder River Trails.

Within the impact analysis area (depicted in Figure 1-1), popular sites include Hermit's Rest (on the South Rim), Bright Angel Point, Phantom Ranch, Point Sublime, Point Imperial, Toroweap Point, and Supai Village.

3.6.2 Grand Canyon West Tourism and Recreation Areas in the Hualapai Reservation

Grand Canyon West is an area of approximately 9,000 acres in the northwest corner of the Hualapai Reservation. The Hualapai Tribe has designated the Grand Canyon West area for economic development through tourism and recreational uses. Since 1988, the Hualapai Tribe has worked with air and bus services based in Las Vegas, Nevada, to bring visitors to Grand Canyon West. Grand Canyon West receives approximately 100,000 visitors annually. Current improvements at Grand Canyon West consist of a paved airstrip, a terminal building, a visitor center with shops and restrooms, paved roads to scenic vistas, mobile homes for Grand Canyon West employee lodging, water tanks, a dining facility with a scenic vista at Guano Point where lunch is served to visitors, and hiking trails along the Grand Canyon Rim. An undeveloped Grand Canyon viewing area at Quartermaster Point is part of the Grand Canyon West tours conducted by a Hualapai tribal corporation. The Tribe has invested 15 million dollars in these improvements and on infrastructure to accommodate further tourism development at Grand Canyon West.

In addition, a Hualapai tribal enterprise conducts float trips down portions of the Colorado River. The Tribe grants trespass permits for vehicles that use the Diamond Creek Road to access the Colorado River. The Tribe also regulates trophy big-game hunting on the plateau and smaller canyons along the Grand Canyon through permits for Desert bighorn sheep, elk, antelope, and mountain lion; a tribal guide must accompany all hunters. The number of permits is limited to ensure conservation of game species.

The Hualapai Tribe has designated Grand Canyon West for further development to serve larger numbers of visitors and to accommodate overnight visitors. The Tribe anticipates that development will include moving the airport away from the rim and constructing a lodge at Quartermaster Canyon, one or more restaurants, a museum/cultural center, and additional hiking trails.[13] The Tribe intends to construct all structures with low profiles and Canyon-view windows designed to provide visitors with scenic vistas while minimizing the visual impact of the building from the Canyon Rim area and the Colorado River. With these improvements, the Tribe projects that visitors will increase to approximately 500,000 annually in six years. The Tribe's plans for Grand Canyon West are the primary means identified by the Tribe to address its high unemployment rate while preserving the Tribe's natural and cultural resources. Areas designated for development at Grand Canyon West are away from important traditional cultural site areas. The Tribe also plans to improve the habitat at Grand Canyon West to increase wildlife native to the area.

3.6.3 Historic/Cultural/Archaeological Sites in the GCNP

Historic properties in GCNP listed in the National Register of Historic Places consist primarily of buildings associated with tourism, park administration and operations, and mining enterprises. In total, 884 buildings are included in the park's list of classified structures, 61 of which are archaeological sites with standing walls.[14]

Four historic districts and two historic buildings on the South Rim are listed in the

National Register of Historic Places. These and other eligible properties are identified in the 1995 GCNP General Management Plan/Environmental Impact Statement. Eligible properties receive the same protection as listed properties (in the National Register) under the National Historic Preservation Act (NHPA). The Grand Canyon Village Historic District includes some 238 buildings, four of which have been designated as National Historic Landmarks: the "El Tovar" Hotel, the Grand Canyon park operations building, the Grand Canyon powerhouse, and the Grand Canyon railroad station. The Mary Elizabeth Jane Colter National Landmark District (also designated a national historic landmark) consists of four buildings: Hopi House, Lookout Studio (both of which are also in the Grand Canyon Village Historic District), Hermits Rest, and Desert View Watchtower. The Grandview Mine and Orphan Mine historic districts, the latter having been determined eligible for listing in 1994, are representative examples of mining operations in the park. Two other national register properties are located on the South Rim: the water reclamation plant and the Tusayan Ruins.[15]

Three historic districts on the North Rim are listed in the National Register of Historic Places. These include the Grand Canyon Inn (North Rim Inn) and Campground District, the Grand Canyon North Rim Headquarters Historic District, and the Grand Canyon Lodge Historic District, which is a designated National Historic Landmark.[16]

Other historical districts in the park include the Cross-Canyon Corridor District and the Trans-Canyon Telephone Line District. The Cross-Canyon Corridor District includes 44 buildings and structures as well as the Bright Angel, South Kaibab, North Kaibab, and connecting river trails. Among the principal structures in the district are four trailside rock shelters and the Phantom Ranch complex, including the five original stone buildings designed by Mary Jane Colter for the Fred Harvey Company along Bright Angel Creek at the bottom of the Grand Canyon in 1922.[17]

Archaeological resources are also prevalent. The earliest suggestion of human use of the Grand Canyon is a Folsom projectile point discovered in the Marble Canyon area, which may have been left there as early as 10,500 years ago. Consistent, well-documented evidence of human use of the Grand Canyon appears in the form of small figures made of split-willow twigs that represent game animals and date to about 2,500 B.C. Habitation levels of the canyon appear to have been relatively stable until around 500 A.D., when small groups of basket makers began living in modest villages of circular pit-houses with mud and brush roofs, and using a distinctive gray pottery. The population of the canyon then began to grow considerably. The population increased dramatically by 1100 A.D.; of the more than 2,700 archaeological sites known within the park, 70 percent were occupied between 1050 A.D. and 1150 A.D.[18]

Only a small portion of the park has been formally surveyed for archaeological sites, but more than 3,700 have been recorded. The river corridor, the southern extension of the Walhalla Plateau on the North Rim (known as Walhalla Glades), portions of the Grand Canyon Village, the trans-canyon corridor, and portions of East Rim Drive have been systematically surveyed for archaeological resources. These are all areas that receive heavy visitation and disturbance by modern visitors. The remainder of the canyon has not been thoroughly inventoried.

Archaeologists estimate there may be as many as 61,000 sites in the park. The density of sites in surveyed areas averages 1 site in 20 acres and ranges from 1 site for every 7 acres in the vicinity of the Grand Canyon Village to 1 site in 349 acres on Swamp Ridge. The estimated density for the North Rim is 1 site in every 14 acres and 1 site in every 31 acres on the South Rim.[19]

Site density on the South Rim is high, with archaeological materials nearly continuous from Buggeln Hill (east of the Kaibab monocline) to Desert View. In addition to the prehistoric materials, the area contains remains suggesting limited and continuous use into historic times. The area near the Hance trailhead is known to be sacred to the Havasupai.[20]

The North Rim has some of the most important archaeological sites in the park, especially in the Walhalla Glades area. The expansion and exploitation of the North Rim by ancestral Puebloan peoples is evidenced by the extensive remains found on the North Rim, particularly in Walhalla Glades. Intensive surveys of this 4,000-acre area have located hundreds of sites. There are only three known archaeological sites near Bright Angel Point, but none are within the existing development area. One small masonry structure lies near the Rim Transept trail and is currently interpreted to the public.[21]

There are a large number of archaeological remains in the Tuweep area; the entire Esplanade consists of a dispersed scatter. Three recorded sites are within the campground and are sustaining ongoing impacts from visitor use.[22] The corridor trails were used prehistorically and pass many archaeological sites of varying size and importance. The trails have been surveyed for archaeological resources, but subsequent checks have indicated that the existing data are of poor quality. Archaeological sites near trails often receive some of the greatest impacts from erosion and illicit collection. Human burials associated with ancestral Puebloan occupation have been found at an archaeological site near Cottonwood Camp on the North Kaibab Trail.[23]

Phantom Ranch contains one well-studied pueblo and a number of features associated with it. Human burials have been found nearby. Besides having considerable evidence of Puebloan use, Indian Garden was the home of several Havasupai families until well into the 20th century.[24]

3.6.4 Historic/Cultural/Archaeological Sites in the Hualapai Reservation

The Hualapai Tribe are descendants of the 14 bands of the Pai (people) from the Grand Canyon and vicinity in the northwest quarter of Arizona. The Hualapai have occupied and used the lands and water lying within their aboriginal territory, including their present Reservation, for more than a thousand years. The Colorado River itself is a significant landmark for the Hualapai, both physically and spiritually. The northern boundary of the Hualapai Reservation is the Colorado River. The Hualapai traditionally practiced agriculture and hunted game extensively in and around the Grand Canyon and tributary canyons. Traditional Hualapai dwellings are small, dome-shaped structures, known as wicki-ups, constructed with small poles and branches covered by juniper bark or thatched. Traditional structures also include rock shelters, sweat houses, and rectangular, flat-roofed shade houses. Traditional ceremonial sites continue to be used today.

By agreement with the NPS, dated August 20, 1996, the Hualapai Tribal Historic Preservation Officer (THPO) (the Director of the Hualapai Department of Cultural Resources (HDCR)) assumed certain responsibilities of the State Historic Preservation Officer, including those for Section 106 of the NHPA, for the Hualapai Reservation.

In March 1998, the FAA and the Hualapai Tribe entered into a Statement of Work (SOW) providing for the HDCR to conduct an Ethnographic Archaeological Study. The SOW was accompanied by a firm fixed price contract. This study will allow the HDCR to assist the FAA in identifying, documenting, and evaluating TCPs within the area of potential effect (APE) for FAA actions over the Hualapai Reservation. The FAA actions covered by the study are actions in compliance with Public Law 100-91, planning the revisions to the SFRA in the vicinity of the GCNP and the associated air tour routes. The SOW provides for a three-phased study.

The first phase of the study was to address areas considered especially critical and sensitive. It included relevant archival research for recorded TCPs and archeological sites within the entire APE. Phase I of the study included areas affected by both existing air tour routes and the proposal to shift the southern portion of Blue 2 out of the GCNP onto the Reservation. The second phase was to address other areas of the APE. The third phase was to address the Comprehensive Aircraft Noise Management Plan, for which FAA contemplated a programmatic agreement under Section 106 of the National Historic Preservation Act. In the SOW, the APE was defined as the area within three miles of the centerline of the proposed commercial air tour routes. The SOW was to be modified if the FAA proposed to change the proposed commercial air tour routes. In December 1998, the Tribe provided a draft preliminary report for Phase I of the Ethnographic study.

After the SOW was signed, based in part upon consultation with the Hualapai Tribe and THPO, FAA revised the proposed commercial air tour routes. Among other things, the revised proposed action would eliminate existing commercial air tour routes south and west of Surprise Canyon. In March 1999, the HDCR submitted the final Ethnographic Study for Phase I. Based upon that Report, at least seven areas of concern appeared to be affected by the proposed action.

In July 1999, FAA met with the Hualapai Tribe and THPO to revise the SOW for Phase II of the Study to account for the proposed route changes and associated noise exposure. During this meeting, the Tribe proposed to revise the APE using the standards proposed by the NPS in January 1999 and subsequently adopted for the GCNP.[25] To facilitate consultation, FAA offered to expand the APE to include the 20 dB L_{Aeq12h} noise contour for the Preferred Alternative. In August 1999, at the request of the Tribe, FAA provided documentation to support definition of the APE as three miles on either side of the centerline of commercial air tour routes. In mid-September, the Tribe proposed to define the APE as "…the entire area extending from the Colorado River on the north to the line drawn on the attached map to the south and from the western boundary of the Hualapai Reservation to the eastern boundary of the Hualapai Reservation. This APE would have included approximately 95% of the Hualapai Reservation and areas approximately 40 to 50 miles from air tour routes.

In mid-October, the parties agreed that the APE would consist of those areas on the Hualapai Reservation within either or both (1) the 20 dB L_{Aeq12h} noise contour as depicted on Figure A-1 of the June 1999 Draft SEA (i.e. for the Preferred Alternative) or (2) the 20 dB L_{Aeq12h} noise contour for the Preferred Alternative in the December 1996 Final Environmental Assessment, as amended in the October 1997 Written Reevaluation. The APE would also include those areas identified as critical and sensitive that lie partly under or abut one or both of the above-described noise contours and where the Hualapai Tribe establish to the satisfaction of FAA that the integrity of the entire canyon or area is essential for religious or cultural reasons, including but not limited to Merwitca Canyon.

The parties also agreed that Phase II study would be completed in two parts. Phase II (A) would evaluate at least 12 additional canyons and areas identified as especially critical and sensitive. Phase II (B) would evaluate other TCPs that may be located in the remainder of the APE not covered by prior phases of the study.[26] Phase II (A), which was commenced by the HDCR in July 1999, pending amendment of the SOW, was to be completed on or before November 24, 1999. The federal agencies and the Tribe and THPO signed an amended SOW on November 19, 1999.

The Hualapai Tribe has identified the areas within the APE that are considered especially critical and sensitive. The Ethnographic Study reports for Phase I, dated March 31, 1999, and Phase IIA, dated December 3, 1999, identified 10 TCPs. Additionally, the Hualapai Tribe and THPO provided FAA with a December 15, 1999, list of 40 TCPs. Based upon these reports and information provided by the Hualapai Tribe and THPO during Section 106 consultation, the undertaking may alter the characteristics of at least some of the Hualapai TCPs. The FAA has determined in consultation with the Hualapai Tribe and THPO that these 40 TCPs meet the criteria for inclusion in the National Register of Historic Places. FAA and NPS, with the Advisory Council on Historic Preservation, have entered into a Programmatic Agreement with the Hualapai Tribe and THPO to comply with Section 106.

The HDCR has provided FAA with extensive information about TCPs located on the Hualapai Reservation and archaeological sites associated with those TCPs pursuant to the SOW, as amended. The Hualapai Tribe has also provided information to FAA in written comments and correspondence on previous route proposals and verbally in meetings with FAA since 1996. Through these communications, the Hualapai Tribe has indicated that the natural quiet, privacy, and natural viewscape of the TCPs on the Hualapai Reservation are important characteristics of these sites that are considered to contribute to their eligibility for listing in the National Register of Historic Places.

Confidential information about specific TCPs and associated archaeological sites on the Hualapai Reservation is not disclosed here to protect those resources. Section 304 of the NHPA, as amended, and Section 9(a) of the Archaeological Resources Protection Act of 1979 authorize the restriction of information about the location, nature, and character of cultural and archaeological resources where disclosure may create a risk of harm to the resources or their setting. As explained in NPS' National Register Bulletin 29, "Guidelines for Restricting Information

About Historic and Prehistoric Resources," "[c]ultural resources are often fragile, and their value as a physical representation of the past and as a source of information about human activities can easily be destroyed by theft, vandalism, and unauthorized public visitation." When a "resource is used in traditional cultural practices, such as those by Native Americans and Pacific Islanders, and disclosure would likely result in a desecration of the property," then the resource's location and character should be restricted. The Hualapai THPO has advised the FAA that the disclosure of the location or character of the TCPs and associated archaeological sites on the Hualapai Reservation would likely result in theft, vandalism, desecration, and unauthorized public visitation of those sites.

3.6.5 Wild and Scenic River Segments in GCNP

GCNP includes 277 miles of the Colorado River, one of the longest and most challenging recreational whitewater rivers in the world, with 160 recognized rapids. The NPS reports that the Colorado River within the GCNP, as well as many of its major tributaries, meets the criteria but has not been designated as part of the national wild and scenic rivers system.[27] The NPS is required by its Management Policies (1988), consistent with applicable legislation, to manage its lands that meet the criteria for this designation the same as if they were so designated. This is to preserve the resources pending Congressional action.

3.7 NATURAL RESOURCES

In addition to geologic resources previously described, the Grand Canyon region is one of the most ecologically diverse in North America. Plant communities vary from cool, moist, subalpine forests and meadows between 8,000 and 9,000 feet elevation, to those of the hot, dry Great Basin, Sonoran, and Mojave Deserts at elevations as low as 1,200 feet. Grand Canyon vegetation is primarily controlled climatically, "with precipitation, maximum summer temperatures, and minimum winter temperatures interacting to distribute plants into more or less discrete elevational zones."[28] As noted in Section 3.1, these characteristics contribute to GCNP's significance as a World Heritage Site.

3.7.1 Wilderness and Wildlife Resources in the GCNP

Over one million acres in the park meet the criteria for wilderness designation as part of the National Wilderness Preservation System. If combined with over 400,000 additional acres of proposed or designated wilderness contiguous to the park boundary, this area could become one of the largest, primarily desert wilderness areas in the United States.[29] The NPS is required by its Management Policies (1988), consistent with applicable legislation, to manage its lands that meet the criteria for this designation the same as if they were so designated. This is to preserve the resources pending Congressional action.

Because of the diverse geologic, ecological, and climatic conditions within the park, there are about 1,500 plant species, 290 bird species, 90 species of mammals, 60 reptile and amphibian species, and 25 species of fish. These include three endangered and five threatened plant species, and ten endangered and four threatened animal species, as well as one experimental

population (treated as threatened) listed on the U.S. List of Endangered and Threatened Species (see **Table 3.1**).[30] Of the listed animal species, five are avian. Table 3.1 has been updated to reflect recent changes in the U.S. Fish and Wildlife Service (FWS) candidate categorization. The American peregrine falcon, shown as endangered in the June 1999 Draft EA, was recently delisted (64 FR 46541-46558, Aug. 25, 1999). The endangered California condor is an "experimental population" in the Grand Canyon area, and, as such, is treated as if it was listed threatened in the area. In addition to the condor, three other threatened species are birds. Only two of the endangered species are not ground-living. The endangered species most likely to be affected by the proposed SFRA modifications would be the avian species, specifically the Mexican Spotted Owl, Bald Eagle and the California condor. Section 4.9 discusses the potential for impacts to these endangered species.

Additionally, the Hualapai Tribe has provided a listing of the following species of special concern to the Tribe: mule deer, chuckwallas, eagles, hawks, falcons, cottontail rabbits, pronghorn antelope, and Desert bighorn sheep.

3.7.2 Wilderness and Wildlife Resources in the Hualapai Reservation

The Hualapai Tribe's Reservation encompasses nearly one million acres of land in the lower Grand Canyon. Due to the great diversity of wildlife habitats on these rugged lands, there is a great diversity of both game and non-game wildlife. Desert bighorn sheep, elk, deer, antelope, turkey, quail, and Mourning Doves are all species that are hunted on the Hualapai Reservation. Non-game wildlife includes numerous small mammal species, including the endangered Hualapai Mexican Vole, a variety of birds, lizards, snakes, and amphibians.

The Hualapai people have traditionally depended on some of these wildlife species for their sustenance. Desert bighorn sheep, mule deer, chuckwallas, eagles, hawks, falcons, cottontail rabbits, and pronghorn antelope are all species that have been of great importance to the Tribe for food and for use in ceremonies and continue to be of special concern to the Hualapai people today.

The Colorado River provides a variety of habitats for wildlife, fish, and other aquatic organisms. Included are several endangered species, such as the Southwestern Willow Flycatcher, razorback sucker, and humpback chub. In 1997, the Southwestern Willow Flycatcher was first documented to successfully nest in the lush riparian vegetation in lower Grand Canyon. In addition, over 50 other bird species nest on the Hualapai Reservation along the Colorado River. In all, the remote nature of these lands offers a great variety and abundance of wildlife and spectacular wilderness experiences.

Plants of special concern, and ones that have been used traditionally by tribal members for food, medicinal purposes, and in ceremonial activities are the ponderosa pine, pinyon pine, Goodding's willow, sage brush, agave, mesquite, and other species known only to the Hualapai. The primary mineral of concern on the Hualapai Reservation is the hematite used for ceremonial activities. Other minerals of importance are, again, known only to the Hualapai people.

Table 3.1

Species of Special Concern In and Adjacent to Grand Canyon

North Rim	Category		Category
North Rim		**Tuweep**	
American peregrine falcon	delisted	American peregrine falcon	delisted
Mexican spotted owl	T	Bunch flower evening primrose	C2
Cliff milk vetch	C2	Grand Canyon rose	C2
Grand Canyon rose	C2		
Northern goshawk	C2	**Corridor Trails**	
North Rim primrose	C2	American peregerine falcon	delisted
Bittterweed	C3	Southwestern willow flycatcher	T
Century plant	C3	Roaring Springs prickly poppy	C2
Dutch primrose	C3	Grand Canyon catchfly	C2
Eriogonum zionus var. coccineum	C3	Chuckwalla	C2
Kaibab beardtongue	C3	Mogollon columbine	C3
Kaibab paintbrush	C3	*Camissonia specuicola var. specuicola*	C3
Kaibab saber daisy	C3	Bigelow onion	SR
Mogollon columbine	C3	Our Lord's candle	SR
Tawny turpentine bush	C3		
Western fairy slipper	SR	**Other Sensitive Species (continued)**	
		Black-footed ferret	E
South Rim		California condor	E
American peregrine falcon	delisted	Brady pincushion cactus	E**
Hualapai Mexican vole	E	Hualapai Mexican vole	E
Sentry milk vetch	E	Colorado Pike - minnow	E
Mexican spotted owl	T	Humpback chub	E
		Bonytail chub	E
Grand Canyon catchfly	C2	Kanab ambersnail	E
Grand Canyon rose	C2	Razorback sucker	E
		Arizona cliffrose	E
		Virgin River chub	E
		Woundfin	E
		Yuma clapper rail	E
		Black-footed ferret	E
Northern goshawk	C2	Desert tortoise	T
Phacelia serrata	C2	Bald eagle	T
Navajo Mountain Mexican vole	C2	Little Colorado spinedace	T
Tusayan flameflower	C2	Navajo sedge	T
Camisionia specuicola var. specuicola	C3	San Francisco Peaks groundsel	T
Mogollon columbine	C3	Silver pincushion cactus	T
Slender rock cress	C3	Welshs milkweed	T
		Jones' cycladenia	T
Arizona leather flower	C1 (only)	Parish Alkali Grass	PE
Tusavan rabbit brush	C2 (only)	Fickeisen pincushion cactus	C1**
Kaibab bladderpod	C2 (only)	Coconino Arizona pocket mouse	C2
		Ditch evening primose	C2**
Other Sensitive Species		Flannelmouth sucker	C2
Greater Western mastiff-bat	C2	Grand Canyon cave pseudoscorpion	C2
Houserock Valley chisel-toothed kangaroo rat	C2**	Yuma Myotis	C2
Pediomelum castoreum	C2**	Long-legged myotis	C2
Southwestern river otter	C2	Lowland leopard frog	C2
Spotted bat	C2**	Marble Canyon kangaroo rat	C2
Whiting dalea	C2	Mt. Trumbull beardtongue	C2
Arizona shrew	C2	Occult little brown bat	C2
Camissonia confertiflora	C2	Pale Townsend's big-eared bat	C2
Cave myotis	C2	Prospect Valley pocket gopher	C2
Ferruginous hawk	C2	Roundtail chub	C2

Table 3.1

Species of Special Concern In and Adjacent to Grand Canyon

North Rim	Category		Category
Fringed myotis	C2	Small-footed myotis	C2
Loggerhead shrike	C2	Western burrowing owl	C2
Long-eared myotis	C2	Yellow-flowered desert poppy	C2
Mt. Trumbull beardtongue	C2	White-faced Ibis	C2
Mexican Long-tongued bat	C2		
Greater western mastiff bat	C2	Speckled Dace	C2
Allen's big-eared bat	C2	Our Lord's candle	SR
Big free-tailed bat	C2	Blue curls	SR**
California leaf-nosed bat	C2	Navajo Bridge cactus	SR**
Grand Canyon flaveria	C3	Western red bat	SC-S
Carex scirpoidea var. curatorum	C3	Black-crowned night heron	S

** Only known outside the park

E = Endangered (U.S. Fish and Wildlife Service)
T = Threatened (U.S. Fish and Wildlife Service)
PE = Proposed endangered listing
SC = Candidate for State's threatened native wildlife list
S = Sensitive (U.S. Forest Service)
SR = Salvage restricted (as defined by Arizona Native Plant Law)
Category 1, 2, or 3 Candidate Species - taxonomic groups or species being considered for threatened or endangered status
C1 = data exist to support listing; additional data being gathered about precise habitat needs or boundaries for critical habitat designations.
C2 = data exist to possibly support listing, but substantial data about biological vulnerability and threats are lacking; further research and field study required.
C3 = no longer being considered for listing because of extinction, not classified as species, or more abundant or widespread than previously believed.

Sources: Sender (GRCA_Wildlife_Biologist@nps.gov) (1999, April 29). Endangered Species List. E-mail to Fred Bankert (Bankert_Fred@prc.com); NPS GMP DEIS, March 1995, pg. 136, updated from NPS GMP FEIS, July 1995, pg. 35.

3.7.3 Noise Environment

The Grand Canyon is noted for its rich sound environment. Such sounds include rushing water, the Canyon warbler's cascading song, the wind whistling through the pines, and thunder and lightning heralding a desert storm, as well as a sense of quiet. These are in contrast to the sounds of visitors talking, cars moving around the South Rim, tourist buses idling, aircraft flying, motorboats speeding up from Hoover Dam, mules baying, and so forth. Congress required the NPS to substantially restore "natural quiet" in the GCNP. "Natural Quiet" is a resource for which the GCNP was established and under the NPS Organic Act, as amended, is to be protected.

Ambient noise has been described as the continuous background sound environment (such as waves breaking on the shore, or a distant waterfall, or absolute silence in the absence of any wind or sounds from other sources). The ambient environment establishes the quieter moments in a setting and can mask intermittent sources (such as aircraft under some conditions). However, even in loud ambient settings, such as near waterfalls, distant sounds such as aircraft can sometimes be clearly audible.

The range in ambient sound levels, even from indigenous sources, can vary considerably

from one location to another, or from time to time at any given location. At one end of the spectrum is the sound level at the base of a powerful waterfall. At the other end of the spectrum is the near absence of any perceptible sound at all. These latter conditions may be found in areas devoid of flora or fauna. In the middle is an array of sound conditions which vary from moment to moment, hour to hour.

During non-inclement weather conditions, these variations result from three factors in natural environments:

- Wind (its interaction with foliage, irregular terrain, or the human ear)
- Water (movement in streams, falls, or wave action)
- Animal (near continuous, such as insect; or intermittent, such as birds, coyotes, etc.)

Figure 3-1 illustrates ambient noise within the noise study area.

3.8 POPULATION AND GROWTH CHARACTERISTICS

FAA Order 1050.1D requires that the affected environment section of an environmental assessment "identify, as appropriate, population and growth characteristics of the affected area…."[31] In the context of the proposed action, the appropriate demography to consider includes visitors to the GCNP and residents of affected communities, including Native Americans.

Therefore, the following sections describe the expectations of GCNP visitors, where data is available, indicators of visitor activity, and according to the Hualapai Tribe, expectations of Hualapai Reservation residents and visitors. Local communities are also discussed.

3.8.1 National Park Visitors

Understanding visitor expectations and the nature of visitor activity at GCNP is important in assessing aircraft noise impacts. The following discussion attempts to enhance the understanding of visitor types and park areas where restoring natural quiet is of greatest concern, keeping in mind the overall goal of substantial restoration of natural quiet.

Surveyed Visitor Expectations

The NPS surveyed GCNP visitors to rank the various reasons for their visit to the park. The results indicate the expectations visitors have for their experience at the park. The ability of the park to fulfill these expectations is considered by NPS as an important factor in visitor satisfaction, the success of the park, and the ability to meet mission requirements.

Throughout the National Park System, approximately 90 percent of visitors rated "enjoy[ing] the natural quiet and sound of nature" as moderately to extremely important. At GCNP, 90 to 95 percent of responses from a mail survey gave natural quiet a similar rating. Visitor type affected response rates substantially, especially among visitors rating natural quiet as "extremely important."

Table 3.2 summarizes the approximate value placed on natural quiet by different visitor types at GCNP.[32] It should be noted that the

FAA has concern regarding the subjectivity of visitor survey data for the purposes of measuring aircraft noise impacts.

Table 3.2

Visitors to GCNP Rating Natural Quiet as Extremely Important

Visitor Type	Rating (approx. %)
Frontcountry	35%
Summer Backcountry	50%
Fall Backcountry	75%
River (Motor)	68%
River (oar)	88%

Source: National Park Service, Report to Congress, Fig. 9-4.

Survey results also clearly report that there are many other moderately to extremely important reasons for visits to GCNP. Overall, over 85 percent of visitors report exercise, learning, and family activity among the most important reasons.[33]

Visitor Activity

Table 3.3 shows recent activity levels by selected visitor types at GCNP. It is important to note that most classes of visitor activity at GCNP are limited or controlled in some way by the NPS to insure that there will be no derogation or impairment of resources and values.[34]

3.8.2 Hualapai Reservation Residents and Visitors

As noted above, the Hualapai Reservation has a resident population of approximately 1,800 persons. Residents include 1,000 enrolled Tribal members and 800 non-enrolled persons (primarily Native American), with the majority of this population residing at Peach Springs near the southern edge of the Reservation. Per capita income of Indian residents of the Hualapai Reservation was $3,630 in 1990. Over 56 percent of Indian residents were below the poverty level in the 1990 Census, and over 80 percent were below the U.S. Department of Housing and Urban Development's Very Low Income Standard in 1991. The Reservation unemployment rate is quite high: 56 percent according to 1995 Bureau of Indian Affairs (BIA) Labor Force data and up to 70 percent seasonally according to the Hualapai Tribe's most recent data.

When Hualapai Reservation residents are in Peach Springs, they can be assumed to have the noise and visual intrusion expectations of residents of similar small residential communities. However, Hualapai tribal members have different noise and visual intrusion expectations when they are engaged in ceremonies at traditional cultural sites. Tribal members have strong expectations of natural quiet at traditional cultural sites because their traditional activities usually require natural quiet. They also have strong expectations of privacy from outsiders and a natural viewscape. These are essential to the proper performance of traditional activities at traditional cultural sites.

3.8.3 Local Communities[35]

Several communities are located near GCNP, with the largest near the South Rim. These communities are dependent upon GCNP due to the tourist activity and employment generated by GCNP. GCNP depends upon these communities for traveler facilities that do not exist at the park and for permanent and seasonal employees. The communities with the most immediate relevance to GCNP and this study are briefly discussed below.

Table 3.3

GNCP Visitor Activity Level

Total Visitors to GCNP	
1993	4,928,509
1994	4,702,989
1995	4,908,073
Inner Canyon Visitors	
1995 Overnight Backcountry Hikers*	47,563 people 115,478 user nights
1995 Colorado River Users*	23,459 people 168,602 user nights
1994 Mule Riders - day trips**	16,440 people
1994 Mule Riders - overnight trips**	4,766 people

* Numbers of overnight backcountry and river users are strictly limited by permit systems, use limits and scheduling.

** Numbers of mule riders are limited by concession contracts and facility capacities.

Note: 1994 numbers were used for mule riders because severe flooding and government shutdowns in 1995 severely reduced the number of mule riders from normal levels. While overnight backcountry hikers and river users were affected to some extent by the flooding and shutdowns, the total 1995 numbers for those groups are close to normal, and it was felt that those groups were not as adversely affected as mule riders for a number of reasons.

Source: National Park Service.

The South Rim communities are Grand Canyon Village, Tusayan, and Valle. These three communities are located on Arizona 64/U.S. 180. These communities are service areas for the majority of park visitors and they also function as residential areas for households of NPS and private service business employees. The economies of all three communities are oriented to serving park visitors.

Grand Canyon Village provides housing for NPS and concessionaire employees and their families. The village's population was reported to be 1,499 at the time of the 1990 census. During mid-summers, the addition of seasonal workers increases the village's population to about 2,100. The State of Arizona projects the year-round population of Grand Canyon Village to be 1,950 in 2010 (Arizona Department of Economic Security 1993a). Based on the current ratios for permanent-to-seasonal workers, the peak summertime population is projected to be 2,730 in 2010.

Tusayan is an unincorporated community three miles from the park's south entrance. The 1990 population of Tusayan was 555. Tusayan's population is estimated to increase to about 1,000 during the peak of the tourist season. The State of Arizona projects the year-round population of Tusayan to be 1,000 in 2010 (Arizona Department of Economic Security 1993a). Based on the current ratios for permanent-to-seasonal workers, the peak summertime population would be 1,800 in 2010. Tusayan's business district is almost exclusively oriented to serving tourists going to and from the park. In addition, the U.S. Forest Service is proceeding with a land exchange and plans to develop recreational, commercial and

residential facilities between Tusayan and the GCNP boundary.[36]

Grand Canyon National Park Airport (see Figure 1-1), south of Tusayan, is the third busiest airport in Arizona, with 535,000 deplanements in 1993. Long-range plans include expanding the airport in anticipation of continued growth in air travel. Commercial air tour flights over the Grand Canyon are staged out of the airport area.

Valle is a small, unincorporated community at the junction of Arizona 64 and 180. The 1990 census reported its population to be 123; its population increases during the tourist season. No population projections are available.

Communities outside the east entrance to the park include Page, Tuba City, Cameron, and Gray Mountain. U.S. 89 links these communities and is traveled by tourists visiting the park's North and South Rims.

Much of the East Rim area is on the Navajo Reservation. Tuba City and Cameron are on the Reservation, and Page and Gray Mountain are adjacent to it.

The Colorado River and the Grand Canyon serve as barriers that isolate North Rim communities from the more populated areas of Coconino County. The North Rim communities include the developed North Rim area within GCNP (including Bright Angel Point), Jacob Lake, Fredonia, Kanab, and Marble Canyon. Visitors to the North Rim travel U.S. Alternate Route 89 east through Fredonia or west through Marble Canyon to Jacob Lake. From Jacob Lake, Arizona 67 provides a direct route to the park's North Rim.

3.9 RELATIONSHIP OF PROPOSED ACTION TO NATIONAL PARK SERVICE GOALS FOR GCNP

In its September 1994 report to Congress, the NPS reviewed its mandates, regulations, policies, and plans related to the protection of natural quiet and the provision of various visitor experience opportunities. From this review, a statement of management goals and objectives was developed to further assist the NPS in its evaluation of the effectiveness of SFAR 50-2.

1. Substantially restore natural quiet as a natural resource.

2. Provide recreation opportunities and experiences for park visitors, consistent with park policies, where the opportunity for natural quiet is an important component.

3. Mitigate any aircraft-related impacts on other natural and cultural resources.

4. Address issues of health, safety and welfare of on-ground visitors and employees.

5. Restore and maintain natural quiet by protecting the wilderness character of remote areas.

6. Provide primitive recreation opportunities without aircraft intrusions in most backcountry areas, most locations on the river, and at destination points accessed by both.

7. Provide developed recreation opportunities with limited aircraft

intrusions for visitors at rim developed areas and major front country destination points.

8. Provide for protection of sensitive wildlife habitat areas and cultural resources.

9. Provide for welfare and safety of below-rim, backcountry, and rim visitors.

10. Provide a quality aerial viewing experience while protecting park resources (including natural quiet) and minimizing conflicts with other park visitors.

As with previous revisions to Subpart U of Part 93, the proposed actions addressed in this document would advance many of these NPS goals without derogating any. Enlarging the SFRA boundary by more than three percent responds to Native American interests (specifically, the Hopi and Zuni Tribes and the Navajo Nation). Modifying and increasing flight-free coverage, and removing and realigning flight corridors represent substantial steps in furthering NPS goals for GNCP.

4

Chapter Four
ENVIRONMENTAL CONSEQUENCES

This chapter presents the analysis conducted to determine the environmental impacts of the No Action alternative and the three proposed alternatives under consideration for modifying the SFRA in the vicinity of the GCNP, hereafter referred to as the GCNP study area. The primary goal of the Proposed Action, as implemented through the proposed alternative, is to substantially restore natural quiet. The chapter summarizes the unique conditions underlying this analysis. The environmental factors considered are those contained in FAA Order 1050.1D and the 1995 Report to Congress (NPS Report on Effects of Aircraft Overflights on the National Park System, July 1995). The primary environmental consideration in the GCNP study area is noise. The analysis presented herein indicates that the overall noise environment for the entire study area is improved by all of the proposed alternatives. The analysis also demonstrates that progress towards restoration of natural quiet can be achieved with any of the proposed alternatives; however, without implementation of an operations limitation, these results are diminished over time. At certain representative locations, predicted noise levels increase with the proposed alternatives when compared to the No Action alternative; however, for the majority of locations, a decrease is observed.

4.1 NOISE

This aircraft noise modeling study was conducted to predict sound levels from tour aircraft activity in the study area. The scope of the study area was defined by the smallest rectangle encompassing the entire SFRA boundary, which includes the area of noise exposure from the commercial air tour routes. The total area amounts to approximately 13,510 square statute miles, 145.5 statute miles east-to-west by 92.9 statute miles north-to-south. The study area is shown in Figure 3-1.

The purpose of the study was to compare a No Action alternative and proposed alternatives (which consider commercial air tour routes) with or without the implementation of commercial air tour limitations. This comparison is: to identify the alternative that best accommodates the goal of substantially restoring natural quiet, with or without commercial air tour limitations; to examine whether any significant adverse effects could be expected; and to disclose any benefits, as well as impacts, that would result from the federal action. The analysis was conducted to meet the following two objectives:

1. Determine whether the Proposed Action, when compared to the No Action and two other alternatives, will result in any significant noise impacts.

2. Determine the effectiveness of the Proposed Action, with consideration of the No Action alternative and two other alternatives, in providing substantial restoration of natural quiet to GCNP.[37]

The noise analysis was conducted by the FAA, in conjunction with the Volpe National Transportation Systems Center Acoustics Facility (Volpe Center). The FAA and NPS provided data used in the modeling process.

The analysis estimates aircraft sound levels by providing values of equivalent sound levels for a specified time period (L_{AeqT}) and percentage of time within which aircraft are audible ($\%TA_T$). For definitions of L_{AeqT} and $\%TA_T$, refer to **Appendix B.** These noise metrics are described in more detail below.

Because of the unique physical and natural environment in the study area, technical considerations were associated with this modeling task that are not normally employed in aircraft noise studies. The following sections address the technical issues, discuss the modeling assumptions used in the analysis, and compare the findings and results for the four alternatives.

4.1.1 Noise Criteria

Traditionally, the scope of issues to be addressed relates to proposed airport and airway expansion projects. The analysis of aircraft noise focuses on communities and parks in the vicinity of airports and military airfields. In these situations, interference with activities such as education, adverse health effects, conversation, sleep, listening to radio or television, and traditional recreational activities are the important issues. The Proposed Action and alternatives under consideration in this Draft Supplemental EA reflect the mandate of the National Park Overflight Act. The issues have been expanded and modified here to address the statutory requirements applicable to the GCNP. The following explains the separate criteria used to evaluate the effects of the Proposed Action and alternatives considered in this Supplemental EA.

Significant Noise Impacts for Study Area

The first criterion addresses the significance of noise impacts on people using the threshold levels defined in its environmental policies and procedures (FAA Order 1050.1D, CHG 1, Attachment 2, p. 1, Policies and Procedures for Considering Environmental Impacts, June 14, 1999; FAA Order 5050.4a, paragraph 47e(1)(d)2, Airport Environmental Handbook, October 8, 1985). FAA guidance in turn references 14 CFR Part 150, Appendix A, Table 1, which is a land use compatibility table that lists land uses and the noise levels considered compatible with each use. The 65 Ldn standard was established in response to Congress' direction that the FAA produce a reliable methodology for measuring noise and human response (49 USC 47502). Except for locations inside the GCNP and, as explained below for traditional cultural properties (TCPs), the FAA used these criteria to evaluate the potential significance of increases in noise on land uses in the study area. Under these guidelines, significant noise impacts occur if the proposed action causes a 1.5 dB Day Night Average Sound Level (DNL) increase in noise within noise sensitive areas exposed to noise levels at or above DNL 65 dB. DNL is a 24-hour day average sound level represented by the symbol L_{dn} (see FAA Order 1050.1D, CHG 1, Attachment 2, p. 1, 14 CFR 150.21(2)(d), August 1992 Federal Interagency Committee on Noise Report, p. 3-5). For this analysis, the DNL 65 dB criterion is translated into a 12 hour sound equivalent average, represented by the symbol L_{Aeq12h}. The L_{dn} 65 dB criterion equates to an L_{Aeq12h} of 68 dB (See Appendix C). Contours of L_{Aeq12h} and computations of levels at representative

locations are used to judge this type of noise impact. For more detail about how noise impacts on people were assessed, including how potential to interfere with speech was determined, see Appendix C, pages C-4 and C-5.

FAA relied upon the Part 150 guidelines to determine the significance of impacts to TCPs to the extent that the land uses specified in the guidelines bear relevance to the value, significance, and enjoyment of the resource. Based upon FAA and Federal Highway Administration guidelines, FAA considered perceptible noise increases of 3 dB and greater to indicate when the Preferred Alternative might adversely affect the historic characteristics of the TCPs identified by the Hualapai Tribe during NHPA Section 106 consultation (see Section 4.3 for a more detailed discussion). Using the best available data, FAA evaluated the potential significance of adverse noise and visual effects by considering: (1) how effects may be expected to compare with those currently experienced from existing air tour routes (i.e. the magnitude of the change in effects); (2) the activities and values associated with adversely affected Hualapai TCPs; and (3) whether a quiet setting is a generally recognized feature or attribute of that TCP's significance.

Restoration of Natural Quiet in GCNP

The second criterion examines progress toward restoring natural quiet. In the Report to Congress (RTC) for aircraft overflights, the NPS defined "substantial restoration of natural quiet" in the GCNP in the following quantitative way:

> ...substantial restoration requires that 50% or more of the park achieve 'natural quiet' (i.e., no aircraft audible) for 75 - 100 percent of the day. [RTC p 182]

This definition establishes several requirements for the criterion used to judge restoration of natural quiet. First, the criterion must consider aircraft-produced sound in terms of audibility. Second, audibility of aircraft must be examined for the entire area of the park. Third, audibility of aircraft needs to be examined throughout the day, which is defined as the 12-hour daytime period of primary visitor activity.

With these considerations, the criterion for judging progress toward substantial restoration can be described in the following terms. *Substantial restoration of natural quiet will be judged to be achieved when tour aircraft are audible for less than 25 percent of the day in more than half of the park area. Hence, to meet the NPS definition of substantial restoration, the total area of GCNP that experiences audible aircraft for more than 25 percent of the day must be less than half (50 percent) of the park.*

In this analysis, the noise metric that represents the percentage of time aircraft are audible during the 12-hour daytime period of primary visitor activity is the $\%TA_{12h}$ metric. According to the definitions listed above, when the 25 $\%TA_{12h}$ contour (the area where $\%TA_{12h} > 25$ percent) for a particular alternative occupies less than half of the area of GCNP, then that alternative has achieved substantial restoration of natural quiet in the GCNP.

Because the primary impact of aircraft sound in this context is its impact on natural quiet within the GCNP boundary, progress toward substantial restoration of natural quiet (increasing areas experiencing natural quiet)

is an important indicator of no significant noise impacts. The FAA and the NPS have recognized that, although sound levels may increase in some areas of the GCNP, progress toward the goal of substantial restoration is measured on a park-wide basis.

Ambient Sound Levels. For this study, the NPS provided the FAA with A-weighted ambient sound levels for the area encompassed by the GCNP boundary. These GCNP ambient levels are shown in Figure 3-1.

The NPS ambient file was based on field measurements conducted for the NPS in GCNP (HMMH memorandum 295860.05, February 5, 1999—see **Appendix D**). The NPS assigned areas of land cover to one of three vegetative categories. These categories and their associated A-weighted ambient sound levels are: pinyon/juniper woodland at 20 dB, desert scrub at 20 dB, and sparse conifer forest at 31 dB. In addition, the NPS-assigned areas influenced by the sounds of moving water are represented by two general categories: Colorado River rapids and water-affected. Within the Colorado River rapids category is a range of acoustic conditions from 25.0 dB to 65.9 dB for distances of 1,950 and 150 meters, respectively, from major rapids and falls. The water-affected category of 38.0 dB includes areas with perennial running water not included in the Colorado River rapids category. Figure 3-1 depicts all these categories and their ambient levels. Comparable ambient levels were applied outside the GCNP within the study area according to vegetation.

The NPS provided the FAA with two sets of A-weighted ambient values: L_{50} and L_{90}. The FAA selected the L_{50} noise levels, which is the ambient sound exceeded 50 percent of the time, to represent the full range of natural sound levels (see **Appendix D** for details).

Audibility. Audibility of aircraft depends upon many factors, such as the level and frequency spectra of the aircraft sounds, the level and frequency of ambient or non-aircraft sounds, and the attentiveness of the listener. The NPS has adopted the percent time audible metric for assessing noise and defining natural quiet in GCNP. This metric is defined as the percentage of time aircraft noise is audible to a human observer at a receptor location during the daytime period of primary GCNP visitor activity.

As part of the December 1996 Final EA, the FAA defined the threshold for evaluating substantial restoration of natural quiet as sound of up to three decibels above the ambient level (see the Final EA Section 4-4). Use of this methodology to estimate the percent of time that aircraft would be audible was upheld in Grand Canyon Air Tour Coalition v. FAA, 154 F.3d 455 (DC Cir. 1998). To more accurately reflect the potential for aircraft noise impacts in the GCNP based on the specific characteristics of the different areas of the Park, the NPS recently adopted, after publishing notice in the Federal Register and affording an opportunity for public comment, a noise evaluation criteria (Change in Noise Evaluation Methodology for Air Tour Operations Over Grand Canyon National Park, 64 FR 3969; January 26, 1999 and Notice of Disposition of Public Comments and Adoption of Final Noise Evaluation Methodology; 64 FR 38006, July 14, 1999).

As set forth by the NPS in its January 26, 1999, Federal Register (FR) notice, different thresholds will be applied to each of two zones in evaluating progress toward

achieving substantial restoration of natural quiet at GCNP. The NPS two-zone noise evaluation system reflects differences in visitor use, geography, facilities development, and regulatory constraints for specific geographic areas. **Figure 4-1** depicts the zones within GCNP and the study area for which these two noise evaluation thresholds apply.

As explained in the FR Notice, a noticeability standard for time above analysis is used (average A-weighted natural ambient level plus 3 decibels) for Zone One (about one-third of the Park). This same standard was used for the entire study area outside of the GCNP in this SEA. In previous environmental assessments related to GCNP rulemaking since 1996, the noticeability standard was used singularly for the entire GCNP and study area. Zone One generally encompasses the Park's developed areas plus the Marble Canyon and Sanup regions.

For Zone One, using A-weighted levels, the +3 dB criterion assumes that the frequency characteristics of the ambient and the aircraft are relatively similar. The +3 dB sensitivity criterion is commonly accepted in the acoustics community as the smallest change in sound level audible to the human ear. For example, given an ambient A-weighted sound level of 40 dB, the introduction of an aircraft into the ambient environment, which raises the sound level to 43 dB (a 3 dB increase), would be noticeable to a person with average hearing.

For Zone Two (about two-thirds of the Park), an audibility standard (average natural ambient level minus 8 decibels) is used to reflect the results of studies conducted in GCNP for the NPS, which have shown that individuals who are *actively*[38] listening can hear aircraft at lower levels than the ambient A-weighted sound levels (HMMH memorandum 294530.22, May 15, 1997—see **Appendix D**). This occurs because aircraft sound often contains tones that are not present in the natural ambient sound. These tones can lead to audibility levels below that of the ambient A-weighted levels. The NPS studies concluded that an active listener could hear aircraft when their sound levels were between 8 and 11 dB below the A-weighted ambient.

4.1.2 Noise Modeling

Noise metrics are computed that relate to these effects, namely L_{dn} or similar "average" sound level metrics. Also, because of the GCNP goal of achieving substantial restoration of natural quiet, simply hearing aircraft-produced sound is also considered an impact. Hence, the computer modeling needs to provide a metric that quantifies how much of the time aircraft can be heard.

The Integrated Noise Model (INM) is the FAA's standard computer methodology for assessing and predicting aircraft noise impacts. Its use in regulatory actions is governed by FAA Order 1050.1D, "Policies and Procedures for Considering Environmental Impacts" under the NEPA. Since 1978, the INM has been widely used by the aviation community, both nationally and internationally, to evaluate noise impacts from new airports, runways, arrival and departure routes, flight procedures, and fleet forecasts. The FAA has continuously refined and updated the INM's system capabilities, aircraft noise and performance data, and computer technology.

The FAA chose to use INM for the GCNP analysis because of its: (1) widespread scientific acceptance, (2) use of methodology

that conforms to industry and international standards, (3) measurement-derived noise and performance data, (4) ability to calculate noise exposure over varying terrain elevation, and (5) adaptability and reliability for assessing a variety of situations, including GCNP noise impacts. Based on the above, the FAA determined that a modified version of INM (ver. 5) is an appropriate tool to use for this analysis.

Specific modifications to the model include the development of a new "circuit" or round-trip aircraft profile capability to simulate tour operations. This capability allows combinations of departure, arrival, and level flight procedures with unlimited altitude changes, including descents below airport elevation. Additional modifications to the model are described in the next sections: Propagation Distance and Suppression of Overground Attenuation Algorithm.

The INM noise calculation methodology and aircraft noise and performance database meet the standards of the Society of Automotive Engineers (SAE), Aerospace Information Report (AIR) 1845, "Procedure for the Calculation of Airplane Noise in the Vicinity of Airports," March 1986 and the International Civil Aviation Organization (ICAO) Circular 205-AN/1/25, "Recommended Method for Computing Noise Contours Around Airports," 1988.

Propagation Distance

An important technical consideration for the study area analysis includes accounting for the actual distance between the aircraft (noise source) and the listener. The abrupt elevation changes in the vicinity of the canyon make this a particular concern. For a given aircraft overflight altitude, the sound level experienced by a person at the Canyon rim directly below the flight path will be higher than the sound level experienced by a person several thousand feet lower on a trail in the Inner Canyon. Factors such as terrain, meteorological conditions, and natural and vegetative characteristics are increasingly likely to alter the propagation and characteristics of aircraft sound as the distance from the receptor to the aircraft increases. Also, the amount of sound absorbed or reflected by the ground can alter the sound levels heard.

Since 1993, the INM has been capable of calculating the effects of varying terrain elevation on slant distance from the aircraft to a receptor on the ground. This capability was previously limited to a 1-degree latitude by 1-degree longitude area of approximately 2,300 square statute miles, with the reference point at the center of the grid. For this study, the area of terrain analysis is expanded to 4-degrees latitude by 2-degrees longitude. Consequently, changing slant distance from aircraft to receptor is considered for the entire Grand Canyon noise study area.

Elevation data used in the INM are obtained from Micropath Corporation of Golden, Colorado, and are derived from U.S. Geological Survey information. These three-arc-second elevation data provide a basis for noise contour calculations and noise assessments at specific points.

While the adapted INM accurately accounts for the effect that varying terrain can have on propagation distance, the model does not account for line-of-site blockage between the source and the observer. For example, a terrain characteristic, such as, an overhanging ledge that blocks a hiker from seeing the tour aircraft, could also serve as a noise buffer reducing the noise received by the observer. While terrain characteristics

may provide some acoustic buffering effects through line-of-sight blockage, terrain effects from nearby geologic features may also reflect noise back into areas experiencing line-of-sight blockage. Thus, the net effect of terrain characteristics is difficult to compute. Although the INM does not take into account the effects of line-of-sight blockage, there are currently no accepted standardized practices for modeling line-of-sight blockage with regard to aircraft noise prediction. The FAA recognizes that the model could overestimate noise at those locations.

Suppression of Overground Attenuation Algorithm

The lateral attenuation algorithm in the FAA's Integrated Noise Model is based on SAE AIR 1751, "Prediction Method for Lateral Attenuation of Airplane Noise During Takeoff and Landing," the best currently available technology. As stated in the AIR, this algorithm is intended for application to jet aircraft sound propagating over flat, acoustically soft terrain, such as grass, as would be found in the vicinity of most major airports. For sites in the vicinity of the Canyon rim, this algorithm is inappropriate since there is effectively no ground surface between the source and receiver for such locations. For the vast majority of other locations within the Canyon, the ground surface is made up of acoustically hard rock and packed dirt. The algorithms within the AIR are inappropriate in such situations.

Based on the FAA review of the technical considerations affecting this study, the FAA modified the INM to eliminate computation of lateral overground attenuation, which is oriented toward acoustically soft grassy terrain unlike that found in most of GCNP.

In determining the appropriateness of the above modifications for this analysis, FAA performed a check of reasonableness of INM predictions using data obtained from actual measurements in the Grand Canyon (Volpe Center Letter Report DTS-75-FA465-LR11, August 9, 1994; see **Appendix D**). This check compared measured and INM-predicted sound exposure levels (SEL, denoted by the symbol L_{AE}) for individual flyover operations and L_{Aeq1h} values at GCNP. The results from INM analysis with the overground attenuation suppressed correlate closely with actual measured data in the Canyon.

Other Noise Models

There are a number of aviation noise models in use for specialized purposes. Many of these models contain different assumptions and sound propagation algorithms as compared with the INM.

Of relevance to this analysis is the NPS development of a computer model designed specifically for analyzing audibility of aircraft in park environments. The NPS has used this model, called the National Park Service Overflight Decision Support System (NODSS), in support of its evaluation of aircraft noise impacts at GCNP. NODSS uses different methodology than that accepted under FAA guidelines, including the calculation of the d´ metric for audibility. Unlike the modified version of the INM described herein, NODSS calculations are frequency-based (1/3 octave band) to account for the tonal nature of the source. The modified version of INM time audible metric (Percent Time Audible ($\%TA_{12h}$) using a variable ambient and the +3 dB and –8 dB noise evaluation factors) offers a viable

comparison of modeled results with NPS noise predictions and noise criteria.

The current INM, as modified by the FAA, complies with all known standards and recommended practices for the prediction of aircraft noise. It produces reasonably accurate predictions of aircraft noise exposure in the vicinity of the GCNP. While there is no evidence that either the INM or the NPS models are inaccurate, field validation is an important activity in any model development. As part of a comprehensive noise management plan, the FAA and the NPS are planning to conduct an evaluation of respective noise assessment methodologies. A study program will be developed that includes a noise measurement program at GCNP to support a model validation study, correlation of metrics, and collection of ambient data.

4.1.3 Aircraft and Operational Data for Modeling

This section describes the comparative analysis of noise impacts between the No Action alternative and the proposed alternatives. The proposed alternatives are described in more detail in Section 2.3.

In order to compute sound levels, considerable information was used, including selection of aircraft types, flight tracks flown (see Figures 2-2 through 2-4), and numbers of operations on each flight track. All input data for modeling both the No Action alternative and the proposed alternatives, including aircraft noise, aircraft operations, and aircraft performance, are discussed below. Information for modeling the airspace that results from the proposed alternatives was developed by FAA Offices of Air Traffic and Flight Standards.

Aircraft Types

There are various types of aircraft operating in the study area, some of which are not included directly in the INM database. In such instances, official INM equivalent aircraft were used for the current analysis. An INM equivalent aircraft is an aircraft that performs similarly and has similar Noise-Power-Distance (NPD) data as compared with the aircraft in actual operation. Approved equivalents are included in the INM database based on aircraft noise and performance data. The specific INM-equivalent noise data, operational data, and INM-equivalent performance data are discussed separately in the following sections.

Aircraft Noise Data

Table 4.1 presents the aircraft types that are currently flying in the SFRA and the FAA-approved/INM-equivalent aircraft. The noise versus distance data used for INM predictions were developed by the Volpe Center based on measurements taken in October and November of 1996 at Crows Landing, California. NPD data were collected for departure, level flight, and approach flight conditions. The MD900, a relatively new, state-of-the-art helicopter, was tested at conditions similar to how air tours operate at GCNP.

During the same Crows Landing measurements, NPD data were also collected for the de Havilland DHC-6-300 Twin Otter equipped with the Raisbeck/Hartzell “quiet” propellers found on all DHC-6 aircraft currently operating in the study area. Data were collected for departure and approach conditions as well as two level flight conditions, tour (flaps 10, 94 knots) and

Table 4.1

Categories of Aircraft Flying in SFAR

Current Tour Aircraft	INM Equivalent Aircraft
Cessna 401/402/421 Beechcraft B76 Piper 31-325	Beechcraft B58P (BEC58P)
Cessna 206/207 Beechcraft A36 Cessna 180/182	General Aviation Single-Engine Variable-Pitch Propeller(GASEPV)**
de Havilland DHC-6-300	De Havilland DHC-6-300***
Cessna 208 Cessna 172 Cessna 177	General Aviation Single-Engine Fixed-Pitch Propeller(GASEPF)*
Bell 206 B Bell 206 L	Bell 206L - 0.1 dB†
Aerospatiale 350D	A350D + 1.5 dB††
McDonnell-Douglas MD600 NOTAR	MD900 NOTAR***

* The general aviation, single-engine, fixed-pitch propeller aircraft (GASEPF) is a generic aircraft meant to represent a composite of all common, single-engine craft, with fixed-pitch propellers not specifically represented in the INM data base.

** The general aviation, single-engine, variable-pitch propeller aircraft (GASEPV) is a generic aircraft meant to represent a composite of all common, single-engine craft, with variable-pitch propellers not specifically represented in the INM data base.

*** Noise curves are based on measurement program at Crows Landing, 1996.

† The -0.1 dB adjustment factor contains two corrections. The first corrects the INM noise level data from a speed of 116 kts (as currently in the HNM database) to a speed of 90 kts, which is considered typical for GCNP tour operations. The second adjusts the Blade Tip Mach number correction for the above speeds.

†† The 1.5 dB adjustment factor contains two corrections. The first corrects the INM noise level data from a speed of 127.8 kts (as currently in the HNM database) to a speed of 90 kts. The second adjusts the Blade Tip Mach number correction for the above speeds.

cruise (flaps retracted, 125 knots) (Volpe Center memorandum, March 19, 1999).

The helicopters in operation in the vicinity of GCNP are modeled with three types: the Aerospatiale AS-350D, the Bell 206L, and the MD900. These helicopters and the DHC-6 are modeled in the INM with profile points rather than procedure steps. Profile points enable the user to set the location, speed, and thrust exactly. **Appendix D** provides detailed information on helicopter modeling within INM. Because the INM uses thrust as the independent variable for calculating source noise, this method of specifying thrust allows the user to also specify source noise at all points in the flight track.[39] This is the procedure used in the modeling to exactly coordinate the modeled tour profiles with the noise data collected at

Crows Landing. See **Appendix D** for specifics relative to modeling helicopter operations within INM for the Grand Canyon.

Operational Data

The operational data were based on an FAA-supplied activity report (the Activity Report) on operations in the SFRA from May 1, 1997, to April 30, 1998. The Activity Report contains data on every operation reported by air tour operators during this 1-year period. These data, presented by aircraft type, tail number, routes, and time of operation, are the most accurate and current operational information available.

This analysis modeled the air tours and transportation/repositioning flights in support of those air tours, as well as most flights with FAA permission to deviate from those air tour routes. In addition, based on available data, FAA modeled flights with FAA permission to deviate from those routes that connected to other air tour routes. This analysis did not model routes designated as weather routes. These routes are only used during adverse weather conditions. Use of the routes requires commercial air tour operators to file reports of deviation from the established air tour route structure. The FAA estimates that these weather routes are used less than five percent of the time. Therefore, there would be minimal environmental impacts.

For the No Action Alternative, total operations for future years are based on an FAA-projected annual 3.3 percent compound growth rate applied to the 1997-1998 operational levels. For the proposed alternatives without operations limitation, the same methodology was used except for Hualapai support operations. For these operations, the 3.3 percent growth was applied to the 1999 Hualapai support operations level. The operations modeled in the operations limitation scenario include Hualapai support operations that are increased at 3.3 percent from 1999 levels. This data for Hualapai support operations was provided during consultation following issuance of the Draft SEA.

The summary of the types of operations for each of the study years is given in **Table 4.2** for the No Action alternative and in **Table 4.3** for the three commercial air tour route proposed alternatives. The INM categorizes each operation as an arrival, a departure, a circuit, or an overflight. Detailed operations data is provided in **Appendix E**.

Arrivals are flights that land at Grand Canyon National Park Airport (GCN) after having passed through some portion of the SFRA. Departures are flights which take off from GCN, enter the SFRA, and do not return to GCN. Circuits are flights which takeoff from GCN, enter the SFRA, and return to land at GCN. Overflights are flights that pass through some portion of the SFRA, but never land or take off at GCN.

It should be noted that the number of arrivals and departures at GCN, although close, are not equal. This is because operations to and from the Airport that do not enter the SFRA are not counted. For example, consider a flight that departs Las Vegas, enters the SFRA, lands at GCN, and then departs GCN and heads directly south to Valle Airport (due south of GCN). This departure from GCN is not counted in the present study since this leg of the flight is conducted entirely outside of the SFRA. It should also be noted that the total number of operations for the No Action Alternative with continued growth is less than the Preferred Alternative

with continued growth in 2000, 2003 and 2008. This results from use of more accurate baseline data in modeling year 2000 air tour operations providing support to the Hualapai Tribe. In the Final SEA, noise impacts for the Preferred Alternative were modeled using 1999 operations values for air tour operations under contract with the Hualapai Tribe. The 1997-1998 operations values used for other commercial air tour operations were not available for the Hualapai support operations because the runway at Grand Canyon West Airport was not paved until November 1997. 1999 values exceed by 30% the 1997-1998 values used to model the Hualapai operations in the No Action Alternative.

Table 4.2

Summary of SFAR Operational Activities as a Function of Type of Operation, No Action Alternative

Type of Operation[1] (Annual Average Day)	Year			
	1998	**2000**	**2003**	**2008**
Approaches[2]	80.13	85.51	94.25	110.87
Departures[3]	70.35	75.07	82.75	97.33
Circuits[4]	110.10	117.49	129.51	152.33
Overflights[5]	61.20	65.31	71.99	84.67
Total	321.78	343.37	378.50	445.21

Table 4.3

Summary of SFAR Operational Activities as a Function of Type of Operation, for Alternatives 2, 3, and 4 with Commercial Air Tour Limitations and Continued Growth

Type of Operation[1] (Annual Average Day)	Year						
	1998	**2000 Commercial Air Tour Limitations[6]**	**2000 Growth**	**2003 Commercial Air Tour Limitations[6]**	**2003 Growth**	**2008 Commercial Air Tour Limitations[6]**	**2008 Growth**
Approaches[2]	80.11	80.11	87.33	80.11	96.22	80.11	113.22
Departures[3]	70.28	70.28	75.00	70.28	82.64	70.28	97.24
Circuits[4]	111.44	111.44	119.49	111.44	131.71	111.44	154.95
Overflights[5]	59.95	71.76	74.50	74.96	82.08	81.04	96.59
Total	321.78	333.59	356.32	336.79	392.65	342.88	461.99

Notes for Tables 4.2 and 4.3:

1 The average annual-day operations as a function of type of operation are calculated from the 1997-1998 Activity Report.
2 An approach is defined as an activity in which an aircraft that is in flight enters into the SFRA from an origin outside the GCNP study area (e.g., Las Vegas, NV, approaches, and lands at GCN).
3 A departure is an activity in which an aircraft departs from GCN, enters the SFRA, and continues on in flight to a destination outside of the GCNP study area.
4 A circuit is an activity in the SFRA in which an aircraft departs from GCN, continues on in flight with various changes in performance and spatial position, approaches, and lands at GCN.
5 An overflight is an activity in the SFRA in which an aircraft that is already in flight continues on in flight, and does not approach and land at GCN.
6 The Operations Limitation column includes growth in Hualapai support operations that are not subject to an operations limitation.

The INM's method of categorizing flights differs from both the way operations are typically counted by Air Traffic Control (ATC) at GCN and from the way operations are counted in the Activity Report.[40]

Supplemental Analysis

As part of this study, three supplemental analyses were conducted. These supplemental analyses examined the projected noise environment at the Grand Canyon in three special cases. These cases included typical days for the summer and shoulder seasons as well as a peak day for the summer season. The FAA determined that the peak hour analysis addressed in the Draft SEA was not a realistic scenario as computed. These supplemental analyses are discussed in **Appendix F**.

In accordance with FAA guidelines, aircraft noise exposure must be established in terms of yearly day/night sound level (DNL). The formula to calculate yearly DNL includes specific aircraft noise levels combined with the annual average daily operations of those aircraft. The FAA recognizes that seasonal fluctuation in visitors to the park (by air and by land) would mean that the number of air tour operations on any particular day could be substantially higher or lower than the annual average.

The FAA guidelines include the provision that the DNL analysis may optionally be supplemented on a case-by-case basis to characterize specific noise effects. The supplemental noise analysis must be tailored to enhance the public's understanding of both the noise impacts and the pertinent facts surrounding the changes. In this context, the supplemental analysis is intended to convey the relationship between noise exposure and daily air tour operations.

Flight Track Assignments

Each of the proposed alternatives has fewer flight tracks than the No Action (existing) alternative. Operations on flight tracks in the No Action alternative that do not exist in the proposed alternatives have been moved to similar tracks in the proposed alternatives. Tracks that no longer exist in the proposed alternatives are referred to as 'terminated' tracks. Fixed-wing and helicopter operations on terminated tracks originating and ending at GCN, except those which pass through the middle of the Canyon, have been moved to either the new Black-1 or the new Green-1, respectively. Operations on terminated tracks passing through the middle of the

Canyon, primarily the old Blue-1, have been moved so that the northern route receives 37 percent and the southern route receives 63 percent. These percentages are based on information supplied by operators and are consistent with current business practices. Operations on terminated tracks over the west end of GCNP have been moved to either the new Blue-2 or the new Green-4.

Simplifying assumptions were used to model helicopter operations flown under contract to the Hualapai Tribe. These assumptions result in the appearance of a "spike" in the 20 dB L_{Aeq12h} contour in Figure 4-5 between Representative Locations 25 (Granite Gorge) and 26 (Grand Canyon West). These operations descend below the rim of the Canyon and land. However, due to lack of data for traffic patterns flown by these helicopters when landing, they were modeled as if they exited the SFRA to the southwest at 5,000 feet MSL abeam Bat Cave.

Flight operations are modeled as standard arrivals and departures from the existing and proposed Green-4 routes.

Profiles and Performance Data

In developing the airspace for the No Action and the proposed alternatives, air traffic and operator data were used to assign altitudes for each unique flight track. On Blue Direct/Blue Direct North for the proposed alternatives, 85 percent of twin engine aircraft operations were assigned to the higher altitude, and the remaining 15 percent were assigned to the lower altitude. All single engine aircraft were assigned to the lower altitude on Blue Direct/Blue Direct North. For Proposed Alternative 4, all aircraft use the 85/15 percent altitude assignment on both Blue Direct North and Blue Direct South. These assignments are based on operator inputs.

INM standard takeoff and approach procedures were assumed for all departure, approach, and circuit operations at GCN. Once aloft, changing-altitude flight profiles were developed using the INM profile generator,[41] with the specific altitudes at the start and end of a flight-path segment as input. The generator was, in turn, used to compute performance and position information for each segment, including distance from start of profile, altitude, speed, and thrust. Similarly, performance and position information associated with level flight-track segments was also computed using the INM profile generator.[42]

4.1.4 Model Output

All modeling was performed for the No Action, Proposed Action, and two other alternatives described in Chapter Two. Two types of analyses were performed with the INM: a contour analysis and a representative location analysis. All modeling output is reported for an average annual day.

Contours

For the purposes of INM, a set of contours consists of lines of constant noise or time exposure that tend to decrease with increasing distance from an airport or flight track. For the current study area analysis, both L_{Aeq12h} and $\%TA_{12h}$ contours were computed for the study area.

In determining areas encompassed by specific sound level contours, two types of analyses were performed, a wide-area analysis and a GCNP boundary analysis. The wide-area analysis included the entire case

analysis window in computing area values encompassed by specific contour levels (a 13,510 square statute mile area). The GCNP boundary analysis included only the area encompassed by the GCNP boundary (a 1,886.79 square statute mile area).

L_{Aeq12h} contours were computed for levels ranging from 20 to 60 dB. $\%TA_{12h}$ contours were computed for 25 percent. These $\%TA_{12h}$ contours were used in the evaluation of the NPS goal for restoration of natural quiet.

Representative Locations

A total of 72 individual points were considered in the analysis as representative of noise sensitive areas within the study area (e.g., attraction sites and sensitive resources). Both L_{Aeq12h} and $\%TA_{12h}$ were computed for each representative location. The representative locations are presented in **Tables 4.4 through 4.7**. These tables provide a descriptive name, a 6-character identifier, a latitude, a longitude, and an elevation above mean sea level (MSL). The four tables present the location points in quadrants of the study area. The quadrants are defined as east or west of GCN and north or south of the Colorado River.

Figure 4-2 displays the individual point locations. These point locations are overlaid on the study area map.

Table 4.4

Representative Point Locations in the Grand Canyon Vicinity
North of Colorado River, West of GCNP Airport

	Location	Latitude	Longitude	Elevation (feet MSL)
1	NPS Admin Site (ADMIN)	36-08-00.000N	113-31-30.000W	6102
2	Andrus Canyon (ANDRUS)	35-13-00.000N	113-25-00.000W	4204
3	Bass Camp (BASCMP)	36-14-14.091N	112-20-39.845W	2201
4	Bat Cave (BATCAV)	36-02-52.800N	113-48-10.200W	2314
5	Burnt Springs Canyon (BRNTSP)	35-57-58.379N	113-44-38.955W	1359
6	Castle Peak (CASTLE)	36-11-00.000N	113-34-00.000W	6397
7	Kanab Point (KANAPT)	36-24-15.875N	112-39-04.927W	5449
8	Kelly Point (KELLPT)	35-50-06.186N	113-28-10.443W	6000
9	Mt. Dellenbaugh (MTDELL)	36-06-31.800N	113-32-24.000W	6750
10	Point Sublime (PTSUBL)	36-11-54.012N	112-14-59.113W	7187
11	Sanup (SANUP)	36-07-17.065N	113-49-15.706W	4390
12	Separation Canyon at Colorado River (SCCORV)	35-50-00.000N	113-34-00.000W	2165
13	Separation Canyon (SEPARC)	35-49-24.232N	113-34-12.258W	1401
14	Shivwitz Fire Camp SHWZFC	36-07-00.00N	113-32-30.000W	6479
15	Stone Creek (STONCK)	36-20-47.881N	112-27-13.878W	2008
16	Suicide Point (SUIPNT)	36-00-15.000N	113-32-09.600W	5979
17	Toroweap Overlook (TOROWP)	36-12-48.603N	113-03-29.722W	4140
18	Tower of Ra (TOWER)	36-08-28.200N	112-12-10.200W	6269
19	Twin Point (TWINPT)	35-59-49.800N	113-37-40.200W	6052
20	Upper Deer Creek (UPDRCK)	36-23-37.457N	112-30-21.754W	2406
21	West End (WESEND)	36-07-00.000N	113-58-27.000W	1014

Table 4.5

Representative Point Locations in the Grand Canyon Vicinity
South of Colorado River, West of GCNP Airport

	Location	Latitude	Longitude	Elevation (feet MSL)
22	Coyote Canyon (COYCAN)	36-12-42.000N	112-46-09.000W	4677
23	Diamond Creek (DIACRK)	35-45-57.000N	113-22-16.800W	1601
24	The Dome (DOME)	36-13-00.000N	112-50-00.000W	5797
25	Granite Gorge (GRAGOR)	36-02-00.000N	113-52-00.000W	2076
26	Grand Canyon West (GCWEST)	35-59-18.600N	113-48-35.400W	4748
27	Granite Park (GRNTPK)	35-57-53.400N	113-19-00.000W	1603
28	Gus Plateau (GUSPLT)	36-00-01.800N	113-17-22.500W	6573
29	Havasu Point (HAVAPT)	36-18-33.059N	112-45-44.203W	1809
30	Havatagvitch Canyon (HAVCAN)	36-08-01.800N	112-34-18.000W	4199
31	Hermit Basin (HBASIN)	36-03-21.827N	112-13-22.679W	5175
32	Horse Flat Canyon (HFCAN)	35-51-41.400N	113-46-31.200W	2934
33	Meriwhitca (MERIWH)	35-46-31.800N	113-42-00.000W	4028
34	Mohawk Canyon (MOHAWK)	36-08-00.000N	112-59-00.000W	3999
35	Mohawk Canyon (MOHCAN)	36-09-52.800N	112-59-00.000W	3398
36	Mount Sinyala (MTSINY)	36-18-00.000N	112-42-19.800W	5007
37	National Canyon (NATCAN)	36-09-59.400N	112-54-21.600W	4388
38	Jackson Canyon (JCKCAN/NONAME)	35-52-00.000N	113-43-00.000W	2060
39	Parashant Wash (PARWAS)	36-05-40.200N	113-19-19.800W	1703
40	Pumpkin Springs (PMPKIN)	35-53-42.000N	113-19-00.000W	1801
41	Prospect Canyon (PROCAN)	36-09-52.800N	113-05-00.000W	4074
42	Prospect Canyon (PRSPCT)	36-07-00.000N	113-05-00.000W	4622
43	Peach Spring Canyon North (PSCNNO)	35-45-00.000N	113-20-00.000W	3343
44	Peach Spring Canyon South (PSCNSO)	35-37-00.000N	113-25-00.000W	3802
45	Quartermaster Point (QMPNT)	35-56-30.000N	113-47-30.000W	2201
46	The Ranch (RANCH)	36-01-27.000N	112-17-54.000W	6200
47	Spencer/Meriwhitica Canyons (SCMCIG)	35-47-00.000N	113-34-00.000W	4504
48	South Supai Canyon (SOSUPC)	36-00-19.200N	112-31-16.200W	4403
49	Spencer Canyon (SPENCA)	35-47-15.000N	113-38-45.000W	2790
50	Supai Village (SUPVIL)	36-14-12.338N	112-41-18.816W	3210
51	Three Springs Rapids (THRSPR)	35-52-30.000N	113-1-36.000W	1968
52	Whitmore Rapids (WHTRAP)	36-08-20.357N	113-12-11.219W	1680
53	96 Mile Camp (96MILE)	36-06-27.645N	112-13-30.800W	2401

Table 4.6

Representative Point Locations in the Grand Canyon Vicinity
North of Colorado River, East of GCNP Airport

	Location	Latitude	Longitude	Elevation (feet MSL)
54	The Basin (BASIN)	36-15-42.203N	112-06-10.941W	8198
55	Bright Angel Point (BRTANG)	36-11-53.011N	112-03-06.380W	8151
56	Cape Royal (CAPROY)	36-07-23.034N	111-56-54.549W	7621
57	Cliff Dwellers Lodge (CLDWEL)	36-44-38.400N	111-45-19.800W	4214
58	Marble Canyon Dam Site (MARBDM)	36-24-31.388N	111-52-21.588W	3007
59	Nankoweap Mesa (NANMES)	36-16-00.000N	111-51-28.800W	5391
60	North Canyon (NOCANY)	36-37-00.000N	111-46-30.000W	4457
61	Point Imperial (PTIMPL)	36-16-44.711N	111-58-39.584W	7425
62	Saddle Mountain (SADMTN)	36-18-43.800N	111-56-57.600W	7171
63	South Canyon (SOCAN)	36-30-20.000N	111-51-50.000W	5196
64	Temple Butte (TEMBUT)	36-10-01.200N	111-49-28.200W	3749

Table 4.7

Representative Point Locations in the Grand Canyon Vicinity
South of Colorado River, East of GCNP Airport

	Location	Latitude	Longitude	Elevation (feet MSL)
65	Cedar Ridge (CEDRIG)	36-03-50.889N	112-05-19.856W	6013
66	Lipan Point (LIPAN)	36-01-55.919N	111-51-12.981W	7063
67	Little Colorado (LITCOL)	36-11-25.200N	111-43-36.000W	5306
68	Little Colorado River (LTCORV)	36-11-45.230N	111-48-01.162W	2915
69	Nankoweap at river (NANRIV)	36-18-26.819N	111-51-27.960W	3254
70	Ten X Meadow (TENMED)	35-56-03.000N	112-03-36.000W	6906
71	Zuni Alpha (ZUNALF)	35-58-19.800N	111-53-21.000W	6859
72	Zuni Charlie (ZUNCHR)	36-07-30.000N	111-47-35.000W	5337

4.1.5 Noise Modeling Results

Traditional FAA noise analyses focus on the effects of a particular action on L_{dn} contours, in particular the 65 dB L_{dn} contour. As stated previously, the current analysis has focused on L_{Aeq12h} instead of L_{dn} due to the limited hours of aircraft operations and the typical period of daytime visitor activity at GCNP. **Tables 4.8 and 4.9** present a comparison of areas covered by the L_{Aeq12h} contours (20 to 60 dB) for the year 2003. Although multiple years were analyzed, the year 2003 results are presented in this section to provide interim results. Detailed results for 1998, 2000 and 2008 are provided in **Appendix A**. **Figure 4-3** depicts the L_{Aeq12h} contours (20 to 60 dB) for the 1998 No Action condition. **Figure 4-4** depicts the L_{Aeq12h} contours (20 to 60 dB) for the 2003 No Action condition. **Appendix A** contains the figures of the contours for the other years and the alternatives. **Figure 4-5** illustrates the three alternatives considered for the year 2003 with commercial air tour limitations implemented compared to the 2003 No Action alternative. **Figure 4-6** illustrates the three alternatives considered for the year 2003 with continued growth compared to the 2003 No Action alternative.

Tables 4.10 and 11 present the percentage of GCNP restored to natural quiet, as defined in Section 4.1.1. **Tables 4.12 and 4.13** present a comparison of areas covered by the 25 percent TA_{12h} contours for the year 2003. Additional years are detailed in **Appendix A**. These tables compare contour areas in square statute miles for the No Action and the three proposed alternatives. The comparisons are presented in terms of both a wide-area analysis and an analysis restricted to the GCNP boundary. **Figure 4-7** depicts the TA_{12h} contour for the 1998 No Action condition. **Figure 4-8** depicts the TA_{12h} contours for the 2003 No Action condition. **Appendix A** contains the figures of the contours for the other years and the alternatives. **Figure 4-9** illustrates the TA_{12h} contours for the three alternatives considered for the year 2003 with commercial air tour limitations implemented compared to the 2003 No Action alternative.

Figure 4-10 illustrates the TA_{12h} contours for the three alternatives considered for the year 2003 with continued growth compared to the 2003 No Action alternative.

L_{Aeq12h} Analysis

For the three proposed alternatives, with commercial air tour limitations or with continued growth, there are no regions in the study area that have an L_{Aeq12h} equal to or greater than 65 dB. Therefore, none of the proposed alternatives compared to the No Action alternative show a significant impact based on the criteria found in FAA Order 1050.1D. This finding is also true for the supplemental noise analysis as shown in **Appendix F**.

TA_{12h} (25 %) Analysis

Each of the proposed alternatives, with or without commercial air tour limitations, will reduce the time in which aircraft are audible for the general study area compared to the No Action alternative. Each of the proposed alternatives reduces the time in which aircraft are audible within the GCNP boundary. Although the proposed alternatives reduce the time in which aircraft are audible in GCNP, natural quiet is not substantially restored with any of the proposed alternatives or with the No Action alternative.

Table 4.8

Square Mile Area Covered by L_{Aeq12h} Contours (20-60) Considering Commercial Air Tour Limitations
2003

Analysis	Contour Level (dB)	No Action	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
	20	4723.79	3647.41	-22.79	3807.74	-19.39	4247.69	-10.08
W	30	2169.59	1628.08	-24.96	1684.51	-22.36	1770.05	-18.42
I	40	604.24	444.77	-26.39	425.99	-29.50	426.75	-29.37
D	50	33.01	30.75	-6.85	30.82	-6.63	30.76	-6.82
E	60	3.65	3.57	-2.19	3.63	-0.55	3.54	-3.01
	20	1619.78	1093.04	-32.52	1093.29	-32.50	1183.61	-26.93
G	30	701.92	556.14	-20.77	519.76	-25.95	558.31	-20.46
C	40	159.72	106.54	-33.30	93.57	-41.42	113.47	-28.96
N	50	5.54	2.41	-56.50	2.41	-56.50	2.51	-54.69
P	60	0.05	0	-100.00	0	-100.00	0	-100.00

Table 4.9

Square Mile Area Covered by L_{Aeq12h} Contours (20-60) Considering Continued Growth
2003

Analysis	Contour Level (dB)	No Action	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
	20	4723.79	3851.67	-18.46	4008.99	-15.13	4490.34	-4.94
W	30	2169.59	1727.7	-20.37	1804.34	-16.83	1898.17	-12.51
I	40	604.24	516.43	-14.53	502.56	-16.83	501.92	-16.93
D	50	33.01	35.5	7.54	35.54	+7.66	35.60	+7.85
E	60	3.65	4.05	10.96	4.12	+12.88	4.01	+9.86
	20	1619.78	1129.98	-30.24	1130.72	-30.19	1224.61	-24.40
G	30	701.92	589.89	-15.96	559.87	-20.24	599.35	-14.61
C	40	159.72	129.26	-19.07	112.15	-29.78	135.58	-15.11
N	50	5.54	3.53	-36.28	3.52	-36.46	3.67	-33.75
P	60	0.05	0	-100.00	0	-100.00	0	-100.00

Table 4.10

Percentage of Park Restored to Natural Quiet Considering Commercial Air Tour Limitations
Average Annual Day

Year	No Action	Alternative 2	Alternative 3	Alternative 4
1998	32.0	43.6	44.1	43.8
2000	30.6	43.6	44.1	43.7
2003	28.5	43.6	44.0	43.7
2008	25.3	43.5	44.0	43.7

Table 4.11

Percentage of Park Restored to Natural Quiet Considering Continued Growth, Average Annual Day

Year	No Action	Alternative 2	Alternative 3	Alternative 4
1998	32.0	43.6	44.0	43.7
2000	30.6	41.4	41.7	40.9
2003	28.5	37.9	38.0	36.7
2008	25.3	32.7	31.9	29.5

Table 4.12

Square Mile Area Where %TA_{12h} is Greater Than 25% Considering Commercial Air Tour Limitations 2003

	No Action	Alternative 2		Alternative 3		Alternative 4	
Analysis	**Sq. Mi.**	**Sq. Mi.**	**% Change in Sq. Mi. Area**	**Sq. Mi.**	**% Change in Sq. Mi. Area**	**Sq. Mi.**	**% Change in Sq. Mi. Area**
WIDE	3164.92	2534.38	-19.92	2602.68	-17.76	2400.60	-24.15
GCNP	1348.97	1064.95	-21.05	1055.83	-21.73	1062.48	-21.24

Table 4.13

Square Mile Area Where %TA_{12h} is Greater Than 25% Considering Continued Growth 2003

	No Action	Alternative 2		Alternative 3		Alternative 4	
Analysis	**Sq. Mi.**	**Sq. Mi.**	**% Change in Sq. Mi. Area**	**Sq. Mi.**	**% Change in Sq. Mi. Area**	**Sq. Mi.**	**% Change in Sq. Mi. Area**
WIDE	3164.92	2798.39	-11.58	2908.43	-8.10	2802.70	-11.44
GCNP	1348.97	1171.19	-13.18	1169.51	-13.30	1195.26	-11.39

For example, analysis of the three proposed alternatives indicates that modifications to the airspace will restore natural quiet to a level of approximately 44 percent of the GCNP in 2000. By contrast, the No Action alternative results in approximately 31 percent natural quiet in the GCNP.

The benefits of all of the proposed alternatives erode over time if commercial air tours increase, as shown in the analysis using a 3.3 percent expected growth rate. Operational growth through the year 2008 for the No Action alternative reduces the level of natural quiet to approximately 25 percent of the GCNP. A similar effect in 2008 is shown for the Preferred Alternative, where the level of natural quiet falls to approximately 33 percent of the GCNP. **Appendix A** provides detailed information for the year 2008.

The benefits of the commercial air tour proposed alternatives are primarily due to the elimination of aircraft operations near the mid-canyon region of the GCNP. In the No Action alternative, aircraft operations on Blue-1 heavily influence the mid-canyon noise environment. In all the proposed alternatives, operations on Blue-1 were

replaced by operations on both Blue Direct/Blue Direct North and Blue Direct South/Blue South Direct. For this study, 37 percent of the existing Blue-1 operations were assigned to Blue Direct/Blue Direct North, 63 percent to Blue Direct South/Blue South Direct. Moving these operations from the mid-canyon to the south increased the areas of GCNP where natural quiet has been restored.

Representative Location Analysis

For each of the study years and the proposed alternatives, the 72 representative locations all have L_{Aeq12h} levels less than 68 dB. Therefore, none of the representative locations show a significant impact based on the criteria found in FAA Order 1050.1D.

For the majority of the representative locations, each of the proposed alternatives results in a decrease in both the L_{Aeq12h} and the $\%TA_{12h}$ levels with commercial air tour limitations or continued growth.

The summary of the $\%TA_{12h}$ improvements is shown in **Tables 4.14 and 4.15**. The L_{Aeq12h} improvements are shown in **Tables 4.16 and 4.17**. The left side of the Tables presents the percentage of sites where the noise levels either decrease or remain the same going from the No Action alternative to the particular alternative. The right side represents the arithmetic average of the differences, taking into account all sites, between the No Action alternative and each of the proposed alternatives.

For example, in the year 2000, Alternative 2 would provide an improvement or no change in $\%TA_{12h}$ at 56 of the 72 sites (78 percent) and an improvement or no change in L_{Aeq12h} at 52 of the 72 sites (72 percent) considering continued growth. The average increase in time when aircraft are *not* audible, taking into account all sites is approximately 30 minutes considering continued growth. For this example, the L_{Aeq12h} noise level improves an average of 6.2 dB at the 72 sites considering continued growth.

Table 4.14

Improvements in Percent Time Audible Considering Commercial Air Tour Limitations

	Percent Time Audible ($\%TA_{12h}$)							
	Percent of Sites Improved				**Overall Average Improvement (minutes per 12 hour analysis period)**			
Year	**1998**	**2000**	**2003**	**2008**	**1998**	**2000**	**2003**	**2008**
Alternative 2(1)	79.2%	81.9%	84.7%	90.3%	29.1	37.8	54.5	83.7
Alternative 3(1)	80.6%	81.9%	88.9%	95.8%	29.6	38.4	55.1	84.2
Alternative 4(1)	66.7%	70.8%	75.0%	80.6%	24.4	33.2	49.8	79.0

(1) Improvements are all relative to the No Action alternative (Alternative 1).

Table 4.15

Improvements in Percent Time Audible Considering Continued Growth

	Percent Time Audible ($\%TA_{12h}$)							
	Percent of Sites Improved				Overall Average Improvement (minutes per 12 hour analysis period)			
Year	**1998**	**2000**	**2003**	**2008**	**1998**	**2000**	**2003**	**2008**
Alternative 2(1)	79.2%	77.8	76.4	79.2	29.1	27.9	30.6	36.3
Alternative 3(1)	80.6%	77.8	76.4	79.2	29.6	28.6	31.4	37.2
Alternative 4(1)	66.7%	66.7	65.3	68.1	24.4	22.7	24.9	29.2

(1) Improvements are all relative to the No Action alternative (Alternative 1).

Table 4.16

Improvements in Equivalent Sound Level Considering Commercial Air Tour Limitations

	Equivalent Sound Level (L_{Aeq12h})							
	Percent of Sites Improved				Overall Average Improvement (dB)			
Year	**1998**	**2000**	**2003**	**2008**	**1998**	**2000**	**2003**	**2008**
Alternative 2(1)	70.8%	77.8%	79.2%	81.9%	5.9	6.5	6.9	7.6
Alternative 3(1)	72.2%	73.6%	79.2%	79.2%	6.1	6.3	6.8	7.4
Alternative 4(1)	69.4%	72.2%	75.0%	76.4%	5.3	5.6	6.0	6.7

(1) Improvements are all relative to the No Action alternative (Alternative 1).

Table 4.17

Improvements in Equivalent Sound Level Considering Continued Growth

	Equivalent Sound Level (L_{Aeq12h})							
	Percent of Sites Improved				Overall Average Improvement (dB)			
Year	**1998**	**2000**	**2003**	**2008**	**1998**	**2000**	**2003**	**2008**
Alternative 2(1)	70.8%	72.2	72.2	72.2	5.9	6.2	6.2	6.2
Alternative 3(1)	72.2%	72.2	72.2	72.2	6.1	6.0	6.0	6.0
Alternative 4(1)	69.4%	69.4	69.4	69.4	5.3	5.3	5.3	5.3

(1) Improvements are all relative to the No Action alternative (Alternative 1).

Appendix A contains the complete $\%TA_{12h}$ and L_{Aeq12h} data for each of the 72 representative locations. The tables in this appendix present the data for the particular metric at each representative location for each proposed alternative and also compare the proposed alternatives with the No Action alternative. Examination of these data show that the majority of the sites that exhibit the largest increase in noise levels are under the proposed Blue Direct South route alternative, regardless of continued growth or commercial air tour limitations alternatives (e.g., SUIPNT). Those sites that exhibit a decrease in noise tend to be mid-Canyon sites (HAVCAN, MTSINY, PROCAN). This is expected since one of the major changes in the airspace is the elimination of the Blue-1 route (through the mid-canyon), and the switch of the majority of these operations to Blue Direct South. Note that the site with the largest increase in noise under the Preferred Alternative is GUSPLAT. This increase in noise is also due to the additional flights on Blue Direct South.

Potential impacts to locations outside of the GCNP were considered relative to standard noise level criteria as described in FAR Part 150 Table 1, unless TCPs were identified through consultation with individual Native American Tribes. Impacts on TCPs have been evaluated and FAA has found that the proposed action (Preferred Alternative) will have No Adverse Effect on any TCPs identified by any Tribe or Nation, except the Hualapai Tribe. Regarding the Hualapai Tribe, FAA has determined that the undertaking adversely affects at least some of the TCPs identified by the Hualapai Tribe and THPO. Therefore, FAA, NPS, the Advisory Council on Historic Preservation, the Hualapai Tribe and Hualapai Tribal Historic Preservation Officer have entered into a Programmatic Agreement (PA). The PA is discussed in detail in Section 4.2.

4.1.6 Conclusions

The analysis presented here indicates that, within the study area as shown in Figure 3-1, the noise environment as a whole is improved by implementation of the proposed action with any of the proposed alternatives, with or without an operations limitation or continued growth. The expected overall improvement is not limited to the immediate vicinity of GCNP, but extends beyond the boundaries of GCNP to include the entire study area. Both the L_{Aeq12h} and the TA_{12h} contours support these conclusions.

Although the three proposed alternatives do not achieve substantial restoration of natural quiet to GCNP, they represent a tangible improvement over the No Action alternative.

4.2 HISTORIC, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Various statutes and Executive Orders govern cultural resources. In addition to NEPA and the Department of Transportation Act of 1966, as recodified, which require consideration of cultural resources the following are most relevant. The National Historic Preservation Act (NHPA) of 1966, as amended, establishes measures to coordinate Federal actions affecting properties included in or eligible for inclusion in the National Register of Historic Places. The Archaeological and Historic Preservation Act of 1974 provides for the survey and preservation of significant cultural resources that may be harmed due to a Federal project. Executive Order 13007,

Indian Sacred Sites, requires Federal agencies to accommodate access and use of sacred sites, and to avoid adverse effects to the physical integrity of such sacred sites located on Federal land or land under Federal jurisdiction.

Sec. 110 of the NHPA requires Federal agencies to consult with State Historic Preservation Officers (SHPO), Tribal Historic Preservation Officers (THPO), tribes, and interested parties concerning proposed Federal actions that may affect properties included in or eligible for inclusion in the National Register of Historic Places (National Register). The National Register includes sites and structures that range from local to national importance. These can include, but are not limited to, traditional cultural properties (TCP) as described in NPS National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties. Section 110 requires agencies to comply with Section 106, which governs consultation. The regulations governing consultation are 36 CFR 800. Section 304 governs confidentiality.

The NHPA and related laws and regulations also require specific consideration of impacts on World Heritage Sites, National Historic Landmarks and National Natural Landmarks established under the Historic Sites Act of 1935. GCNP was designated a National Natural Landmark and, later, a World Heritage Site for its natural features, cultural resources and continuing relationship to Native American culture to the present day. Consultation under these provisions occurred through the Section 106 process.

Pursuant to the NHPA, an initial review of properties on or eligible for inclusion in the National Register which are within the area of potential effect (APE) of the undertaking was conducted (see Sections 3.6.3 and 3.6.4). This review indicated that the area in the vicinity of the GCNP contains a great number and variety of historic properties that are distributed throughout the area.

The 1996 Final EA and this Supplemental EA focus on areas in and around the Grand Canyon that could potentially be impacted by the new flight regulations and route structure. In developing the proposed commercial air tour route structure and airspace configuration, the FAA considered sites identified by Native American communities as TCPs. The FAA consulted with tribal representatives and authorities in an effort to minimize overflights of properties located in areas to which the tribes ascribe traditional cultural significance. As a first step in the consulting process, while no specific TCPs were formally identified and evaluated by FAA to determine their eligibility for inclusion in the National Register, FAA adopted a broad approach to fulfill its NHPA, Section 106 responsibilities. This approach involved an attempt to avoid impact and accommodate privacy concerns of the Tribes without identifying and determining the eligibility of specific TCPs that could be impacted. This is considered an excellent practice in the identification and treatment of TCPs as set forth in the National Register Bulletin 38, page 17, and also complies with Executive Order 13007.

Four GCNP areas containing substantial historic resources would be beneficially affected by expanding the Bright Angel and Desert View Flight Free Zones. Aircraft flights would be farther from the Grand Canyon Village Historic District, North Rim Historic District, and the Desert View Watchtower and Hermits Rest areas (both

part of the Mary Elizabeth Jane Colter National Landmark District). This is as a result of the larger Bright Angel and Desert View FFZs.

The expansion of the Desert View FFZ to the GCNP boundary, along with the enlargement of the SFRA boundary, help to protect TCPs of importance to the Navajo Nation, and the Hopi Tribe and Pueblo of Zuni Tribe. The relocation of commercial air tour routes known as Black-2 and Green-3 has mitigated some effects of overflights on TCPs identified by Native American Tribes. Also, the most heavily used air tour route, Blue 1, would be eliminated under the Preferred Alternative. This advances substantial restoration of natural quiet to the GCNP and also avoids impacts on TCPs of concern to the Havasupai and other Tribes in the National Canyon area. Among Native American Tribes, only the Havasupai have statutorily designated traditional use lands within the boundaries of the GCNP.

As a result of the FAA's initial consultation efforts, the low annual average daily noise levels involved (see Section 4.1), and mitigation measures incorporated in the undertaking, the FAA has determined that none of the alternatives will have adverse effects on historic, cultural, or archaeological resources except as noted below. Therefore, the FAA issued a Finding of No Adverse Effect for the areas of concern to the Kaibab Paiute Tribe, the Paiute Indian Tribe of Utah, the San Juan Southern Paiute Tribe, the Hopi Tribe, the Pueblo of Zuni, the Havasupai Tribe, and the Navajo Nation with any of the proposed alternatives.

The FAA recognizes the concern for privacy expressed by Native Americans with regard to the majority of these TCPs. Therefore, not all sites of traditional religious or cultural importance have been specifically identified in this document.

The FAA forwarded the Finding letters to the Arizona SHPO (with copies to the appropriate Tribes) and the Navajo Nation THPO on July 7, 1999, and again on September 9, 1999, after modification of the Preferred Alternative in the Draft SEA. On October 10, 1999, the Arizona SHPO forwarded a letter to the FAA (see **Appendix H**) advising concurrence with the Finding, contingent upon Tribal concurrence. In accordance with 36 CFR Part 800.5(c), the Navajo THPO and Tribes had 30 days to submit an objection to the Agency's Finding. The FAA did not receive a response from the Navajo THPO and the other interested Tribes. Therefore, pursuant to 36 CFR Part 800.5 (c)(1), the FAA has complied with NHPA Section 106 for this undertaking and has issued a Finding of No Adverse Effect for the Undertaking except for that portion involving lands of the Hualapai Tribe.

The FAA, in cooperation with the NPS, has conducted Section 106 consultations with the Hualapai Tribe and THPO for the past three years. FAA began identifying cultural and historic properties that might be affected by the undertaking early in the process. Between March 1998 and December 1999, FAA funded ethnographic studies by the Hualapai Department of Cultural Resources (HDCR). These studies included archival research, initial community contact, use of helicopters to bring Hualapai elders over TCPs and to visit sites within the APE, interviews with elders, and review of maps to identify TCPs and resource areas.

These ethnographic studies were completed in two phases and focused on major canyons, critical and sensitive areas, and locations most accessible and closest to the proposed

flight routes. The first phase addressed the December 1996 Notice of Availability of Commercial Air Tour Routes. The second phase addressed the June 1999 Notice. In all, three reports were prepared, a Draft Preliminary Report, dated November 2, 1998, and two Final Ethnographic Study Reports, dated March 31, 1999, and December 3, 1999. The non-confidential aspects of the resource identifications developed through consultation and study were presented in the December 1996 Final EA, the June 1999 Draft SEA, and in this Final SEA.

In addition to funding these ethnographic studies, to meet the mandate of Pub. L. 100-91 within the timeframe established by the April 1996 Presidential Memorandum, Additional Transportation Planning To Address Impacts Of Transportation on National Parks, 61 FR 18229, April 25, 1996, the FAA sought to expedite the Section 106 process. With the Hualapai Tribe, as with the other Tribes as discussed above, the FAA sought to take the broad approach encouraged by National Register Bulletin 38. Through scoping for the Draft SEA and consultations with the Hualapai Tribe, the FAA sought to redesign the proposed commercial air tour routes to address certain areas identified by the Hualapai Tribe as being of traditional religious and cultural significance. Section 4.1 of the Draft SEA included locations selected by the FAA to represent areas where Hualapai TCPs were known to exist by FAA and NPS, as well as other noise sensitive areas outside the GCNP.

To the west, the Hualapai Reservation currently experiences overflights by fixed wing tour aircraft on Blue-2 and helicopter tour aircraft on Green-4. Some of these sightseeing operations land at Grand Canyon West Airport under contract to the Hualapai Tribe. To the east, the Hualapai Reservation experiences overflights by commercial air tour operators using fixed wing aircraft enroute to Tusayan from Las Vegas on Blue-1, Blue Direct, and Blue Direct South. Under the No Action alternative, for 2003, Blue-1 would average approximately 80 flights per day, Blue Direct approximately 70 flights per day, and Blue Direct South approximately 25 flights per day.

To address potential impacts on areas of concern to the Hualapai Tribe, portions of the commercial air tour routes known as Blue-2 (fixed wing) and Green-4 (helicopter) east and south of the area known as Surprise Canyon would be eliminated under the Preferred Alternative. Additionally, the remaining helicopter and fixed wing routes west over the Colorado River in the Sanup area would be modified so that they do not directly overfly TCPs. Further, as discussed above, Blue-1, the most heavily used air tour route, would be eliminated both to enhance substantial restoration of natural quiet and to avoid impacts on TCPs in the vicinity of National Canyon of importance to both the Havasupai and Hualapai Tribes.

The elimination of Blue-1 would redistribute flights from Blue-1 to Blue Direct North and Blue Direct South, the remaining two direct routes over the east side of the Reservation used by tour operators flying fixed wing aircraft. Under the Preferred Alternative, for 2003, Blue Direct North would average approximately 90 flights per day and Blue Direct South, approximately 64 flights per day (see Figure 2-2 for route locations). The Hualapai reported TCPs near both of these routes. As part of the Preferred Alternative, the FAA also raised the minimum altitude and adjusted the location of the route known as Blue Direct South as far northward as

feasible consistent with minimum separation and safety standards.

After NPS proposed to refine the way natural quiet is measured in the GCNP pursuant to Pub. L. 100-91, in July 1999, the Hualapai Tribe and THPO proposed to apply this same methodology to the Hualapai Reservation and define a larger APE. To facilitate consultation, FAA agreed to an APE larger than first delineated, which the Tribe accepted in mid-October 1999. For a more detailed discussion, see Section 3.6.4. Devoting special attention to the area in the vicinity of Blue Direct North and Blue Direct South, the FAA began the process of determining whether the undertaking (the Preferred Alternative) would have adverse effects. The HDCR provided, in confidence, geographic coordinates for 30 additional representative locations. In its final report of the Ethnographic Study, dated December 3, 1999, the HDCR identified 10 properties, all of which are TCPs and associated archaeological sites. The FAA provided the Hualapai Tribe with its assessment of noise and visual impacts for the representative locations selected by the FAA (see Section 4.1) and the 30 provided by the Tribe.

The FAA met with representatives of the Hualapai Tribe, NPS, and the Advisory Council on Historic Preservation on December 14, 15, and 16, 1999; and held teleconferences on December 17, 20, 22, and 27, 1999 and January 3, 4, 5 and 7, 2000. During the December 15 meeting, the HDCR provided FAA with a list of 40 TCPs.[43] During the consultation process, the FAA consulted the Keeper of the National Register (the National Park Service) for its views on specific location issues. As part of this consultation, the FAA determined that the undertaking would adversely affect at least some of the 40 TCPs, deemed eligible by FAA for inclusion in the National Register of Historic Places.[44]

During consultation, the Tribe and THPO rejected the FAA's proposal to use a memorandum of agreement (MOA). Pursuant to 36 CFR Section 800.6(c)(6) (formerly 36 CFR 800.11(a)(2)), Federal agencies may address unknown resources in an MOA by planning for subsequent discovery or identification of additional historic properties affected by the undertaking. The Tribe was unwilling to agree to an MOA because, in its view, provisions for subsequent discovery could not be relied upon until the Phase II (B) ethnographic study to identify all TCPs in the remainder of the APE had been completed. Programmatic Agreements (PA) may be used pursuant to 36 CFR 800.14(b)(3) instead of MOAs where effects on historic properties cannot be fully determined prior to approval of an undertaking. PAs may also be used where, as here, other circumstances, such as an extremely large geographic area and complex undertaking, warrant a departure from the normal Section 106 process. Rather than conclude that negotiation and seek formal comment by the Advisory Council (which is considered a last resort), the FAA, in cooperation with the NPS, and in consultation with the Hualapai Tribe, THPO, and the Advisory Council determined to follow the programmatic approach allowed in NHPA Section 106. Therefore, the FAA, NPS, the Advisory Council, the Hualapai Tribe, and the Hualapai THPO signed a PA pursuant to 36 CFR 800.14(b) in January 2000. As part of developing this PA, the FAA followed the same procedures for resolving adverse effects that are used in completing a MOA. (36 CFR Section 800.14 (b)(3) provides that consultation shall follow Section 800.6).

The PA includes provisions for further identification and evaluation of TCPs. It governs implementation of a negotiated program to monitor effects and mitigate adverse effects to TCPs located within the APE on the Hualapai Reservation. Briefly, in addition to the design of mitigation measures described above in the Preferred Alternative, the FAA commits: to encourage operators using visual flight rules routes to fly on the highest altitude practicable on Blue Direct North and Blue Direct South consistent with safety, to issue Notices to Airmen to mitigate effects of overflights on traditional cultural ceremonies of short duration, to incorporate appropriate information in FAA safety and informational meetings for operators, to consider opportunities in describing routes on maps to reduce impacts on TCPs, to provide training to members of the Hualapai Tribe in identifying and reporting violations, and to respond to violations reported by members of the Tribe.

The FAA also agreed to a program of assistance to the Hualapai Tribe in monitoring the auditory, visual, and other effects of the undertaking on TCPs. As part of long-term mitigation, the FAA agreed to consider the results of the monitoring program and, if necessary to address adverse effects, to develop and evaluate alternative mitigation measures, including rerouting of commercial SFRA operations and revision of the SFRA airspace to minimize overflights of the Hualapai Reservation, and time of day restrictions. Long-term mitigation will be done as part of the Comprehensive Noise Management Plan or as otherwise scheduled under the terms of the PA.

In exercising its authority to manage the navigable airspace, FAA also accommodated religious practices engaged in by the Hualapai Tribe. During the NHPA Section 106 consultation process, the Hualapai Tribe and THPO indicated that activities at TCPs include traditional hunting, religious and ceremonial activities, pilgrimage routes, and burial sites, among others. Also, traditional hunting and plant gathering incorporate prayer and contemplation. The Hualapai Tribe and THPO expressed concern that the religious and ceremonial activities undertaken at TCPs depend upon an uninterrupted viewshed and a clear line of sight for prayers to travel uninterrupted from one site to another. In addition, traditional practitioners described the importance of privacy and natural quiet to religious and ceremonial activities. Some of the religious activities are believed to be essential to restoring or maintaining the health of tribal members and the socio-cultural well being of the tribal community.

As described above, the FAA has taken numerous steps to minimize the impact that approval of revised air tour routes will have on Hualapai religious activities. For example FAA proposes to choose the best alternative route to protect sites in critical and sensitive areas from adverse audible intrusion. FAA is also planning steps to reduce the visual impact of flights on Blue Direct North and South on the surrounding area. FAA carefully considered concerns for natural quiet, a clear viewshed, and complete privacy. However, fixed wing air tour aircraft already overfly the eastern portion of the Reservation on the routes known as Blue Direct and Blue Direct South. Therefore, the FAA conducted its evaluation and consideration of alternatives and mitigation measures in the context of the current air tour environment, and not in the context of conditions existing before SFAR 50-2 was established or before air tour routes existed. FAA used the existing air tour routes as a

baseline against which to evaluate alternatives and mitigation. The solicitude shown by FAA accords with the requirements of American Indian Religious Freedom Act of 1978 and Executive Order 13007 to accommodate access to, and use of sacred sites on Federal land. The Preferred Alternative also comports with the Religious Freedom Restoration Act, as applicable.

4.3 DOT SECTION 4(f)

Section 4(f) of the Department of Transportation Act, 49 U.S.C. Section 303, provides that the Secretary of Transportation shall not approve a program or project that requires the use of publicly-owned land of a park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of a historic site of national, State, or local significance (as determined by the officials having jurisdiction thereof), unless there is no feasible and prudent alternative to the use of such land and such program or project includes all possible planning to minimize harm. FAA guidance implementing Section 4(f) and the regulations implementing Section 106 of the NHPA similarly define historic sites.

Under Section 4(f), use may be actual and physical or it may be constructive. Actions which render Section 4(f) properties unsuitable for the uses occurring at these sites may constitute a "constructive use" of such properties even if no physical taking of property is involved. FAA must determine if the activity associated with the proposal conflicts with or is compatible with the normal activity or aesthetic value associated with the property. For example, noise levels and other associated environmental impacts, which substantially impair the use and value of such properties or preclude the activities normally occurring at such properties, would therefore constitute a constructive use of property.

As the proposal involves commercial air tour routes, limitation on operations, and airspace modifications, none of the alternatives considered require construction activity, ground disturbance, or the physical use of any lands protected under Section 4(f) within the GCNP and adjoining public lands or adjoining Native American lands.

Grand Canyon National Park and Adjoining Public Lands

The U.S. Congress stated in Pub. L. 100-91 that noise associated with aircraft overflights at GCNP was causing "a significant adverse effect on the natural quiet and experience of the park...."[45]

The Proposed Action is an effort to address the Congressional concern by reducing the effects of aircraft noise. To the extent that the proposed project reduces aircraft noise effects, the proposed action does not cause a use (actual or constructive) under DOT Section 4(f) to the GCNP or its adjoining public lands.

The analysis in Section 4.1 indicates that increases in noise under the Preferred Alternative would range from 0 dB to 13.6 dB A, at levels between 18 to 43 dB, at the representative locations provided in **Appendix A**. The proposed action would not exceed the FAA's accepted thresholds of significant noise impact for traditional recreational activities at any of these representative locations. In addition, noise levels associated with any of the proposed alternatives are well below the FAA's accepted threshold of significance for residential land uses at all points in the SFRA

area with the exception of Grand Canyon National Park Airport itself.

Adjoining Native American Lands

As a result of the undertaking, the FAA recognized the potential for effects to TCPs on adjoining Native American lands, as defined in Section 106 of the NHPA and Section 4(f).

Historic properties are not used within the meaning of Section 4(f) when compliance with Section 106 results in a determination of no effect or no adverse effect.[46] There is also no use if the increase in projected noise when compared with the no action alternative is barely perceptible (3 dB or less). 3 dB changes represent a doubling in sound energy. Also, Section 4(f) does not apply to archaeological resources that have value chiefly for data recovery and which are not important for preservation in place.

If compliance with Section 106 results in a finding of adverse effect, whether there is a corresponding use under Section 4(f) depends upon whether the adverse effects would substantially impair historic integrity. Other than the three-decibel screening criteria for protected properties under DOT Section 4(f), there are no federal guidelines for determining compatibility of TCPs with aircraft noise exposure levels. Accordingly, the determination is made on a site by site basis of whether increases in noise above three decibels conflict with the normal activity and values associated with the historic property to the extent that it results in substantial impairment.

Adjoining Native American Lands except the Hualapai Reservation

Based upon Section 106 consultation and the Finding of No Adverse Effect for all adjoining Native American lands except the Hualapai Reservation, there is no use under Section 4(f) in these areas.

The Hualapai Reservation

As explained in Section 4.2, during the approximately three year NHPA Section 106 consultation process, the Hualapai Department of Cultural Resources (HDCR) identified 40 TCPs in critical and sensitive areas, closest to the proposed air tour routes. As part of a Programmatic Agreement (PA) with the Hualapai Tribe and THPO, FAA determined that the current undertaking (Preferred Alternative) would adversely affect some of the TCPs the Hualapai identified. Such effects result from elimination of Blue-1 and corollary increases in traffic on Blue Direct (to be designated Blue Direct North) and Blue Direct South. In the year 2003 under the Preferred Alternative when compared to the No Action alternative, average annual flights per day on Blue Direct North would increase from approximately 72 to 83. On Blue Direct South, such flights would increase from approximately 25 to 60.

FAA evaluated the potential for adverse effects by considering whether Hualapai TCPs would be subject to perceptible noise increases under the Preferred Alternative.[47]

Under the Preferred Alternative for 2000, six of the 40 identified TCPs would experience increases in noise of 3 dB and above. The increases range from 4.3 to 13.6 dB, as shown in **Table 4.18.**[48] With the continuing increase in the number of operations under

the No Action Alternative and the limitation on operations under the Preferred Alternative, the differences between the No Action and Preferred Alternatives diminish over time.

After determining that six TCPs experience perceptible increases in noise that may alter the characteristics that make them eligible for inclusion in the National Register of Historic Places, FAA carefully reviewed the information provided by the HDCR, including two reports from the ethnographic study, describing the values, activities, attributes, and setting of these historic properties. Under the Department of Transportation Act Section 4(f), FAA had to determine whether this adverse effect would conflict with the normal activities and aesthetic values of the historic property. In particular, it was necessary to consider whether the magnitude of expected noise increases would be of sufficient degree to substantially impair the features or activities that are elements of their historic significance. FAA recognizes that TCP historic integrity has both physical and associative elements. Further, the views of traditional cultural practitioners must be carefully weighed in determining whether

Table 4.18

Grand Canyon Preferred Alternative L_{Aeq12h}
For Selected Hualapai Reservation TCPs

TCP ID Number	Site	No Action (2000)	Preferred Action (2000)	Change From No Action (2000)	No Action (2003)	Preferred Action (2003)	Change From No Action (2003)	No Action (2008)	Preferred Action (2008)	Change From No Action (2008)
1	1a	29.2	40.6	11.4	29.6	40.6	11	30.3	40.6	10.3
2	2a	32.4	41.2	8.8	32.9	41.2	8.3	33.6	41.2	7.6
	2b	33.7	39.5	5.8	34.1	39.5	5.4	34.8	39.5	4.7
	2c	30.4	37.6	7.2	30.8	37.6	6.8	31.5	37.6	6.1
	2d	31.2	37.7	6.5	31.6	37.7	6.1	32.3	37.7	5.4
	2e	30.9	37.4	6.5	31.3	37.4	6.1	32.0	37.4	5.4
3	3a	28.7	39.9	11.2	29.2	39.9	10.7	29.9	39.9	10
	3b	29.0	42.6	13.6	29.4	42.6	13.2	30.1	42.6	12.5
4	4a	29.3	41.2	11.9	29.7	41.2	11.5	30.4	41.2	10.8
5	5a	33.6	40.7	7.1	34.1	40.7	6.6	34.8	40.7	5.9
6	6a	33.2	37.5	4.3	33.7	37.5	3.8	34.4	37.5	3.1

and to what extent alteration of the setting and environment through additional aircraft noise and overflights will impact the continued significance and value of a TCP. The evaluation of noise and visual effects on such properties is an emerging field in historic preservation. It is acceptable to consider how traditional practices have been affected by similar noise intrusions at other TCPs.

The following summarizes activities for the six TCPs with the corresponding 11 representative locations. The details concerning the actual use of the TCPs are confidential. This information is taken from the December 1999 Ethnographic Study that was conducted by the Hualapai Tribe. For Site 1, uses include traditional cattle ranching, hunting and ancestral habitation. Site 2 is used for traditional hunting, ceremonial plant gathering and ranching. It is also used for access and prayer to a certain religious site. Site 3 is used for traditional game and cattle grazing, and religious and healing purposes. Site 4 is used for religious purposes, which includes singing and praying. Site 5 is used for traditional hunting, ceremonial plant gathering and ranching; ancestral habitation; and religious activities that includes prayer, song, vision quest, and pilgrimages by foot and through dreams. Site 6 is used for traditional ranching and hunting. Traditional religious activities at Hualapai TCPs are described in more detail in Section 4.2.

Commercial air tour aircraft currently overfly all six TCPs, which experience L_{Aeq12h} noise levels ranging from 28.5 to 33.4 dB. By contrast, rural areas typically experience ambient noise levels in the range of 20 dB. Under the Preferred Alternative for 2000, cumulative L_{Aeq12h} noise levels for these TCPs would range from 37.5 to 42.6 dB. The ethnographic studies prepared by the Hualapai Tribe and THPO indicate that the Tribe continues to use and value TCPs in areas of the Reservation near existing air tour routes that currently experience comparable noise levels and have comparable religious, traditional ranching, and other activities and aesthetic values.

As to the effects of noise on traditional cattle ranching and hunting, the nature of the action in consolidating existing air tour routes and limiting the growth in the number of flights suggests that these activities should be little, if at all, affected. According to the NPS biological assessment prepared for the endangered species consultation, although aircraft may startle or momentarily alter the behavior of individual animals, there is no evidence that animal populations or their habitats in the Grand Canyon area have been negatively impacted by the existing air tour operations. The subject has not received concentrated attention, with the result being that "…it has proven difficult to draw any general conclusions on the subject because there is much variability in response both between and within species. Thus, no clear policies or guidelines have been developed concerning noise exposure and animals" (see Newman and Beattie 1985[49]). Based upon the best available information, and the mitigation measures included in the January 2000 NHPA Section 106 Programmatic Agreement, FAA has determined that the increases in noise caused by the Preferred Alternative will not substantially impair or have a significant adverse impact upon the value of the six Hualapai TCPs.

To determine the potential for visual impact for the six TCPs that experienced perceptible increases in noise, FAA considered the size of the largest aircraft expected to operate on Blue Direct North and Blue Direct South,

which is a 52-foot long Twin Otter. FAA also considered the distance of the TCP from the air tour route, the elevation of the TCP and the altitude of the commercial air tour aircraft. FAA posited that perceptible increases in noise reflect the potential for significant visual intrusion.

Based upon this information, the FAA determined the percentage of the viewing plane that the aircraft would occupy when viewed from the TCP. This was determined for both the No Action alternative and Preferred Alternative. **Tables 4.19 and 4.20** provide the results of this analysis. FAA assumed a 55-degree field of vision for this analysis.

Additionally FAA determined how large the aircraft would appear when viewed at arm's length from the TCP under both alternatives. This information is provided in **Tables 4.21 and 4.22**.

Table 4.19

Grand Canyon TCP Vision Field Calculations Preferred Alternative

TCP ID Number	Site Within TCP	Minimum Altitude (ft)	Site Elevation (ft)	Elevation Difference (ft)	Site Horizontal Distance From Tour Route (ft)	Aircraft Closest Proximity To Site (ft)	Portion of Horizon Visible (ft)	% Visual Field Obscured by Aircraft
1	1a	9,500	6,610	2,890	4,620	5,449	5,231	0.99%
2	2a	9,500	6,460	3,040	0	3,040	2,918	1.78%
	2b	9,500	6,680	2,820	1,320	3,114	2,989	1.74%
	2c	9,500	7,024	2,476	7,260	7,671	7,363	0.71%
	2d	9,500	6,460	3,040	7,260	7,871	7,555	0.69%
	2e	9,500	6,600	2,900	7,920	8,434	8,096	0.64%
3	3a	9,500	1,620	7,880	5,940	9,868	9,473	0.55%
	3b	9,500	6,573	2,927	7,920	8,444	8,105	0.64%
4	4a	9,500	6,570	2,930	3,960	4,926	4,729	1.10%
5	5a	9,500	6,020	3,480	660	3,542	3,400	1.53%
6	6a	9,500	6,307	3,193	9,240	9,776	9,384	0.55%

Table 4.20

Grand Canyon TCP Vision Field Calculations No Action Alternative

TCP ID Number	Site Within TCP	Minimum Altitude (ft)	Site Elevation (ft)	Elevation Difference (ft)	Site Horizontal Distance From Tour Route (ft)	Aircraft Closest Proximity To Site (ft)	Portion of Horizon Visible (ft)	% Visual Field Obscured by Aircraft
1	1a	8,500	6,610	1,890	10,560	10,728	10,298	0.50%
2	2a	8,500	6,460	2,040	0	2,040	1,958	2.66%
	2b	8,500	6,680	1,820	2,640	3,207	3,078	1.69%
	2c	8,500	7,024	1,476	11,880	11,971	11,492	0.45%
	2d	8,500	6,460	2,040	13,200	13,357	12,822	0.41%
	2e	8,500	6,600	1,900	11,880	12,031	11,549	0.45%
3	3a	8,500	1,620	6,880	7,920	10,491	10,071	0.52%
	3b	8,500	6,573	1,927	9,240	9,439	9,061	0.57%
4	4a	8,500	6,570	1,930	4,752	5,129	4,923	1.06%
5	5a	8,500	6,020	2,480	2,640	3,622	3,477	1.50%
6	6a	8,500	6,307	2,193	9,240	9,497	9,116	0.57%

Table 4.21

Grand Canyon TCP Arm's Length Calculations Preferred Alternative

TCP ID Number	Site Within TCP	Minimum Altitude (ft)	Site Elevation (ft)	Elevation Difference (ft)	Site Horizontal Distance From Tour Route (ft)	Aircraft Closest Proximity To Site (ft)	Aircraft Size Viewed At Arm's Length (in)
1	1a	9,500	6,610	2,890	4,620	5,449	0.34
2	2a	9,500	6,460	3,040	0	3,040	0.62
	2b	9,500	6,680	2,820	1,320	3,114	0.60
	2c	9,500	7,024	2,476	7,260	7,671	0.24
	2d	9,500	6,460	3,040	7,260	7,871	0.24
	2e	9,500	6,600	2,900	7,920	8,434	0.22
3	3a	9,500	1,620	7,880	5,940	9,868	0.19
	3b	9,500	6,573	2,963	7,920	8,456	0.22
4	4a	9,500	6,570	2,930	3,960	4,926	0.38
5	5a	9,500	6,020	3,480	660	3,542	0.53
6	6a	9,500	6,307	3,193	9,240	9,776	0.19

Table 4.22

Grand Canyon TCP Arm's Length Calculations No Action Alternative

TCP ID Number	Site Within TCP	Minimum Altitude (ft)	Site Elevation (ft)	Elevation Difference (ft)	Site Horizontal Distance From Tour Route (ft)	Aircraft Closest Proximity To Site (ft)	Aircraft Size Viewed At Arm's Length (in)
1	1a	8,500	6,610	1,890	10,560	10,728	0.17
2	2a	8,500	6,460	2,040	0	2,040	0.92
	2b	8,500	6,680	1,820	2,640	3,207	0.58
	2c	8,500	7,024	1,476	11,880	11,971	0.16
	2d	8,500	6,460	2,040	13,200	13,357	0.14
	2e	8,500	6,600	1,900	11,880	12,031	0.16
3	3a	8,500	1,620	6,880	7,920	10,491	0.18
	3b	8,500	6,573	1,963	9,240	9,446	0.20
4	4a	8,500	6,570	1,930	4,752	5,129	0.36
5	5a	8,500	6,020	2,480	2,640	3,622	0.52
6	6a	8,500	6,307	2,193	9,240	9,497	0.20

The distance between the aircraft and each of the six TCPs ranges from 3,040 feet to 9,868 feet under the Preferred Alternative. For the No Action alternative, the range is from 2,040 feet to 13,357 feet.

For example, the TCP with the highest elevation along the Blue Direct North and Blue Direct South routes is Site 2c (elevation 7,024 feet MSL). Under the No Action alternative, the lowest altitude at which commercial air tour aircraft will overfly this location is 8,500 feet MSL. Accordingly, an aircraft would occupy .45 percent of the viewing plane of an individual standing at this location. Under the Proposed Action, the percentage occupied would be .71 percent. Additionally, the analysis indicates that the aircraft would appear to be .16 inches long when viewed at arm's length under the No Action Alternative and .24 inches under the Preferred Alternative. The visual intrusion for these sites is relatively small, as shown in Tables 4.21 and 4.22.

Biophysical literature states that a person with standard 20/20 vision can recognize an object that subtends an angle of one minute of arc; this equates to approximately .64 mile.[50] Of these TCPs, there are only two locations in the vicinity of Prospect Canyon at which aircraft are closer than six tenths of a mile from the location. At these distances, people on the aircraft may be able to distinguish activities at the TCP. Additionally, the increases in magnitude of the arm's length view are less than one inch. For the foregoing reasons, the FAA has determined that the Preferred Alternative does not cause a significant visual intrusion amounting to a constructive use.

In summary, the Preferred Alternative would adversely affect but would not substantially impair the value of the six TCPs in the vicinity of Blue Direct North and Blue Direct South that would experience an increase in overflights. These six TCPs are not in a pristine acoustic environment, but one that

already experiences visual intrusions and aircraft noise. The noise is at levels greater than those typically experienced in a rural area. The Hualapai Tribe continues to use and value similar Hualapai TCPs in areas currently experiencing comparable levels of noise. Based upon the proposal to encourage air tour operators to operate at the highest altitude operationally feasible consistent with safety requirements, the agreement to issue Notices to Airmen to protect important religious ceremonies and other mitigation measures in the January 2000 Programmatic Agreement, the impacts, while adverse, would not substantially impair the historic characteristics of these TCPs.

The Hualapai Tribe's assessment that there would be significant adverse impacts on the attributes and settings of all 40 TCPs identified is based, at least in part, upon a pre-SFAR 50-2 or pre-air tour set of conditions. The No Action Alternative was properly used as a baseline to evaluate the potential effects of the proposed action and reasonable alternatives, consistent with NEPA and CEQ.

To obtain more complete data and address the concerns of the Hualapai Tribe and THPO, the January 2000 PA stipulates, among other things, that FAA, in cooperation with NPS and in consultation with the Hualapai Tribe and THPO, will initiate a monitoring program to consider the auditory, visual and other effects of the undertaking on TCPs. If significant new information is revealed through this monitoring program, FAA will reevaluate this environmental assessment and reconsider its determination of "no use" under Section 4(f). This reevaluation will be done in conjunction with the Comprehensive Noise Management Plan or in accordance with the provisions for scheduling in the PA. If constructive use is found, then the existence of prudent and feasible alternatives and planning to minimize harm will be evaluated, consistent with Section 4(f). Measures to be considered if the monitoring program reveals adverse effects include the rerouting of commercial SFRA operations and revision of SFRA airspace to minimize overflights of the Hualapai Reservation and time of day restrictions as provided in Paragraph V (C)(1)(b) of the PA.

However, if there is a constructive use of these six TCPs, then based upon the information available to date and consultation with the Hualapai Tribe and THPO as part of the NHPA Section 106 process, FAA has met the requirements of Section 4(f). FAA's analysis of alternatives for this Final SEA (see Sections 2.1 and 2.2) indicates that there is no feasible and prudent alternative to avoid the use of historic properties. Each alternative route proposal before the FAA, according to the ethnographic reports prepared by the Hualapai Tribe, involved a "use" of at least one TCP. As shown in Section 2.2, FAA thoroughly considered a range of alternatives to avoid the six Hualapai TCPs by eliminating or relocating the remaining two Blue Direct routes. FAA determined that these alternatives were not safe. Even if there were not safety issues, it is unclear that these alternatives would achieve the purposes and need of the project (see also Section 1.2). Further, commercial air tour routes between Las Vegas, Nevada, and Tusayan, Arizona, cannot avoid the six known TCPs on the east side of the Reservation without flying a circuitous complex route. This circuitous routing is not reasonable from a safety standpoint considering the level of traffic, lack of visual reference points and flight under visual flight rules. Where there are no alternatives that

avoid all affected 4(f) properties, subsection 4(f)(2) requires the agency to ensure that its plans minimize harm to the properties. Through Section 106 consultations, during which FAA sought ways to avoid or reduce adverse effects to Hualapai TCPs, FAA has met the requirements of Section 4(f)(2). The immediate and long-term mitigation and monitoring program in the January 2000 Programmatic Agreement constitute all possible planning to minimize harm resulting from any use.

As discussed in Section 4.2, FAA began identifying cultural and historic properties that might be affected by the undertaking early in the process. Between March 1998 and December 1999, FAA funded ethnographic studies by the HDCR. The non-confidential aspects of the resource identifications developed through consultation and study were presented in the December 1996 Final EA, the June 1999 Draft SEA, and in this Final SEA. The 40 TCPs identified by the HDCR in the December 15, 1999, list reflect the range of uses, activities, settings, and feelings and other elements of historic eligibility for Hualapai TCPs. FAA conducted supplemental noise modeling at representative locations provided by the HDCR for known TCPs in critical and sensitive areas near the blue direct routes, the area most adversely affected by Preferred Alternative. Supplemental noise modeling verifies that the FAA has reduced overall noise levels on the Hualapai Reservation. Apart from the operations by air tour companies with contracts to land at Grand Canyon West Airport that will be execpted, the limitation on commercial SFRA operations will assure an overall decrease in noise and visual impacts on Hualapai TCPs. Noise has been reduced or eliminated near TCPs on the west and southern portions of the Reservation where routes have been modified and partially or completely eliminated. Although further studies have been agreed-upon to identify all TCPs in the remainder of the APE as part of the NHPA Section 106 process, in these circumstances FAA has sufficiently identified Section 4(f) properties to proceed with the project.[51] Based upon the nature of the impacts and of potential new sites, the possibility of substantial impairment is extremely remote.

4.4 WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act (Pub. L. 90-542, as amended) describes those river areas eligible to be included in a system afforded protection under the Act as free-flowing and possessing "...outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values." As described in Section 3.6.5, the NPS reports that the Colorado River within the SFRA, as well as many of its major tributaries, meets the criteria for designation as a wild and scenic river, and so is treated in accordance with the requirements of the Wild and Scenic Rivers Act.

The proposed alternatives considered adding flight-free zones over large sections of the Colorado River and portions of the Little Colorado River. Within the impact analysis area, the Colorado River and Little Colorado River receive additional protection from the Toroweap/Shinumo and Desert View FFZs. Based on a review of Figures 4-9 and 4-10, parts of the river, including the intersection of the Colorado and Little Colorado Rivers under the expanded Toroweap/Shinumo and Desert View FFZs, will experience reduced noise levels when compared to the No Action alternative.

4.5 VISUAL IMPACTS

This impact category is normally related to considerations of the aesthetic integrity of an area in relation to proposed development in residential areas, disruption of scenic vistas, impairment of experience at historic sites, and interference with privacy during ceremonies at Native American sacred sites. None of the proposed alternatives considered involve physical development or construction.

The visual impact of air traffic across the scenic vistas of the Grand Canyon is a matter of potential concern. The U.S. Forest Service report, National Forest Landscape Management, Volume 2, indicates the difficulty of establishing acceptable levels of visible activity. The report finds that an individual's reaction to visible elements in the environment is dependent upon their personal expectations and images of the area. Accordingly, persons expecting a pristine environment may be concerned by the visible presence of any aircraft. Others with different expectations might not be concerned by any amount of aircraft activity.

As stated in the 1996 Final EA, the visual impact of air traffic across the scenic vistas of GCNP is a potential concern. The Proposed Action, considering any of the proposed alternatives, reduces the area of the GCNP that is subject to low-level overflights relative to the No Action alternative. There will be increases in density of aircraft in specific areas due to the revised commercial air tour routing, but such increases are not likely to change the visual character of these areas for the same reasons that visual character was not changed for the Final EA Proposed Action.

Potential adverse visual impacts to TCPs identified by the Hualapai Tribe and THPO are discussed in Sections 4.2 and 4.3.

4.6 SOCIAL/ SOCIOECONOMIC IMPACTS

This impact category addresses the physical disruption or division of communities, relocation of residences or businesses, altered surface transportation systems, shifts in population movement or growth, changes in public service demands and business or economic activity. Of these, the only impact that the Proposed Action may have relates to business activity.

The Hualapai Tribe expressed concern over the potential detrimental economic impact of the Proposed Rule evaluated in the Final EA. The Proposed Action, with any of the proposed commercial air tour routes analyzed in this Supplemental EA, does not alter the Hualapai's unrestricted access to the airport on the Hualapai Reservation. Additionally, the FAA is still committed to working with the Hualapai Tribe, whenever necessary, to support future development at Grand Canyon West Airport.

To this end, during the public comment period, the Hualapai Tribe expressed concern that the operations limitation, if imposed on commercial air tour operations that land on the Hualapai Reservation, would undermine economic development efforts at Grand Canyon West. The Hualapai Tribe currently collects more than $2.3 million annually from commercial air tour operators. Without the exception for commercial air tour operations conducted along Blue-2 and Green-4 under

contract with the Hualapai Tribe, the FAA estimates that the Tribe would lose about $4.9 million in ground tour revenue and landing fees over the next nine years. The Tribe estimates that over 45 percent of its general fund budget is supported by the revenues derived from the commercial air tours conducted to the reservation along Green-4 and Blue-2. The general fund is the primary funding source for tribal government positions (the tribal government employs 40% of tribal members), and is used to fund all public works programs.

Based on this information, the FAA has determined that the operations limitation rule would have a significant adverse economic impact on the Hualapai Tribe. Therefore, pursuant to the Federal government's trust responsibility to the Hualapai Tribe, the FAA and NPS have determined to except commercial air tour operations that support Hualapai economic development from the operations limitation under very strict guidelines. The actual exception language is contained in the proposed final rule for the Commercial Air Tour Limitation in the Grand Canyon National Park Special Flight Rules Area. The Regulatory Evaluation, published with the operations limitation proposed final rule, also addresses the economic benefits accruing to commercial air tour operators who are under contract with the Hualapai Tribe. This includes 90% of the helicopter and 10% of the fixed wing aircraft operations that are conducted along Green-4 and Blue-2, respectively.

As a result of comments from the Navajo Nation expressing concern that the expansion of the Desert View FFZ would prohibit operators from conducting contracted aerial filming over Navajo lands, the eastern boundary of the Desert View FFZ has been placed at the GCNP boundary. This modification to the preferred alternative (as contained in the Draft SEA) will avoid negative impacts to economic activities in support of the Navajo Nation. Leaving the location of the tour routes identified as Black-2 and Green-3 and the SFRA boundary (as proposed in the Draft SEA) will protect areas containing TCPs, including sacred sites identified by Native American Tribes.

The remaining air tour operations in the SFRA are proposed to be subject to an operations limitation. Commercial air tour operators expressed concern that the operations limitation would undermine their economic growth. The FAA acknowledges there will be significant economic impact as a result of this Proposed Action (see the Regulatory Evaluation for the proposed final rule).

As with the proposed action in the 1996 Final EA, the Proposed Action in this Supplemental EA does not involve ground traffic and associated impacts.

4.7 ENVIRONMENTAL JUSTICE

The DOT issued DOT order 5610.2, Environmental Justice in Low-Income Populations and Minority Populations (62 FR 18377, April 15, 1997) to implement, in part, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (59 FR 7629, February 16, 1994) and the accompanying Presidential Memorandum and the DOT Strategy (60 FR 33896, June 29, 1995). The Preferred Alternative would eliminate existing air tour routes in the vicinity of Supai Village over the Havasupai Reservation. At the same

time, the Preferred Alternative would also eliminate one of the three direct routes that overflies the east side of the Hualapai Reservation. The Preferred Alternative also eliminates portions of the routes known as Blue-2 and Green-4 south of Surprise Canyon which overfly the west side of the Hualapai Reservation. The Supplemental EA indicates that the Proposed Action would decrease overall noise impacts on all Native American lands that are adjacent to the GCNP. It would not result in significant noise or other environmental impacts on minority or low-income populations in the study area.

Environmental justice (EJ) is concerned with whether or not adverse impacts to the environment and public health of minority populations and low-income populations of Federal actions are disproportionate. E.O. 12898 requires an examination of whether these impacts, including impacts to Native American subsistence hunting and gathering, are disproportionately high and adverse. The accompanying Presidential Memorandum encourages consideration of EJ in environmental assessments, especially to determine whether a significant impact may occur.

The population of the Grand Canyon region is small and, thus, census tracts are large. The population within census tracts is not uniformly distributed. Population groups tend to be dispersed or transient.

Native American populations are defined as minority populations and are presumed to be low-income or disadvantaged. Federally recognized tribes, including the tribes in the vicinity of the Grand Canyon (see 1994 Federally Recognized Indian Tribe List Act), also enjoy a political relationship with the U.S. Government based on the U.S. Constitution, treaties, specific statutes and executive orders, and court decisions. These populations tend to be concentrated in widely dispersed settlements. Their activities, such as ceremonies at traditional cultural sites, or subsistence hunting and gathering, are also dispersed.

Similarly, the population at or near the GCNP tends to be seasonal and concentrated in dispersed sites. Visitor activity occurs throughout the year but peaks during the summer. Ranches and dispersed villages in the vicinity of the GCNP may have a high proportion of Hispanic people, many of whom are also low-income, and non-Hispanics who are low-income.

The GCNP and, to a lesser extent, surrounding public lands and tribal lands receive large numbers of visitors, especially during the summer, who may stay a few hours to several days or weeks. Many visitors concentrate their activities at highly developed sites, such as the South Rim, while many others engage in dispersed recreation, such as wilderness camping.

Impacts to Native Americans. Because census tract data do not fully capture the nature of these populations and their activities, FAA qualitatively analyzed the impacts and benefits following the procedures in DOT Order 5610.2. In working toward substantially restoring natural quiet, in the context of increasing visitor activity, including air tour activity, in GCNP, the FAA has worked with Native American tribes adjacent to or with aboriginal interests in the Grand Canyon. This effort is to reduce or avoid adverse impacts, especially from noise, by adjusting proposed routes and allowing for Notice to Airmen (NOTAM) on specific occasions in limited areas. A NOTAM can be issued for a

specific reason and only for a limited time period.

Impacts to Native American Subsistence Hunting and Gathering. In accordance with Sec. 5 of E.O. 12898, concerning impacts to subsistence hunting, fishing, and gathering by Native Americans, FAA analyzed the effects of the alternative air tour and airspace structure and procedures on these activities. The Paiute commented on air pollution and intrusion during subsistence gathering activities in the context of Sec. 106 consultation, but have concurred with a No Effect Determination under Sec. 106. The Hualapai Tribe commented on impacts to subsistence hunting resulting from both short term effects (game fleeing from aircraft during hunts) and long-term effects (stress on herds on movement of game out of traditional hunting areas). The Hualapai stated that "existing studies do not evaluate the long-term impacts of overflights on Big Horn Sheep." The Navajo commented on potential impacts to subsistence sheep herding activities during the Sec. 106 consultation as a traditional cultural practice. In this latter situation, FAA through its Flight Standard District Office is training tribal members in procedures for requesting a NOTAM and reporting low-flying aircraft. The Hualapai commented on potential impacts to subsistence cattle ranching activities during the Sec. 106 consultation as a traditional cultural practice.

Impacts to Non-Native American Minority or Low-Income Populations. FAA has issued public notice and requested comments through Federal Register notices and numerous public hearings at the Grand Canyon, in Phoenix, Las Vegas, St. George, and elsewhere. No comments were received from other potentially affected EJ populations. The route structure outside of the SFRA that might impact EJ populations, other than Native American populations, is similar to the historic route structure. No significant impacts to non-Native American or other minority or low-income populations have been identified.

4.8 NATIVE AMERICAN COMMUNITIES

Section 3.3 provides a brief description of the Native American communities that inhabit and have ties to the areas around GCNP. The Proposed Action or any of the proposed alternatives, with commercial air tour limitations or with continued growth, reduce noise levels over the majority of Native American areas with the exception of a few locations, most notably, Hualapai TCP Number 10. Improvements made by commercial air tour route alternatives are eroded with continued growth. For the No Action alternative and the proposed alternatives considered, noise levels associated with aircraft activity in and around the GCNP are substantially below any established threshold of significant impact. In addition, the analysis in Section 4.1.1 indicates that aircraft noise levels generally would not interfere with normal outdoor speech communication.

The FAA has made progress toward protecting Native American resources. This is evidenced by refining commercial air tour routes over Supai Village, as requested by the Havasupai Tribe. The FAA has also expanded the SFRA boundary and relocated the tour routes labeled Black-2 and Green-3 five miles east to avoid the confluence of the Colorado and Little Colorado Rivers. This expansion to the SFRA provides protection to sites of importance identified by the

Navajo Nation, the Hopi, and the Pueblo of Zuni Tribes.

A record of consultation with Native American Tribes and Nations and a list of applicable laws are provided in **Appendix H**.

4.9 ENDANGERED SPECIES

As discussed in Section 3.7, three endangered plants and ten endangered animal species are found in GCNP and adjoining lands, including the Hualapai Reservation. In addition, five threatened plants, four threatened animals, and one experimental population (treated as threatened) also occur in the study area (see Table 3.1). The NPS is the lead agency for consultation pursuant to Section 7 of the 1973 Endangered Species Act, as amended. NPS initiated formal consultation for this action by submitting a biological assessment to the U.S. Fish and Wildlife Service (USFWS) on November 8, 1999. A draft biological opinion was sent to FAA and NPS on December 16, 1999. After review by both FAA and NPS, a final biological opinion was completed by the USFWS on January 26, 2000.

In their biological opinion, the USFWS concurred that the only listed species likely to be affected by this action were the California condor, Mexican spotted owl, and bald eagle, which are all treated as threatened without critical habitat. The biological opinion concludes that the Proposed Action is not likely to jeopardize the continued existence of these three species, and that no critical habitat exists for these three species, so none will be affected. However, in accordance with USFWS guidelines, the Proposed Action "is likely to adversely affect" the California condor, Mexican spotted owl, and bald eagle. According to the biological assessment prepared by the NPS and the Biological Opinion, the potential adverse effects include the potential for collisions between individual birds (i.e., California condor and bald eagle) and air tour aircraft on the flight routes and near the GCNP Airport in Tusayan. They also include harassment, which is defined under USFWS guidelines as intentional or negligent actions that create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Low-level flights over habitat for the listed bird species are considered likely to cause harassment.

An incidental take statement was included in the biological opinion along with terms and conditions implementing reasonable and prudent measures as a condition for exemption of the Proposed Action from the prohibitions of Section 9 of the Endangered Species Act, as amended. The measures imposed on the FAA and NPS by the terms and conditions in the biological opinion include developing and implementing a plan to further evaluate and mitigate the impacts of the action on the listed species. This plan would include: a monitoring program to further assess the effects of the action on the listed species, an education/awareness program to help pilots avoid collisions and other impacts on the species, bird avoidance measures in the vicinity of GCNP Airport, and an evaluation of the feasibility of avoiding certain sensitive areas during sensitive time periods for the species.

On August 25, 1999, the American peregrine falcon was removed from the list of endangered and threatened species, so it was not detailed in the consultation. A species petitioned, but deemed not warranted for

listing, the northern goshawk, also occurs in the study area, but because it is not listed it also was not detailed in this consultation.

Although the Desert bighorn sheep is not listed in Arizona as a federally threatened species, it is a species of special concern to the Hualapai Tribe. The Hualapai Tribe has expressed concerns about single event noise impacts as well as long-term exposures and lower level noise events on the Desert bighorn sheep.

The effect of the Proposed Action will be to decrease air traffic in some areas with proportional increases in other airspace that is currently in use. The proposed actions may therefore reduce the potential for bird strikes in the SFRA.

Literature on flight altitudes for condors and peregrines is limited; however, discussions with raptor observers indicate that peregrines may soar at 3,000 feet or higher when hunting.[52] Although condors and falcons have the ability to climb as high as 10,000 to 20,000 feet and sometimes as high as 25,000 feet, observers find that these species are typically not flocking by nature and often migrate at altitudes lower than 3,000 feet.

The only new area where flights will be less than 500 feet above ground level would be over the North Rim between the Dragon and Zuni Point Corridors; however, this is not an area of high activity for any of these species. Other areas with flights at such low levels would remain the same as under the No Action alternative, such as over the South Rim, where collisions, if any, are most likely to occur. The vast majority of all the flight routes are over areas of the canyon where flight altitudes are much greater than 500 feet AGL. Research completed for the FAA on potential bird hazards found that approximately 98% of bird strikes involving raptors occurred at less than 500 feet AGL.[53]

The USFWS biological opinion concurred with the NPS determination in the biological assessment that the Proposed Action is “not likely to adversely affect” the desert tortoise, Hualapai Mexican vole, black-footed ferret, southwestern willow flycatcher, or the Yuma clapper rail. The NPS biological assessment concluded that there would be no effect to the fifteen listed plant and aquatic species.

Requirements of a biological assessment or a biological opinion are to address listed species and their critical habitat; therefore, candidate species species and other sensitive species were not addressed in those documents. However, consistent with the above determinations, of the species discussed in Section 3.7.2, the proposed actions are considered by the NPS to have the potential for effects only upon the following species: recently delisted (American peregrine falcon); considered sensitive by the Hualapai Tribe (Desert bighorn sheep, eagles, raptors, mule deer, pronghorn antelope); other sensitive species (northern goshawk, ferruginous hawk).

Recent monitoring of peregrine falcons (including their eyries) by the NPS suggests that they have abandoned eyries in flight corridors; however, further studies will be necessary before any conclusions can be reached regarding the nature or cause of this monitoring observation. The NPS will be conducting such studies. Previous studies conducted elsewhere have suggested that peregrines may be more tolerant of noise and visual stimuli than other raptor species.

Golden eagles and other raptors are also known to fly at altitudes over the study area that may include the flight routes, indicating

a possibility for occasional bird strikes. While bird strikes have occurred in the study area, they were considered not significant enough to report to the FAA (61 FR 54044). The incidental take statement in the biological opinion anticipates no more than one collision in five years of a bald eagle or California condor with an aircraft in the SFRA; the potential for collisions with non-listed eagles and other raptor species is expected to be similar.

According to the NPS biological assessment, although aircraft may startle or momentarily alter the behavior of individual animals, there is no evidence that animal populations or their habitats in the Grand Canyon area have been negatively impacted by the existing air tour operations. Responses of animals to overflights vary greatly among species, and the ability of different species to adapt to overflights also varies. In general, the long-term effects of aircraft overflights on wildlife are unclear. The majority of studies on wildlife responses to overflights suggest that responses appear to be temporary and do not result in long-term effects to animal population numbers or habitat use. Therefore, other than occasional bird strikes, based upon the best available information and the nature of the proposed actions as a step in reducing the effects of aircraft noise upon the study area, the potential for the proposed actions to adversely affect the wildlife species in the study area appears to be limited to temporary behavioral modifications in limited areas. These areas primarily include those limited portions of the flight routes over the forested areas on the South Rim and North Rim where helicopters fly at 500 feet or less above ground level, and a portion of the helicopter routes in the vicinity of Grand Canyon West.

As part of its monitoring program, the NPS will also continue to monitor such potential effects on Desert bighorn sheep, peregrine falcons and other wildlife species, as well as on the listed species. If any additional impacts are found as part of this monitoring program, they will be addressed as a subsequent step in the process of achieving substantial restoration of natural quiet in the GCNP.

4.10 AIR QUALITY

The thresholds of significant impacts to air quality relate to conformity of the Proposed Action with the State Implementation Plan (SIP), and to the potential for the Proposed Action or any of the proposed alternatives to exceed National Ambient Air Quality Standards (NAAQS) for any criteria pollutant. The GCNP is an attainment area for all criteria pollutants.

The Proposed Action, which includes an operations limitation, is projected to maintain total aviation activity at 1997/1998 levels relative to the No Action alternative. Accordingly, the Proposed Action would not increase emissions due to aircraft operations when compared to the No Action alternative. This outcome would clearly be in conformance with the SIP. Emissions under the No Action alternative would be no worse than with any of the alternatives.

The EPA, in issuing the final rule on Determining Conformity of General Federal Actions to State or Federal Implementation Plans under Section 176(c) of the Clean Air Act, identified “de minimis” emissions levels, which do not require a conformity determination. The EPA also identified Federal actions, which are de minimis in nature. In the preamble to that final rule, the EPA stated that air traffic control activities

and adopting approach, departure, and en route procedures for air operations are de minimis actions, exempt from conformity determinations requirements.

4.11 CUMULATIVE IMPACTS

CEQ 1508.7 states that cumulative impact is the effect on the environment, which results from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions. In this way, the cumulative impacts which result from individually minor, but collectively significant, actions occurring over a period of time may be examined.

The cumulative impacts of the following types of actions should be considered in the preparation of an environmental assessment:[54]

1. Actions which are closely related and should be discussed in the same NEPA document. Actions are connected if they meet one or more of the following criteria:

    - Actions which automatically trigger other actions which may require the preparation of an environmental impact statement.

    - Actions which cannot or will not proceed unless other actions are taken previously or simultaneously.

    - Actions which are interdependent parts of a larger action and depend on the larger actions for their justification.

2. Cumulative actions, when considered with other proposed actions, have cumulatively significantly impacts and should therefore be discussed in the same NEPA document.

3. Similar actions which are similarities, such as timing or location, with other reasonably foreseeable or Proposed Actions that provide a basis for evaluating their environmental impacts in the same NEPA document.

The previous analyses indicate that there is very little potential for adverse impact, given the relatively low noise levels in the study area. The potential for cumulative impacts is limited to local areas, which would experience increased noise levels as a result of implementation of the final rule with the Preferred Alternative. Overall, however, because the number of commercial air tours operations is being limited, the SFRA will not experience increased noise levels.

A Notice of Proposed Rulemaking for the establishment of noise limitations for aircraft operations in the vicinity of the GCNP (transition to quiet technology), was issued in December 1996 accompanied by a Draft EA. A quiet technology rulemaking has not been finalized but is expected to provide a net benefit impact upon implementation. The Noise Limitations/ Quiet Technology final rule will be analyzed in an EA, which will consider the cumulative impacts of the air tour routes, final SFAR boundary, FFZs, implementation of the 1996 curfew and aircraft cap and this proposed action to implement a commercial air tour limitation.

Grand Canyon West Airport is located in the vicinity of the Proposed Action and alternatives. Based upon the current low level of airport operations, potentially significant cumulative noise or other environmental impacts are not anticipated.

The FAA is aware that the Hualapai Tribe plans to further develop Grand Canyon West; however, these plans are conceptual in nature. The plans are described as follows:

> **Grand Canyon West Airport**: The Hualapai Tribe plans to expand the development at Grand Canyon West, including moving the airstrip back from the rim. Most of the air tours on Green-4 land at Grand Canyon West or on Hualapai lands near the Colorado River below Grand Canyon West.

The development is contemplated, but not yet proposed. As such, the development is too uncertain and far in the future for its impacts to be reasonably foreseen and analyzed along with the Proposed Action and alternatives. The Proposed Action, which will proceed independently, is not related to future development of Grand Canyon West.

Any proposal to relocate and expand Grand Canyon West, including potential cumulative impacts of airport operations along with air tour operations and the potential for expansion of the airport to increase use of the tour routes, will be subject to environmental review by the Hualapai Tribe. FAA will also participate or conduct appropriate environmental review if a grant of federal funds is contemplated.

The FAA is aware of US Forest Service intentions for proceeding with a land exchange and plans to develop recreational, commercial and residential facilities between Tusayan and the GCNP boundary.

4.12 OTHER IMPACT CATEGORIES

The Environmental Consequences "section forms the scientific and analytic basis for the comparisons" in the alternatives section.[55] FAA Order 1050.1D advises, in essence, that specific environmental impact areas should be discussed "as much as is necessary to support the comparisons [of alternatives]."[56] Accordingly, an early review of the potential environmental impacts was conducted to guide the development of the environmental consequences section. This review indicated that most impact categories typically evaluated in an environmental assessment would not be affected by any of the alternatives. Scoping comments confirmed that this review was reasonable. Therefore, the following impact categories were not analyzed in detail:

- Coastal Zone
- Water Quality
- Wetlands
- Coastal Barriers
- Compatible Land Use
- Biotic Communities
- Light Emissions
- Floodplains
- Farmland
- Solid Waste
- Bird Hazard
- Energy/Natural Resources
- Construction

4.13 MITIGATION

Pursuant to the mitigation and monitoring program agreed to in the PA signed in January 2000, the FAA will provide both financial and technical assistance to the Hualapai Tribe. The FAA has and will continue to protect any confidentiality requested by the Tribes to limit public access and preserve the character and integrity of sacred sites.

Pursuant to Section 7 of the Endangered Species Act, and in accordance with the Biological Opinion of USFWS, NPS will initiate a monitoring program which will assess long-term impacts for the three (3) listed species likely to be adversely effected and other species of concern.

Notes

[1] NPS Report to Congress on the Effects of Aircraft Overflights on the National Park System, July 1995, p. 182.

[2] FAA Order 1050.1D, Par 64, 1986..

[3] Ibid.

[4] National Park Service General Management Plan DEIS, p.155; Note that a GMP Final EIS was completed and a Record of Decision (ROD) issued in August 1995.

[5] National Park Service General Management Plan, pp. 141-145 and comments provided by the Hualapai in memoranda dated May 19, and June 1, 1999.

[6] Kaibab National Forest Final EIS, August 6,1999.

[7] National Park Service General Management Plan DEIS, p. 157.

[8] National Park Service General Management Plan DEIS, Management Zones map, p. 15.

[9] National Park Service General Management Plan DEIS, p. 4.

[10] Ibid., p. 48.

[11] Ibid., p. 6.

[12] Ibid., p. 154.

[13] Grand Canyon West, Economic Development Concept Presentation, December 1998.

[14] National Park Service General Management Plan DEIS, pg. 146.

[15] Ibid.

[16] Ibid., p. 148.

[17] Ibid.

[18] Ibid., p. 140.

[19] Ibid.

[20] Ibid., p. 141.

[21] Ibid.

[22] Ibid.

[23] Ibid.

[24] Ibid.

[25] By letter dated June 4, 1999, to Secretary of Interior Bruce Babbitt, the Vice Chairman of the Hualapai Tribe asked the Secretary to revise the NPS recommendations under Pub. L. 100-91 to address the actions necessary to protect tribal resources in the Grand Canyon from adverse impacts associated with aircraft overflights and to drop the residential noise standard for tribal lands used in the Draft SEA as unsupported and adopt a two-tiered standard like the standard adopted for the GCNP. See, Notice, Change in Noise Evaluation Methodology for Air Tour Operations Over Grand Canyon National Park, 64 Fed. Reg. 3969, January 26, 1999. NPS declined to apply the two-tiered noise thresholds developed for GCNP to tribal lands for reasons explained in Change in Noise Evaluation Methodology for Air Tour Operations over the GCNP, Notice of Disposition of Public Comments and Adoption of Final Noise Methodology, Discussion of Comments, Response 4, Tribal Trust Resources, 64 Fed. Reg. 38006, 38008-9, July 14, 1999.

[26] During discussions to amend the SOW, the parties consulted with a representative of the Advisory Council on Historic Preservation. The Advisory Council representative advised that the Preferred Alternative should be addressed separately from the Comprehensive Aircraft Noise Management Plan because it was too soon to enter into an agreement concerning the Plan. FAA proposed use of a Memorandum of Agreement for the Preferred Alternative. FAA suggested that TCPs unknown when the Phase II study is completed could be addressed using the provisions for after-discovered properties under NHPA Section 106 regulations. The Tribe indicated that studies to identify TCPs in the entire APE of the Reservation had to be completed before it would agree that FAA could rely upon the provisions for "after-discovered properties." However, the Tribe agreed to consider a combination MOA/PA document. FAA agreed to include provisions in the SOW for further identification of TCPs in the remainder of the APE. FAA also advised that FAA planned to use three decibel changes in noise as the criteria for identifying the potential for adverse effects.

[27] Ibid., p. 4.

[28] Phillips et al, 1987.

[29] National Park Service General Management Plan DEIS, p. 4.

[30] Sender (GRCA_Wildlife_Biologist@nps.gov) (1999, April 29). Endangered Species List. E-mail to Fred Bankert (Bankert_Fred@prc.com); USDOI Fish and Wildlife Service Arizona Ecological Services Field Office letter, dated November 13, 1996, and National Park Service General Management Plan DEIS, pg. 135.

[31] FAA Order 1050.1D, par. 65(b).

[32] National Park Service Report To Congress, Figure 9-4, p. 191.

[33] Ibid., Figure 9-3, p. 190.

[34] Ibid., p. 175.

[35] National Park Service General Management Plan, pp. 157-158.

[36] USDA Forest Service Tusayan Growth EIS and Record of Decision, 1999

[37] Previous sections discuss this objective and note that it is the primary motivation for the rule.

[38] "Actively listening" means the sole task of the observer is to listen for the presence of aircraft.

[39] Note that the noise heard on the ground is a function of both the source noise and the propagation path from the source to the receiver, so specifying source noise is not equivalent to specifying the noise a listener hears.

[40] ATC does not count overflights as operations. On the other hand, ATC counts circuits as two operations (each circuit has a departure and an arrival). The Activity Report counts the number of commercial air tour routes flown, not the number of takeoff and landings. For example, an air tour which enters the SFRA on Black 2, overflies Cape Solitude and Nankoweap Rapids on Black 1, and exits the SFRA on Black 3 counts as 3 operations in the Activity Report, as one operation (an overflight) in the INM, and is not counted at all by Air Traffic Control at GCN.

[41] The INM profile generator was used for all aircraft except the three helicopter types and the DHC-6, as explained above.

[42] The INM profile generator is based on recommendations found in the Society of Automotive Engineers' Aerospace Information Report 1845 (SAE AIR 1845). It presents an empirical method for computing aircraft position and performance, using a set of aerodynamic and engine coefficients unique to each aircraft model. These coefficients, along with the standard procedure for each aircraft exist in INM as an automated profile generation utility.

[43] Portions of the representative locations provided by the Hualapai Tribe and THPO are within the boundaries of the 40 TCPs identified by the Tribe and THPO in the December 15, 1999 List. 5 of the TCPs are in the vicinity of Blue-2 and Green-4. These sites would experience the same impacts under the No Action Alternative as under the exception in the Operational Limitations proposed Final Rule. 27 of the TCPs are located in the

vicinity of those routes or portions of routes proposed for elimination. These sites will either experience a decrease in noise or will be neutrally affected by the elimination of Blue-1, Blue-1A, Blue-2A and that portion of Blue-2 and Green-4 southeast of Separation Canyon. 2 of the sites, specifically Grand Canyon and the Colorado River will experience an overall decrease in noise with the Preferred Alternative. The remaining 6 sites are located near Blue Direct North and the modified Blue Direct South.routes.

[44] During consultation, the Hualapai Tribe objected to the FAA's use of the No Action Alternative as a baseline to evaluate effects and use of three-decibel changes in noise to assess when noise increases were potentially adverse.

[45] NPRM, p. 5.

[46] FAA Order 1050.1D, Policies and Procedures for Considering Environmental Impacts, Change 4, Attachment 2, para. 5b(4), June 1999; DOT Order 5610.1C, Procedures for Considering Environmental Impacts, Attachment 2, para. 5e; 23 CFR 771.135(p).

[47] In general, changes in sound level of three or four decibels are barely perceptible. Aviation Noise Effects, FAA Report FAA-EEE-85-2. Three decibel changes in noise represent a doubling of sound energy, are clearly noticeable, and at cumulative noise levels between DNL 60 dB and DNL 65 dB, suggest a need for further analysis to consideration of alternative mitigation measures. Federal Interagency Committee on Noise, August 1992, Federal Agency Review of Selected Noise Analysis, page 3-6, 3-15-3-16 (clarify Technical or Policy Chapter). See also, 23 CFR 771.135(p))(FHWA Section 4(f) Constructive Use).

[48] The Hualapai Department of Cultural Resources did not provide specific geographic coordinates to allow modeling for all of the TCPs that were identified during the Section 106 process. Comparable representative locations in Section 4.1 indicate that the Hualapai Reservation will experience either a decrease or no change in noise from the Preferred Alternative.

[49] Aviation Noise Effects, FAA Report FAA-EEE-85-2.

[50] Bioastronautics Data Book, Second Edition, NASA SP-3006, 1973.

[51] The Hualapai Tribe and THPO declined to enter into a Memorandum of Agreement (MOA) that could have included provisions to address unknown TCPs as after-discovered properties. Rather than seek comment of the Advisory Council on Historic Preservation, the FAA entered into a Programmatic Agreement that called for further identification of all TCPs in the APE. See also Section 3.6.4.

[52] Expanded East Coast Plan FEIS, USDOT FAA, 1995, Page 5-67.

[53] Harrison, Michael J., Assessment of Potential Bird Hazards Houston West Side Airport, Table 6, April 3, 1989.

[54] Paragraph 26 of FAA Order 5050.4A, Airport Environmental Handbook, Council on Environmental Quality (CEQ) Regulations sec. 1508.25.

[55] CEQ Regulations Sec. 1502.16.

[56] FAA Order 1050.1D, par. 66, p. 38.

Chapter Five
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APPENDIX A

NOISE RESULTS

This appendix presents noise results summarized in Section 4.1.

Table A.1

Comparison of L_{Aeq12h} at Representative Locations in GCNP
North of Colorado River, West of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	37.5	32.2	-5.3	31.0	-6.5	31.7	-5.8
2	Andrus Canyon (ANDRUS)	24.5	18.8	-5.7	26.3	1.8	17.9	-6.6
3	Bass Camp (BASCMP)	21.4	22.1	0.7	21.8	0.4	21.7	0.3
4	Bat Cave (BATCAV)	39.4	41.2	1.8	40.8	1.4	40.8	1.4
5	Burnt Springs Canyon (BRNTSP)	39.5	41.9	2.4	41.5	2.0	41.6	2.1
6	Castle Peak (CASTLE)	31.0	23.7	-7.3	42.9	11.9	23.2	-7.8
7	Kanab Point (KANAPT)	17.3	9.8	-7.5	9.6	-7.7	9.1	-8.2
8	Kelly Point (KELLPT)	16.1	15.1	-1.0	14.1	-2.0	25.3	9.2
9	Mt. Dellenbaugh (MTDELL)	42.8	42.1	-0.7	26.4	-16.4	41.7	-1.1
10	Point Sublime (PTSUBL)	30.9	31.3	0.4	31.0	0.1	31.0	0.1
11	Sanup (SANUP)	38.5	39.0	0.5	32.7	-5.8	39.2	0.7
12	Separation Canyon at Colorado River (SCCORV)	27.0	16.3	-10.7	15.5	-11.5	34.1	7.1
13	Separation Canyon (SEPARC)	25.2	15.9	-9.3	15.1	-10.1	32.2	7.0
14	Shivwitz Fire Camp (SHWZFC)	38.5	38.4	-0.1	27.4	-11.1	38.0	-0.5
15	Stone Creek (STONCK)	28.7	14.6	-14.1	14.3	-14.4	14.1	-14.6
16	Suicide Point (SUIPNT)	29.2	38.9	9.7	38.5	9.3	23.0	-6.2
17	Toroweap Overlook (TOROWP)	32.5	16.2	-16.3	17.7	-14.8	15.0	-17.5
18	Tower of Ra (TOWER)	45.9	42.0	-3.9	41.7	-4.2	41.7	-4.2
19	Twin Point (TWINPT)	32.5	34.4	1.9	34.1	1.6	28.4	-4.1
20	Upper Deer Creek (UPDRCK)	17.3	12.3	-5.0	12.0	-5.3	11.8	-5.5
21	West End (WESEND)	37.3	34.8	-2.5	33.8	-3.5	34.5	-2.8

Table A.2

Comparison of L_{Aeq12h} at Representative Locations in GCNP
South of Colorado River, West of GC Airport
1998

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	32.3	15.1	-17.2	15.3	-17.0	14.0	-18.3
23	Diamond Creek (DIACRK)	26.4	12.7	-13.7	11.8	-14.6	32.7	6.3
24	The Dome (DOME)	34.7	14.8	-19.9	15.1	-19.6	13.6	-21.1
25	Granite Gorge (GRAGOR)	42.1	40.3	-1.8	39.7	-2.4	37.6	-4.5
26	Grand Canyon West (GCWEST)	40.3	32.8	-7.5	32.2	-8.1	30.9	-9.4
27	Granite Park (GRNTPK)	29.1	29.7	0.6	29.1	0.0	20.9	-8.2
28	Gus Plateau (GUSPLT)	27.7	42.8	15.1	42.5	14.8	24.9	-2.8
29	Havasu Point (HAVAPT)	28.5	12.2	-16.3	12.1	-16.4	11.3	-17.2
30	Havatagvitch Canyon (HAVCAN)	40.5	19.2	-21.3	19.2	-21.3	18.3	-22.2
31	Hermit Basin (HBASIN)	39.8	34.0	-5.8	33.7	-6.1	33.6	-6.2
32	Horse Flat Canyon (HFCAN)	27.0	22.5	-4.5	22.0	-5.0	22.6	-4.4
33	Meriwhitca (MERIWH)	28.2	14.4	-13.8	13.7	-14.5	17.4	-10.8
34	Mohawk Canyon (MOHAWK)	25.5	21.6	-3.9	23.4	-2.1	20.5	-5.0
35	Mohawk Canyon (MOHCAN)	30.2	19.0	-11.2	20.3	-9.9	17.8	-12.4
36	Mount Sinyala (MTSINY)	45.6	12.2	-33.4	12.1	-33.5	11.3	-34.3
37	National Canyon (NATCAN)	26.0	18.2	-7.8	19.0	-7.0	16.9	-9.1
38	Jackson Canyon (JCKCAN/NONAME)	38.5	24.3	-14.2	23.9	-14.6	25.2	-13.3
39	Parashant Wash (PARWAS)	34.4	34.6	0.2	29.4	-5.0	34.1	-0.3
40	Pumpkin Springs (PMPKIN)	18.8	20.3	1.5	19.3	0.5	18.8	0.0
41	Prospect Canyon (PROCAN)	42.4	19.8	-22.6	22.5	-19.9	18.7	23.7
42	Prospect Canyon (PRSPCT)	30.8	24.9	-5.9	29.5	-1.3	24.0	-6.8
43	Peach Spring Canyon North (PSCNNO)	27.0	11.9	-15.1	11.0	-16.0	37.4	10.4
44	Peach Spring Canyon South (PSCNSO)	7.9	7.7	-0.2	7.0	-0.9	15.9	8.0
45	Quartermaster Point (QMPNT)	39.4	34.8	-4.6	34.4	-5.0	34.4	-5.0
46	The Ranch (RANCH)	31.8	37.8	6.0	37.4	5.6	37.4	5.6
47	Spencer/Meriwhitica Canyons (SCMCIG)	27.8	13.4	-14.4	12.6	-15.2	29.3	1.5
48	South Supai Canyon (SOSUPC)	30.9	32.9	2.0	34.0	3.1	31.7	0.8
49	Spencer Canyon (SPENCA)	29.4	14.7	-14.7	14.0	-15.4	20.8	-8.6
50	Supai Village (SUPVIL)	31.7	14.5	-17.2	14.4	-17.3	13.6	-18.1
51	Three Springs Rapids (THRSPR)	17.2	18.7	1.5	17.7	0.5	19.4	2.2
52	Whitmore Rapids (WHTRAP)	38.7	24.1	-14.6	33.2	-5.5	23.2	-15.5
53	96 Mile Camp (96MILE)	40.7	36.1	-4.6	35.8	-4.9	35.8	-4.9

Table A.3

Comparison of L_{Aeq12h} at Representative Locations in GCNP
North of Colorado River, East of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	36.5	27.2	-9.3	26.9	-9.6	26.9	-9.6
55	Bright Angel Point (BRTANG)	25.1	23.3	-1.8	23.0	-2.1	22.9	-2.2
56	Cape Royal (CAPROY)	23.2	26.5	3.3	26.2	3.0	26.2	3.0
57	Cliff Dwellers Lodge (CLDWEL)	15.2	19.7	4.5	19.4	4.2	19.4	4.2
58	Marble Canyon Dam Site (MARBDM)	21.1	17.0	-4.1	16.6	-4.5	16.6	-4.5
59	Nankoweap Mesa (NANMES)	41.2	25.0	-16.2	24.4	-16.8	24.4	-16.8
60	North Canyon (NOCANY)	29.7	22.1	-7.6	21.8	-7.9	21.8	-7.9
61	Point Imperial (PTIMPL)	34.8	24.1	-10.7	23.6	-11.2	23.6	-11.2
62	Saddle Mountain (SADMTN)	28.3	37.0	8.7	36.6	8.3	36.6	8.3
63	South Canyon (SOCAN)	25.8	16.8	-9.0	16.5	-9.3	16.5	-9.3
64	Temple Butte (TEMBUT)	37.5	29.4	-8.1	28.8	-8.7	28.8	-8.7

Table A.4

Comparison of L_{Aeq12h} at Representative Locations in GCNP
South of Colorado River, East of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	27.6	28.4	0.8	28.1	0.5	28.0	0.4
66	Lipan Point (LIPAN)	30.2	35.6	5.4	35.3	5.1	35.3	5.1
67	Little Colorado (LITCOL)	24.8	16.9	-7.9	16.5	-8.3	16.5	-8.3
68	Little Colorado River (LTCORV)	36.8	24.7	-12.1	23.9	-12.9	23.9	-12.9
69	Nankoweap at river (NANRIV)	35.8	21.2	-14.6	20.7	-15.1	20.7	-15.1
70	Ten X Meadow (TENMED)	35.8	43.1	7.3	42.9	7.1	42.9	7.1
71	Zuni Alpha (ZUNALF)	34.6	38.5	3.9	38.2	3.6	38.2	3.6
72	Zuni Charlie (ZUNCHR)	27.6	23.5	-4.1	23.1	-4.5	23.1	-4.5

Table A.5

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	37.8	31.8	-6.0	31.0	-6.8	31.7	-6.1
2	Andrus Canyon (ANDRUS)	24.8	18.4	-6.4	26.3	1.5	17.9	-6.9
3	Bass Camp (BASCMP)	21.7	21.7	0.0	21.8	0.1	21.7	0.0
4	Bat Cave (BATCAV)	39.7	41.0	1.3	40.9	1.2	40.9	1.2
5	Burnt Springs Canyon (BRNTSP)	39.8	41.6	1.8	41.6	1.8	41.7	1.9
6	Castle Peak (CASTLE)	31.3	23.4	-7.9	42.9	11.6	23.2	-8.1
7	Kanab Point (KANAPT)	17.6	9.5	-8.1	9.6	-8.0	9.1	-8.5
8	Kelly Point (KELLPT)	16.4	14.8	-1.6	14.2	-2.2	25.3	8.9
9	Mt. Dellenbaugh (MTDELL)	43.0	41.7	-1.3	26.4	-16.6	41.7	-1.3
10	Point Sublime (PTSUBL)	31.2	31.0	-0.2	31.0	-0.2	31.0	-0.2
11	Sanup (SANUP)	38.8	38.6	-0.2	32.7	-6.1	39.2	0.4
12	Separation Canyon at Colorado River (SCCORV)	27.3	16.0	-11.3	15.6	-11.7	34.1	6.8
13	Separation Canyon (SEPARC)	25.5	15.6	-9.9	15.2	-10.3	32.2	6.7
14	Shivwitz Fire Camp (SHWZFC)	38.8	38.0	-0.8	27.4	-11.4	38.0	-0.8
15	Stone Creek (STONCK)	29.0	14.2	-14.8	14.3	-14.7	14.1	-14.9
16	Suicide Point (SUIPNT)	29.5	38.6	9.1	38.5	9.0	23.0	-6.5
17	Toroweap Overlook (TOROWP)	32.8	15.9	-16.9	17.7	-15.1	15.0	-17.8
18	Tower of Ra (TOWER)	46.2	41.7	-4.5	41.7	-4.5	41.7	-4.5
19	Twin Point (TWINPT)	32.8	34.2	1.4	34.1	1.3	28.4	-4.4
20	Upper Deer Creek (UPDRCK)	17.6	12.0	-5.6	12.0	-5.6	11.8	-5.8
21	West End (WESEND)	37.6	34.6	-3.0	34.6	-3.0	35.2	-2.4

Table A.6

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	32.6	14.8	-17.8	15.3	-17.3	14.0	-18.6
23	Diamond Creek (DIACRK)	26.7	12.4	-14.3	11.8	-14.9	32.7	6.0
24	The Dome (DOME)	35	14.5	-20.5	15.1	-19.9	13.6	-21.4
25	Granite Gorge (GRAGOR)	42.4	40.1	-2.3	40.0	-2.4	38.2	-4.2
26	Grand Canyon West (GCWEST)	40.5	32.5	-8.0	32.5	-8.0	31.3	-9.2
27	Granite Park (GRNTPK)	29.4	29.4	0.0	29.1	-0.3	20.9	-8.5
28	Gus Plateau (GUSPLT)	29.0	42.6	13.6	42.5	13.5	24.9	-4.1
29	Havasu Point (HAVAPT)	28.8	11.8	-17.0	12.1	-16.7	11.3	-17.5
30	Havatagvitch Canyon (HAVCAN)	40.8	18.9	-21.9	19.2	-21.6	18.3	-22.5
31	Hermit Basin (HBASIN)	40.1	33.7	-6.4	33.7	-6.4	33.6	-6.5
32	Horse Flat Canyon (HFCAN)	27.3	22.2	-5.1	22.2	-5.1	22.8	-4.5
33	Meriwhitca (MERIWH)	28.5	14.1	-14.4	13.9	-14.6	17.5	-11.0
34	Mohawk Canyon (MOHAWK)	25.8	21.3	-4.5	23.4	-2.4	20.5	-5.3
35	Mohawk Canyon (MOHCAN)	30.5	18.7	-11.8	20.3	-10.2	17.8	-12.7
36	Mount Sinyala (MTSINY)	45.9	11.8	-34.1	12.1	-33.8	11.3	-34.6
37	National Canyon (NATCAN)	26.2	17.8	-8.4	19.0	-7.2	16.9	-9.3
38	Jackson Canyon (JCKCAN/NONAME)	38.8	24.0	-14.8	23.9	-14.9	25.2	-13.6
39	Parashant Wash (PARWAS)	34.7	34.3	-0.4	29.4	-5.3	34.1	-0.6
40	Pumpkin Springs (PMPKIN)	19.1	20.0	0.9	19.3	0.2	18.8	-0.3
41	Prospect Canyon (PROCAN)	42.6	19.5	-23.1	22.5	-20.1	18.7	-23.9
42	Prospect Canyon (PRSPCT)	31.1	24.6	-6.5	29.5	-1.6	24.0	-7.1
43	Peach Spring Canyon North (PSCNNO)	27.3	11.6	-15.7	11.0	-16.3	37.4	10.1
44	Peach Spring Canyon South (PSCNSO)	8.2	7.4	-0.8	7.0	-1.2	15.9	7.7
45	Quartermaster Point (QMPNT)	39.7	34.6	-5.1	34.6	-5.1	34.6	-5.1
46	The Ranch (RANCH)	32	37.4	5.4	37.4	5.4	37.4	5.4
47	Spencer/Meriwhitica Canyons (SCMCIG)	28.1	13.1	-15.0	12.7	-15.4	29.3	1.2
48	South Supai Canyon (SOSUPC)	31.2	32.6	1.4	34.0	2.8	31.7	0.5
49	Spencer Canyon (SPENCA)	29.7	14.4	-15.3	14.1	-15.6	20.8	-8.9
50	Supai Village (SUPVIL)	31.9	14.2	-17.7	14.4	-17.5	13.6	-18.3
51	Three Springs Rapids (THRSPR)	17.5	18.4	0.9	17.7	0.2	19.4	1.9
52	Whitmore Rapids (WHTRAP)	39	23.8	-15.2	33.2	-5.8	23.2	-15.8
53	96 Mile Camp (96MILE)	41	35.8	-5.2	35.8	-5.2	35.8	-5.2

Table A.7

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	36.8	26.9	-9.9	26.9	-9.9	26.9	-9.9
55	Bright Angel Point (BRTANG)	25.4	23.0	-2.4	23.0	-2.4	22.9	-2.5
56	Cape Royal (CAPROY)	23.4	26.2	2.8	26.2	2.8	26.2	2.8
57	Cliff Dwellers Lodge (CLDWEL)	15.5	19.4	3.9	19.4	3.9	19.4	3.9
58	Marble Canyon Dam Site (MARBDM)	21.4	16.6	-4.8	16.6	-4.8	16.6	-4.8
59	Nankoweap Mesa (NANMES)	41.4	24.4	-17.0	24.4	-17.0	24.4	-17.0
60	North Canyon (NOCANY)	29.9	21.8	-8.1	21.8	-8.1	21.8	-8.1
61	Point Imperial (PTIMPL)	35	23.6	-11.4	23.6	-11.4	23.6	-11.4
62	Saddle Mountain (SADMTN)	28.6	36.6	8.0	36.6	8.0	36.6	8.0
63	South Canyon (SOCAN)	26.1	16.5	-9.6	16.5	-9.6	16.5	-9.6
64	Temple Butte (TEMBUT)	37.8	28.8	-9.0	28.8	-9.0	28.8	-9.0

Table A.8

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	27.9	28.1	0.2	28.0	0.2	28.0	0.1
66	Lipan Point (LIPAN)	30.5	35.3	4.8	35.3	4.8	35.3	4.8
67	Little Colorado (LITCOL)	25.1	16.5	-8.6	16.5	-8.6	16.5	-8.6
68	Little Colorado River (LTCORV)	37.1	23.9	-13.2	23.9	-13.2	23.9	-13.2
69	Nankoweap at river (NANRIV)	36.1	20.7	-15.4	20.7	-15.4	20.7	-15.4
70	Ten X Meadow (TENMED)	36.1	42.9	6.8	42.9	6.8	42.9	6.8
71	Zuni Alpha (ZUNALF)	34.9	38.2	3.3	38.2	3.3	38.2	3.3
72	Zuni Charlie (ZUNCHR)	27.9	23.1	-4.8	23.1	-4.8	23.1	-4.8

Table A.9

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	37.8	32.2	-5.6	31.4	-6.4	32.1	-5.7
2	Andrus Canyon (ANDRUS)	24.8	18.8	-6.0	26.7	1.9	18.3	-6.5
3	Bass Camp (BASCMP)	21.7	22.1	0.4	22.1	0.4	22.0	0.3
4	Bat Cave (BATCAV)	39.7	41.2	1.5	41.2	1.5	41.2	1.5
5	Burnt Springs Canyon (BRNTSP)	39.8	41.9	2.1	41.9	2.1	42.0	2.2
6	Castle Peak (CASTLE)	31.3	23.7	-7.6	43.3	12.0	23.5	-7.8
7	Kanab Point (KANAPT)	17.6	9.8	-7.8	9.9	-7.7	9.5	-8.1
8	Kelly Point (KELLPT)	16.4	15.1	-1.3	14.5	-1.9	25.6	9.2
9	Mt. Dellenbaugh (MTDELL)	43.0	42.1	-0.9	26.7	-16.3	42.0	-1.0
10	Point Sublime (PTSUBL)	31.2	31.3	0.1	31.3	0.1	31.3	0.1
11	Sanup (SANUP)	38.8	39.0	0.2	33.0	-5.8	39.5	0.7
12	Separation Canyon at Colorado River (SCCORV)	27.3	16.3	-11.0	15.9	-11.4	34.4	7.1
13	Separation Canyon (SEPARC)	25.5	15.9	-9.6	15.5	-10.0	32.5	7.0
14	Shivwitz Fire Camp (SHWZFC)	38.8	38.4	-0.4	27.8	-11.0	38.3	-0.5
15	Stone Creek (STONCK)	29.0	14.6	-14.4	14.6	-14.4	14.4	-14.6
16	Suicide Point (SUIPNT)	29.5	38.9	9.4	38.8	9.3	23.3	-6.2
17	Toroweap Overlook (TOROWP)	32.8	16.2	-16.6	18.0	-14.8	15.3	-17.5
18	Tower of Ra (TOWER)	46.2	42.0	-4.2	42.0	-4.2	42.0	-4.2
19	Twin Point (TWINPT)	32.8	34.4	1.6	34.4	1.6	28.7	-4.1
20	Upper Deer Creek (UPDRCK)	17.6	12.3	-5.3	12.3	-5.3	12.1	-5.5
21	West End (WESEND)	37.6	34.8	-2.8	34.7	-2.9	35.4	-2.2

Table A.10

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	32.6	15.1	-17.5	15.6	-17.0	14.3	-18.3
23	Diamond Creek (DIACRK)	26.7	12.7	-14.0	12.1	-14.6	33.0	6.3
24	The Dome (DOME)	35.0	14.8	-20.2	15.4	-19.6	14.0	-21.0
25	Granite Gorge (GRAGOR)	42.4	40.3	-2.1	40.3	-2.1	38.4	-4.0
26	Grand Canyon West (GCWEST)	40.5	32.8	-7.7	32.7	-7.8	31.5	-9.0
27	Granite Park (GRNTPK)	29.4	29.7	0.3	29.4	0.0	21.3	-8.1
28	Gus Plateau (GUSPLT)	29.4	42.8	13.8	42.8	13.8	25.2	-3.8
29	Havasu Point (HAVAPT)	28.8	12.2	-16.6	12.5	-16.3	11.6	-17.2
30	Havatagvitch Canyon (HAVCAN)	40.8	19.2	-21.6	19.5	-21.3	18.6	-22.2
31	Hermit Basin (HBASIN)	40.1	34.0	-6.1	34.0	-6.1	33.9	-6.2
32	Horse Flat Canyon (HFCAN)	27.3	22.5	-4.8	22.4	-4.9	23.0	-4.3
33	Meriwhitca (MERIWH)	28.5	14.4	-14.1	14.2	-14.3	17.7	-10.8
34	Mohawk Canyon (MOHAWK)	25.8	21.6	-4.2	23.7	-2.1	20.9	-4.9
35	Mohawk Canyon (MOHCAN)	30.5	19.0	-11.5	20.6	-9.9	18.2	-12.3
36	Mount Sinyala (MTSINY)	45.9	12.2	-33.7	12.4	-33.5	11.7	-34.2
37	National Canyon (NATCAN)	26.2	18.2	-8.0	19.3	-6.9	17.3	-8.9
38	Jackson Canyon (JCKCAN/NONAME)	38.8	24.3	-14.5	24.2	-14.6	25.5	-13.3
39	Parashant Wash (PARWAS)	34.7	34.6	-0.1	29.7	-5.0	34.4	-0.3
40	Pumpkin Springs (PMPKIN)	19.1	20.3	1.2	19.6	0.5	19.1	0.0
41	Prospect Canyon (PROCAN)	42.6	19.8	-22.8	22.8	-19.8	19.0	-23.6
42	Prospect Canyon (PRSPCT)	31.1	24.9	-6.2	29.8	-1.3	24.4	-6.7
43	Peach Spring Canyon North (PSCNNO)	27.3	11.9	-15.4	11.3	-16.0	37.7	10.4
44	Peach Spring Canyon South (PSCNSO)	8.2	7.7	-0.5	7.3	-0.9	16.2	8.0
45	Quartermaster Point (QMPNT)	39.7	34.8	-4.9	34.8	-4.9	34.8	-4.9
46	The Ranch (RANCH)	32.0	37.8	5.8	37.8	5.8	37.7	5.7
47	Spencer/Meriwhitica Canyons (SCMCIG)	28.1	13.4	-14.7	13.0	-15.1	29.6	1.5
48	South Supai Canyon (SOSUPC)	31.2	32.9	1.7	34.3	3.1	32.1	0.9
49	Spencer Canyon (SPENCA)	29.7	14.7	-15.0	14.4	-15.3	21.1	-8.6
50	Supai Village (SUPVIL)	31.9	14.5	-17.4	14.8	-17.1	13.9	-18.0
51	Three Springs Rapids (THRSPR)	17.5	18.7	1.2	18.0	0.5	19.7	2.2
52	Whitmore Rapids (WHTRAP)	39.0	24.1	-14.9	33.6	-5.4	23.6	-15.4
53	96 Mile Camp (96MILE)	41.0	36.1	-4.9	36.1	-4.9	36.1	-4.9

Table A.11

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2000

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	36.8	27.2	-9.6	27.2	-9.6	27.2	-9.6
55	Bright Angel Point (BRTANG)	25.4	23.3	-2.1	23.3	-2.1	23.3	-2.1
56	Cape Royal (CAPROY)	23.4	26.5	3.1	26.5	3.1	26.5	3.1
57	Cliff Dwellers Lodge (CLDWEL)	15.5	19.7	4.2	19.7	4.2	19.7	4.2
58	Marble Canyon Dam Site (MARBDM)	21.4	17.0	-4.4	17.0	-4.4	17.0	-4.4
59	Nankoweap Mesa (NANMES)	41.4	25.0	-16.4	25.0	-16.4	25.0	-16.4
60	North Canyon (NOCANY)	29.9	22.1	-7.8	22.1	-7.8	22.1	-7.8
61	Point Imperial (PTIMPL)	35.0	24.1	-10.9	24.1	-10.9	24.1	-10.9
62	Saddle Mountain (SADMTN)	28.6	37.0	8.4	37.0	8.4	37.0	8.4
63	South Canyon (SOCAN)	26.1	16.8	-9.3	16.8	-9.3	16.8	-9.3
64	Temple Butte (TEMBUT)	37.8	29.4	-8.4	29.4	-8.4	29.4	-8.4

Table A.12

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2000

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	27.9	28.4	0.5	28.4	0.5	28.3	0.4
66	Lipan Point (LIPAN)	30.5	35.6	5.1	35.7	5.2	35.6	5.1
67	Little Colorado (LITCOL)	25.1	16.9	-8.2	17.0	-8.1	16.9	-8.2
68	Little Colorado River (LTCORV)	37.1	24.7	-12.4	24.7	-12.4	24.7	.12.4
69	Nankoweap at river (NANRIV)	36.1	21.2	-14.9	21.2	-14.9	21.2	-14.9
70	Ten X Meadow (TENMED)	36.1	43.1	7.0	43.1	7.0	43.1	7.0
71	Zuni Alpha (ZUNALF)	34.9	38.5	3.6	38.5	3.6	38.5	3.6
72	Zuni Charlie (ZUNCHR)	27.9	23.5	-4.4	23.5	-4.4	23.5	-4.4

Table A.13

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	38.2	31.8	-6.4	31.0	-7.2	31.7	-6.5
2	Andrus Canyon (ANDRUS)	25.2	18.5	-6.7	26.4	1.2	17.9	-7.3
3	Bass Camp (BASCMP)	22.1	21.7	-0.4	21.8	-0.3	21.7	-0.4
4	Bat Cave (BATCAV)	40.1	41.0	0.9	40.9	0.8	40.9	0.8
5	Burnt Springs Canyon (BRNTSP)	40.2	41.7	1.5	41.7	1.5	41.8	1.6
6	Castle Peak (CASTLE)	31.7	23.4	-8.3	42.9	11.2	23.2	-8.5
7	Kanab Point (KANAPT)	18.0	9.5	-8.5	9.6	-8.4	9.1	-8.9
8	Kelly Point (KELLPT)	16.8	14.8	-2.0	14.2	-2.6	25.3	8.5
9	Mt. Dellenbaugh (MTDELL)	43.5	41.7	-1.8	26.4	-17.1	41.7	-1.8
10	Point Sublime (PTSUBL)	31.7	31.0	-0.7	31.0	-0.7	31.0	-0.7
11	Sanup (SANUP)	39.2	38.6	-0.6	32.8	-6.4	39.2	0.0
12	Separation Canyon at Colorado River (SCCORV)	27.7	16.0	-11.7	15.6	-12.1	34.1	6.4
13	Separation Canyon (SEPARC)	25.9	15.6	-10.3	15.2	-10.7	32.2	6.3
14	Shivwitz Fire Camp (SHWZFC)	39.2	38.0	-1.2	27.4	-11.8	38.0	-1.2
15	Stone Creek (STONCK)	29.4	14.2	-15.2	14.3	-15.1	14.1	-15.3
16	Suicide Point (SUIPNT)	29.9	38.6	8.7	38.5	8.6	23.0	-6.9
17	Toroweap Overlook (TOROWP)	33.2	15.9	-17.3	17.7	-15.5	15.0	-18.2
18	Tower of Ra (TOWER)	46.6	41.7	-4.9	41.7	-4.9	41.7	-4.9
19	Twin Point (TWINPT)	33.2	34.2	1.0	24.1	0.9	28.4	-4.8
20	Upper Deer Creek (UPDRCK)	18.1	12.0	-6.1	12.0	-6.1	11.8	-6.3
21	West End (WESEND)	38.0	34.7	-3.3	34.7	-3.3	35.3	-2.7

Table A.14

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	33	14.8	-18.2	15.3	-17.7	14.0	-19.0
23	Diamond Creek (DIACRK)	27.1	12.4	-14.7	11.8	-15.3	32.7	5.6
24	The Dome (DOME)	35.4	14.5	-20.9	15.1	-20.3	13.6	-21.8
25	Granite Gorge (GRAGOR)	42.8	40.2	-2.6	40.1	-2.7	38.3	-4.5
26	Grand Canyon West (GCWEST)	40.9	32.6	-8.3	32.6	-8.3	31.3	-9.6
27	Granite Park (GRNTPK)	29.8	29.4	-0.4	29.1	-0.7	20.9	-8.9
28	Gus Plateau (GUSPLT)	29.4	42.6	13.2	42.5	13.1	24.9	-4.5
29	Havasu Point (HAVAPT)	29.2	11.8	-17.4	12.1	-17.1	11.3	-17.9
30	Havatagvitch Canyon (HAVCAN)	41.2	18.9	-22.3	19.2	-22.0	18.3	-22.9
31	Hermit Basin (HBASIN)	40.5	33.7	-6.8	33.7	-6.8	33.6	-6.9
32	Horse Flat Canyon (HFCAN)	27.7	22.3	-5.4	22.2	-5.5	22.8	-4.9
33	Meriwhitca (MERIWH)	29	14.2	-14.8	13.9	-15.1	17.5	-11.5
34	Mohawk Canyon (MOHAWK)	26.2	21.3	-4.9	23.4	-2.8	20.5	-5.7
35	Mohawk Canyon (MOHCAN)	30.9	18.7	-12.2	20.3	-10.6	17.8	-13.1
36	Mount Sinyala (MTSINY)	46.3	11.8	-34.5	12.1	-34.2	11.3	-35.0
37	National Canyon (NATCAN)	26.7	17.8	-8.9	19.0	-7.7	16.9	-9.8
38	Jackson Canyon (JCKCAN/NONAME)	39.3	24.0	-15.3	24.0	-15.3	25.2	-14.1
39	Parashant Wash (PARWAS)	35.1	34.3	-0.8	29.4	-5.7	34.1	-1.0
40	Pumpkin Springs (PMPKIN)	19.5	20.0	0.5	19.3	-0.2	18.8	-0.7
41	Prospect Canyon (PROCAN)	43.1	19.5	-23.6	22.5	-20.6	18.7	-24.4
42	Prospect Canyon (PRSPCT)	31.5	24.6	-6.9	29.5	-2.0	24.0	-7.5
43	Peach Spring Canyon North (PSCNNO)	27.7	11.6	-16.1	11.0	-16.7	37.4	9.7
44	Peach Spring Canyon South (PSCNSO)	8.6	7.4	-1.2	7.1	-1.5	15.9	7.3
45	Quartermaster Point (QMPNT)	40.1	34.6	-5.7	34.6	-5.7	34.6	-5.7
46	The Ranch (RANCH)	32.5	37.4	4.9	37.4	4.9	37.4	4.9
47	Spencer/Meriwhitica Canyons (SCMCIG)	28.5	13.2	-15.3	12.8	-15.7	29.3	0.8
48	South Supai Canyon (SOSUPC)	31.6	32.6	1.0	34.0	2.4	31.7	0.1
49	Spencer Canyon (SPENCA)	30.1	14.4	-15.7	14.2	-15.9	20.8	-9.3
50	Supai Village (SUPVIL)	32.4	14.2	-18.2	14.4	-18.0	13.6	-18.8
51	Three Springs Rapids (THRSPR)	17.9	18.4	0.5	17.7	-0.2	19.4	1.5
52	Whitmore Rapids (WHTRAP)	39.4	23.8	-15.6	33.2	-6.2	23.2	-16.2
53	96 Mile Camp (96MILE)	41.4	35.8	-5.6	35.8	-5.6	35.8	-5.6

Table A.15

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	37.2	26.9	-10.3	26.9	-10.3	26.9	-10.3
55	Bright Angel Point (BRTANG)	25.9	23.0	-2.9	23.0	-2.9	22.9	-3.0
56	Cape Royal (CAPROY)	23.9	26.2	2.3	26.2	2.3	26.2	2.3
57	Cliff Dwellers Lodge (CLDWEL)	15.9	19.4	3.5	19.4	3.5	19.4	3.5
58	Marble Canyon Dam Site (MARBDM)	21.8	16.6	-5.2	16.6	-5.2	16.6	-5.2
59	Nankoweap Mesa (NANMES)	41.9	24.4	-17.5	24.4	-17.5	24.4	-17.5
60	North Canyon (NOCANY)	30.4	21.8	-8.6	21.8	-8.6	21.8	-8.6
61	Point Imperial (PTIMPL)	35.5	23.6	-11.9	23.6	-11.9	23.6	-11.9
62	Saddle Mountain (SADMTN)	29	36.6	7.6	36.6	7.6	36.6	7.6
63	South Canyon (SOCAN)	26.5	16.5	-10.0	16.5	-10.0	16.5	-10.0
64	Temple Butte (TEMBUT)	38.2	28.8	-9.4	28.8	-9.4	28.8	-9.4

Table A.16

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	28.3	28.1	-0.2	28.1	-0.2	28.0	-0.3
66	Lipan Point (LIPAN)	30.9	35.3	4.4	35.3	4.4	35.3	4.4
67	Little Colorado (LITCOL)	25.5	16.5	-9.0	16.5	-9.0	16.5	-9.0
68	Little Colorado River (LTCORV)	37.5	23.9	-13.6	23.9	-13.6	23.9	-13.6
69	Nankoweap at river (NANRIV)	36.5	20.7	-15.8	20.7	-15.8	20.7	-15.8
70	Ten X Meadow (TENMED)	36.5	42.9	6.4	42.9	6.4	42.9	6.4
71	Zuni Alpha (ZUNALF)	35.3	38.2	2.9	38.2	2.9	38.2	2.9
72	Zuni Charlie (ZUNCHR)	28.3	23.1	-5.2	23.1	-5.2	23.1	-5.2

Table A.17

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2003

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	38.2	32.6	-5.6	31.8	-6.4	32.5	-5.7
2	Andrus Canyon (ANDRUS)	25.2	19.2	-6.0	27.1	1.9	18.7	-6.5
3	Bass Camp (BASCMP)	22.1	22.5	0.4	22.5	0.4	22.4	0.3
4	Bat Cave (BATCAV)	40.1	41.7	1.6	41.6	1.5	41.6	1.5
5	Burnt Springs Canyon (BRNTSP)	40.2	42.4	2.2	42.4	2.2	42.5	2.3
6	Castle Peak (CASTLE)	31.7	24.1	-7.6	43.7	12.0	23.9	-7.8
7	Kanab Point (KANAPT)	18.0	10.2	-7.8	10.3	-7.7	9.9	-8.1
8	Kelly Point (KELLPT)	16.8	15.5	-1.3	14.9	-1.9	26.0	9.2
9	Mt. Dellenbaugh (MTDELL)	43.5	42.5	-1.0	27.2	-16.3	42.4	-1.1
10	Point Sublime (PTSUBL)	31.7	31.8	0.1	31.8	0.1	31.8	0.1
11	Sanup (SANUP)	39.2	39.4	0.2	33.5	-5.7	39.9	0.7
12	Separation Canyon at Colorado River (SCCORV)	27.7	16.7	-11.0	16.3	-11.4	34.8	7.1
13	Separation Canyon (SEPARC)	25.9	16.3	-9.6	15.9	-10.0	32.9	7.0
14	Shivwitz Fire Camp (SHWZFC)	39.2	38.8	-0.4	28.2	-11.0	38.7	-0.5
15	Stone Creek (STONCK)	29.4	15.0	-14.4	15.0	-14.4	14.9	-14.5
16	Suicide Point (SUIPNT)	29.9	39.3	9.4	39.2	9.3	23.8	-6.1
17	Toroweap Overlook (TOROWP)	33.2	16.6	-16.6	18.5	-14.7	15.8	-17.4
18	Tower of Ra (TOWER)	46.6	42.4	-4.2	42.4	-4.2	42.4	-4.2
19	Twin Point (TWINPT)	33.2	34.9	1.7	34.8	1.6	29.1	-4.1
20	Upper Deer Creek (UPDRCK)	18.1	12.7	-5.4	12.8	-5.3	12.6	-5.5
21	West End (WESEND)	38.0	35.2	-2.8	35.2	-2.8	35.8	-2.2

Table A.18

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	33.0	15.5	-17.5	16.0	-17.0	14.8	-18.2
23	Diamond Creek (DIACRK)	27.1	13.1	-14.0	12.6	-14.5	33.4	6.3
24	The Dome (DOME)	35.4	15.2	-20.2	15.8	-19.6	14.4	-21.0
25	Granite Gorge (GRAGOR)	42.8	40.7	-2.1	40.7	-2.1	38.8	-4.0
26	Grand Canyon West (GCWEST)	40.9	33.2	-7.7	33.2	-7.7	31.9	-9.0
27	Granite Park (GRNTPK)	29.8	30.1	0.3	29.8	0.0	21.7	-8.1
28	Gus Plateau (GUSPLT)	29.4	43.3	13.9	43.2	13.8	25.7	-3.7
29	Havasu Point (HAVAPT)	29.2	12.6	-16.6	12.9	-16.3	12.0	-17.2
30	Havatagvitch Canyon (HAVCAN)	41.2	19.6	-21.6	19.9	-21.3	19.0	-22.2
31	Hermit Basin (HBASIN)	40.5	34.4	-6.1	34.4	-6.1	34.3	-6.2
32	Horse Flat Canyon (HFCAN)	27.7	23.0	-4.7	22.9	-4.8	23.5	-4.2
33	Meriwhitca (MERIWH)	29.0	14.8	-14.2	14.6	-14.4	18.2	-10.8
34	Mohawk Canyon (MOHAWK)	26.2	22.1	-4.1	24.1	-2.1	21.3	-4.9
35	Mohawk Canyon (MOHCAN)	30.9	19.4	-11.5	21.0	-9.9	18.6	-12.3
36	Mount Sinyala (MTSINY)	46.3	12.6	-33.7	12.8	-33.5	12.1	-34.2
37	National Canyon (NATCAN)	26.7	18.6	-8.1	19.7	-7.0	17.7	-9.0
38	Jackson Canyon (JCKCAN/NONAME)	39.3	24.7	-14.6	24.7	-14.6	25.9	-13.4
39	Parashant Wash (PARWAS)	35.1	35.0	-0.1	30.1	-5.0	34.9	-0.2
40	Pumpkin Springs (PMPKIN)	19.5	20.7	1.2	20.0	0.5	19.5	0.0
41	Prospect Canyon (PROCAN)	43.1	20.2	-22.9	23.2	-19.9	19.5	-23.6
42	Prospect Canyon (PRSPCT)	31.5	25.3	-6.2	30.2	-1.3	24.8	-6.7
43	Peach Spring Canyon North (PSCNNO)	27.7	12.3	-15.4	11.8	-15.9	38.1	10.4
44	Peach Spring Canyon South (PSCNSO)	8.6	8.1	-0.5	7.8	-0.8	16.6	8.0
45	Quartermaster Point (QMPNT)	40.1	35.3	-4.8	35.3	-4.8	35.3	-4.8
46	The Ranch (RANCH)	32.5	38.2	5.7	38.2	5.7	38.2	5.7
47	Spencer/Meriwhitica Canyons (SCMCIG)	28.5	13.9	-14.6	13.4	-15.1	30.0	1.5
48	South Supai Canyon (SOSUPC)	31.6	33.3	1.7	34.7	3.1	32.5	0.9
49	Spencer Canyon (SPENCA)	30.1	15.1	-15.0	14.8	-15.3	21.5	-8.6
50	Supai Village (SUPVIL)	32.4	14.9	-17.5	15.2	-17.2	14.3	-18.1
51	Three Springs Rapids (THRSPR)	17.9	19.1	1.2	18.4	0.5	20.1	2.2
52	Whitmore Rapids (WHTRAP)	39.4	24.5	-14.9	34.0	-5.4	24.0	-15.4
53	96 Mile Camp (96MILE)	41.4	36.5	-4.9	36.5	-4.9	36.5	-4.9

Table A.19

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	37.2	27.6	-9.6	27.6	-9.6	27.6	-9.6
55	Bright Angel Point (BRTANG)	25.9	23.7	-2.2	23.7	-2.2	23.7	-2.2
56	Cape Royal (CAPROY)	23.9	26.9	3.0	26.9	3.0	26.9	3.0
57	Cliff Dwellers Lodge (CLDWEL)	15.9	20.1	4.2	20.1	4.2	20.1	4.2
58	Marble Canyon Dam Site (MARBDM)	21.8	17.4	-4.4	17.4	-4.4	17.4	-4.4
59	Nankoweap Mesa (NANMES)	41.9	25.4	-16.5	25.4	-16.5	25.4	-16.5
60	North Canyon (NOCANY)	30.4	22.5	-7.9	22.5	-7.9	22.5	-7.9
61	Point Imperial (PTIMPL)	35.5	24.5	-11.0	24.5	-11.0	24.5	-11.0
62	Saddle Mountain (SADMTN)	29.0	37.4	8.4	37.4	8.4	37.4	8.4
63	South Canyon (SOCAN)	26.5	17.2	-9.3	17.2	-9.3	17.2	-9.3
64	Temple Butte (TEMBUT)	38.2	29.8	-8.4	29.8	-8.4	29.8	-8.4

Table A.20

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	28.3	28.8	0.5	28.8	0.5	28.8	0.5
66	Lipan Point (LIPAN)	30.9	36.1	5.2	36.1	5.2	36.1	5.2
67	Little Colorado (LITCOL)	25.5	17.4	-8.1	17.4	-8.1	17.4	-8.1
68	Little Colorado River (LTCORV)	37.5	25.1	-12.4	25.1	-12.4	25.1	-12.4
69	Nankoweap at river (NANRIV)	36.5	21.7	-14.8	21.7	-14.8	21.7	-14.8
70	Ten X Meadow (TENMED)	36.5	43.5	7.0	43.5	7.0	43.5	7.0
71	Zuni Alpha (ZUNALF)	35.3	38.9	3.6	38.9	3.6	38.9	3.6
72	Zuni Charlie (ZUNCHR)	28.3	23.9	-4.4	23.9	-4.4	23.9	-4.4

Table A.21

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2008

		No Action (Alt.1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	38.9	31.8	-8.1	31.0	-7.69	31.7	-7.2
2	Andrus Canyon (ANDRUS)	25.9	18.5	-7.4	26.4	0.5	17.9	-8.0
3	Bass Camp (BASCMP)	22.8	21.8	-1.0	21.8	-1.0	21.7	-1.1
4	Bat Cave (BATCAV)	40.8	41.0	0.2	41.0	0.2	40.9	0.1
5	Burnt Springs Canyon (BRNTSP)	40.8	41.7	0.9	41.7	0.9	41.8	1.0
6	Castle Peak (CASTLE)	32.4	23.4	-9.0	42.9	10.5	23.2	-9.2
7	Kanab Point (KANAPT)	18.7	9.5	-9.2	9.6	-9.1	9.1	-9.6
8	Kelly Point (KELLPT)	17.5	14.8	-2.7	14.2	-3.3	25.3	7.8
9	Mt. Dellenbaugh (MTDELL)	44.2	41.7	-2.5	26.4	-17.8	41.7	-2.5
10	Point Sublime (PTSUBL)	32.4	31.0	-1.4	31.0	-1.4	31.0	-1.4
11	Sanup (SANUP)	39.9	38.7	-1.2	32.8	-7.1	39.2	-0.7
12	Separation Canyon at Colorado River (SCCORV)	28.4	16.0	-12.4	15.6	-12.8	34.1	5.7
13	Separation Canyon (SEPARC)	26.6	15.7	-10.9	15.3	-10.5	32.2	5.6
14	Shivwitz Fire Camp (SHWZFC)	39.9	38.0	-1.9	27.4	-13.1	38.0	-1.9
15	Stone Creek (STONCK)	30.1	14.2	-15.9	14.3	-15.8	14.1	-16.0
16	Suicide Point (SUIPNT)	30.6	38.6	8.0	38.5	7.9	23.0	-7.6
17	Toroweap Overlook (TOROWP)	33.9	15.9	-18.0	17.7	-16.2	15.0	-18.9
18	Tower of Ra (TOWER)	47.3	41.7	-5.6	41.7	-5.6	41.7	-5.6
19	Twin Point (TWINPT)	33.9	34.2	0.3	34.1	0.2	28.4	-5.5
20	Upper Deer Creek (UPDRCK)	18.8	12.0	-6.8	12.0	-6.8	11.8	-7.0
21	West End (WESEND)	38.7	35.1	-3.6	35.0	-3.7	35.6	-3.1

Table A.22

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	33.7	14.8	-18.9	15.3	-18.4	14.0	-19.7
23	Diamond Creek (DIACRK)	27.8	12.4	-15.4	11.9	-15.9	32.7	4.9
24	The Dome (DOME)	36.1	14.5	-21.6	15.1	-21.0	13.6	-22.5
25	Granite Gorge (GRAGOR)	43.5	40.3	-3.2	40.3	-3.2	38.6	-4.9
26	Grand Canyon West (GCWEST)	41.4	32.7	-8.7	32.7	-8.7	31.5	-9.9
27	Granite Park (GRNTPK)	30.5	29.4	-1.1	29.1	-1.4	20.9	-9.6
28	Gus Plateau (GUSPLT)	30.1	42.6	12.5	42.5	12.4	24.9	-5.2
29	Havasu Point (HAVAPT)	29.9	11.8	-18.1	12.1	-17.8	11.3	-18.6
30	Havatagvitch Canyon (HAVCAN)	41.9	18.9	-23.0	19.2	-22.7	18.3	-23.6
31	Hermit Basin (HBASIN)	41.2	33.7	-7.5	33.7	-7.5	33.6	-7.6
32	Horse Flat Canyon (HFCAN)	28.4	22.4	-6.0	22.3	-6.1	22.9	-5.5
33	Meriwhitca (MERIWH)	29.7	14.2	-15.5	14.0	-15.7	17.5	-12.2
34	Mohawk Canyon (MOHAWK)	26.9	21.3	-5.6	23.4	-3.5	20.5	-6.4
35	Mohawk Canyon (MOHCAN)	31.6	18.7	-12.9	20.3	-11.3	17.8	-13.8
36	Mount Sinyala (MTSINY)	47.0	11.8	-35.2	12.1	-34.9	11.3	-35.7
37	National Canyon (NATCAN)	27.4	17.8	-9.6	19.0	-8.4	16.9	-10.5
38	Jackson Canyon (JCKCAN/NONAME)	40.0	24.1	-15.9	24.0	-16.0	25.3	-14.7
39	Parashant Wash (PARWAS)	35.8	34.3	-1.5	29.4	-6.4	34.1	-1.7
40	Pumpkin Springs (PMPKIN)	20.2	20.0	-0.2	19.3	-0.9	18.8	-1.4
41	Prospect Canyon (PROCAN)	43.8	19.5	-24.3	22.5	-21.3	18.7	-25.1
42	Prospect Canyon (PRSPCT)	32.2	24.6	-7.6	29.5	-2.7	24.0	-8.2
43	Peach Spring Canyon North (PSCNNO)	28.4	11.6	-16.8	11.1	-17.3	37.4	9.0
44	Peach Spring Canyon South (PSCNSO)	9.3	7.4	-1.9	7.1	-2.2	15.9	6.6
45	Quartermaster Point (QMPNT)	40.8	34.7	-6.1	34.7	-6.1	34.7	-6.1
46	The Ranch (RANCH)	33.2	37.4	4.2	37.4	4.2	37.4	4.2
47	Spencer/Meriwhitica Canyons (SCMCIG)	29.2	13.2	-16.0	12.8	-16.4	29.3	4.2
48	South Supai Canyon (SOSUPC)	32.3	32.6	0.3	34.0	1.7	31.7	-0.6
49	Spencer Canyon (SPENCA)	30.9	14.5	-16.4	14.2	-16.7	20.8	-10.1
50	Supai Village (SUPVIL)	33.1	14.2	-18.9	14.4	-18.7	13.6	-19.5
51	Three Springs Rapids (THRSPR)	18.6	18.4	-0.2	17.7	-0.9	19.4	0.8
52	Whitmore Rapids (WHTRAP)	40.1	23.8	-16.3	33.2	-6.9	23.2	-16.9
53	96 Mile Camp (96MILE)	42.1	35.8	-6.3	35.8	-6.3	35.8	-6.3

Table A.23

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	37.9	26.9	-11.0	26.9	-11.0	26.9	-11.0
55	Bright Angel Point (BRTANG)	26.6	23.0	-3.6	23.0	-3.6	22.9	-3.7
56	Cape Royal (CAPROY)	24.6	26.2	1.6	26.2	1.6	26.2	1.6
57	Cliff Dwellers Lodge (CLDWEL)	16.6	19.4	2.8	19.4	2.8	19.4	2.8
58	Marble Canyon Dam Site (MARBDM)	22.5	16.6	-5.9	16.6	-5.9	16.6	-5.9
59	Nankoweap Mesa (NANMES)	42.6	24.4	-18.2	24.4	-18.2	24.4	-18.2
60	North Canyon (NOCANY)	31.1	21.8	-9.3	21.8	-9.3	21.7	-9.3
61	Point Imperial (PTIMPL)	36.2	23.6	-12.6	23.6	-12.6	23.6	-12.6
62	Saddle Mountain (SADMTN)	29.7	36.6	6.9	36.6	6.9	36.6	6.9
63	South Canyon (SOCAN)	27.2	16.5	-10.7	16.5	-10.7	16.5	-10.7
64	Temple Butte (TEMBUT)	38.9	28.8	-10.1	28.8	-10.1	28.8	-10.1

Table A.24

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	29.0	28.1	-0.9	28.1	-0.9	28.0	-1.0
66	`Lipan Point (LIPAN)	31.6	35.3	3.7	35.3	3.7	35.3	3.7
67	Little Colorado (LITCOL)	26.2	16.5	-9.7	16.5	-9.7	16.5	-9.7
68	Little Colorado River (LTCORV)	38.2	23.9	-14.3	23.9	-14.3	23.9	-14.3
69	Nankoweap at river (NANRIV)	37.2	20.7	-16.5	20.7	-16.5	20.7	-16.5
70	Ten X Meadow (TENMED)	37.2	42.9	5.7	42.9	5.7	42.9	5.7
71	Zuni Alpha (ZUNALF)	36.0	38.2	2.2	38.2	2.2	38.2	2.2
72	Zuni Charlie (ZUNCHR)	29.0	23.1	-5.9	23.1	-5.9	23.1	-5.9

Table A.25

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2008

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
1	NPS Admin Site (ADMIN)	38.9	33.3	-5.6	32.5	-6.4	33.2	-5.7
2	Andrus Canyon (ANDRUS)	25.9	19.9	-6.0	27.8	1.9	19.4	-6.5
3	Bass Camp (BASCMP)	22.8	23.2	0.4	23.2	0.4	23.1	0.3
4	Bat Cave (BATCAV)	40.8	42.4	1.6	42.3	1.5	42.3	1.5
5	Burnt Springs Canyon (BRNTSP)	40.8	43.1	2.3	43.1	2.3	43.2	2.4
6	Castle Peak (CASTLE)	32.4	24.9	-7.5	44.4	12.0	24.6	-7.8
7	Kanab Point (KANAPT)	18.7	10.9	-7.8	11.0	-7.7	10.6	-8.1
8	Kelly Point (KELLPT)	17.5	16.2	-1.3	15.6	-1.9	26.7	9.2
9	Mt. Dellenbaugh (MTDELL)	44.2	43.2	-1.0	27.9	-16.3	43.1	-1.1
10	Point Sublime (PTSUBL)	32.4	32.5	0.1	32.5	0.1	32.5	0.1
11	Sanup (SANUP)	39.9	40.1	0.2	34.2	-5.7	40.6	0.7
12	Separation Canyon at Colorado River (SCCORV)	28.4	17.4	-11.0	17.0	-11.4	35.5	7.1
13	Separation Canyon (SEPARC)	26.6	17.0	-9.6	16.6	-10.0	33.6	7.0
14	Shivwitz Fire Camp (SHWZFC)	39.9	39.5	-0.4	28.9	-11.0	39.4	-0.5
15	Stone Creek (STONCK)	30.1	15.7	-14.4	15.7	-14.4	15.6	-14.5
16	Suicide Point (SUIPNT)	30.6	40.0	9.4	39.9	9.3	24.5	-6.1
17	Toroweap Overlook (TOROWP)	33.9	17.3	-16.6	19.2	-14.7	16.5	-17.4
18	Tower of Ra (TOWER)	47.3	43.1	-4.2	43.1	-4.2	43.1	-4.2
19	Twin Point (TWINPT)	33.9	35.6	1.7	35.5	1.6	29.8	-4.1
20	Upper Deer Creek (UPDRCK)	18.8	13.4	-5.4	13.5	-5.3	13.3	-5.5
21	West End (WESEND)	38.7	35.9	-2.8	35.9	-2.8	36.5	-2.2

Table A.26

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
22	Coyote Canyon (COYCAN)	33.7	16.2	-17.5	16.7	-17.0	15.5	-18.2
23	Diamond Creek (DIACRK)	27.8	13.8	-14.0	13.3	-14.5	34.1	6.3
24	The Dome (DOME)	36.1	15.9	-20.2	16.5	-19.6	15.1	-21.0
25	Granite Gorge (GRAGOR)	43.5	41.4	-2.1	41.4	-2.1	39.5	-4.0
26	Grand Canyon West (GCWEST)	41.4	33.9	-7.5	33.9	-7.5	32.6	-8.8
27	Granite Park (GRNTPK)	30.5	30.9	0.4	30.5	0.0	22.4	-8.1
28	Gus Plateau (GUSPLT)	30.1	44.0	13.9	43.9	13.8	26.4	-3.7
29	Havasu Point (HAVAPT)	29.9	13.3	-16.6	13.6	-16.3	12.7	-17.2
30	Havatagvitch Canyon (HAVCAN)	41.9	20.3	-21.6	20.6	-21.3	19.7	-22.2
31	Hermit Basin (HBASIN)	41.2	35.1	-6.1	35.1	-6.1	35.0	-6.2
32	Horse Flat Canyon (HFCAN)	28.4	23.7	-4.7	23.6	-4.8	24.2	-4.2
33	Meriwhitca (MERIWH)	29.7	15.5	-14.2	15.3	-14.4	18.9	-10.8
34	Mohawk Canyon (MOHAWK)	26.9	22.8	-4.1	24.8	-2.1	22.0	-4.9
35	Mohawk Canyon (MOHCAN)	31.6	20.1	-11.5	21.7	-9.9	19.3	-12.3
36	Mount Sinyala (MTSINY)	47.0	13.3	-33.7	13.5	-33.5	12.8	-34.2
37	National Canyon (NATCAN)	27.4	19.3	-8.1	20.4	-7.0	18.4	-9.0
38	Jackson Canyon (JCKCAN/NONAME)	40.0	25.4	-14.6	25.4	-14.6	26.6	-13.4
39	Parashant Wash (PARWAS)	35.8	35.7	-0.1	30.8	-5.0	35.6	-0.2
40	Pumpkin Springs (PMPKIN)	20.2	21.4	1.2	20.7	0.5	20.2	0.0
41	Prospect Canyon (PROCAN)	43.8	20.9	-22.9	23.9	-19.9	20.2	-23.6
42	Prospect Canyon (PRSPCT)	32.2	26.1	-6.1	30.9	-1.3	25.5	-6.7
43	Peach Spring Canyon North (PSCNNO)	28.4	13.0	-15.4	12.5	-15.9	38.8	10.4
44	Peach Spring Canyon South (PSCNSO)	9.3	8.8	-0.5	8.5	-0.8	17.3	8.0
45	Quartermaster Point (QMPNT)	40.8	36.0	-4.8	36.0	-4.8	36.0	-4.8
46	The Ranch (RANCH)	33.2	38.9	5.7	38.9	5.7	38.9	5.7
47	Spencer/Meriwhitica Canyons (SCMCIG)	29.2	14.6	-14.6	14.2	-15.0	30.7	1.5
48	South Supai Canyon (SOSUPC)	32.3	34.0	1.7	35.5	3.2	33.2	0.9
49	Spencer Canyon (SPENCA)	30.9	15.8	-15.1	15.5	-15.4	22.2	-8.7
50	Supai Village (SUPVIL)	33.1	15.6	-17.5	15.9	-17.2	15.0	-18.1
51	Three Springs Rapids (THRSPR)	18.6	19.8	1.2	19.1	0.5	20.8	2.2
52	Whitmore Rapids (WHTRAP)	40.1	25.3	-14.8	34.7	-5.4	24.7	-15.4
53	96 Mile Camp (96MILE)	42.1	37.2	-4.9	37.2	-4.9	37.2	-4.9

Table A.27

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2008

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
54	The Basin (BASIN)	37.9	28.3	-9.6	28.3	-9.6	28.3	-9.6
55	Bright Angel Point (BRTANG)	26.6	24.4	-2.2	24.4	-2.2	24.4	-2.2
56	Cape Royal (CAPROY)	24.6	27.6	3.0	27.6	3.0	27.6	3.0
57	Cliff Dwellers Lodge (CLDWEL)	16.6	20.8	4.2	20.8	4.2	20.8	4.2
58	Marble Canyon Dam Site (MARBDM)	22.5	18.2	-4.3	18.2	-4.3	18.1	-4.4
59	Nankoweap Mesa (NANMES)	42.6	26.1	-16.5	26.1	-16.5	26.1	-16.5
60	North Canyon (NOCANY)	31.1	23.3	-7.8	23.3	-7.8	23.3	-7.8
61	Point Imperial (PTIMPL)	36.2	25.2	-11.0	25.2	-11.0	25.2	-11.0
62	Saddle Mountain (SADMTN)	29.7	38.1	8.4	38.1	8.4	38.1	8.4
63	South Canyon (SOCAN)	27.2	17.9	-9.3	17.9	-9.3	17.9	-9.3
64	Temple Butte (TEMBUT)	38.9	30.5	-8.4	30.5	-8.4	30.5	-8.4

Table A.28

Comparison of L_{Aeq12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2008

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		L_{Aeq12h}	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference	L_{Aeq12h}	Difference
65	Cedar Ridge (CEDRIG)	29.0	29.5	0.5	29.6	0.6	29.5	0.5
66	`Lipan Point (LIPAN)	31.6	36.8	5.2	36.8	5.2	36.8	5.2
67	Little Colorado (LITCOL)	26.2	18.1	-8.1	18.1	-8.1	18.1	-8.1
68	Little Colorado River (LTCORV)	38.2	25.8	-12.4	25.8	-12.4	25.8	-12.4
69	Nankoweap at river (NANRIV)	37.2	22.4	-14.8	22.4	-14.8	22.4	-14.8
70	Ten X Meadow (TENMED)	37.2	44.2	7.0	44.2	7.0	44.2	7.0
71	Zuni Alpha (ZUNALF)	36.0	39.6	3.6	39.6	3.6	39.6	3.6
72	Zuni Charlie (ZUNCHR)	29.0	24.6	-4.4	24.6	-4.4	24.6	-4.4

Table A.29

Comparison of 25%TA_{12h} at Representative Locations in GCNP North of Colorado River, West of GC Airport 1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	39.8	37.1	-2.7	37.7	-2.1	27.8	-12.0
2	Andrus Canyon (ANDRUS)	26.5	10.6	-15.9	25.2	-1.3	10.6	-15.9
3	Bass Camp (BASCMP)	1.6	1.5	-0.1	1.5	-0.1	1.5	-0.1
4	Bat Cave (BATCAV)	27.1	41.8	14.7	31.7	4.6	42.5	15.4
5	Burnt Springs Canyon (BRNTSP)	11.4	5.7	-5.7	5.7	-5.7	9.9	-1.5
6	Castle Peak (CASTLE)	32.8	21.9	-10.9	27.3	-5.5	21.8	-11.0
7	Kanab Point (KANAPT)	36.7	15.5	-21.2	15.9	-20.8	15.0	-21.7
8	Kelly Point (KELLPT)	1.6	0.0	-1.6	0.0	-1.6	19.9	18.3
9	Mt. Dellenbaugh (MTDELL)	17.6	14.8	-2.8	3.4	-14.2	14.7	-2.9
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	62.0	61.7	-0.3	60.4	-1.6	68.2	6.2
12	Separation Canyon at Colorado River (SCCORV)	1.0	0.0	-1.0	0.0	-1.0	11.4	10.4
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	33.7	33.3	-0.4	31.2	-2.5	24.9	-8.8
15	Stone Creek (STONCK)	0.2	0.0	-0.2	0.0	-0.2	0.0	-0.2
16	Suicide Point (SUIPNT)	23.5	41.9	18.4	22.4	-1.1	32.9	9.4
17	Toroweap Overlook (TOROWP)	82.4	64.6	-17.8	70.7	-11.7	44.2	-38.2
18	Tower of Ra (TOWER)	100.0	98.1	-1.9	98.5	-1.5	96.2	-3.8
19	Twin Point (TWINPT)	28.9	47.5	18.6	32.1	3.2	46.1	17.2
20	Upper Deer Creek (UPDRCK)	51.3	23.1	-28.2	23.3	-28.0	22.7	-28.6
21	West End (WESEND)	8.9	4.8	-4.1	4.8	-4.1	5.6	-3.3

Table A.30

Comparison of 25%TA_{12h} at Representative Locations in GCNP
South of Colorado River, West of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	23.2	0.0	-23.2	0.0	-23.2	0.0	-23.2
23	Diamond Creek (DIACRK)	0.4	0.0	-0.4	0.0	-0.4	6.9	6.5
24	The Dome (DOME)	25.2	0.0	-25.2	0.0	-25.2	0.0	-25.2
25	Granite Gorge (GRAGOR)	42.3	60.5	18.2	55.4	13.1	58.2	15.9
26	Grand Canyon West (GCWEST)	37.9	45.1	7.2	41.4	3.5	44.7	6.8
27	Granite Park (GRNTPK)	1.8	1.3	-0.5	1.3	-0.5	0.0	-1.8
28	Gus Plateau (GUSPLT)	29.9	43.0	13.1	29.7	-0.2	23.7	-6.2
29	Havasu Point (HAVAPT)	9.0	0.0	-9.0	0.0	-9.0	0.0	-9.0
30	Havatagvitch Canyon (HAVCAN)	27.7	2.5	-25.2	5.8	-21.9	2.1	-25.6
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	18.0	6.8	-11.2	6.8	-11.2	14.7	-3.3
33	Meriwhitca (MERIWH)	5.2	2.3	-2.9	2.3	-2.9	6.6	1.4
34	Mohawk Canyon (MOHAWK)	33.8	18.6	-15.2	22.9	-10.9	18.4	-15.4
35	Mohawk Canyon (MOHCAN)	30.6	9.9	-20.7	17.1	-13.5	10.0	-20.6
36	Mount Sinyala (MTSINY)	63.3	24.7	-38.6	29.1	-34.2	23.7	-39.6
37	National Canyon (NATCAN)	23.5	3.3	-20.2	12.0	-11.5	3.3	-20.2
38	Jackson Canyon (JCKCAN/NONAME)	14.0	9.2	-4.8	9.2	-4.8	24.5	-39.6
39	Parashant Wash (PARWAS)	23.9	18.0	-5.9	15.4	-8.5	17.9	-6.0
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	34.7	14.0	-20.7	21.8	-12.9	13.9	-20.8
42	Prospect Canyon (PRSPCT)	33.0	30.7	-2.3	35.6	2.6	23.2	-9.8
43	Peach Spring Canyon North (PSCNNO)	0.5	0.0	-0.5	0.0	-0.5	20.7	20.2
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	7.3	7.1
45	Quartermaster Point (QMPNT)	22.5	29.7	7.2	29.7	7.2	30.6	8.1
46	The Ranch (RANCH)	60.5	81.2	20.7	81.5	21.0	78.7	18.2
47	Spencer/Meriwhitica Canyons (SCMCIG)	3.2	0.3	-2.9	0.3	-2.9	20.5	17.3
48	South Supai Canyon (SOSUPC)	44.3	53.0	8.7	53.5	9.2	45.5	1.2
49	Spencer Canyon (SPENCA)	5.0	2.1	-2.9	2.1	-2.9	17.8	12.8
50	Supai Village (SUPVIL)	28.0	0.0	-28.0	0.0	-28.0	0.0	-28.0
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	9.4	0.0	-9.4	8.8	-0.6	0.0	-9.4
53	96 Mile Camp (96MILE)	41.2	40.8	-0.4	40.8	-0.4	40.6	-0.6

Table A.31

Comparison of 25%TA_{12h} at Representative Locations in GCNP
North of Colorado River, East of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	52.8	35.7	-17.1	35.8	-17.0	35.6	-17.2
55	Bright Angel Point (BRTANG)	4.7	1.9	-2.8	1.9	-2.8	1.9	-2.8
56	Cape Royal (CAPROY)	28.8	31.9	3.1	32.0	3.2	31.8	3.0
57	Cliff Dwellers Lodge (CLDWEL)	1.1	0.8	-0.3	0.8	-0.3	0.8	-0.3
58	Marble Canyon Dam Site (MARBDM)	0.3	0.0	-0.3	0.0	-0.3	0.0	-0.3
59	Nankoweap Mesa (NANMES)	43.8	38.0	-5.8	37.9	-5.9	37.9	-5.9
60	North Canyon (NOCANY)	1.3	1.3	0.0	1.3	0.0	1.3	0.0
61	Point Imperial (PTIMPL)	18.0	12.9	-5.1	13.0	-5.0	12.9	-5.1
62	Saddle Mountain (SADMTN)	5.2	3.6	-1.6	3.6	-1.6	3.6	-1.6
63	South Canyon (SOCAN)	1.9	1.4	-0.5	1.4	-0.5	1.4	-0.5
64	Temple Butte (TEMBUT)	45.5	43.0	-2.5	43.0	-2.5	42.9	-2.6

Table A.32

Comparison of 25%TA_{12h} at Representative Locations in GCNP
South of Colorado River, East of GC Airport
1998

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	80.8	82.2	1.4	82.5	1.7	81.4	0.6
66	Lipan Point (LIPAN)	16.7	21.2	4.5	21.2	4.5	21.1	4.4
67	Little Colorado (LITCOL)	6.0	5.1	-0.9	5.1	-0.9	5.1	-0.9
68	Little Colorado River (LTCORV)	12.6	5.3	-7.3	5.3	-7.3	5.3	-7.3
69	Nankoweap at river (NANRIV)	4.9	0.2	-4.7	0.2	-4.7	0.2	-4.7
70	Ten X Meadow (TENMED)	17.8	19.4	1.6	19.7	1.9	19.2	1.4
71	Zuni Alpha (ZUNALF)	4.5	9.1	4.6	9.1	4.6	9.1	4.6
72	Zuni Charlie (ZUNCHR)	45.2	46.6	1.4	46.7	1.5	46.5	1.3

Table A.33

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	42.5	37.1	-5.4	37.7	-4.8	27.8	-14.7
2	Andrus Canyon (ANDRUS)	28.3	10.6	-17.7	25.2	-3.1	10.6	-17.7
3	Bass Camp (BASCMP)	1.7	1.5	-0.2	1.5	-0.2	1.5	-0.2
4	Bat Cave (BATCAV)	29.0	43.0	14.0	32.9	3.9	43.7	14.7
5	Burnt Springs Canyon (BRNTSP)	12.2	5.8	-6.4	5.8	-6.4	10.0	-2.2
6	Castle Peak (CASTLE)	35.0	21.9	-13.1	27.3	-7.7	21.8	-13.2
7	Kanab Point (KANAPT)	39.2	15.5	-23.7	15.9	-23.3	15.0	-24.2
8	Kelly Point (KELLPT)	1.7	0.0	-1.7	0.0	-1.7	19.9	18.2
9	Mt. Dellenbaugh (MTDELL)	18.8	14.8	-4.0	3.4	-15.4	14.7	-4.1
10	Point Sublime (PTSUBL)	100.0	100	0.0	100	0.0	100	0.0
11	Sanup (SANUP)	66.2	64.4	-1.8	63.1	-3.1	70.9	4.7
12	Separation Canyon at Colorado River (SCCORV)	1.0	0	-1.0	0	-1.0	11.4	10.4
13	Separation Canyon (SEPARC)	0.0	0	0.0	0	0.0	0	0.0
14	Shivwitz Fire Camp (SHWZFC)	36.0	33.3	-2.7	31.2	-4.8	24.9	-11.1
15	Stone Creek (STONCK)	0.2	0	-0.2	0	-0.2	0	-0.2
16	Suicide Point (SUIPNT)	25.1	41.9	16.8	22.4	-2.7	32.9	7.8
17	Toroweap Overlook (TOROWP)	87.9	64.6	-23.3	70.7	-17.2	44.2	-43.7
18	Tower of Ra (TOWER)	100.0	98.1	-1.9	98.5	-1.5	96.2	-3.8
19	Twin Point (TWINPT)	30.8	47.6	16.8	32.2	1.4	46.2	15.4
20	Upper Deer Creek (UPDRCK)	54.8	23.1	-31.7	23.3	-31.5	22.7	-32.1
21	West End (WESEND)	9.5	5.7	-3.8	5.7	-3.8	6.5	-3.0

Table A.34

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	24.8	0.0	-24.8	0.0	-24.8	0.0	-24.8
23	Diamond Creek (DIACRK)	0.4	0.0	-0.4	0.0	-0.4	6.9	6.5
24	The Dome (DOME)	26.9	0.0	-26.9	0.0	-26.9	0.0	-26.9
25	Granite Gorge (GRAGOR)	45.2	64.9	19.7	59.8	14.6	62.7	17.5
26	Grand Canyon West (GCWEST)	40.4	48.3	7.9	44.5	4.1	47.8	7.4
27	Granite Park (GRNTPK)	2.0	1.3	-0.7	1.3	-0.7	0.0	-2.0
28	Gus Plateau (GUSPLT)	29.4	43.0	13.6	29.7	-0.3	23.7	-5.7
29	Havasu Point (HAVAPT)	9.6	0.0	-9.6	0.0	-9.6	0.0	-9.6
30	Havatagvitch Canyon (HAVCAN)	29.5	2.5	-27.0	5.8	-23.7	2.1	-27.4
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	19.2	7.1	-12.1	7.1	-12.1	15.0	-4.2
33	Meriwhitca (MERIWH)	5.6	2.3	-3.3	2.3	-3.3	6.6	1.0
34	Mohawk Canyon (MOHAWK)	36.1	18.6	-17.5	22.9	-13.2	18.4	-17.7
35	Mohawk Canyon (MOHCAN)	32.7	9.9	-22.8	17.1	-15.6	10.0	-22.7
36	Mount Sinyala (MTSINY)	67.5	24.7	-42.8	29.1	-38.4	23.7	-43.8
37	National Canyon (NATCAN)	25.0	3.3	-21.7	12.0	-13.0	3.3	-21.7
38	Jackson Canyon (JCKCAN/NONAME)	15.0	9.3	-5.7	9.3	-5.7	24.6	9.6
39	Parashant Wash (PARWAS)	25.5	18.0	-7.5	15.4	-10.1	17.9	-7.6
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	37.0	14.0	-23.0	21.8	-15.2	13.9	-23.1
42	Prospect Canyon (PRSPCT)	35.2	30.7	-4.5	35.6	0.4	23.2	-12.0
43	Peach Spring Canyon North (PSCNNO)	0.6	0.0	-0.6	0.0	-0.6	20.7	20.1
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	7.3	7.1
45	Quartermaster Point (QMPNT)	24.0	32.3	8.3	32.3	8.3	33.2	9.2
46	The Ranch (RANCH)	64.6	81.2	16.6	81.5	16.9	78.7	14.1
47	Spencer/Meriwhitica Canyons (SCMCIG)	3.4	0.3	-3.1	0.3	-3.1	20.5	17.1
48	South Supai Canyon (SOSUPC)	47.2	53.0	5.8	53.5	6.3	45.5	1.7
49	Spencer Canyon (SPENCA)	5.3	2.1	-3.2	2.1	-3.2	17.8	12.5
50	Supai Village (SUPVIL)	29.9	0.0	-29.9	0.0	-29.9	0.0	-29.9
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	10.0	0.0	-10.0	8.8	-1.2	0.0	-10.0
53	96 Mile Camp (96MILE)	44.0	40.8	-3.2	40.8	-3.2	40.6	-3.4

Table A.35

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	56.4	35.7	-20.7	35.8	-20.6	35.6	-20.8
55	Bright Angel Point (BRTANG)	5.0	1.9	-3.1	1.9	-3.1	1.9	-3.1
56	Cape Royal (CAPROY)	30.7	31.9	1.2	32.0	1.3	31.8	1.1
57	Cliff Dwellers Lodge (CLDWEL)	1.2	0.8	-0.4	0.8	-0.4	0.8	-0.4
58	Marble Canyon Dam Site (MARBDM)	0.3	0.0	-0.3	0.0	-0.3	0.0	-0.3
59	Nankoweap Mesa (NANMES)	46.8	38.0	-8.8	37.9	-8.9	37.9	-8.9
60	North Canyon (NOCANY)	1.4	1.3	-0.1	1.3	-0.1	1.3	-0.1
61	Point Imperial (PTIMPL)	19.2	12.9	-6.3	13.0	-6.2	12.9	-6.3
62	Saddle Mountain (SADMTN)	5.6	3.6	-2.0	3.6	-2.0	3.6	-2.0
63	South Canyon (SOCAN)	2.0	1.4	-0.6	1.4	-0.6	1.4	-0.6
64	Temple Butte (TEMBUT)	48.5	43.0	-5.5	43.0	-5.5	42.9	-5.6

Table A.36

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	86.3	82.2	-4.1	82.5	-3.8	81.4	-4.9
66	Lipan Point (LIPAN)	17.8	21.2	3.4	21.2	3.4	21.1	3.3
67	Little Colorado (LITCOL)	6.4	5.1	-1.3	5.1	-1.3	5.1	-1.3
68	Little Colorado River (LTCORV)	13.5	5.3	-8.2	5.3	-8.2	5.3	-8.2
69	Nankoweap at river (NANRIV)	5.2	0.2	-5.0	0.2	-5.0	0.2	-5.0
70	Ten X Meadow (TENMED)	19.0	19.4	0.4	19.7	0.7	19.2	0.2
71	Zuni Alpha (ZUNALF)	4.8	9.1	4.3	9.1	4.3	9.1	4.3
72	Zuni Charlie (ZUNCHR)	48.3	46.6	-1.7	46.7	-1.6	46.5	-1.8

Table A.37

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	42.5	40.2	-2.3	40.8	-1.7	30.2	-12.3
2	Andrus Canyon (ANDRUS)	28.3	11.5	-16.8	27.4	-0.9	11.5	-16.8
3	Bass Camp (BASCMP)	1.7	1.6	-0.1	1.6	-0.1	1.6	-0.1
4	Bat Cave (BATCAV)	29.0	45.8	16.8	34.9	5.9	46.6	17.6
5	Burnt Springs Canyon (BRNTSP)	12.2	6.1	-6.1	6.1	-6.1	10.6	-1.6
6	Castle Peak (CASTLE)	35.0	23.8	-11.2	29.7	-5.3	23.7	-11.3
7	Kanab Point (KANAPT)	39.2	16.6	-22.6	17.1	-22.1	16.1	-23.1
8	Kelly Point (KELLPT)	1.7	0.0	-1.7	0.0	-1.7	21.2	19.5
9	Mt. Dellenbaugh (MTDELL)	18.8	16.1	-2.7	3.6	-15.2	16.0	-2.8
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	66.2	68.8	2.6	67.4	1.2	75.8	9.6
12	Separation Canyon at Colorado River (SCCORV)	1.0	0.0	-1.0	0.0	-1.0	12.1	11.1
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	36.0	36.0	0.0	33.7	-2.3	27.1	-8.9
15	Stone Creek (STONCK)	0.2	0.0	-0.2	0.0	-0.2	0.0	-0.2
16	Suicide Point (SUIPNT)	25.1	45.1	20.0	23.9	-1.2	35.5	10.4
17	Toroweap Overlook (TOROWP)	87.9	69.8	-18.1	76.5	-11.4	48.0	-39.9
18	Tower of Ra (TOWER)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
19	Twin Point (TWINPT)	30.8	51.1	20.3	34.3	3.5	49.5	18.7
20	Upper Deer Creek (UPDRCK)	54.8	24.8	-30.0	25.0	-29.8	24.4	-30.4
21	West End (WESEND)	9.5	5.9	-3.6	5.9	-3.6	6.7	-2.8

Table A.38

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2000

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Diff3rence	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	24.8	0.0	-24.8	0.0	-24.8	0.0	-24.8
23	Diamond Creek (DIACRK)	0.4	0.0	-0.4	0.0	-0.4	7.4	7.0
24	The Dome (DOME)	26.9	0.0	-26.9	0.0	-26.9	0.0	-26.9
25	Granite Gorge (GRAGOR)	45.2	68.8	23.6	63.2	18.0	66.4	21.2
26	Grand Canyon West (GCWEST)	40.4	51.0	10.6	46.9	6.5	50.5	10.1
27	Granite Park (GRNTPK)	2.0	1.4	-0.6	1.4	-0.6	0.0	-2.0
28	Gus Plateau (GUSPLT)	29.4	46.3	16.9	31.8	2.4	25.7	-3.7
29	Havasu Point (HAVAPT)	9.6	0.0	-9.6	0.0	-9.6	0.0	-9.6
30	Havatagvitch Canyon (HAVCAN)	29.5	2.7	-26.8	6.2	-23.3	2.2	-27.3
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	19.2	7.5	-11.7	7.5	-11.7	15.9	-3.3
33	Meriwhitca (MERIWH)	5.6	2.4	-3.2	2.4	-3.2	7.0	1.4
34	Mohawk Canyon (MOHAWK)	36.1	20.2	-15.9	24.9	-11.2	20.0	-16.1
35	Mohawk Canyon (MOHCAN)	32.7	10.8	-21.9	18.6	-14.1	10.8	-21.9
36	Mount Sinyala (MTSINY)	67.5	26.6	-40.9	31.4	-36.1	25.5	-42.0
37	National Canyon (NATCAN)	25.0	3.5	-21.5	13.0	-12.0	3.5	-21.5
38	Jackson Canyon (JCKCAN/NONAME)	15.0	9.9	-5.1	9.9	-5.1	26.2	11.2
39	Parashant Wash (PARWAS)	25.5	19.5	-6.0	16.8	-8.7	19.4	-6.1
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	37.0	15.2	-21.8	23.7	-13.3	15.2	-21.8
42	Prospect Canyon (PRSPCT)	35.2	33.2	-2.0	38.6	3.4	25.3	-9.9
43	Peach Spring Canyon North (PSCNNO)	0.6	0.0	-0.6	0.0	-0.6	22.1	21.5
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	7.8	7.6
45	Quartermaster Point (QMPNT)	24.0	34.0	10.0	34.0	10.0	35.0	11.0
46	The Ranch (RANCH)	64.6	87.4	22.8	87.7	23.1	84.7	20.1
47	Spencer/Meriwhitica Canyons (SCMCIG)	3.4	0.3	-3.1	0.3	-3.1	21.9	18.5
48	South Supai Canyon (SOSUPC)	47.2	57.2	10.0	57.7	10.5	49.2	2.0
49	Spencer Canyon (SPENCA)	5.3	2.3	-3.0	2.3	-3.0	19.0	13.7
50	Supai Village (SUPVIL)	29.9	0.0	-29.9	0.0	-29.9	0.0	-29.9
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	10.0	0.0	-10.0	9.6	-0.4	0.0	-10.0
53	96 Mile Camp (96MILE)	44.0	43.9	-0.1	43.9	-0.1	43.7	-0.3

Table A.39

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2000

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	56.4	39.0	-17.4	39.0	-17.4	38.8	-17.6
55	Bright Angel Point (BRTANG)	5.0	2.0	-3.0	2.0	-3.0	2.0	-3.0
56	Cape Royal (CAPROY)	30.7	34.2	3.5	34.3	3.6	34.1	3.4
57	Cliff Dwellers Lodge (CLDWEL)	1.2	0.8	-0.4	0.8	-0.4	0.8	-0.4
58	Marble Canyon Dam Site (MARBDM)	0.3	0.0	-0.3	0.0	-0.3	0.0	-0.3
59	Nankoweap Mesa (NANMES)	46.8	41.4	-5.4	41.3	-5.5	41.3	-5.5
60	North Canyon (NOCANY)	1.4	1.4	0.0	1.4	0.0	1.4	0.0
61	Point Imperial (PTIMPL)	19.2	14.3	-4.9	14.4	-4.8	14.3	-4.9
62	Saddle Mountain (SADMTN)	5.6	4.1	-1.5	4.1	-1.5	4.1	-1.5
63	South Canyon (SOCAN)	2.0	1.5	-0.5	1.5	-0.5	1.5	-0.5
64	Temple Butte (TEMBUT)	48.5	46.2	-2.3	46.2	-2.3	46.0	-2.5

Table A.40

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2000

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	86.3	88.2	1.9	88.5	2.2	87.3	1.0
66	Lipan Point (LIPAN)	17.8	22.8	5.0	22.8	5.0	22.7	4.9
67	Little Colorado (LITCOL)	6.4	5.5	-0.9	5.5	-0.9	5.5	-0.9
68	Little Colorado River (LTCORV)	13.5	5.8	-7.7	5.8	-7.7	5.8	-7.7
69	Nankoweap at river (NANRIV)	5.2	0.3	-4.9	0.3	-4.9	0.3	-4.9
70	Ten X Meadow (TENMED)	19.0	20.9	1.9	21.2	2.2	20.7	1.7
71	Zuni Alpha (ZUNALF)	4.8	9.8	5.0	9.8	5.0	9.8	5.0
72	Zuni Charlie (ZUNCHR)	48.3	50.0	1.7	50.0	1.7	49.9	1.6

Table A.41

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	46.8	37.1	-9.7	37.7	-9.1	27.8	-19.0
2	Andrus Canyon (ANDRUS)	31.2	10.6	-20.6	25.2	-6.0	10.6	-20.6
3	Bass Camp (BASCMP)	1.8	1.5	-0.3	1.5	-0.3	1.5	-0.3
4	Bat Cave (BATCAV)	31.9	43.3	11.4	33.3	1.4	44.1	12.2
5	Burnt Springs Canyon (BRNTSP)	13.4	5.8	-7.6	5.8	-7.6	10.0	-3.4
6	Castle Peak (CASTLE)	38.6	21.9	-16.7	27.3	-11.3	21.8	-16.8
7	Kanab Point (KANAPT)	43.2	15.5	-27.7	15.9	-27.3	15.0	-28.2
8	Kelly Point (KELLPT)	1.8	0.0	-1.8	0.0	-1.8	19.9	18.1
9	Mt. Dellenbaugh (MTDELL)	20.7	14.8	-5.9	3.4	-17.3	14.7	-6.0
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	72.9	65.1	-7.8	63.9	-9.0	71.7	-1.2
12	Separation Canyon at Colorado River (SCCORV)	1.1	0.0	-1.1	0.0	-1.1	11.4	10.3
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	39.7	33.3	-6.4	31.2	-8.5	24.9	-14.8
15	Stone Creek (STONCK)	0.2	0.0	-0.2	0.0	-0.2	0.0	-0.2
16	Suicide Point (SUIPNT)	27.6	41.9	14.3	22.4	-5.2	32.9	5.3
17	Toroweap Overlook (TOROWP)	96.9	64.6	-32.3	70.7	-26.2	44.2	-52.7
18	Tower of Ra (TOWER)	100.0	98.1	-1.9	98.5	-1.5	96.2	-3.8
19	Twin Point (TWINPT)	34.0	47.7	13.7	32.2	-1.8	46.2	12.2
20	Upper Deer Creek (UPDRCK)	60.4	23.1	-37.3	23.3	-37.1	22.7	-37.7
21	West End (WESEND)	10.5	5.9	-4.6	5.9	-4.6	6.7	-3.8

Table A.42

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	27.3	0.0	-27.3	0.0	-27.3	0.0	-27.3
23	Diamond Creek (DIACRK)	0.5	0.0	-0.5	0.0	-0.5	6.9	6.4
24	The Dome (DOME)	29.6	0.0	-29.6	0.0	-29.6	0.0	-29.6
25	Granite Gorge (GRAGOR)	49.8	66.1	16.3	61.0	11.2	63.9	14.1
26	Grand Canyon West (GCWEST)	44.6	49.2	4.6	45.4	0.8	48.7	4.1
27	Granite Park (GRNTPK)	2.2	1.3	-0.9	1.3	-0.9	0.0	-2.2
28	Gus Plateau (GUSPLT)	32.4	43.0	10.6	29.7	-2.7	23.7	-8.7
29	Havasu Point (HAVAPT)	10.5	0.0	-10.5	0.0	-10.5	0.0	-10.5
30	Havatagvitch Canyon (HAVCAN)	32.5	2.5	-30.0	5.8	-26.7	2.1	-30.4
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	21.2	7.2	-14.0	7.2	-14.0	15.1	-6.1
33	Meriwhitca (MERIWH)	6.2	2.3	-3.9	2.3	-3.9	6.6	0.4
34	Mohawk Canyon (MOHAWK)	39.7	18.6	-21.1	22.9	-16.8	18.4	-21.3
35	Mohawk Canyon (MOHCAN)	36.0	9.9	-26.1	17.1	-18.9	10.0	-26.0
36	Mount Sinyala (MTSINY)	74.4	24.7	-49.7	29.1	-45.3	23.7	-50.7
37	National Canyon (NATCAN)	27.6	3.3	-24.3	12.0	-15.6	3.3	-24.3
38	Jackson Canyon (JCKCAN/NONAME)	16.5	9.3	-7.2	9.3	-7.2	24.6	8.1
39	Parashant Wash (PARWAS)	28.1	18.0	-10.1	15.4	-12.7	17.9	-10.2
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	40.8	14.0	-26.8	21.8	-19.0	13.9	-26.9
42	Prospect Canyon (PRSPCT)	38.8	30.7	-8.1	35.6	-3.2	23.2	-15.6
43	Peach Spring Canyon North (PSCNNO)	0.6	0.0	-0.6	0.0	-0.6	20.7	20.1
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	7.3	7.1
45	Quartermaster Point (QMPNT)	26.5	33.0	6.5	33.0	6.5	33.9	7.4
46	The Ranch (RANCH)	71.2	81.2	10.0	81.5	10.3	78.7	7.5
47	Spencer/Meriwhitica Canyons (SCMCIG)	3.7	0.3	-3.4	0.3	-3.4	20.5	16.8
48	South Supai Canyon (SOSUPC)	52.1	53.0	0.9	53.5	1.4	45.5	-6.6
49	Spencer Canyon (SPENCA)	5.8	2.1	-3.7	2.1	-3.7	17.8	12.0
50	Supai Village (SUPVIL)	32.9	0.0	-32.9	0.0	-32.9	0.0	-32.9
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	11.0	0.0	-11.0	8.8	-2.2	0.0	-11.0
53	96 Mile Camp (96MILE)	48.5	40.8	-7.7	40.8	-7.7	40.6	-7.9

Table A.43

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	62.1	35.7	-26.4	35.8	-26.3	35.6	-26.5
55	Bright Angel Point (BRTANG)	5.5	1.9	-3.6	1.9	-3.6	1.9	-3.6
56	Cape Royal (CAPROY)	33.9	31.9	-2.0	32.0	-1.9	31.8	-2.1
57	Cliff Dwellers Lodge (CLDWEL)	1.3	0.8	-0.5	0.8	-0.5	0.8	-0.5
58	Marble Canyon Dam Site (MARBDM)	0.4	0.0	-0.4	0.0	-0.4	0.0	-0.4
59	Nankoweap Mesa (NANMES)	51.5	38.0	-13.5	37.9	-13.6	37.9	-13.6
60	North Canyon (NOCANY)	1.5	1.3	-0.2	1.3	-0.2	1.3	-0.2
61	Point Imperial (PTIMPL)	21.2	12.9	-8.3	13.0	-8.2	12.9	-8.3
62	Saddle Mountain (SADMTN)	6.2	3.6	-2.6	3.6	-2.6	3.6	-2.6
63	South Canyon (SOCAN)	2.2	1.4	-0.8	1.4	-0.8	1.4	-0.8
64	Temple Butte (TEMBUT)	53.5	43.0	-10.5	43.0	-10.5	42.9	-10.6

Table A.44

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	95.1	82.2	12.9	82.5	-12.6	81.4	-13.7
66	Lipan Point (LIPAN)	19.6	21.2	1.6	21.2	1.6	21.1	1.5
67	Little Colorado (LITCOL)	7.1	5.1	-2.0	5.1	-2.0	5.1	-2.0
68	Little Colorado River (LTCORV)	14.8	5.3	-9.5	5.3	-9.5	5.3	-9.5
69	Nankoweap at river (NANRIV)	5.8	0.2	-5.6	0.2	-5.6	0.2	-5.6
70	Ten X Meadow (TENMED)	21.0	19.4	-1.6	19.7	-1.3	19.2	-1.8
71	Zuni Alpha (ZUNALF)	5.3	9.1	3.8	9.1	3.8	9.1	3.8
72	Zuni Charlie (ZUNCHR)	53.2	46.6	-6.6	46.7	-6.5	46.5	-6.7

Table A.45

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	46.8	44.3	-2.5	44.9	-1.9	33.3	-13.5
2	Andrus Canyon (ANDRUS)	31.2	12.7	-18.5	30.2	-1.0	12.6	-18.6
3	Bass Camp (BASCMP)	1.8	1.8	0.0	1.8	0.0	1.8	0.0
4	Bat Cave (BATCAV)	31.9	50.5	18.6	38.5	6.6	51.4	19.5
5	Burnt Springs Canyon (BRNTSP)	13.4	6.8	-6.6	6.8	-6.6	11.7	-1.7
6	Castle Peak (CASTLE)	38.6	26.3	-12.3	32.7	-5.9	26.1	-12.5
7	Kanab Point (KANAPT)	43.2	18.3	-24.9	18.8	-24.4	17.8	-25.4
8	Kelly Point (KELLPT)	1.8	0.0	-1.8	0.0	-1.8	23.4	21.6
9	Mt. Dellenbaugh (MTDELL)	20.7	17.7	-3.0	4.0	-16.7	17.6	-3.1
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	72.9	75.9	3.0	74.4	1.5	83.6	10.7
12	Separation Canyon at Colorado River (SCCORV)	1.1	0.0	-1.1	0.0	-1.1	13.4	12.3
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	39.7	39.7	0.0	37.2	-2.5	29.8	-9.9
15	Stone Creek (STONCK)	0.2	0.0	-0.2	0.0	-0.2	0.0	-0.2
16	Suicide Point (SUIPNT)	27.6	49.7	22.1	26.4	-1.2	39.2	11.6
17	Toroweap Overlook (TOROWP)	96.9	77.0	-19.9	84.3	-12.6	52.9	-44.0
18	Tower of Ra (TOWER)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
19	Twin Point (TWINPT)	34.0	56.4	22.4	37.9	3.9	54.6	20.6
20	Upper Deer Creek (UPDRCK)	60.4	27.3	-33.1	27.6	-22.8	26.9	-33.5
21	West End (WESEND)	10.5	6.6	-3.9	6.6	-3.9	7.4	-3.1

Table A.46

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2003

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	27.3	0.0	-27.3	0.0	-27.3	0.0	-27.3
23	Diamond Creek (DIACRK)	0.5	0.0	-0.5	0.0	-0.5	8.2	7.7
24	The Dome (DOME)	29.6	0.0	-29.6	0.0	-29.6	0.0	-29.6
25	Granite Gorge (GRAGOR)	49.8	75.9	26.1	69.8	20.0	73.3	23.5
26	Grand Canyon West (GCWEST)	44.6	56.2	11.6	51.7	7.1	55.7	11.1
27	Granite Park (GRNTPK)	2.2	1.6	-0.6	1.6	-0.6	0.0	-2.2
28	Gus Plateau (GUSPLT)	32.4	51.0	18.6	35.1	2.7	28.4	-4.0
29	Havasu Point (HAVAPT)	10.5	0.0	-10.5	0.0	-10.5	0.0	-10.5
30	Havatagvitch Canyon (HAVCAN)	32.5	3.0	-29.5	6.8	-25.7	2.4	-30.1
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	21.2	8.3	-12.9	8.3	-12.9	17.6	-3.6
33	Meriwhitca (MERIWH)	6.2	2.7	-3.5	2.7	-3.5	7.8	1.6
34	Mohawk Canyon (MOHAWK)	39.7	22.2	-17.5	27.5	-12.2	22.0	-17.7
35	Mohawk Canyon (MOHCAN)	36.0	11.9	-24.1	20.5	-15.5	11.9	-24.1
36	Mount Sinyala (MTSINY)	74.4	29.3	-45.1	34.6	-39.8	28.1	-46.3
37	National Canyon (NATCAN)	27.6	3.9	-23.7	14.4	-13.2	3.9	-23.7
38	Jackson Canyon (JCKCAN/NONAME)	16.5	10.9	-5.6	10.9	-5.6	28.9	12.4
39	Parashant Wash (PARWAS)	28.1	21.5	-6.6	18.5	-9.6	21.4	-6.7
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	40.8	16.7	-24.1	26.2	-14.6	16.7	-24.1
42	Prospect Canyon (PRSPCT)	38.8	36.6	-2.2	42.5	3.7	27.9	-10.9
43	Peach Spring Canyon North (PSCNNO)	0.6	0.0	-0.6	0.0	-0.6	24.3	23.7
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	8.5	8.3
45	Quartermaster Point (QMPNT)	26.5	37.5	11.0	37.5	11.0	38.6	12.1
46	The Ranch (RANCH)	71.2	96.4	25.2	96.7	25.5	93.4	22.2
47	Spencer/Meriwhitica Canyons (SCMCIG)	3.7	0.3	-3.4	0.3	-3.4	24.1	20.4
48	South Supai Canyon (SOSUPC)	52.1	63.1	11.0	63.6	11.5	54.2	2.1
49	Spencer Canyon (SPENCA)	5.8	2.5	-3.3	2.5	-3.3	21.0	15.2
50	Supai Village (SUPVIL)	32.9	0.0	-32.9	0.0	-32.9	0.0	-32.9
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	11.0	0.0	-11.0	10.6	-0.4	0.0	-11.0
53	96 Mile Camp (96MILE)	48.5	48.4	-0.1	48.4	-0.1	48.1	-0.4

Table A.47

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2003

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	62.1	42.9	-19.2	43.0	-19.1	42.8	-19.3
55	Bright Angel Point (BRTANG)	5.5	2.2	-3.3	2.2	-3.3	2.2	-3.3
56	Cape Royal (CAPROY)	33.9	37.7	3.8	37.8	3.9	37.6	3.7
57	Cliff Dwellers Lodge (CLDWEL)	1.3	0.9	-0.4	0.9	-0.4	0.9	-0.4
58	Marble Canyon Dam Site (MARBDM)	0.4	0.0	-0.4	0.0	-0.4	0.0	-0.4
59	Nankoweap Mesa (NANMES)	51.5	45.6	-5.9	45.5	-6.0	45.5	-6.0
60	North Canyon (NOCANY)	1.5	1.6	0.1	1.6	0.1	1.6	0.1
61	Point Imperial (PTIMPL)	21.2	15.8	-5.4	15.8	-5.4	15.8	-5.4
62	Saddle Mountain (SADMTN)	6.2	4.5	-1.7	4.5	-1.7	4.5	-1.7
63	South Canyon (SOCAN)	2.2	1.7	-0.5	1.7	-0.5	1.7	-0.5
64	Temple Butte (TEMBUT)	53.5	50.9	-2.6	50.9	-2.6	50.7	-2.8

Table A.48

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2003

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	95.1	97.2	2.1	97.6	2.5	96.2	1.1
66	Lipan Point (LIPAN)	19.6	25.1	5.5	25.2	5.6	25.0	5.4
67	Little Colorado (LITCOL)	7.1	6.1	-1.0	6.1	-1.0	6.0	-1.0
68	Little Colorado River (LTCORV)	14.8	6.4	-8.4	6.4	-8.4	6.4	-8.4
69	Nankoweap at river (NANRIV)	5.8	0.3	-5.5	0.3	-5.5	0.3	-5.5
70	Ten X Meadow (TENMED)	21.0	23.0	2.0	23.3	2.3	22.8	1.8
71	Zuni Alpha (ZUNALF)	5.3	10.8	5.5	10.8	5.5	10.8	5.5
72	Zuni Charlie (ZUNCHR)	53.2	55.1	1.9	55.1	1.9	54.9	1.7

Table A.49

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, West of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	55.1	37.1	-18.0	37.7	-17.4	27.8	-27.3
2	Andrus Canyon (ANDRUS)	36.7	10.6	-26.1	25.2	-11.5	10.6	-26.1
3	Bass Camp (BASCMP)	2.2	1.5	-0.7	1.5	-0.7	1.5	-0.7
4	Bat Cave (BATCAV)	37.5	44.0	6.5	33.9	-3.6	44.7	7.2
5	Burnt Springs Canyon (BRNTSP)	15.8	5.9	-9.9	5.9	-9.9	10.1	-5.7
6	Castle Peak (CASTLE)	45.4	21.9	-23.5	27.3	-18.1	21.8	-23.6
7	Kanab Point (KANAPT)	50.8	15.5	-35.3	15.9	-34.9	15.0	-35.8
8	Kelly Point (KELLPT)	2.2	0.0	-2.2	0.0	-2.2	19.9	17.7
9	Mt. Dellenbaugh (MTDELL)	24.4	14.8	-9.6	3.4	-21.0	14.7	-9.7
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	85.8	66.5	-19.3	65.3	-20.5	73.1	-12.7
12	Separation Canyon at Colorado River (SCCORV)	1.3	0.0	-1.3	0.0	-1.3	11.4	10.1
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	46.7	33.3	-13.4	31.2	-15.5	24.9	-21.8
15	Stone Creek (STONCK)	0.3	0.0	-0.3	0.0	-0.3	0.0	-0.3
16	Suicide Point (SUIPNT)	32.5	41.9	9.4	22.5	-10.0	33.0	0.5
17	Toroweap Overlook (TOROWP)	100.0	64.6	-35.4	70.7	-29.3	44.2	-55.8
18	Tower of Ra (TOWER)	100.0	98.1	-1.9	98.5	-1.5	96.2	-3.8
19	Twin Point (TWINPT)	40.0	47.7	7.7	32.3	-7.7	46.3	6.3
20	Upper Deer Creek (UPDRCK)	71.0	23.1	-47.9	23.3	-47.7	22.7	-48.3
21	West End (WESEND)	12.3	6.4	-5.9	6.4	-5.9	7.1	-5.2

Table A.50

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, West of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	32.1	0.0	-32.1	0.0	-32.1	0.0	-32.1
23	Diamond Creek (DIACRK)	0.6	0.0	-0.6	0.0	-0.6	6.9	6.3
24	The Dome (DOME)	34.8	0.0	-34.8	0.0	-34.8	0.0	-34.8
25	Granite Gorge (GRAGOR)	58.5	68.4	9.9	63.3	4.8	66.2	7.7
26	Grand Canyon West (GCWEST)	52.4	50.8	-1.6	47.0	-5.4	50.3	-2.1
27	Granite Park (GRNTPK)	2.6	1.3	-1.3	1.3	-1.3	0.0	-2.6
28	Gus Plateau (GUSPLT)	38.1	43.0	4.9	29.7	-8.4	23.7	-14.4
29	Havasu Point (HAVAPT)	12.4	0.0	-12.4	0.0	-12.4	0.0	-12.4
30	Havatagvitch Canyon (HAVCAN)	38.3	2.5	-35.4	5.8	-32.5	2.1	-36.2
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	24.9	7.4	-17.5	7.4	-17.5	15.3	-9.6
33	Meriwhitca (MERIWH)	7.2	2.3	-4.9	2.3	-4.9	6.7	-0.5
34	Mohawk Canyon (MOHAWK)	46.8	18.6	-28.2	22.9	-23.9	18.4	-28.4
35	Mohawk Canyon (MOHCAN)	42.4	9.9	-32.5	17.1	-25.3	10.0	-32.4
36	Mount Sinyala (MTSINY)	87.5	24.7	-62.8	29.1	-58.4	23.7	-63.8
37	National Canyon (NATCAN)	32.5	3.3	-29.2	12.0	-20.5	3.3	-29.2
38	Jackson Canyon (JCKCAN/NONAME)	19.4	9.4	-10.0	9.4	-10.0	24.7	5.3
39	Parashant Wash (PARWAS)	33.1	18.0	-15.1	15.4	-17.7	17.9	-14.8
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	48.0	14.0	-34.0	21.8	-26.2	13.9	-34.1
42	Prospect Canyon (PRSPCT)	45.7	30.7	-15.0	35.6	-10.1	23.2	-22.5
43	Peach Spring Canyon North (PSCNNO)	0.7	0.0	-0.7	0.0	-0.7	20.7	20.0
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	7.3	7.1
45	Quartermaster Point (QMPNT)	31.2	34.4	3.2	34.4	3.2	35.3	4.1
46	The Ranch (RANCH)	83.7	81.2	-2.5	81.5	-2.1	78.7	-5.0
47	Spencer/Meriwhitica Canyons (SCMCIG)	4.4	0.3	-4.1	0.3	-4.1	20.5	16.1
48	South Supai Canyon (SOSUPC)	61.2	53.0	-8.2	53.5	-8.7	45.5	-15.7
49	Spencer Canyon (SPENCA)	6.9	2.2	-4.7	2.2	-4.7	17.8	10.9
50	Supai Village (SUPVIL)	38.8	0.0	-38.8	0.0	-38.8	0.0	-38.8
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	13.0	0.0	-13.0	8.8	-4.2	0.0	-13.0
53	96 Mile Camp (96MILE)	57.1	40.8	-16.3	40.8	-16.3	40.6	-16.5

Table A.51

Comparison of 25%TA$_{12h}$ at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
North of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA$_{12h}$	25%TA$_{12h}$	Difference	25%TA$_{12h}$	Difference	25%TA$_{12h}$	Difference
54	The Basin (BASIN)	73.1	35.7	-37.4	35.8	-37.3	35.6	-37.5
.5	Bright Angel Point (BRTANG)	6.5	1.9	-4.6	1.9	-4.6	1.9	-4.6
56	Cape Royal (CAPROY)	39.9	31.9	-8.0	32.0	-7.9	31.8	-8.1
57	Cliff Dwellers Lodge (CLDWEL)	1.6	0.8	-0.8	0.8	-0.8	0.8	-0.8
58	Marble Canyon Dam Site (MARBDM)	0.4	0.0	-0.4	0.0	-0.4	0.0	-0.4
59	Nankoweap Mesa (NANMES)	60.6	38.0	-22.6	37.9	-22.7	37.9	-22.7
60	North Canyon (NOCANY)	1.8	1.3	-0.5	1.3	-0.5	1.3	-0.5
61	Point Imperial (PTIMPL)	24.9	12.9	-12.0	13.0	-11.9	12.9	-12.0
62	Saddle Mountain (SADMTN)	7.2	3.6	-3.6	3.6	-3.6	3.6	-3.6
63	South Canyon (SOCAN)	2.6	1.4	-1.2	1.4	-1.2	1.4	-1.2
64	Temple Butte (TEMBUT)	62.9	43.0	-19.9	43.0	-19.9	42.9	-20.0

Table A.52

Comparison of 25%TA$_{12h}$ at Representative Locations in GCNP
Considering Commercial Air Tour Limitations
South of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA$_{12h}$	25%TA$_{12h}$	Difference	25%TA$_{12h}$	Difference	25%TA$_{12h}$	Difference
65	Cedar Ridge (CEDRIG)	100.0	82.2	-17.8	82.5	-17.5	81.4	-18.6
66	Lipan Point (LIPAN)	23.1	21.2	-1.9	21.2	-1.9	21.1	-2.0
67	Little Colorado (LITCOL)	8.3	5.1	-3.2	5.1	-3.2	5.1	-3.2
68	Little Colorado River (LTCORV)	17.4	5.3	-12.1	5.3	-12.1	5.3	-12.1
69	Nankoweap at river (NANRIV)	6.8	0.2	-6.6	0.2	-6.6	0.2	-6.6
70	Ten X Meadow (TENMED)	24.7	19.4	-5.3	19.7	-5.0	19.2	-5.5
71	Zuni Alpha (ZUNALF)	6.3	9.1	2.8	9.1	2.8	9.1	2.8
72	Zuni Charlie (ZUNCHR)	62.6	46.6	-16.0	46.7	-15.9	46.5	-16.1

Table A.53

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, West of GC Airport
2008

	Location	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
1	NPS Admin Site (ADMIN)	55.1	52.1	-3.0	52.9	-2.2	39.2	-15.9
2	Andrus Canyon (ANDRUS)	36.7	14.9	-21.8	35.5	-1.2	14.9	-21.8
3	Bass Camp (BASCMP)	2.2	2.1	-0.1	2.1	-0.1	2.1	-0.1
4	Bat Cave (BATCAV)	37.5	59.5	22.0	45.3	7.8	60.5	23.0
5	Burnt Springs Canyon (BRNTSP)	15.8	7.9	-7.9	7.9	-7.9	13.8	-2.0
6	Castle Peak (CASTLE)	45.4	30.9	-14.5	38.5	-6.9	30.7	-14.7
7	Kanab Point (KANAPT)	50.8	21.6	-29.2	22.1	-28.7	20.9	-29.9
8	Kelly Point (KELLPT)	2.2	0.0	-2.2	0.0	-2.2	27.5	25.3
9	Mt. Dellenbaugh (MTDELL)	24.4	20.8	-3.6	4.7	-19.7	20.7	-3.7
10	Point Sublime (PTSUBL)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
11	Sanup (SANUP)	85.8	89.3	3.5	87.5	1.7	98.3	12.5
12	Separation Canyon at Colorado River (SCCORV)	1.3	0.0	-1.3	0.0	-1.3	15.7	14.4
13	Separation Canyon (SEPARC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Shivwitz Fire Camp (SHWZFC)	46.7	46.7	0.0	43.7	-3.0	35.1	-11.6
15	Stone Creek (STONCK)	0.3	0.0	-0.3	0.0	-0.3	0.0	-0.3
16	Suicide Point (SUIPNT)	32.5	58.5	26.0	31.1	-1.4	46.1	13.6
17	Toroweap Overlook (TOROWP)	100.0	90.5	-9.5	99.2	-0.8	62.2	-37.8
18	Tower of Ra (TOWER)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
19	Twin Point (TWINPT)	40.0	66.3	26.3	44.5	4.5	64.3	24.3
20	Upper Deer Creek (UPDRCK)	71.0	32.1	-38.9	32.4	-38.6	31.6	-39.4
21	West End (WESEND)	12.3	7.7	-4.6	7.7	-4.6	8.7	-3.6

Table A.54

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, West of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
22	Coyote Canyon (COYCAN)	32.1	0.0	-32.1	0.0	-32.1	0.0	-32.1
23	Diamond Creek (DIACRK)	0.6	0.0	-0.6	0.0	-0.6	9.6	9.0
24	The Dome (DOME)	34.8	0.0	-34.8	0.0	-34.8	0.0	-34.8
25	Granite Gorge (GRAGOR)	58.5	89.3	30.8	82.1	23.6	86.2	27.7
26	Grand Canyon West (GCWEST)	52.4	66.1	13.7	60.9	8.5	65.5	13.1
27	Granite Park (GRNTPK)	2.6	1.8	-0.8	1.8	-0.8	0.0	-2.6
28	Gus Plateau (GUSPLT)	38.1	60.1	22.0	41.3	3.2	33.4	-7.9
29	Havasu Point (HAVAPT)	12.4	0.0	-12.4	0.0	-12.4	0.0	-12.4
30	Havatagvitch Canyon (HAVCAN)	38.3	3.5	-34.8	8.0	-30.3	2.8	-35.5
31	Hermit Basin (HBASIN)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
32	Horse Flat Canyon (HFCAN)	24.9	9.8	-15.1	9.8	-15.1	20.7	-4.2
33	Meriwhitca (MERIWH)	7.2	3.2	-4.0	3.2	-4.0	9.2	2.0
34	Mohawk Canyon (MOHAWK)	46.8	26.2	-20.6	32.3	-14.5	25.9	-20.9
35	Mohawk Canyon (MOHCAN)	42.4	14.0	-28.4	24.1	-18.3	14.0	-28.4
36	Mount Sinyala (MTSINY)	87.5	34.5	-53.0	40.7	-46.8	33.0	-54.5
37	National Canyon (NATCAN)	32.5	4.5	-28.0	16.9	-15.6	4.5	-28.0
38	Jackson Canyon (JCKCAN/NONAME)	19.4	12.8	-6.6	12.8	-6.6	34.0	14.6
39	Parashant Wash (PARWAS)	33.1	25.3	-7.8	21.8	-11.3	25.2	-7.9
40	Pumpkin Springs (PMPKIN)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	Prospect Canyon (PROCAN)	48.0	19.7	-28.3	30.8	-17.2	19.6	-28.4
42	Prospect Canyon (PRSPCT)	45.7	43.1	-2.6	50.0	4.3	32.8	-12.9
43	Peach Spring Canyon North (PSCNNO)	0.7	0.0	-0.7	0.0	-0.7	28.6	27.9
44	Peach Spring Canyon South (PSCNSO)	0.2	0.0	-0.2	0.0	-0.2	10.0	9.8
45	Quartermaster Point (QMPNT)	31.2	44.1	12.9	44.1	12.9	45.4	14.2
46	The Ranch (RANCH)	83.7	100.0	16.3	100.0	16.3	100.0	16.3
47	Spencer/Meriwhitica Canyons (SCMCIG)	4.4	0.4	-4.0	0.4	-4.0	28.4	24.0
48	South Supai Canyon (SOSUPC)	61.2	74.2	13.0	74.8	13.6	63.7	2.5
49	Spencer Canyon (SPENCA)	6.9	3.0	-3.9	3.0	-3.9	24.7	17.8
50	Supai Village (SUPVIL)	38.8	0.0	-38.8	0.0	-38.8	0.0	-38.8
51	Three Springs Rapids (THRSPR)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	Whitmore Rapids (WHTRAP)	13.0	0.0	-13.0	12.4	-0.6	0.0	-13.0
53	96 Mile Camp (96MILE)	57.1	56.9	-0.2	57.0	-0.1	56.6	-0.5

Table A.55

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
North of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
54	The Basin (BASIN)	73.1	50.5	-22.6	50.6	-22.5	50.3	-22.8
55	Bright Angel Point (BRTANG)	6.5	2.6	-3.9	2.6	-3.9	2.6	-3.9
56	Cape Royal (CAPROY)	39.9	44.4	4.5	44.5	4.6	44.2	4.3
57	Cliff Dwellers Lodge (CLDWEL)	1.6	1.1	-0.5	1.1	-0.5	1.1	-0.5
58	Marble Canyon Dam Site (MARBDM)	0.4	0.0	-0.4	0.0	-0.4	0.0	-0.4
59	Nankoweap Mesa (NANMES)	60.6	53.6	-7.0	53.6	-7.0	53.5	-7.1
60	North Canyon (NOCANY)	1.8	1.8	0.0	1.8	0.0	1.8	0.0
61	Point Imperial (PTIMPL)	24.9	18.6	-6.3	18.6	-6.3	18.5	-6.4
62	Saddle Mountain (SADMTN)	7.2	5.3	-1.9	5.3	-1.9	5.3	-1.9
63	South Canyon (SOCAN)	2.6	2.0	-0.6	2.0	-0.6	2.0	-0.6
64	Temple Butte (TEMBUT)	62.9	59.9	-3.0	59.9	-3.0	59.7	-3.2

Table A.56

Comparison of 25%TA_{12h} at Representative Locations in GCNP
Considering Continued Growth
South of Colorado River, East of GC Airport
2008

		No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Location	25%TA_{12h}	25%TA_{12h}	Difference	25%TA_{12h}	Difference	25%TA_{12h}	Difference
65	Cedar Ridge (CEDRIG)	100.0	100.0	0.0	100.0	0.0	100.0	0.0
66	Lipan Point (LIPAN)	23.1	29.5	6.4	29.6	6.5	29.4	6.3
67	Little Colorado (LITCOL)	8.3	7.1	-1.2	7.1	-1.2	7.1	-1.2
68	Little Colorado River (LTCORV)	17.4	7.5	-9.9	7.5	-9.9	7.5	-9.9
69	Nankoweap at river (NANRIV)	6.8	0.3	-6.5	0.3	-6.5	0.3	-6.5
70	Ten X Meadow (TENMED)	24.7	27.1	2.4	27.4	2.7	26.8	2.1
71	Zuni Alpha (ZUNALF)	6.3	12.7	6.4	12.7	6.4	12.7	6.4
72	Zuni Charlie (ZUNCHR)	62.6	64.8	2.2	64.9	2.3	64.7	2.1

Table A.57

Square Mile Area Covered by L_{Aeq12h} Contours (20-60)
1998 (Base)

Analysis	Contour Level (dB)	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
	20	4539.7	3731.56	-17.80	3792.18	-16.47	4230.14	-6.82
W	30	2018.46	1668.05	-17.36	1669.97	-17.27	1754.53	-13.08
I	40	532.97	473.60	-11.14	417.64	-21.64	418.52	-21.47
D	50	26.19	32.43	23.83	29.81	13.82	29.73	13.52
E	60	3.24	3.75	15.74	3.55	9.57	3.46	6.79
	20	1572.85	1109.68	-29.45	1092.81	-30.52	1183.47	-24.76
G	30	644.33	571.11	-11.36	518.64	-19.51	556.72	-13.60
C	40	138.04	115.12	-16.60	90.54	-34.41	110.74	-19.78
N	50	3.75	2.82	-24.80	2.34	-37.60	2.41	-35.73
P	60	0.04	0	-100	0	-100	0	-100

Table A.58

Square Mile Area Covered by L_{Aeq12h} Contours (20-60)
Considering Commercial Air Tour Limitations
2000

Analysis	Contour Level (dB)	No Action (Alt. 1(	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
	20	4616.23	3644.58	-21.05	3805.01	-17.57	4244.50	-8.05
W	30	2078.16	1625.63	-21.78	1681.96	-19.06	1767.46	-14.95
I	40	561.11	443.00	-21.05	424.27	-24.39	425.03	-24.25
D	50	28.82	30.56	6.04	30.64	6.32	30.57	6.07
E	60	3.40	3.56	4.71	3.61	6.18	3.53	3.82
	20	1594.31	1092.94	-31.45	1093.22	-31.43	1183.58	-25.76
G	30	667.07	556.03	-16.65	519.55	-22.11	558.03	-16.35
C	40	146.42	105.70	-27.81	92.80	-36.62	112.85	-22.93
N	50	4.46	2.40	-46.19	2.39	-46.41	2.49	-44.17
P	60	0.04	0.00	-100.00	0.00	-100.00	0.00	-100.00

Table A.59

Square Mile Area Covered by L_{Aeq12h} Contours (20-60)
Considering Continued Growth
2000

Analysis	Contour Level (dB)	No Action (Alt.1)	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
	20	4616.23	3731.56	-19.16	3890.49	-15.72	4348.01	-5.81
W	30	2078.16	1668.03	-19.74	1732.89	-16.61	1821.82	-12.33
I	40	561.11	473.60	-15.60	456.78	-18.59	455.97	-18.74
D	50	28.82	32.43	12.53	32.49	12.73	32.48	12.70
E	60	3.4	3.76	10.59	3.82	12.35	3.72	9.41
	20	1594.31	1109.68	-30.40	1110.27	-30.36	1201.50	-24.64
G	30	667.07	571.11	-14.39	537.19	-19.47	576.25	-13.61
C	40	146.42	115.12	-21.38	100.18	-31.58	121.32	-17.14
N	50	4.46	2.82	-36.77	2.81	-37.00	2.93	-34.30
P	60	0.04	0	-100	0	-100	0	-100

Table A.60

Square Mile Area Covered by L_{Aeq12h} Contours (20-60)
Considering Commercial Air Tour Limitations
2008

Analysis	Contour Level (dB)	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	20	4904.07	3652.39	-25.52	3812.62	-22.26	4253.38	-13.27
	30	2323.70	1632.31	-29.75	1688.91	-27.32	1774.59	-23.63
	40	675.58	448.28	-33.65	429.43	-36.44	430.13	-36.33
	50	42.81	31.10	-27.35	31.18	-27.16	31.11	-27.33
	60	4.12	3.59	-12.86	3.65	-11.41	3.57	-13.35
GCNP	20	1653.95	1093.22	-33.90	1093.48	-33.89	1183.67	-28.43
	30	759.94	556.34	-26.79	520.12	-31.56	558.77	-26.47
	40	180.46	108.52	-39.86	95.44	-47.11	114.97	-36.29
	50	7.64	2.44	-68.06	2.44	-68.06	2.54	-66.75
	60	0.06	0.00	-100.00	0.00	-100.00	0.00	-100.00

Table A.61

Square Mile Area Covered by L_{Aeq12h} Contours (20-60)
Considering Continued Growth
2008

Analysis	Contour Level (dB)	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
		Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	20	4904.07	4061.81	-17.17	3898.03	-20.51	4741.95	-3.31
	30	2323.7	1830.02	-21.25	1739.52	-25.14	2028.44	-12.71
	40	675.58	590.11	-12.65	462.00	-31.61	581.13	-13.98
	50	42.81	41.36	-3.39	33.03	-22.85	41.64	-2.73
	60	4.12	4.56	10.68	3.86	-10.44	4.52	9.71
GCNP	20	1653.95	1161.49	-29.77	1110.56	-32.85	1263.80	-23.59
	30	759.94	622.16	-18.13	537.62	-29.25	639.12	-15.90
	40	180.46	155.52	-13.82	102.95	-42.95	163.47	-9.41
	50	7.64	4.97	-20.12	2.86	-62.57	5.32	-30.37
	60	0.06	0	-100	0	-100	0	-100

Table A.62

Square Mile Area Where $\%TA_{12h}$ is Greater Than 25%
1998 (Base)

Analysis	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	2821.48	2511.80	-10.98	2580.19	-8.55	2384.77	-15.48
GCNP	1283.96	1064.46	-17.10	1054.92	-17.84	1061.32	-17.34

Table A.63

Square Mile Area Where $\%TA_{12h}$ is Greater Than 25%
Considering Commercial Air Tour Limitations
2000

Analysis	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	2979.89	2529.97	-15.10	2598.32	-12.80	2397.36	-19.55
GCNP	1308.87	1064.46	-18.65	1055.56	-19.35	1062.26	-18.84

Table A.64

Square Mile Area Where $\%TA_{12h}$ is Greater Than 25%
Considering Continued Growth
2000

Analysis	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	2979.89	2638.73	-11.45	2730.52	-8.37	2576.72	-13.53
GCNP	1308.87	1106.07	-15.49	1100.29	-15.94	1115.74	-14.76

Table A.65

Square Mile Area Where %TA_{12h} is Greater Than 25%
Considering Commercial Air Tour Limitations
2008

Analysis	No Action (Alt. 1)	Alternative 2		Alternative 3		Alternative 4	
	Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	3419.2	2542.36	-25.64	2610.46	-23.65	2406.49	-29.62
GCNP	1410.07	1065.44	-24.44	1056.40	-25.08	1062.73	-24.63

Table A.66

Square Mile Area Where %TA_{12h} is Greater Than 25%
Considering Continued Growth
2008

Analysis	No Action (Alt.1)	Alternative 2		Alternative 3		Alternative 4	
	Sq. Mi.	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area	Sq. Mi.	% Change in Sq. Mi. Area
WIDE	3419.20	3051.44	-10.76	2740.93	-19.84	3415.20	-0.12
GCNP	1410.07	1269.48	-9.97	1100.98	-21.92	1329.85	-5.69

APPENDIX B

GLOSSARY

APPENDIX C

NOISE BASICS

APPENDIX D

TECHNICAL MEMORANDA

APPENDIX E

OPERATIONS DATA

Summary of 1998 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BD0030	Departure	DHC6	19.03
		GASEPV	0.65
		BEC58P	30.00
BD0016	Arrival	BEC58P	1.97
		DHC6	8.07
		GASEPV	0.09
BD,BL1R-A/G0032	Departure	BEC58P	0.66
		GASEPV	0.01
		DHC6	0.41
BDS0061	Departure	GASEPV	0.53
		DHC6	15.57
		BEC58P	1.27
BDS0060	Arrival	DHC6	3.50
		GASEPV	0.09
		BEC58P	0.20
BK,BL,BR0067	Departure	GASEPV	0.34
BK1 (Gunther)0040	Circuit	GASEPV	0.10
		BEC58P	0.05
BK1,40013	Departure	GASEPV	0.03
		GASEPF	0.01
		DHC6	0.00*
BK1,4X0047	Departure	GASEPV	1.82
		GASEPF	0.02
		DHC6	0.28
BK1A0004	Departure	DHC6	8.62
BK1A0004	Circuit	GASEPF	0.15
		GASEPV	11.11
		BEC58P	0.14
BK2,1,1A0050	Arrival	DHC6	0.18
		GASEPV	1.00
BK2,1,40043	Overflight	GASEPV	0.14
		DHC6	0.00*
BK3,10012	Arrival	GASEPV	1.24
		DHC6	0.22
		GASEPF	0.02
BK3,10044	Arrival	BEC58P	0.11
BK5,10048	Arrival	DHC6	0.81
		GASEPV	1.91
		GASEPF	0.04
BK5,1,1A0046	Arrival	GASEPV	0.02
BK5,1,1A,1,40045	Overflight	GASEPV	0.47
		GASEPF	0.05
		DHC6	0.00*
BL,BR0064	Departure	DHC6	0.05
BL,BR0064	Circuit	GASEPV	0.83
BL,BR,BK0065	Departure	GASEPV	0.98
BL1,BD-A/G0018	Arrival	GASEPV	1.88
		BEC58P	33.98
		DHC6	24.75
BL1,BD-A/O0077	Overflight	GASEPV	0.33
		BEC58P	6.19

Summary of 1998 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BL1,BDS-A/O0069	Overflight	DHC6	0.72
		GASEPV	0.30
		BEC58P	0.19
BL1,BL1A,BDS-MNV0075	Overflight	GASEPV	0.15
		DHC6	0.02
		BEC58P	0.10
BL1R,2B,BDS0070	Circuit	GASEPV	0.04
BL2-A/G0071	Overflight	GASEPF	0.28
		GASEPV	1.47
		DHC6	0.69
BL2-A/G0020	Overflight	GASEPV	2.13
		GASEPF	0.15
		BEC58P	0.55
		DHC6	0.17
BL2-A/O0019	Overflight	BEC58P	0.79
		GASEPV	0.64
		DHC6	0.39
BL2-A/O0021	Overflight	GASEPF	2.52
		GASEPV	12.32
		BEC58P	5.68
		DHC6	2.95
GR1-A/O0033	Departure	AS350	2.02
		MD900	0.02
GR1A-A/O0002	Departure	AS350	2.72
		B206	13.00
		MD900	0.02
GR2-A/O0003	Departure	AS350	11.04
		B206	60.18
		MD900	0.07
GR4-A/G0091	Overflight	AS350	11.18
		B206	0.81
GR4-A/G0093	Overflight	AS350	1.63
GR4-A/G0089	Overflight	AS350	1.56
		B206	0.80
GR4-A/O0081	Overflight	AS350	0.90
		B206	0.17
GR4-A/O0026	Overflight	AS350	0.34
		B206	0.19
GR4-A/O0024	Overflight	B206	2.63
		AS350	0.18
BK,BL,BR0062	Arrival	GASEPV	0.34
BK1,4X,6,5,10042	Arrival	GASEPV	0.05
BK6,BK5,BK10066	Arrival	GASEPV	0.98
BK2,1,4X0085	Overflight	GASEPV	0.14
		DHC6	0.02
BL1,BR1A0087	Overflight	DHC6	0.01
Total Operations			**321.78**

* The number of operations for the DHC6 aircraft on each of the tracks 0013, 0043, and 0045 is 0.003 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.003 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

Summary of 2000 GCNP Operational Activities as a Function of Flight Track
No-Action Alternative

Track	Type of Operation	Aircraft	Operations
BD0030	Departure	DHC6	20.30
		GASEPV	0.69
		BEC58P	32.01
BD0016	Arrival	BEC58P	2.10
		DHC6	8.61
		GASEPV	0.10
BD,BL1R-A/G0032	Departure	BEC58P	0.71
		GASEPV	0.01
		DHC6	0.44
BDS0061	Departure	GASEPV	0.57
		DHC6	16.61
		BEC58P	1.36
BDS0060	Arrival	DHC6	3.73
		GASEPV	0.10
		BEC58P	0.21
BK,BL,BR0067	Departure	GASEPV	0.36
BK1 (Gunther)0040	Circuit	GASEPV	0.11
		BEC58P	0.05
BK1,40013	Departure	GASEPV	0.04
		GASEPF	0.01
		DHC6	0.00*
BK1,4X0047	Departure	GASEPV	1.95
		GASEPF	0.02
		DHC6	0.30
BK1A0004	Departure	DHC6	9.20
BK1A0004	Circuit	GASEPF	0.16
		GASEPV	11.86
		BEC58P	0.14
BK2,1,1A0050	Arrival	DHC6	0.20
		GASEPV	1.08
BK2,1,40043	Overflight	GASEPV	0.15
		DHC6	0.00*
BK3,10012	Arrival	GASEPV	1.33
		DHC6	0.23
		GASEPF	0.02
BK3,10044	Arrival	BEC58P	0.11
BK5,10048	Arrival	DHC6	0.87
		GASEPV	2.04
		GASEPF	0.04
BK5,1,1A0046	Arrival	GASEPV	0.02
BK5,1,1A,1,40045	Overflight	GASEPV	0.50
		GASEPF	0.05
		DHC6	0.00*
BL,BR0064	Departure	DHC6	0.06
BL,BR0064	Circuit	GASEPV	0.89
BL,BR,BK0065	Departure	GASEPV	1.05
BL1,BD-A/G0018	Arrival	GASEPV	2.01
		BEC58P	36.26
		DHC6	26.41
BL1,BD-A/O0077	Overflight	GASEPV	0.36
		BEC58P	6.60

Summary of 2000 GCNP Operational Activities as a Function of Flight Track
No-Action Alternative

Track	Type of Operation	Aircraft	Operations
BL1,BDS-A/O0069	Overflight	DHC6	0.77
		GASEPV	0.32
		BEC58P	0.21
BL1,BL1A,BDS-MNV0075	Overflight	GASEPV	0.16
		DHC6	0.02
		BEC58P	0.10
BL1R,2B,BDS0070	Circuit	GASEPV	0.04
BL2-A/G0071	Overflight	GASEPF	0.30
		GASEPV	1.57
		DHC6	0.73
BL2-A/G0020	Overflight	GASEPV	2.27
		GASEPF	0.16
		BEC58P	0.59
		DHC6	0.18
BL2-A/O0019	Overflight	BEC58P	0.84
		GASEPV	0.68
		DHC6	0.42
BL2-A/O0021	Overflight	GASEPF	2.69
		GASEPV	13.14
		BEC58P	6.06
		DHC6	3.15
GR1-A/O0033	Departure	AS350	2.16
		MD900	0.02
GR1A-A/O0002	Departure	AS350	2.90
		B206	13.88
		MD900	0.02
GR2-A/O0003	Departure	AS350	11.78
		B206	64.21
		MD900	0.07
GR4-A/G0091	Overflight	AS350	11.93
		B206	0.86
GR4-A/G0093	Overflight	AS350	1.74
GR4-A/G0089	Overflight	AS350	1.67
		B206	0.85
GR4-A/O0081	Overflight	AS350	0.97
		B206	0.19
GR4-A/O0026	Overflight	AS350	0.36
		B206	0.20
GR4-A/O0024	Overflight	B206	2.81
		AS350	0.19
BK,BL,BR0062	Arrival	GASEPV	0.36
BK1,4X,6,5,10042	Arrival	GASEPV	0.05
BK6,BK5,BK10066	Arrival	GASEPV	1.05
BK2,1,4X0085	Overflight	GASEPV	0.15
		DHC6	0.02
BL1,BR1A0087	Overflight	DHC6	0.01
Total Operations			**343.37**

* The number of operations for the DHC6 aircraft on each of the tracks 0013, 0043, and 0045 is 0.003 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.003 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

Summary of 2003 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BD0030	Departure	DHC6	22.37
		GASEPV	0.76
		BEC58P	35.29
BD0016	Arrival	BEC58P	2.31
		DHC6	9.49
		GASEPV	0.11
BD,BL1R-A/G0032	Departure	BEC58P	0.78
		GASEPV	0.01
		DHC6	0.49
BDS0061	Departure	GASEPV	0.62
		DHC6	18.31
		BEC58P	1.49
BDS0060	Arrival	DHC6	4.12
		GASEPV	0.11
		BEC58P	0.23
BK,BL,BR0067	Departure	GASEPV	0.40
BK1 (Gunther)0040	Circuit	GASEPV	0.12
		BEC58P	0.05
BK1,40013	Departure	GASEPV	0.04
		GASEPF	0.01
		DHC6	0.00*
BK1,4X0047	Departure	GASEPV	2.14
		GASEPF	0.03
		DHC6	0.33
BK1A0004	Departure	DHC6	10.14
BK1A0004	Circuit	GASEPF	0.17
		GASEPV	13.06
		BEC58P	0.16
BK2,1,1A0050	Arrival	DHC6	0.21
		GASEPV	1.19
BK2,1,40043	Overflight	GASEPV	0.16
		DHC6	0.00*
BK3,10012	Arrival	GASEPV	1.46
		DHC6	0.25
		GASEPF	0.02
BK3,10044	Arrival	BEC58P	0.12
BK5,10048	Arrival	DHC6	0.96
		GASEPV	2.24
		GASEPF	0.04
BK5,1,1A0046	Arrival	GASEPV	0.02
BK5,1,1A,1,40045	Overflight	GASEPV	0.55
		GASEPF	0.05
		DHC6	0.00*
BL,BR0064	Departure	DHC6	0.06
BL,BR0064	Circuit	GASEPV	0.98
BL,BR,BK0065	Departure	GASEPV	1.16
BL1,BD-A/G0018	Arrival	GASEPV	2.21
		BEC58P	39.96
		DHC6	29.12
BL1,BD-A/O0077	Overflight	GASEPV	0.39
		BEC58P	7.28

Summary of 2003 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BL1,BDS-A/O0069	Overflight	DHC6	0.85
		GASEPV	0.35
		BEC58P	0.23
BL1,BL1A,BDS-MNV0075	Overflight	GASEPV	0.18
		DHC6	0.02
		BEC58P	0.12
BL1R,2B,BDS0070	Circuit	GASEPV	0.04
BL2-A/G0071	Overflight	GASEPF	0.33
		GASEPV	1.73
		DHC6	0.81
BL2-A/G0020	Overflight	GASEPV	2.50
		GASEPF	0.18
		BEC58P	0.64
		DHC6	0.20
BL2-A/O0019	Overflight	BEC58P	0.93
		GASEPV	0.75
		DHC6	0.46
BL2-A/O0021	Overflight	GASEPF	2.97
		GASEPV	14.48
		BEC58P	6.67
		DHC6	3.47
GR1-A/O0033	Departure	AS350	2.38
		MD900	0.02
GR1A-A/O0002	Departure	AS350	3.19
		B206	15.30
		MD900	0.02
GR2-A/O0003	Departure	AS350	12.99
		B206	70.78
		MD900	0.08
GR4-A/G0091	Overflight	AS350	13.15
		B206	0.95
GR4-A/G0093	Overflight	AS350	1.92
GR4-A/G0089	Overflight	AS350	1.84
		B206	0.94
GR4-A/O0081	Overflight	AS350	1.06
		B206	0.20
GR4-A/O0026	Overflight	AS350	0.40
		B206	0.22
GR4-A/O0024	Overflight	B206	3.09
		AS350	0.21
BK,BL,BR0062	Arrival	GASEPV	0.40
BK1,4X,6,5,10042	Arrival	GASEPV	0.06
BK6,BK5,BK10066	Arrival	GASEPV	1.16
BK2,1,4X0085	Overflight	GASEPV	0.16
		DHC6	0.02
BL1,BR1A0087	Overflight	DHC6	0.01
Total Operations			**378.50**

* The number of operations for the DHC6 aircraft on each of the tracks 0013, 0043, and 0045 is 0.003 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.003 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

Summary of 2008 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BD0030	Departure	DHC6	26.31
		GASEPV	0.90
		BEC58P	41.51
BD0016	Arrival	BEC58P	2.72
		DHC6	11.16
		GASEPV	0.13
BD,BL1R-A/G0032	Departure	BEC58P	0.92
		GASEPV	0.01
		DHC6	0.57
BDS0061	Departure	GASEPV	0.74
		DHC6	21.54
		BEC58P	1.76
BDS0060	Arrival	DHC6	4.84
		GASEPV	0.13
		BEC58P	0.27
BK,BL,BR0067	Departure	GASEPV	0.47
BK1 (Gunther)0040	Circuit	GASEPV	0.14
		BEC58P	0.07
BK1,40013	Departure	GASEPV	0.05
		GASEPF	0.01
		DHC6	0.00*
BK1,4X0047	Departure	GASEPV	2.52
		GASEPF	0.03
		DHC6	0.38
BK1A0004	Departure	DHC6	11.93
BK1A0004	Circuit	GASEPF	0.21
		GASEPV	15.37
		BEC58P	0.19
BK2,1,1A0050	Arrival	DHC6	0.25
		GASEPV	1.40
BK2,1,40043	Overflight	GASEPV	0.19
		DHC6	0.00*
BK3,10012	Arrival	GASEPV	1.72
		DHC6	0.30
		GASEPF	0.03
BK3,10044	Arrival	BEC58P	0.14
BK5,10048	Arrival	DHC6	1.13
		GASEPV	2.64
		GASEPF	0.05
BK5,1,1A0046	Arrival	GASEPV	0.02
BK5,1,1A,1,40045	Overflight	GASEPV	0.64
		GASEPF	0.07
		DHC6	0.00*
BL,BR0064	Departure	DHC6	0.07
BL,BR0064	Circuit	GASEPV	1.15
BL,BR,BK0065	Departure	GASEPV	1.36
BL1,BD-A/G0018	Arrival	GASEPV	2.61
		BEC58P	47.02
		DHC6	34.25
BL1,BD-A/O0077	Overflight	GASEPV	0.46
		BEC58P	8.56

Summary of 2008 GCNP Operational Activities as a Function of Flight Track			
No-Action Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BL1,BDS-A/O0069	Overflight	DHC6	0.99
		GASEPV	0.41
		BEC58P	0.27
BL1,BL1A,BDS-MNV0075	Overflight	GASEPV	0.21
		DHC6	0.02
		BEC58P	0.14
BL1R,2B,BDS0070	Circuit	GASEPV	0.05
BL2-A/G0071	Overflight	GASEPF	0.39
		GASEPV	2.04
		DHC6	0.95
BL2-A/G0020	Overflight	GASEPV	2.95
		GASEPF	0.21
		BEC58P	0.76
		DHC6	0.23
BL2-A/O0019	Overflight	BEC58P	1.09
		GASEPV	0.88
		DHC6	0.54
BL2-A/O0021	Overflight	GASEPF	3.49
		GASEPV	17.04
		BEC58P	7.85
		DHC6	4.08
GR1-A/O0033	Departure	AS350	2.80
		MD900	0.03
GR1A-A/O0002	Departure	AS350	3.76
		B206	17.99
		MD900	0.02
GR2-A/O0003	Departure	AS350	15.28
		B206	83.26
		MD900	0.10
GR4-A/G0091	Overflight	AS350	15.46
		B206	1.11
GR4-A/G0093	Overflight	AS350	2.26
GR4-A/G0089	Overflight	AS350	2.16
		B206	1.10
GR4-A/O0081	Overflight	AS350	1.25
		B206	0.24
GR4-A/O0026	Overflight	AS350	0.47
		B206	0.26
GR4-A/O0024	Overflight	B206	3.64
		AS350	0.25
BK,BL,BR0062	Arrival	GASEPV	0.47
BK1,4X,6,5,10042	Arrival	GASEPV	0.07
BK6,BK5,BK10066	Arrival	GASEPV	1.36
BK2,1,4X0085	Overflight	GASEPV	0.20
		DHC6	0.02
BL1,BR1A0087	Overflight	DHC6	0.01
Total Operations			**445.21**

* The number of operations for the DHC6 aircraft on each of the tracks 0013, 0043, and 0045 is 0.004 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.004 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

Summary of 1998 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
BD0061	Departure	DHC6(high)	16.30
		DHC6(low)	2.88
		GASEPV(low)	1.18
		BEC58P(high)	25.71
		BEC58P(low)	4.54
BD0060	Arrival	BEC58P(high)	12.35
		BEC58P(low)	2.18
		DHC6(high)	14.64
		DHC6(low)	2.58
		GASEPV(low)	0.78
BDS0063	Departure	DHC6(high)	15.83
		BEC58P(high)	1.69
BDS0062	Arrival	DHC6	19.09
		GASEPV	1.28
		BEC58P	21.61
BK10040	Departure	DHC6	0.86
BK1R0049	Departure	DHC6	7.82
BK10040	Circuit	GASEPV	0.79
		GASEPF	0.01
		BEC58P	0.02
BK1R0049	Circuit	GASEPV	12.47
		GASEPF	0.14
		BEC58P	0.12
BK1/BK2044	Circuit	GASEPV	0.10
		BEC58P	0.04
BK2/BK40041	Departure	GASEPV	0.03
		GASEPF	0.01
		DHC6	0.00*
BK2/BK2X/BK5E/BK5/BK10047	Departure	GASEPV	1.82
		GASEPF	0.02
		DHC6	0.28
BK2S/BK10050	Arrival	DHC6	0.40
		GASEPV	2.25
		BEC58P	0.11
		GASEPF	0.02
BK2S/BK1/BK40043	Overflight	GASEPV	0.14
		DHC6	0.00*
BK5/BK10046	Arrival	DHC6	0.81
		GASEPV	1.93
		GASEPF	0.04
BK5/BK1/BK1/BK40045	Overflight	GASEPV	0.47
		GASEPF	0.05
		DHC6	0.00*
BL20069	Overflight	GASEPV	15.90
		BEC58P	13.49
		DHC6	4.25
		GASEPF	2.67
BL2/BL2E0071	Overflight	GASEPF	0.28
		GASEPV	1.47
		DHC6	0.69

Summary of 1998 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
GR10080	Departure	AS350	4.74
		B206	13.00
		MD900	0.04
GR20086	Departure	AS350	11.04
		B206	60.18
		MD900	0.07
GR40095	Overflight	AS350	15.27
		B206	1.78
GR40087	Overflight	AS350	0.52
		B206	2.82
BK5/BK10054	Arrival	GASEPV	0.05
BK2S/BK2/BK2X0051	Overflight	GASEPV	0.14
		DHC6	0.02
Total Operations			**321.78**

* The number of operations for the DHC6 aircraft on each of the tracks 0041, 0043, and 0045 is 0.003 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.003 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

Summary of 2000 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
BD0061	Departure	DHC6(high)	16.30
		DHC6(low)	2.88
		GASEPV(low)	1.18
		BEC58P(high)	25.71
		BEC58P(low)	4.54
BD0060	Arrival	BEC58P(high)	12.35
		BEC58P(low)	2.18
		DHC6(high)	14.64
		DHC6(low)	2.58
		GASEPV(low)	0.78
BDS0063	Departure	DHC6(high)	15.83
		BEC58P(high)	1.69
BDS0062	Arrival	DHC6	19.09
		GASEPV	1.28
		BEC58P	21.61
BK10040	Departure	DHC6	0.86
BK1R0049	Departure	DHC6	7.82
BK10040	Circuit	GASEPV	0.79
		GASEPF	0.01
		BEC58P	0.02
BK1R0049	Circuit	GASEPV	12.47
		GASEPF	0.14
		BEC58P	0.12
BK1/BK2044	Circuit	GASEPV	0.10
		BEC58P	0.04
BK2/BK40041	Departure	GASEPV	0.03
		GASEPF	0.01
		DHC6	0.00*
BK2/BK2X/BK5E/BK5/BK10047	Departure	GASEPV	1.82
		GASEPF	0.02
		DHC6	0.28
BK2S/BK10050	Arrival	DHC6	0.40
		GASEPV	2.25
		BEC58P	0.11
		GASEPF	0.02
BK2S/BK1/BK40043	Overflight	GASEPV	0.14
		DHC6	0.00*
BK5/BK10046	Arrival	DHC6	0.81
		GASEPV	1.93
		GASEPF	0.04
BK5/BK1/BK1/BK40045	Overflight	GASEPV	0.47
		GASEPF	0.05
		DHC6	0.00*
BL20069	Overflight	GASEPV	15.90
		BEC58P	13.49
		DHC6	4.25
		GASEPF	2.67
BL2/BL2E0071	Overflight	GASEPF	0.00
		GASEPV	0.93

Summary of 2000 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
		DHC6	1.38
		BEC58P	1.05
GR10080	Departure	AS350	4.74
		B206	13.00
		MD900	0.04
GR20086	Departure	AS350	11.04
		B206	60.18
		MD900	0.07
GR40095	Overflight	AS350	23.04
		B206	4.91
GR40087	Overflight	AS350	0.52
		B206	2.82
BK5/BK10054	Arrival	GASEPV	0.05
BK2S/BK2/BK2X0051	Overflight	GASEPV	0.14
		DHC6	0.02
Total Operations			**333.59**

* The number of operations for the DHC6 aircraft on each of the tracks 0041, 0043, and 0045 is 0.003 operations and for the GASEPV is 0.002 operations, which converts to 0.00 operations when rounded to two decimal places. The operations for the DHC6 and GASEPV on each of these tracks is included as part of the total aircraft operations.

Summary of 2003 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
BD0061	Departure	DHC6(high)	16.30
		DHC6(low)	2.88
		GASEPV(low)	1.18
		BEC58P(high)	25.71
		BEC58P(low)	4.54
BD0060	Arrival	BEC58P(high)	12.35
		BEC58P(low)	2.18
		DHC6(high)	14.64
		DHC6(low)	2.58
		GASEPV(low)	0.78
BDS0063	Departure	DHC6(high)	15.83
		BEC58P(high)	1.69
BDS0062	Arrival	DHC6	19.09
		GASEPV	1.28
		BEC58P	21.61
BK10040	Departure	DHC6	0.86
BK1R0049	Departure	DHC6	7.82
BK10040	Circuit	GASEPV	0.79
		GASEPF	0.01
		BEC58P	0.02
BK1R0049	Circuit	GASEPV	12.47
		GASEPF	0.14
		BEC58P	0.12
BK1/BK2044	Circuit	GASEPV	0.10
		BEC58P	0.04
BK2/BK40041	Departure	GASEPV	0.03
		GASEPF	0.01
		DHC6	0.00*
BK2/BK2X/BK5E/BK5/BK10047	Departure	GASEPV	1.82
		GASEPF	0.02
		DHC6	0.28
BK2S/BK10050	Arrival	DHC6	0.40
		GASEPV	2.25
		BEC58P	0.11
		GASEPF	0.02
BK2S/BK1/BK40043	Overflight	GASEPV	0.14
		DHC6	0.00*
BK5/BK10046	Arrival	DHC6	0.81
		GASEPV	1.93
		GASEPF	0.04
BK5/BK1/BK1/BK40045	Overflight	GASEPV	0.47
		GASEPF	0.05
		DHC6	0.00*
BL20069	Overflight	GASEPV	15.90
		BEC58P	13.49
		DHC6	4.25
		GASEPF	2.67
BL2/BL2E0071	Overflight	GASEPF	0.00*
		GASEPV	1.02
		DHC6	1.52
		BEC58P	1.16

Summary of 2003 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
GR10080	Departure	AS350	4.74
		B206	13.00
		MD900	0.04
GR20086	Departure	AS350	11.04
		B206	60.18
		MD900	0.07
GR40095	Overflight	AS350	25.39
		B206	5.41
GR40087	Overflight	AS350	0.52
		B206	2.82
BK5/BK10054	Arrival	GASEPV	0.05
BK2S/BK2/BK2X0051	Overflight	GASEPV	0.14
		DHC6	0.02
Total Operations			**336.79**

Summary of 2008 GCNP Operational Activities as a Function of Flight Track Preferred Alternative			
Track	**Type of Operation**	**Aircraft**	**Operations**
BD0061	Departure	DHC6(high)	16.30
		DHC6(low)	2.88
		GASEPV(low)	1.18
		BEC58P(high)	25.71
		BEC58P(low)	4.54
BD0060	Arrival	BEC58P(high)	12.35
		BEC58P(low)	2.18
		DHC6(high)	14.64
		DHC6(low)	2.58
		GASEPV(low)	0.78
BDS0063	Departure	DHC6(high)	15.83
		BEC58P(high)	1.69
BDS0062	Arrival	DHC6	19.09
		GASEPV	1.28
		BEC58P	21.61
BK10040	Departure	DHC6	0.86
BK1R0049	Departure	DHC6	7.82
BK10040	Circuit	GASEPV	0.79
		GASEPF	0.01
		BEC58P	0.02
BK1R0049	Circuit	GASEPV	12.47
		GASEPF	0.14
		BEC58P	0.12
BK1/BK2044	Circuit	GASEPV	0.10
		BEC58P	0.04
BK2/BK40041	Departure	GASEPV	0.03
		GASEPF	0.01
		DHC6	0.00*
BK2/BK2X/BK5E/BK5/BK10047	Departure	GASEPV	1.82
		GASEPF	0.02
		DHC6	0.28
BK2S/BK10050	Arrival	DHC6	0.40
		GASEPV	2.25
		BEC58P	0.11
		GASEPF	0.02
BK2S/BK1/BK40043	Overflight	GASEPV	0.14
		DHC6	0.00*
BK5/BK10046	Arrival	DHC6	0.81
		GASEPV	1.93
		GASEPF	0.04
BK5/BK1/BK1/BK40045	Overflight	GASEPV	0.47
		GASEPF	0.05
		DHC6	0.00*
BL20069	Overflight	GASEPV	15.90
		BEC58P	13.49
		DHC6	4.25
		GASEPF	2.67
BL2/BL2E0071	Overflight	GASEPF	0.00*
		GASEPV	1.20
		DHC6	1.79
		BEC58P	1.36

Summary of 2008 GCNP Operational Activities as a Function of Flight Track

Preferred Alternative

Track	Type of Operation	Aircraft	Operations
GR10080	Departure	AS350	4.74
		B206	13.00
		MD900	0.04
GR20086	Departure	AS350	11.04
		B206	60.18
		MD900	0.07
GR40095	Overflight	AS350	29.87
		B206	6.37
GR40087	Overflight	AS350	0.52
		B206	2.82
BK5/BK10054	Arrival	GASEPV	0.05
BK2S/BK2/BK2X0051	Overflight	GASEPV	0.14
		DHC6	0.02
Total Operations			**342.88**

* The number of operations for the DHC6 aircraft on each of the tracks 0041, 0043, and 0045 is 0.004 operations, which converts to 0.00 operations when rounded to two decimal places. The 0.004 operations for the DHC6 on each of these tracks is included as part of the total aircraft operations.

APPENDIX F

SUPPLEMENTAL ANALYSIS

SUPPLEMENTAL ANALYSIS

As part of this noise study, three supplemental analyses were conducted. Rather than using all of the yearly data from the Activity Report, as is done in the main analysis, the supplemental analysis examines the projected noise environment in GCNP for three shorter time periods. Each of the analyses was done assuming that the Preferred Alternative (Alternative 2) is implemented. Selection of one Alternative for this sensitivity analysis provides a representative comparison for all of the Proposed Alternatives and the No Action Alternative.

The first supplemental analysis models operations on an average summer day, the second models an average 'shoulder' season day, and the third models a day of high aircraft activity ("peak day").

Due to comments on the Draft SEA, the FAA has determined that the peak hour analysis shown in the Draft SEA was not a realistic scenario as computed. To allow comparisons with other analyses, it was necessary to convert the peak hour into a 12-hour day; however, upon additional analysis, the computed 12-hour day was found to be unrealistic, so the peak hour analysis was dropped from this Final SEA.

The NPS defined the summer season as the five-month period from May 1 through September 30, and the shoulder season as the four months, two in the spring and two in the fall, on both sides of the summer season. Shoulder season months are March, April, October, and November.

Average activity levels during these seasons were represented in the modeling by a day that most closely matched the seasonal average. The summer day used was June 6, 1997, the shoulder day was November 19, 1997, and the peak day was August 11, 1997.

For the summer and shoulder seasons, the average number of operations per day was determined by taking the total number of air tour routes flown in the season and dividing by the number of days in the season. As an effective surrogate for operations and the most readily available statistic in the FAA Activity Report, it should be noted that the number of routes flown does not equate with the number of operations modeled in the INM analysis. The number of routes flown in the Activity Report actually refers to routes or route segments, and a single commercial SFRA operation may include several route segments. The INM modeling was based upon the number of commercial SFRA operations, not the number of route segments flown, so the number of operations modeled will always be less than the number of routes flown in the Activity Report. See Section 4.1.3.

Specifically, the summer average for routes flown in 1997 was 579 per day. June 6 was the closest to this average with 578 routes flown, so it was chosen to represent an average summer day in this analysis. The shoulder season average for routes flown in 1997 was 346 per day. November 19 was the closest to the average with 345 routes flown, so it was chosen to represent an average shoulder season day in the analysis. The highest single day of activity was August 11, 1997, which was used for the peak day analysis, with 816 routes flown. The corresponding number of commercial SFRA operations modeled in INM was 429

on June 6, 1997, 289 for November 19, 1997, and 653 for August 11, 1997.

As with the main analysis, both the L_{Aeq12h} and $\%TA_{12h}$ metrics were computed for this supplemental analysis of the study area using A-weighted decibels. A discussion of these two metrics follows.

L_{Aeq12h} Analysis

Review of the L_{Aeq12h} results show that the 30 and 40 dB levels contain the most useful information on the variation of noise within the study periods. These levels contain the greatest area of exposure above the ambient levels. In comparison, the 20 dB levels are below the ambient in many areas of the Park, while the 50 and 60 dB levels do not encompass a significant area of the Park. The total area in square miles for each of these contours, both over the entire study area and the area within GCNP, are presented in **Table F.1**.

The percentage of GCNP within the 30 dB L_{Aeq12h} level varies from 38.2 for the peak to 31.7 for the average summer day and 24.8 for the average shoulder season day. For the higher dB levels, the areas drop off significantly. 11.6 percent of GCNP experienced a L_{eq12h} level of 40 dB or higher on the peak day. On the average summer day, 7.9 percent of the Park was within the 40-dB L_{eq12h} level; 4.8 percent was within the 40-dB level on the average shoulder day. These percentages are found by dividing the appropriate entries in Table **F.1** by the total area of GCNP (1886.78 square miles).

While the $\%TA_{12h}$ metric tends to correlate linearly with the number of operations, the L_{Aeq12h} metric tends to be less sensitive to operations due to its acoustic-energy basis foundation. For example, assuming that all other factors (such as track loading and aircraft types) remain constant for a given measurement location, doubling the number of operations will double the $\%TA_{12h}$ compared with increasing the L_{Aeq12h} by 3 dB. For this reason, the L_{Aeq12h} levels for the three periods show less variation than the $\%TA_{12h}$ levels described below.

$\%TA_{12h}$ Analysis

The high number of operations on the peak day may require the $\%TA_{12h}$ metric for that day to be interpreted with some caution. For example, on the peak day in 1997, there were 184 operations on Green 2. This is an average, over the 12-hour activity period, of about 15 operations an hour, or one operation every four minutes. At these high levels of activity, noise from consecutive operations will almost certainly overlap, particularly during the peak activity periods of the day. The INM calculates the $\%TA_{12h}$ metric for each event independently, and then sums the time for all the events, so the INM reported $\%TA_{12h}$ will always be equal or greater than a $\%TA_{12h}$ metric that accounts for overlapping operations. This effect is not as pronounced at lower levels of operations, where the probability of noise events overlapping is relatively low.

Table F.2 presents the areas of the $25\%TA_{12h}$ contours for both the entire study area and the area within GCNP. The amount of substantial restoration of natural quiet in GCNP varies depending upon the time period analyzed. This Table also shows the percentage of GCNP that experiences substantial restoration of natural quiet during each study period. The percent of restoration ranges from 19.0% for the peak day, to 43.6% for the annual average day (as discussed in Sec. 4.1), to 53.7% for the shoulder season day. The Table also includes the Alternative 2 average annual day results for easy comparison.

The results presented in this Appendix apply only for the particular days under study. The individual air tour routes in use on any day will greatly influence which parts of the Park are exposed to aircraft noise and the level of that exposure.

Table F.1

Square Mile Area for L_{Aeq12h} Contours (20-60)
(Based on Alternative 2 routes)

Analysis	Contour Level (dB)	Average Annual Day 1998 (Alternative 2)	Average Annual Day 2000 (Alternative 2)	Shoulder Day November 19, 1997	Summer Day June 6, 1997	Peak Day August 11, 1997
WIDE	20	3731.56	3644.58	3593.80	4059.49	4847.98
	30	1668.05	1625.63	1578.52	1834.84	2195.55
	40	473.6	443.00	470.42	592.76	758.79
	50	32.43	30.56	18.22	27.12	60.05
	60	3.75	3.56	3.09	4.66	6.36
GCNP	20	1109.68	1092.94	1006.69	1172.65	1282.84
	30	571.11	556.03	467.23	598.92	721.58
	40	115.12	105.70	90.89	149.43	219.01
	50	2.82	2.40	0.32	3.94	9.98
	60	0.00	0.00	0.00	0.00	.06

Table F.2

Square Mile Area for 25%TA_{12h} Contour
(Based on Alternative 2 routes)

Analysis	Average Annual Day 1998 (Alternative 2)	Average Annual Day 2000 (Alternative 2)	Shoulder Day November 19, 1997	Summer Day June 6, 1997	Peak Day August 11, 1997
WIDE	2511.80	2529.97	2517.32	3115.79	3727.50
GCNP	1064.46	1064.76	1069.38	1295.81	1529.09
% Restored	43.6	43.6	53.7	31.3	19.0

Note: The Average Annual Day 1998 column in Tables F-1 and F-2 was based on what was modeled in the June 1999 Draft SEA. The Average Annual Day 2000 column includes Hualapai support operations that have increased over 1998 levels. (See Section 4.1.3). The Hualapai operations were provided to FAA as annual data and could not be assigned to specific days. The Average Annual Day 1998 and 2000 columns are based on a route structure that includes the Zuni corridor turn-around. (See Section 2.3.2.) The other scenarios include the route structure as of June 1999.

APPENDIX G

COMMENTS and RESPONSES

Comments on the Draft Supplemental EA

#	Commentor	Date	Comment	Response
Written Comments				
1	Dr. Donald James Barry Austin, Texas	7/27/99	1a. Supports strong federal mandates against overflights of the Grand Canyon. 1b. Recommends that overflights be administered as a Park resource and not as a distributed commercial opportunity. Specifically, an NPS/citizen's board should have authority to determine rates, routes, and franchises. Allocation of tickets should be made on a lottery system rather than highest-bidder to insure equitable access.	1a. Comment noted. 1b. FAA has exclusive jurisdiction to manage the navigable airspace of the United States and there is a public right to transit that airspace. NPS is charged with management of natural and cultural resources and values of the Park. FAA has worked cooperatively with NPS towards achieving substantial restoration of natural quiet in the GCNP, while accommodating the needs of other parties.
2	Mr. Robert G. McCune Grand Canyon Air Tour Council (GCATC) Las Vegas, Nevada	9/3/99	2a. The GCATC believes any effort, other than a complete EIS, will not be in compliance with the NEPA. 2b. Recommends the DSEA be pulled until the noise concerns have been professionally reconsidered because it appears that most of the DSEA-Supplemental EA noise rationale and methodology is not anchored to acceptable noise science.	2a. This supplemental environmental assessment is NEPA compliant. The analysis in the Final SEA indicates that the Preferred Alternative has adverse, but not significant adverse, impacts. The Preferred Alternative includes mitigation for Native American historic properties, but will adversely affect some Hualapai Tribe TCPs. It is likely to adversely affect, but not jeopardize the existence, of some endangered species See, Final SEA, Table 2.1. 2b. Noise issues have been professionally considered in this Supplemental Environmental Assessment (see Chapter 4 and appendices, which have been clarified in the Final SEA) in accordance with FAA guidelines, policies and regulations. In accordance with agency guidelines, aircraft noise exposure must be established in terms of yearly day/night sound level (DNL). The formula to calculate Yearly DNL includes specific aircraft noise levels combined with the annual average daily operations of those aircraft. The FAA recognizes that seasonal fluctuation in visitors to the park (by air and by land) would mean that the number of air tour operations on any particular day could be substantially higher or lower than the annual average. The FAA guidelines include the provision that the DNL analysis may optionally be supplemented on a case-by-case basis to characterize specific noise effects. The supplemental noise analysis must be

#	Commentor	Date	Comment	Response
				tailored to enhance the public's understanding of both the noise impacts and the pertinent facts surrounding the changes. In this context, the supplemental analysis is intended to convey the relationship between noise exposure and daily air tour operations. For more detail see Section 4.1.2 which has been clarified in the Final SEA
			2c. Requests that the FAA include in its scoping an analysis of the positive benefits of air tourism on the tangible natural resources of GCNP. FAA should analyze the impact if over 800,000 aerial visitors, including over 160,000 physically challenged visitors, used ground transportation to visit GCNP. Failure to consider these impacts may be inconsistent with NEPA and the Americans with Disabilities Act (ADA).	2c. It is the intent of the Preferred Alternative to permit aerial viewing to continue in a manner consistent with Pub. L. 100-91. The actions by the FAA to here are additive to actions being taken by NPS to protect the natural resources of GCNP from adverse impacts resulting from ground visitation. The physically challenged will continue to have opportunities to view and appreciate the beauty of the canyon both on the ground and through the air in accordance with the spirit of the ADA. For more detail, see Special Flight Rules in the Vicinity of the GCNP, 61 Fed Reg. 69302, 69308-69309, December 31, 1996; proposed Final Rule, Commercial Air Tour Limitation in the GCNP SFRA, page 43-44. The vast majority of air tour visitors already also visit the park on the ground. The Final EA is consistent with NEPA, which does not require a worst-case analysis.
			2d. Requests that the FAA add to the scope of the EA, "values associated with aircraft flights" as called for in Section 1 (c) (4) of Public Law 100-91.	2d. The Regulatory Evaluation contained in the Final Rules addresses the "values associated with aircraft flights."
			2e. Environmental impacts of proposed rules should properly recognize the impact to the environment of air tour visitors as well as ground visitors.	2e. Pub. L. 100-91 does not require elimination of air tours over GCNP. Modifications to the airspace, and commercial air tour routes are part of the proposed Federal action to fulfill Pub. L. 100-91, ground visitors are not. See Response to Comment 2c, above
3	Mr. Eric Jorgensen	9/5/99	3. Believes all air tours over the GC should be eliminated.	3. Pub. L. 100-91 does not require the elimination of all tour flights provided substantial restoration of natural quiet can be achieved. See also proposed Final Rule, Commercial Air Tour Limitation in the GCNP SFRA, Section III, C (FAA Response).
4	Mr. Phil Davis	8/30/99	4a. Supports the air tour operators' recommendation of the dogleg modification of the Dragon Corridor flight zone.	4a. In response to concerns of air tour operators, this is included in the Preferred Alternative.

#	Commentor	Date	Comment	Response
			4b. Agrees with all pilots who fly air tours at GCNP: re-routing flights over the North Rim is unsafe. 4c. Believes substantial restoration of natural quiet in GCNP has been achieved.	4b. In response to comments from the air tour operators regarding weather and flight over the north rim a turn-around has been added to the Zuni-Corridor (see Notice of Routes Availability). 4c. Under the Preferred Alternative, natural quiet will be achieved for only 43.6 per cent of the GCNP by 2000. Final SEA at Table 4.10
5	Henna82@aol.com	8/30/99	5. Submitted identical comments as Commentor #4 (Phil Davis).	5. See response to Comment 4.
6	Ms. Diane Gruner	9/1/99	6a. Believes helicopter tours are quiet and unseen, and that the new regulatory proposals are unjustified, unwarranted, and unnecessary. 6b. Submitted partially identical comments as Commentor #4 (Phil Davis).	6a. As part of Pub. L. 100-91, Congress found that noise associated with aircraft overflights was causing "a significant adverse effect on the natural quiet and experience of the park…" After careful study, in its 1994 Report to Congress NPS concluded that additional steps were needed to substantially restore natural quiet to the GCNP. See also, Memorandum to Heads of Federal Agencies and Executive Departments, April 22, 1996, 61 Fed Reg. 18229, April 25, 1996. This Final SEA confirms that limitations on air tour overflights are needed to meet the goals of Pub. L. 100-91. 6b. See Responses to Comment 4.
7	Mr. Michael C. Shiel Rothstein, Donatelli, Hughes, Dahlstron, Cron & Schoenberg, LLP Attorneys at Law	9/2/99	7. For over two decades it has been the consistent position of the Havasupai Tribe that all commercial fixed wing air tour flights be removed from the Havasupai Reservation. The Land Use Plan for the Havasupai Reservation that the Department of Interior adopted pursuant to Section 10 of the Grand Canyon Enlargement Act, 16 USC 228I(b)(4), acknowledged the Tribe's desire to remove tour flights "[I]n the interests of privacy and respect for the peace and quiet of certain special areas" throughout the Reservation. The Havasupai Tribe appreciates the efforts of the FAA to consult with the Havasupai Tribe and FAA's recognition of the Tribe's concern regarding confidentiality of traditional cultural properties and sacred sites. The Tribe enclosed a discussion of important aspects of historical and current Havasupai life and requested that this discussion be	7. Pages 3-2 and 3-3 in the Final SEA have been revised to clarify important aspects of historical and current Havasupai life. As to consistency with local land use plans, see the Response to Comment 8g.

#	Commentor	Date	Comment	Response
			added to the Supplemental EA at pages 3-2 and 3-3..	
8	Ron W. Williams, Chairman, AirStar Helicopter	9/7/99	8a. SEA is inadequate, should be withdrawn and a full EIS be complied with.	8a. See response to Comment 2a.
			8b. Additional environmental impacts of air tour passenger becoming ground visitors should be addressed.	8b. See response to Comment 2e.
			8c. Positive environmental impacts caused by visitor air touring versus ground touring have not been addressed.	8c. See response to Comment 2e.
			8d. Use of NPS Dual Standard should be withdrawn as the method is just beginning the validation process.	8d. NPS has made a management decision that the threshold for measurement of the onset of impact to natural quiet will vary across the GCNP according to two zones. This approach does not set standards for different parts of the Park that aircraft overflights will be required to meet. Since the thresholds are used as inputs for modeling and have no bearing on the workings of the models (such as the algorithms) that are addressed in the validation study, there is no reasonable basis to postpone implementation of changes to the process for assessing noise impacts. Validation in this context is equivalent to improvement. The current modeling is the best available and produces results consistent with available data. See, Change in Noise Evaluation Methodology for Air Tour Operations over the GCNP, Notice of Disposition of Public Comments and Adoption of Final Noise Evaluation Methodology, Discussion of Comments, Response 3, Disagreement With Two-Zone System, and Response 19, Noise Validation, 64 Fed Reg. 38006, 38008-9, 38015, July 14, 1999.
			8e. Proposed regulations have not been scientifically justified and the entire data collection process has been biased.	8e. Based on the FAA review of the technical considerations affecting this study, the FAA modified the INM. In determining the appropriateness of the above modifications for this analysis, FAA performed a check of reasonableness of INM predictions using data obtained from actual measurements in the Grand Canyon (Volpe Center Letter Report DTS-75-FA465-LR11, Aug. 9, 1994 – see **Appendix D**). This check compared measured and INM-predicted sound exposure levels (SEL, denoted by the symbol L_{AE}) for individual flyover operations and L_{Aeq1h} values at GCNP. The results from INM

#	Commentor	Date	Comment	Response
				analysis correlate closely with actual measured data in the Canyon.
			8f. FAA and NPS appear to be acting primarily for political reasons. Their actions seem to not seriously address regulatory requirements of the Small Business Administration or the Office of Management and Budget.	8f. These actions meet SBA and all applicable regulatory requirements, as discussed in detail in the proposed Final Rule.
			8g. We do not believe that the FAA's statutory authority is to discourage the growth of commercial aviation and limit the uses of our country's airways. DOT and FAA should stand up to the political pressures and exercise their statutory responsibility. FAA will not achieve the goals of Free Flight 2000 at least in the western United States if these rules are enacted and this precedent established.	8g. Federal law and executive policy require FAA and NPS to work cooperatively to achieve substantial restoration of natural quiet in the GCNP. As the volume of noise is positively related to flight operations, a limitation to the number of air tours is one of the steps being taken to toward the mandated goal of substantial restoration of natural quiet. Aerial viewing opportunities will continue consistent with this objective. FAA's authority is not limited to aviation safety and efficiency. See, December 31, 1996 Final Rule, 61 Fed Reg. 69302, 69308. Restrictions on operations by other than air tours are not being contemplated. See, Change in Noise Evaluation Methodology for Air Tour Operations over the GCNP, Notice of Disposition of Public Comments and Adoption of Final Noise Evaluation Methodology, Discussion of Comments, Response 23, FAA Authority and Role, 27, Restrictions at Higher Altitudes, 64 Fed Reg. 38006, 38016-17, July 14, 1999. State, local, and tribal governments may not use their police powers, including their land use control authority, to regulate use of the navigable airspace. Further, unless precluded by other law from causing or contributing to any inconsistency with local land use plans, policies, or controls, FAA is aware that Federal agencies retain the authority to decide to go forward with proposals, despite the conflict. To the extent that GCNP is the only Park subject to a statutory mandate to substantially restore natural quiet, the proposed actions have limited precedential value.
9	Ms. Brenda Halvorson President, CEO Papillon Grand Canyon Helicopters	9/7/99	9. No comments on SEA.	
10	Hualapai Tribe,	9/7/99	10a. Tribe commends FAA for revising Chapter 3 to include	10a. The data contained in Chapter 4 and Table 2.1 has been revised to

#	Commentor	Date	Comment	Response
	Hualapai Overflight Committee, Teresa Leger and Susan G. Jordan		several sections drafted by the Tribe describing the affected environment on the Hualapai Reservation. However, the SEA analysis of environmental impacts in Chapter 4 and Table 2.1 remains inadequate.	include the results of Phase I and IIA of the Ethnographic Study.
			10b. Requests FAA include in the record the comments previously submitted on the proposed action.	10b. In accordance with the Cooperating Agency Agreement, the Final SEA discloses where comments of the Tribe were not incorporated. FAA will also include the comments received from the Tribe as part of the administrative record and make them available to the public upon request pursuant to the Freedom of Information Act.
			10c. The scope of the SEA must be the entire Grand Canyon Region Affected by the SFAR. The EA incorrectly states at p. 1-6 that the mandate of the Overflights Act does not extend to the areas of the Grand Canyon located outside the boundaries of the GCNP. This contradicts the plain language of the statute because this section of the statute is not limited to the Park. Section 3(b)(1) of the Act calls for recommendations for actions necessary to protect the resources in the Grand Canyon from adverse impacts associated from aircraft overflights.	10c. As noted later in the comment, the noise study area for the Final SEA included the area of potential impact of the SFAR and revisions to the commercial air tour routes. The statement in the Final SEA is correct. When the recommendations for action in Section 3(b)(1) are read in the context of the statute, which is entitled the National Park Overflights Act, and harmonized with other portions of Section 3 and the statute, it is clear that the mandate is limited to the GCNP. Section 3(a) is the legislative finding that supports the requirement for action in Section 3(b). Section 3(a) finds that "Noise associated with aircraft overflights at the Grand Canyon National Park is causing a significant adverse effect on the natural quiet and experience of the park…" Section 1.3 in the Final EA has been revised to clarify the basis for the statement and to acknowledge the Tribe's different interpretation of the Act.
			Chapter 4 still gives only cursory and inadequate attention to the noise, visual and other impacts on tribal lands outside the GCNP.	There has been extensive noise analysis of impacts on tribal lands outside the GCNP. Chapter 4 and Appendix A contain noise contours and analysis of representative locations on tribal lands. Sections 4.2 and 4.3 of Chapter 4 have been revised to provide detailed analysis of the noise and visual impacts on traditional cultural properties on Hualapai lands. The FAA determined that the Preferred Alternative would have adverse effects on some Hualapai TCPs identified during NHPA Section 106 consultation. . Impacts on wildlife are addressed in Section 4.9.

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			10d. SEA continues to refer to the "GCNP" and "GCNP Study Area" in many instances where it is not appropriate. The references in the SEA should be changed to Grand Canyon, except of course where the information or analysis truly applies to the GCNP.	10d. As to the applicability of the mandate in Pub. L. 100-91, see Response to Comment 10c above. FAA has clarified the reference to the GCNP, GCNP Study Area, and Grand Canyon in Chapter 3 of the Final SEA.
			10e. SEA's conclusions that the proposed actions will have not significant impact on the Hualapai Tribe are inadequate, premature and not supported by the record in numerous respects. First the SEA inappropriately applies the residential standard to assess impacts on the non-Park lands. The FAA is de facto using the Part 150 residential noise standard to evaluate noise impacts on the Hualapai Reservation, despite some suggestions to the contrary at 4-2 and 4-20 in the SEA. Use of this standard on the Reservation is inappropriate, the appropriate noise thresholds are those that correspond to the land uses within the area of exposure: the audibility and noticeability thresholds developed for comparable land uses in the Park. The DSEA does not identify a decibel level for evaluation of noise impacts on TCPs for which a quiet setting is an attribute or an important aspect of its current use. Nor does the DSEA identify any threshold applied to impacts on areas of the Hualapai Reservation used for nonresidential recreational outdoor purposes. FAA has apparently discarded an approach to evaluating noise impacts on these non-TCP outdoor recreational areas that was similar to the approach used for TCPs. The FAA omitted from the DSEA a statement that had been included the Preliminary DSEA, "FAA considered whether predicted increases in noise would substantially impair the enjoyment and value of areas in the vicinity of areas in the vicinity of the GCNP." The DSEA asserts that aircraft noise levels under all alternatives "are substantially below any established threshold of significant impact" and that noise levels generally would not interfere with normal outdoor speech communication on Native American lands. Many of the noise levels on the Hualapai Reservation are above the audibility and noticeability thresholds	10e. FAA appropriately used the thresholds in FAA's established environmental policies and procedures, which in turn reference the Part 150 land use compatibility guidelines, to evaluate the significance of changes in noise levels on the Hualapai Reservation. The text of the Final SEA has been revised to clarify this. FAA did not claim that average daily noise levels below 68 LAEQ12hr have no impact on land uses and that noise below these levels can have no impact on ordinary activities. Rather, in the Final SEA the FAA evaluated whether increases in noise would have a significant impact considering existing noise exposure levels. Unlike the policies avowed under Department of Transportation Act Section 4(f), those under NEPA, allow FAA to focus primarily upon the reaction of people to noise in determining whether there is a significant impact in the land use category. The text in the Final SEA has also been revised to clarify the legal basis for use of the Ldn methodology and thresholds in rural and Native American settings. The Ldn system is the best available measure of noise exposure to identify significant impact on the quality of the human environment and is the only noise metric with a substantial body of scientific data on the reactions of people to noise. The noise zones adopted by the NPS for the GCNP reflect thresholds for determining the onset of impact, not noise level limits for operation of aircraft or land use compatibility guidelines analogous to 14 CFR Part 150. (NPS continued the use of the noticeability threshold for time above analysis for developed areas of the GCNP and the Sanup and Marble Canyon areas, designated Zone 1. NPS adopted an audibility threshold for more noise sensitive areas of the GCNP known as Zone 2). The NPS authority to establish policy regarding noise impact methodology for GCNP is limited to the area within the park boundary.

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			that the FAA and NPS developed for the Park. Except for the small developed area of Grand Canyon West, the Hualapai Reservation lands within the area of noise exposure are largely undeveloped and are used for contemplative, ceremonial, hiking, hunting, preservation and other such uses which are extremely noise sensitive. The FAA omitted the description that the Hualapai provided to describe the noise expectations of the Hualapai residents and visitors other than Hualapai's using TCPs. Peach Springs, the residential area on the Reservation, is outside the area of noise exposure. The Part 150 standards do not apply to any of the land uses on the Hualapai Reservation within the area of noise exposure. Part 150 establishes standard for use on urban and suburban land uses and traditional recreational activities, which are not those engaged in at the Park or the Hualapai lands within the area of noise exposure. Outdoor sports arena events are not comparable to private ceremonies at TCPs or observation of nature, and spectators at such events are far less sensitive to noise than hikers or Hualapai ceremonial participants. The SEA should apply explicit rational standards (or thresholds) using the best data available to evaluate the environmental impacts of the proposed actions on the Hualapai Reservation. The best data available is the noise impact thresholds applied to the GCNP, not Part 150. There is no justification for using a residential noise standard or for refusing to state the threshold when reliable data is available for the environmental settings found on the Reservation. FAA should give the Tribe the benefit of the better data and most appropriate noise impact assessment methodology for the resource characteristics of the Reservation. The trust duty of the FAA supports the use of a noise threshold comparable to that used for the Park. The United States, through NPS and FAA, cannot treat its lands in a preferential manner that operates to the detriment of Tribal lands. FAA must protect the trust resources of the Tribe from the adverse impacts of aircraft overflights and must articulate an explicit, rational threshold for evaluating the	NPS may not exceed its delegated authority and establish similar thresholds for areas of the Hualapai Reservation or other neighboring lands. The mandate of Section 3 of the National Park Overflights Act to substantially restore natural quiet as defined by these thresholds applies only to the GCNP. See, Change in Noise Evaluation Methodology for Air Tour Operations over the GCNP, Notice of Disposition of Public Comments and Adoption of Final Noise Evaluation Methodology, Discussion of Comments, Response 3, Disagreement With Two-Zone System, Response 4, Tribal Trust Resources, 64 Fed Reg. 38006, 38008-9, July 14, 1999. As to why the trust responsibility does not compel a different result, see the above-referenced NPS notice at 38008-9. See also, Response to Comment 8d. (the current noise modeling is the best available). FAA properly concluded in the SEA that aircraft noise levels under all alternatives "are substantially below any established threshold of significant impact" and that noise levels generally would not interfere with normal outdoor speech communication on Native American lands. The Preferred Alternative, which includes a limitation on operation and many modifications to routes to reduce impacts to areas of concern to the Hualapai Tribe, reduces overall noise levels on the Hualapai Reservation. The Hualapai Tribe has not shown how FAA's use of 65 Ldn as the threshold of significance for noise impacts is unreasonable. FAA acknowledged in Section 4.1.1 that the decibel level standards in the Part 150 guidelines have limited applicability in assessing how noise impacts the uses and values of TCPs. FAA evaluated each TCP on a case-by-case basis, using supplemental noise modeling of representative locations. As to Hualapai TCPs, see Response to Comment 10c above. For a general description of how FAA assessed the significance of adverse impacts to six of the 40 TCPs identified by the Hualapai Tribe during NHPA Section 106 consultation, see Section 4.1.1, as revised. Sections 4.2 and 4.3 in the Final SEA have been updated to provide a detailed explanation. As to non-TCP outdoor recreational activities, the FAA appropriately used its well-established thresholds and the Part 150 guidelines. The

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			significance of impacts on Tribal trust resources. SEA should assess impacts on the environmental settings found on the Reservation using the noise impact thresholds applied to the GCNP. The threshold used to evaluate significant impact on the developed tourist area at Grand Canyon West should be the same as the onset of impact threshold applied to the comparable area of the Park, i.e. the Zone one threshold. The Zone two thresholds, for more sensitive areas in the Park, should be used to measure impact on the areas that the Tribe manages for wilderness and wildlife values and for undeveloped recreational use. The Zone Two threshold should also be used for TCPs.	non-traditional cultural property types of outdoor recreational activities on the Hualapai Reservation include hiking, camping, and boating to which Part 150 guidelines have relevance. The recreational category of land uses includes parks, resorts, and camps and water recreation. Because Part 150 guidelines apply and the mandate in Pub. L. 100-91 does not, FAA did not include the text supplied by the Hualapai Tribe that described the noise expectations of Hualapai Reservation residents and visitors at sites other than TCPs. The "suggestion to the contrary" (at page 4-2 and 4-20) referenced by the Tribe was the statement in Section 4.1.1 of the Draft SEA that "FAA relied upon [the Part 150] guidelines where the land uses specified were relevant to the value, significance, and enjoyment of the land uses in the study area. The federal courts have held that FAA may rely upon Part 150 guidelines to determine whether noise impacts result in a use of properties protected under Section 4(f) that are used for traditional recreational activities. However, Part 150 guidelines governing nature exhibits, zoos, and other such activities are not relevant in assessing impacts on land uses such as the role of a wildlife refuge used for bird watching. As Section 4(f) applies to historic properties on the Hualapai Reservation, FAA has narrowed the statement to so specify. The SEA appropriately refers to Part 150 land use compatibility standards for residential land uses. There are residential land uses in the vicinity of Tusayan within the area of noise exposure. To minimize confusion the statement in the Final SEA has been revised to delete the reference to residential and traditional recreational activities. FAA did not apply Part 150 guidelines to private ceremonies at TCPs, as discussed above. As explained below, though requested to do so, the Hualapai Tribe did not provide the FAA with sufficient data to determine whether and where there are non-TCP nature observation activities comparable to wildlife refuges on the Reservation. At page 4-4 of the SEA, FAA specified that the noticeability threshold (3 decibels above ambient noise levels) was used to measure the onset of noise impact to the Hualapai Reservation and other lands adjacent to the GCNP. This is the same threshold used by the NPS for the Sanup Plateau portions of the GCNP, which are adjacent to the Hualapai

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				Reservation. During NHPA Section 106 consultation and consultation with the Hualapai Tribe as a cooperating agency on this SEA, FAA explained that the same categories of ambient noise values for vegetative categories were used for lands adjoining the GCNP as were used for the GCNP. Final SEA at 4-3. FAA environmental policies and procedures provide for the FAA to conduct supplemental noise analysis, on a case by case basis, as appropriate. Although Department of Section 4(f) does not apply to Native American Reservation lands, FAA sought to address the comments of the Hualapai Tribe on the preliminary Draft SEA. FAA asked the Tribe to specify non-TCP outdoor areas of concern and describe the uses and activities of the sites. FAA also asked for geographic coordinates so that supplemental noise modeling could be done to evaluate how effects would be expected to change at these sites where it was determined that Part 150 guidelines were inappropriate. As to claims concerning impacts on tourist activities such as Guano Point, see Response to Comment 10h. The Tribe otherwise generally described a youth camp and hiking trails, but did not provide information about usage to enable the FAA to determine that Part 150 guidelines were not relevant. Nor did the Tribe provide geographic coordinates for supplemental noise modeling. As discussed above, the description of reliance upon Part 150 guidelines has been clarified to reflect that, based upon the best available data, TCPs are the only land use outside the GCNP to which Part 150 guidelines may not apply. Absent necessary information from the Tribe, FAA was authorized to rely upon Part 150 guidelines. As to Federal authority to regulate use of the navigable airspace notwithstanding state, local, or tribal land use plans, see the Response to Comment 8g, above. In any event, there was no inconsistency between the Preferred Alternative and Hualapai tribal land use plans. The Tribe provided plans for development of Grand Canyon West Airport and tribal resolutions limiting access to certain sacred sites in certain areas of the Reservation, but did not provide land use plans for the Reservation. FAA dropped the sentence in the preliminary DSEA that referred to substantial impairment of Hualapai outdoor recreational activities because areas outside the GCNP are not protected properties within the meaning of Section 4(f) and are therefore not subject to its

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				standard. The FAA appropriately used the noticeability hold to measure the onset of noise impacts on the Hualapai Reservation and other lands adjoining the GCNP. FAA's use of the noticeability threshold was upheld by the DC Circuit in Grand Canyon Air Tour Coalition v. FAA. As explained in detail above the NPS noticeability and audibility thresholds do not apply to lands adjacent to GCNP, only to GCNP. These thresholds are inputs for purposes of noise modeling and do not substitute for standards to evaluate the significance of noise impacts.
			10f. Second, the DSEA erroneously uses the No Action Alternative as a proxy for significant impact. The No Action Alternative is not the relevant baseline. Congress recognized that there were already significant adverse impacts from overflights when it enacted the National Park Overflights Act. The relevant question is whether each alternative has a significant impact using the appropriate decibel standard for each land use, not whether the alternative is worse than the already unacceptable situation.	10f. It is critical to have a baseline condition against which to compare the environmental consequences of the proposed action and the reasonable alternatives. See, CEQ "Considering Cumulative Effects Under the NEPA", January 1997, page 23. Without it, there is no way to determine the effects of the proposed action on the environment. The FAA's choice of the existing project baseline and analysis of alternatives complies with the procedural requirements. The No Action Alternative is the existing condition where, as here, by operation of law it would continue should the Preferred Alternative not be implemented (CEQ Response to 40 Most Asked Questions Concerning NEPA Regulations, Question 3, 46 Fed Reg. 18026, 18027 (1981)). Under Pub. L. 100-91, the effect of disapproving the proposed action would be to extend SFAR 50-2 until the mandate of substantial restoration is achieved Pub. L. 100-91 does not require the FAA to compare the proposed action with the conditions in the vicinity of the GCNP before the Act was enacted or air tours began. The Act does not mention a baseline and the legislative finding of significant adverse effects in Section 3(a) relates to the GCNP. The FAA may not use the findings in the Act as a proxy for the analysis and comparison of alternatives required by NEPA. As noted above in the Response to Comment 10e, the Hualapai Tribe does not have a land use plan that conflicts with the proposed action. Nor did the Tribe provide additional information necessary to determine whether Part 150 guidelines are applicable to non-TCP outdoor recreational activities on the Reservation. FAA properly used the Part 150 guidelines to determine the potential significance of impacts in these circumstances.

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			10g. Third, the SEA wrongly asserts that there will be no significant impacts on TCPs. The SEA ignores the information provided by the Tribe indicating that noise and visual impacts on traditional cultural properties located on the Hualapai Reservation will be significant. As requested by the Tribe, FAA should have completed consultation pursuant to Section 106 on the most critical and sensitive TCP areas identified by the Tribe before issuing the DSEA. The Tribe has advised that natural quiet and a quiet setting is essential and that audible aircraft noise and visual intrusion from aircraft have significant adverse effects on TCPs. Based upon this information, the only conclusion supported is that there will be potentially significant adverse impacts. FAA's noise data indicates that the aircraft will be above the audibility threshold at some or all of the TCP areas. The turn around of the Blue 2 air tour route on the western end, for example, may significantly impact some of the Tribe's most sensitive and important TCPs disclosed to FAA.	10g. See response to Comment 10c, above as to TCPs. . The Preferred Alternative would move the turnaround away from Quartermaster and Horse Flat Canyon and toward the main canyon and GCNP.
			Table 2.1 wrongly asserts that there will be no significant impacts on these TCPs, including visual impacts of the No Action Alternative and historical and archeological impacts for Alternatives 2 and 3. Table 2.1 contradicts the DSEA's acknowledgement that the Preferred Alternative, with a limitation on overflights, will increase noise to 39.6 at the TCP identified by the Hualapai Tribe as H10. This is far above the audibility threshold. In addition, the Tribe previously objected to Alternatives 2 and 3 because of impacts on TCPs in the Diamond Creek area and on National and Prospect Canyon.	Alternative 2 was preferred over Alternatives 3 and 4 because Alternative 3 would require a northward extension of the SFRA boundary that would interfere with the commercial aircraft arrival route into Las Vegas McCarran Airport. Additionally, Alternative 4 was not preferred because it would impact especially critical and sensitive Hualapai TCPs and the residential areas of the Hualapai Reservation. Alternative 4 would be most costly in fuel usage for the commercial air tour operators.
			SEA does not define the Area of Potential Effect under NHPA Section 106 regulations correctly and therefore underestimates the environmental impacts of the proposed actions. Given the new concerns about the definition of the Area of Potential Effect, all of the alternatives may have significant adverse impacts on Hualapai TCPs. The FAA has no justification for defining the APE as three miles on either side of the centerline. The Air Traffic Noise Screening Model does not provide a rational basis because it does not apply to air traffic actions at elevations at	The three-mile APE was derived from prior studies conducted by the US Department of Defense and from FAA's Air Traffic Screening Notice (ATSN). The Air Traffic Screening Notice is based upon scientific research showing in areas of cumulative aircraft noise exposure outside of DNL 60 dB, changes in air traffic routes that cause 5 decibel or greater increases in noise are likely to result in community reaction. See, Final SEA Appendix C. The Screening Notice addresses higher altitude routes and louder types of aircraft than are typical of air tour operations in the Grand Canyon. FAA could have

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			issue in the proposed actions, it is derived from the same source of scientific knowledge that supports the Integrated Noise Model, which has been modified to address the unique terrain of the Grand Canyon, it is intended to be applied where an EA is not required, and it is designed to address noise on residential communities, not TCPs. Nothing in the ATNS Manual shows how three miles from three miles from the centerline developed for higher altitude flights over residential areas could meet the definition of the APE at 36 CFR 800.16(d). The DSEA indicates that the noise exposure area is far larger. The 20-decibel noise contour depicted in the DSEA maps extend substantially farther than three miles from the western air tour route lines. The proposed actions' effects on critical and sensitive canyons and areas studied under Phase I of the Statement of Work must be reexamined in light of a correct definition of the APE and the actual noise exposure. We also need clarification of the extent to which the blue direct route crosses National, Prospect, and Mohawk Canyons. The current route map seems to show the routes further within the center of these canyons that the initial maps provided.	defined the APE as one mile on either side of the centerline, however more conservatively use three miles on either side. To address concerns raised by the Tribe and THPO in July 1999 about FAA's noise standards, among other things, FAA first agreed to use 3 instead of 5 decibel changes in noise as the APE. Subsequently, FAA and the Hualapai Tribe and THPO agreed to define the APE to include the 20 LAEQ12hr noise contour area for the Preferred Alternative in the June 1999 SEA and the October 1997 Reevaluation for the Notice of Clarification, and certain other areas. It should be noted that the FAA, Hualapai Tribe, and THPO reached agreement on the APE after these comments were submitted. For more detail, see Sections 3.6.4 and 4.2 of the Final SEA, which have been updated to describe the NHPA Section 106 consultation with the Tribe.
			10h. Fourth, the SEA fails to consider the adverse economic impacts of overflights on the Hualapai Reservation. SEA needs to be rewritten to include specific analysis of the proposed actions' impacts on economic activity on the Hualapai Reservation, including tourism at Grand Canyon West, Diamond Bar Creek, river running, and guided hunting trips. Instead, the DSEA suggests that the interests of all of the tribes are "spiritual and traditional". DSEA at 3-2. The DSEA Section entitled "Socioeconomic Impacts" needs to be revised to include specific analysis of the proposed actions' impacts on economic activity on the Hualapai Reservation, including tourism at Grand Canyon West, Diamond Bar Creek, river running and guided hunting trips. The proposed limitation on flights would have significant socioeconomic impacts. Overflights (aircraft that do not land on the Hualapai	10h. The Proposed Final Rule, Commercial Air Tour Limitation in the Grand Canyon National Park Special Flight Rules Area, Sect. 93.319(f) provides an exception to the allocations for commercial air tour operations conducted in support of the Hualapai tourism interests. This exception should eliminate adverse economic impacts on the Hualapai economic development efforts at Grand Canyon West. Section 4.6, Social/Socioeconomic Impacts, has been revised to discuss this modification to the Proposed Final Rule. Following consultations with the Hualapai Tribe, the FAA determined that the Proposed Action does not increase the number of commercial air tour flights over tourism areas (Diamond Bar Creek, river running, guided hunting trips, and hiking trails) at the west end of the Reservation at 9500 feet MSL and above. Guano Point gets an increase in the number of fixed-wing aircraft traveling on Blue Direct south. However, FAA points out that Guano Point is located at Grand Canyon West Airport and currently 80 percent of the helicopter traffic

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			Reservation) have an adverse economic impact on the Reservation. The Tribe is carefully developing areas located on the rim at Grand Canyon West for park-type tourism, has made current improvements including a dining facility and scenic vista at Guano Point, and hiking trails along the rim. The Tribe has invested $15 million in this and planning for further development, including a lodge at Quartermaster Canyon. Aircraft overflights on proposed Blue 2 and Green 4 will traverse Grand Canyon West. These routes should be appropriate located and overflights appropriately capped to provide visitors with protection comparable to that provided to visitors in developed areas of the GCNP.	and 10-20 percent of the fixed-wing traffic landing at Grand Canyon West in support of Hualapai economic development efforts pass by Guano Point. The remaining traffic continues on route at 5500 feet and above for fixed-wing and 5,000 feet for helicopters. In addition, Guano Point currently gets a significant amount of both ground and air visitor activity. FAA is committed to revisiting the location of commercial air tour routes in the west end of the Reservation when the Tribe has finalized its economic development plans for Grand Canyon West. This part of the reservation experiences commercial air tour overflights at this time. The Proposed Alternative will eliminate portions of Green-4 and Blue-2 east and south of Surprise Canyon and will limit the number of commercial air tours operating on these routes (that do not qualify for the operations limitation exception noted above). These modifications will reduce environmental impacts to the west end of the reservation. To clarify that Section 3.3 addresses economic interests, the Final SEA has been revised at page 3-2 to state, "The following is a summary of each community's interests, including spiritual, traditional and other interests." See Response to Comment 10e for discussion of impacts on non-TCP, outdoor recreational areas on the Hualapai Reservation.
			10i. SEA fails to consider impacts on certain endangered species on the Hualapai Reservation and fails to evaluate impacts on other wildlife. SEA neglects to address impacts on the endangered Hualapai Mexican Vole. The statement in the DSEA that monitoring suggests significant disturbances to peregrines from overflights contradicts Table 2.1, which concludes that none of the alternatives have significant impacts on endangered species. Chapter 4 of SEA must address impacts on other wildlife and wilderness areas as well as endangered species. Existing studies do not evaluate the long-term impacts of overflights on Big Horn	10i. The Final SEA considers the potential impacts on the endangered and threatened plant and animal species found in the GCNP and the adjoining Hualapai Reservation. (See Section 3.7) The Final SEA, Section 4.9, has been updated to summarize the results of Section 7 ESA consultation. NPS, as the designated lead agency for this consultation, completed the Biological Assessment and provided comments to the USFWS on the Biological Opinion. In its Biological Opinion the USFWS concurred that the only listed species likely to be affected by this action were the California Condor, Mexican spotted owl and bald eagle. The Biological Opinion concludes that the Proposed Action is "not likely to jeopardize" the continued existence of these three species. The USFWS also concurred with the NPS that

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			Sheep.	the Proposed Action is "not likely to adversely affect" the desert tortoise, Hualapai Mexican vole, black-footed ferret, southwestern willow flycatcher, or the Yuma clapperrail. An incidental take statement was included in the Biological Opinion along with terms and conditions implementing reasonable and prudent measures as a condition for exemption of the Proposed Action form prohibitions of Section 9 of the ESA. Included as part of the terms and conditions of the Biological Opinion, the NPS and FAA will develop and implement a monitoring program to further assess the effects of the Proposed Action on listed species. NPS has agreed to include the Desert big horn sheep in this monitoring program.
			10j. Noise Impacts on the Hualapai Reservation should be assessed against the two-zone audibility standard and not against the residential standard.	10j. See Response to Comment 10e above.
			10k. SEA fails to analyze the significant socioeconomic impacts on the Hualapai Tribe of treating Hualapai transport flights as tour flights subject to caps. The Tribe estimates that income from transport flights comprises 45% of its general fund budget. These flights have a minimal environmental impact on the GCNP. The Tribe is taking steps to minimize environmental impacts associated with these flights. As part of its land use plans, the Tribe selected landing sites to avoid sacred sites and continues to ask the FAA to ensure that flight routes avoid such sites. Allowing these flights to continue without a cap strikes a reasonable balance between protecting the resources of the Park and the Tribe's interests. The trust duty requires the FAA to avoid adverse impacts on Hualapai resources. Overflights make trust lands incompatible with outdoor tourism and recreation. Reservation transport flights, on the other hand, are vital to the Tribe's realization of trust income from the Tribe's trust lands. The Tribe recommends three alternatives to address its concerns in the comments on the proposed caps.	10k. Final SEA, Section 4.6 has been revised to incorporate modifications made to the Proposed Final Commercial Air Tour Limitation in the Grand Canyon National Park Special Flight Rules Area (Proposed Final Operations Limitation Rule). Following comments submitted by the Hualapai Tribe and Tribal members, the FAA and NPS determined that the Operations Limitation Rule, as proposed in the July 9, 1999 NPRM, 64 Fed. Reg. 37304, would significantly adversely impact the Hualapai Tribe's economic development efforts at Grand Canyon West. The Hualapai Tribe is carefully developing Grand Canyon West for tourism and the income derived from these operations currently comprises 45% of its general fund budget. In order to support the Tribe's economic development efforts at Grand Canyon West, several federal agencies, including the FAA, have provided federal grant money for various improvement projects. The Federal government has a general trust responsibility to Native American Tribes to support their efforts for economic development and self-sufficiency. Along with the general trust responsibility, the existence of a trust duty between the United States and a Native American Tribe can be inferred from the provisions of a statute, treaty or other agreement. Congress has enacted a number of statutes that promote tribal self-sufficiency, including the Indian

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				Financing Act of 1974, as amended 25 U.S.C. Section 1451 et seq. The Indian Financing Act of 1974 declares the policy of Congress "to help develop and utilize Indian resources, both physical and human, to a point where the Indians will fully exercise responsibility for the utilization and management of their own resources…." Thus, in order to fulfill the governments trust responsibility to the Hualapai Tribe, the Proposed Final Operations Limitation Rule has been modified to provide an exception to the commercial air tour limitations if specific conditions are met. The conditions are set forth in the Proposed Final Rule, Commercial Air Tour Limitation in the Grand Canyon National Park Special Flight Rules Area, Section 93.319(f). The Regulatory Evaluation accompanying the Rules details the adverse economic impacts that are mitigated by the exception to the Proposed Final Operations Limitation Rule.
			10l. SEA wrongly concludes that the proposed actions will have no adverse environmental justice impacts. The DSEA at 4-24 incorrectly and misleadingly states: "The Proposed Action has eliminated existing air tour routes…over the Hualapai Reservation except in the vicinity of Grand Canyon West Airport. The Supplemental EA indicates that the Proposed Action would not result in significant noise impacts on minority and low income populations in the study area." The blue direct routes will still traverse the eastern portion of the Reservation. In addition, the green (sic) fixed wing route will fly over Grand Canyon West Airport. Both routes will overfly sensitive TCPs used by the Hualapai for ceremonial purposes. Air tour routes have a significant adverse impact on TCPs, tourism, and Reservation employment.	10l. The commenter is correct about the statement at page 4-24. This statement in the Draft SEA did not address existing blue direct routes used for transporting passengers from Las Vegas to Tusayan. The Proposed Action would eliminate existing air tour routes in the vicinity of Supai Village over the Havasupai Reservation. This same route that would be eliminated is one of three that overflies the east side of the Hualapai Reservation. The portions of the existing two routes on the west side of the Hualapai Reservation east and south of Surprise Canyon are also being eliminated. Blue Direct South is being shifted northward approximately one mile and the minimum altitude is being raised from 8,500 feet MSL to 9,500 feet MSL. The statement in the Final SEA has been revised accordingly. As a result of these measures and others, the Preferred Alternative results in a net overall decrease in noise over all Native American lands in the vicinity of the GCNP. Peach Springs on the Hualapai Reservation is outside the noise exposure area (the 20 L_{Aeq12h}). The noise analysis in Section 4.1 indicates that the Preferred Alternative does not result in significant impacts on Native American populations. The levels of commercial air tour noise on the Hualapai Reservation are well below established thresholds of significant impact. As to the claim that adverse effects would result from the routes that would continue on the west end, see Response to Comment 10h.

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				As to TCPs, assuming that historic properties are within the scope of the Executive Order on Environmental Justice, the Preferred Alternative does not cause disproportionately high and adverse impacts. There are adverse effects on some Hualapai TCPs, but these effects are not significant. Under the Preferred Alternative, the minimum altitude of Blue Direct South would be raised and it would be shifted north approximately one mile to reduce impacts on Hualapai historic properties. These mitigation measures, and others included in the Section 106 PA, assure that there will be no potentially significant impact on TCPs.
			10m. SEA should include more specific analysis of the environmental impacts of each of the alternatives. Table 2.1 contains only cursory statements, such as "not significant" without any meaningful analysis or explanation. This Table would lead a decisionmaker or member of the public to conclude that there is no significant basis for choosing the Preferred Alternative or the No Action Alternative over any of the other alternatives. Table 2.1 does not support the DSEA's conclusion that the Preferred Alternative is the central transit route because of the significant environmental impacts associated with the other alternatives.	10m. All impact categories required under NEPA and FAA Order 1050.1D were analyzed in Chapter 4 of the SEA. Table 2.1 and the Final SEA have been updated to include more specific analysis based upon ESA Section 7 and NHPA Section 106 consultation. Table 2.1 is merely intended to summarize the conclusions that are supported by the detailed analysis in Chapter 4. In response to this comment, the Table has been revised to clarify that there are adverse effects for all alternatives in the category of Historic, Archeological, and Cultural impacts. As the projected noise levels for the No Action were comparable to Alternatives 2, 3, and 4, and Section 106 consultation was only completed for Alternative 2, it was inappropriate and speculative to characterize impacts of the No Action in this category as significant. To make the Table more useful in comparing alternatives, the percent of the GCNP that would experience substantial restoration of natural quiet by 2008 has been added.
			10n. SEA should consider alternative tour routes and a real alternative blue direct route. The alternatives differ only in that they have alternative direct routes. At the very least, SEA should consider an alternative that omits any tour route on the west end. SEA fails to analyze a blue direct route alternative that avoids the Hualapai Reservation. The Tribe is concerned that these blue direct routes will have significant impacts on canyons that contain TCPs. The absence of a blue direct route that avoids the Reservation renders the range of alternatives presented unreasonable. The Tribe appreciates and supports the concept	10n. The FAA developed the Proposed Action and a reasonable range of commercial air tour routes examined in this SEA in accordance with its statutory authorities and P. L. 100-91 for the substantial restoration of natural quiet to the GCNP. FAA considered, but did not retain for detailed study an alternative blue direct route that would avoid transiting the Reservation altogether, as explained in detail in Section 2.1, Proposal 10. The Hualapai Tribes Blue Direct North proposal was not studied in detail because it would not meet the purpose and need for the action of substantially restoring natural quiet to the GCNP. FAA has determined that the Preferred Alternative would adversely

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			behind the suggestions of an alternative blue direct route made by environmental groups to avoid the Reservations. Blue direct should skirt the reservation to the south or could traverse north of the Sanup and Toroweap/Shinumo Flight Free Zones and access Tusayan Airport via Dragon Corridor, Zuni Point Corridor, or a transit corridor that would pass through the eastern portion of the Toroweap/Shinumo Flight Free Zone but would avoid the Hualapai and Havasupai Reservations.	affect six of the 40 TCPs identified by the Hualapai Tribe during Section 106 consultation. The Section 106 PA includes a monitoring and mitigation program to address these adverse effects. If necessary to address adverse effects based upon further analysis of additional TCPs and the results of the monitoring program, the FAA and NPS have committed to consider other alternative commercial air tour routes to minimize overflights over the Hualapai Reservation. This will be done either as part of the Comprehensive Noise Management Plan or according to the schedule set forth in the PA.
			10o. SEA should disclose that weather exit routes are part of the proposed actions and analyze the environmental impacts of these routes. The DSEA assumes that the weather exit routes will have "minimal environmental impacts" because they "are used less than five percent of the time." DSEA at 4-9. This estimate sounds low considering the frequency of storms in the area. We urge the FAA to develop a reasoned estimate of the usage and not rely upon staff judgment. Because these routes cross some of the Hualapai's most sensitive canyons, the Tribe and FAA need to know the impact on TCPs in these canyons. The route maps should be revised to depict the weather exit routes and the impacts should be modeled and analyzed. The SEA should reference the limitations placed on the use of weather routes as well as FAA's commitment to monitor the use of these routes and make changes as necessary to protect the Tribe's TCPs and the Park's Sanup FFZ. During the May 1999 meeting, we discussed the need to reference the strict limitations that would be placed on use of the weather routes in the DSEA, the maps, and operating manuals. We are discouraged to see that FAA has not included any of these safeguards in the proposed rules or the DSEA.	10o. The weather routes contained on the chart are only a depiction to provide the commercial air tour operators with a general idea for a course of action if weather is encountered, and therefore are not part of this undertaking. The chart will contain specific language related to the use of a "weather route". Flights on such "routes" only occur when pilots encounter bad weather that has not been forecast. When poor weather is forecast, air tours are cancelled. Therefore, the use of weather routes is infrequent. As part of the comprehensive noise management, FAA and NPS will address any further concerns and any significant new information regarding use of these routes and potential impacts to TCPs. The route maps and FAA's sectional charts that will be published with the proposed Final Rules will indicate that operators on Blue 2 and Green 4 that encounter bad weather may not use the weather routes. Only air tour operators using Blue Direct North and South may use the weather "routes" depicted on the map. When they use weather 'routes," they must file deviation reports with the FAA's Las Vegas Flight Standards District Office (FSDO). The FSDO will monitor use of these routes. The route maps and aeronautical charts have been modified to include a caption identifying the weather routes as "weather routes" rather than just a dashed line and referral to the map key.
			10p. SEA wrongly concludes that the proposed actions will not constitute constructive use of Hualapai lands. The DOT Section 4(f) section of the DSEA acknowledges that "noise levels which substantially interfere with the use and value of [Section 4(f)] properties or preclude activities occurring at such properties	10p. Section 4.3 in the Final SEA has been updated to evaluate whether adverse effects on some of the TCPs identified by the Hualapai during NHPA Section 106 consultation are minimal or significant, so as to constitute a use under DOT Section 4(f). The conclusion referenced by the commenter related to the GCNP, not

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			would therefore constitute a constructive use of property." The Tenth Circuit Court of Appeals held in National Parks and Conservation Association v. FAA, 998 F.2d at 1531 that "[t]he relevant inquiry is…whether the project would have a 'significant' impact on the lands." Accordingly, the proper thresholds for the Section 4(f) analysis are the audibility and noticeability thresholds discussed above. The DSEA concludes that "it does not appear that constructive use of Section 4(f) properties would occur" on the basis of "accepted" thresholds and residential standards for noise impacts. DSEA at 4-23. When the appropriate standards discussed above are applied, it is clear that significant impacts and constructive use of Hualapai TCPs would occur under certain route alternatives. The likelihood of constructive use of these TCPs supports the selection of routes that avoid much of the Hualapai Reservation. A use of Hualapai lands that is not approved by the Tribal Council or mandated by the United States Congress would be a taking, which is prohibited by federal law.	TCPs. See, Section 4.1. Hualapai TCPs in the vicinity of the blue direct routes are not located in pristine, quiet settings. These TCPs already experience aircraft noise levels above those typical for a rural area. Under the Preferred Alternative, predicted annual average daily noise levels remain below those typical of an urban environment. The Tribe's contrary view is based upon the world before air tours existed, which is not the appropriate baseline for evaluating the effects of this Undertaking. See, Response to Comment 10f. Based upon the immediate and long-term mitigation measures in the Section 106 Programmatic Agreement and careful review of the Hualapai Tribe's ethnographic studies, additional fixed wing overflights on the blue direct routes under the Preferred Alternative would not destroy the value of nearby Hualapai TCPs. FAA recognizes that there is not much precedent for evaluating impacts on TCPs and perceptions of traditional cultural practitioners. As part of the PA, if the monitoring data reveals adverse effects on Hualapai TCPs, the FAA has agreed to consider alternatives to further minimize overflights of the Hualapai Reservation. FAA will reevaluate its determination of no use to address any significant new information resulting from the monitoring program. Alternatively, if there is a use of Hualapai TCPs under Section 4(f), then through the NEPA and Section 106 processes the FAA has determined that there is no feasible and prudent alternative and has included all possible planning to minimize the harm resulting from the use. The noise levels of the Proposed Action and alternatives do not rise to the level of a taking requiring compensation under the Tenth Amendment of the U.S. Constitution. The noise levels are all well below accepted thresholds for residential land use at all points in the Hualapai Reservation.
			10q. SEA fails to address mitigation of any impacts except impacts on TCPs and raises concerns that TCPs will not be avoided. DSEA's three-sentence discussion of mitigation in section 4.13 is wholly inadequate. It fails to discuss mitigation of socioeconomic impacts and endangered species and wildlife impacts. The socioeconomic impacts may be partially mitigated by the NPS providing the Hualapai Tribe a share of the millions	10q. Section 4.13 has been updated to describe monitoring and mitigation measures adopted for Hualapai TCPs, as part of a Programmatic Agreement under NHPA Section 106 impacts and for endangered species. It has also been revised to discuss the exemption from the proposed Final Rule (i.e. the Limitation on Commercial SFRA Operations) to avoid significant adverse socioeconomic impacts on the Hualapai Tribe. The sentences in the preliminary SEA were artifacts of the earlier

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			of dollars in impact fees collected from air tour operators in the SFAR. The Tribe is concerned that the FAA may back away from its commitment to avoid TCPs in accordance with the NHPA. Sentences in the Preliminary DSEA pledging such avoidance were omitted in the DSEA. The FAA also dropped the last sentence of this section stating that the FAA would adopt all measures necessary to assure that the routes do not substantially interfere with the religious practices of Native Americans. Mitigation would constitute a constitutionally allowable accommodate of religion. FAA should again make this commitment, or at least explain why it has now decided not to mitigate its actions in this respect.	December 1996 Final EA. In that document the FAA committed not to implement the air tour routes until Section 106 consultation was completed and to "avoid or address all potential adverse effects on properties included in or eligible for inclusion in the National Register of Historic Places during the development of air tour routes." This commitment complies with Section 106, which requires Federal agencies that are unable to avoid adverse effects on historic properties, to enter into formal consultation and consider means to avoid or mitigate adverse effects to such properties. This commitment was obsolete in June 1999, when the FAA had determined that it was not possible to redesign the air tour routes to avoid potential impacts on all Hualapai TCPs identified through Section 106 consultation. Section 4.2 of the Final SEA documents how the FAA, in cooperation with NPS, as part of Section 106 consultation, also consulted with Native American tribes to protect traditional religious practices in accordance with the American Indian Religious Freedom Act and Executive Order 13007, Indian Sacred Sites. To the extent that the Religious Freedom Restoration Act continues to govern actions by Federal actions (see City of Boerne v. P.F, Flores, 521 U.S. 507, 117 S.Ct. 2157, 138 L.Ed2d 624, 1997 U.S. LEXIS 4035 (1997)), the Proposed Action fulfills its requirements. Considering the monitoring and mitigation measures included in the Section 106 Programmatic Agreement, between the FAA, NPS Hualapai Tribe, Tribal Historic Preservation Officer and the Advisory Council on Historic Preservation, there will be no substantial interference with religious practices of the Hualapai Tribe.
11	Pete Imus, Member Hualapai Tribe	8/27/99	11. No comments on EA.	
12	John Putnam Clark County Department of Aviation	9/7/99	12a. FAA proposes to eliminate the most-used and highest-revenue route on the basis of concerns about possible impacts to Native American cultural or religious sites. E.g. 64 Fed Reg 37,296, 37, 297 (July 9, 1999). However, FAA does not identify with any specificity what resources are affected or what standard of impact FAA applies. Id. Without this information providing the basis for the decision, the public has no ability to assess	12a. While the FAA certainly has the authority to manage the nation's airspace, it has an equally compelling mandate under 100-91, which relates only to the GCNP; that is to assist the Department of Interior in achieving substantial restoration of natural quiet at GCNP. To this end, the FAA while pursuing the mandate of Pub. L. 100-91 has continually sought to balance the interests of commercial air tour operators with the interests of GCNP ground visitors. .

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			whether FAA's decision is justified or arbitrary. Congress did not give the FAA the power to arbitrarily limit airspace. The United States Court of Appeals for the District of Columbia Circuit recently stressed the need for agencies to identify "intelligible principles" guiding their actions under power delegated by Congress. American Trucking Ass'n v. EPA, No. 97-1440 (DC Cir. 1999)("[W]hat EPA lacks is any determinate criterion for drawing lines. It has failed to state intelligibly how much is too much.") Neither the principles nor basic information appear to exist here. (Footnote: The problem is exacerbated by FAA's decision to use different thresholds of significance in nearly identical contexts. See e.g. Morongo Band of Mission Indians v. FAA, 161 F.3d 569 (9th Cir. 1998)(upholding FAA use of DNL 65 dB threshold of significance of impacts to Native Americans)). FAA must carefully revisit its decision to avoid creating a precedent that could affect flights over thousands of sites across the West for which some cultural, historic, and/or religious claim could be made. FAA alone has the obligation and authority to manage the nation's airspace. 49 USC 40103. This carries with it a responsibility to be conscientious stewards of a limited, non-renewable and vital publicly held resource. Unfortunately, as airspace managers, the FAA may have to adopt regulations that are not always fully compatible with the desires of the underlying land users/owners. Nevertheless, the FAA's first and foremost allegiance must continue to be the preservation of the public's airspace in support of the national air transportation system.	The Blue-1 commercial air tour route traverses some of the most sensitive backcountry habitation in the GCNP. In addition, its location and associated environmental impacts raised significant concerns with the Havasupai Tribe that reside under or near the flight path. Finally, the location of Blue-1 affected traditional cultural properties of religious and/or cultural significance to the Havasupai and Hualapai Tribes. After much consultation with all parties concerned, including the commercial air tour industry, FAA determined to eliminate Blue-1 and Blue-1A and the associated corridor through the Toroweap/Shinumo Flight Free Zone (FFZ). In a narrow sense, FAA did not go through the formal process of evaluation recommended by National Register Bulletin 38 with the Havasupai Tribe and all other interested Tribes, except for the Hualapai Tribe. As a first step with all of the tribes FAA used a broad approach more sensitive to tribal concerns about confidentiality and privacy. Rather than seeking to identify the specific location and determine the eligibility of potentially affected traditional cultural properties for inclusion in the National Register of Historic Places. FAA consulted with tribal representatives and authorities in an effort to minimize overflights of properties in the areas to which they ascribed traditional cultural and religious significance. The National Register Bulletin 38 (pages 17-18) notes that in a broader sense such an approach represents an excellent practice. During NHPA Section 106 consultation since late 1996 and during the scoping process for the DSEA, the FAA identified various alternative airspace and commercial air tour route configurations for Blue-1, including alternative locations and quiet technology aircraft. However, the FAA withdrew its proposal to continue a Blue-1 and Blue-1A and the associated corridor through the Toroweap/Shinumo Flight Free Zone. This was primarily because of the mandate under Pub. L. 100-91 and the discovery that the cap on operations implemented pursuant to the December 1996 Final Rule would not effectively cap operations. The comments of the Havasupai Tribe concerning TCPs, also supported that decision. (See 61 FR 69302, 61 FR 69334; 62 FR 26902, 26904, 26907; 62 FR 26906; 62 FR 66248; and 63 FR 38233). Finally, FAA also modified the routes on the west end of GCNP in an

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				effort to address the concerns of the Hualapai Tribe while still pursuing the mandate of Pub.L. 100-91. As explained in the Final SEA, Chapter 4 (Sections 4.1, 4.2, and 4.3), and the Response to Comment 10e and 10g, above, the FAA used the same criteria for evaluating impacts on Native American Tribes and traditional cultural properties in the vicinity of the GCNP as were used in evaluating the expansion of arrivals into Los Angeles International Airport. In Morongo Band of Mission Indians v. FAA, 161 F.3d 569 (9th Cir. 1998), the Ninth Circuit Court of Appeals upheld the FAA's use of the DNL 65 dB criteria for residential land uses and the 3-decibel increase in noise to measure potential adverse effects. Notably, because Los Angeles Airport (LAX) arrivals are 16,000 feet above ground level (AGL), there were no increases in noise predicated above one or two decibels on the Morongo Reservation. The FAA determined during Section 106 consultation that there would be adverse effects on six of 40 Hualapai TCPs identified during Section 106 consultation. Here, in contrast to LAXs, GCNP SFRA commercial air tour flights operate approximately 500 to 10,500 feet AGL. Although the Preferred Alternative eliminated one of the three routes over the Hualapai Reservation, and shifted one a mile north to reduce impacts on TCPs, the shift of additional air tours to these routes from Blue-1 would increase noise is areas underlying Blue Direct North and Blue Direct South. The FAA, in cooperation with the NPS, entered into a programmatic agreement with the Hualapai Tribe and THPO, and the Advisory Council on Historic Preservation to comply with Section 106. The PA reflects the dearth of precedent for addressing effects on TCPs and perceptions of traditional practitioners. The Proposed Action is consistent with FAA's statutory responsibility to preserve the airspace in support of the national transportation system. As to precedential value for flights at higher altitudes and in the western U.S., see the Response to Comment 8g.
			12b. FAA's proposed rules are not based on a solid foundation of science. FAA's assessment of the "natural quiet" impacts of its rule and the need for more extensive air tour overflight regulation are based on the indefensible methodology for assessing "natural quiet" recently announced by NPS. 64 Fed. Reg. 38006 (July 14,	12b. See, Change in Noise Evaluation Methodology for Air Tour Operations over the GCNP, Notice of Disposition of Comments and Adoption of Final Noise Evaluation Methodology, Response 7, Ambient Sound Levels, Response 8, Audibility and Noticeability, Response 9, Hearing Aircraft Below Ambient Levels, Response 19,

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			1999). This methodology proposes to use two thresholds for defining when the "natural quiet" in the Grand Canyon is exceeded – ambient levels plus three decibels in some portions of the Park and ambient levels minus eight decibels in others. This approach is flawed at its core. "Natural quiet" can only mean one thing. It cannot be both a level "three decibels above" and "eight decibels below" the ambient. Just as importantly, the newly established metric of eight decibels below ambient lacks a credible scientific basis. Given naturally occurring noise levels in all portions of the Grand Canyon, the methodology would count air tour aircraft as audible a sound energy levels that are barely above the threshold of human hearing, even without the masking effects of background noise.	Model Validation Study, Response 20, Rulemaking Process and Public Comment, and Response 25, Terminology Used In the Notice, 64 Fed Reg. 38006, 38008-9, 38015, July 14, 1999. See also, proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, H8. This response supplements that provided as part of the Disposition of Comments on the Commercial Routes. As the Clark County Comments on the Commercial Routes for the GCNP, 64 Fed Reg. 37191, July 9, 1999 included environmental issues, FAA has addressed those issues in detail here as part of the Final SEA. This response supplements that provided as part of the Disposition of Comments on the Commercial Routes Notice.
13	Hualapai Tribe, Teresa Leger and Susan G. Jordan	1/24/00	13a. The assertion in the Draft FSEA that there is no evidence of potential adverse impacts upon Desert bighorn sheep is incorrect. The Hualapai Department of Natural Resources has reported to FAA in consultation meetings, in written comments and in ethnographic reports that the Desert bighorn sheep are startled by aircraft and are not found in areas in the vicinity of flight routes where they were found historically. 13b. The Tribe reiterates and emphasizes previous comments on Table 2.1, that all alternatives, including the No Action Alternative, have significant adverse noise impacts, cultural resources impacts, Section 4(f) impacts, visual impacts, socioeconomic impacts, environmental justice impacts and wildlife impacts on the Hualapai Reservation. Because the adverse effects on Hualapai TCPs result from significant noise and visual impacts, noise impacts and visual impacts are significant for all alternatives. The Tribe has previously commented extensively on these impacts and the socioeconomic impacts and has also provided information indicating significant impacts to wildlife species that are not listed as threatened or	13a. In its Biological Opinion, USFWS has included mitigation measures, including the development and implementation of a monitoring program to evaluate and mitigate impacts of the proposed action on the listed species. Section 4.9 of the FSEA has been revised to reflect the conclusion, terms and conditions of the Biological Opinion. Studies conducted by NPS indicate that while aircraft may startle and momentarily alter the behavior of individual animals, there is no evidence of negative impacts on animal populations or critical habitat. However, as part of the monitoring program, NPS has agreed to include the Desert bighorn sheep in its study of potential effects of aircraft on species of concern. 13b. Table 2.1 is intended to provide a brief summary comparison of each of the alternatives. When determining the potential environmental impacts of each separate alternative, including the No Action Alternative, the FAA evaluates the potential environmental impacts to the then existing environmental conditions (or the environmental conditions should no action be taken). Table 2.1 has been revised to clarify that there are adverse effects for all alternatives in the Historic, Archaeological and Cultural impact category. See also response to comment 10f, 10l and 10m.

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			endangered. Because each of these impacts falls disproportionately on Native Americans, there are significant environmental justice impacts. Moreover, we do not need to elaborate again on the significant impact that would continue to befall the Hualapai if the FAA were to select the No Action Alternative.	
			13c. We wonder if the difficulty in revising Table 2.1 has more to do with the approach of the table than the actual disagreement about the relative impacts of the various alternatives. Table 2.1 assumes that a "yes" or "no" (or "adverse effect" or "no adverse effect") label can be meaningfully assigned for each category of impact across such a vast geographical area without some description of the location and extent of the impacts. As a result, Table 2.1 creates the erroneous impression that all of the alternatives have essentially the same impacts. This inherent problem with the Table would remain even if FAA makes the changes we have urged to correct the no significant impact entries (although the Table would be much more accurate than it is now). Therefore, unless Table 2.1 can be amended to briefly describe the impacts in a way that allows meaningful comparison of the alternatives, it should be omitted.	13c. The FAA declines to omit Table 2.1 from the Final SEA. Section 2.1.5 clearly describes the intent of Table 2.1 to provide a brief summary comparison of each of the alternatives. This same Section refers the reader to Chapter Four where the environmental impacts of each alternative are discussed and analyzed in detail by impact category.
			13d. The expectations of the Indian people who reside in the Grand Canyon for their experience and activities there are as important (or more important) than the expectations of visitors in the discussion of the physical and cultural resources and areas sensitive to aircraft noise.	13d. See Response to Comment 10e.
			13e. The Tribe requests that the northern boundary of the Hualapai Reservation be described as the center of the Colorado River or for the purposes of the SEA, the Tribe would not object to the northern boundary being described as lying within the Colorado River.	13e. The FAA is aware that there is a disagreement between the Hualapai Tribe and the NPS as to where the northern boundary of the reservation is located. The FAA notes the Tribe's comment but reiterates that the FSEA is not the format for resolving this disagreement.

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			13f. The Tribe requests that language describing the expectations of Hualapai residents and visitors be inserted in the FSEA to reflect the similar expectations of such populations with the expectations of their counterparts in the GCNP. Specifically, that Tribal member' expectations of natural quiet and lack of visual intrusions during recreational and hunting activities in undeveloped areas are high, but somewhat less than their expectations during traditional cultural activities. Their expectations during recreational and hunting activities can be assumed to be similar to those of backcountry visitors at GCNP. This assumption is appropriate even though hunting is prohibited at GCNP because Hualapai hunters, like back country hikers, expect a wilderness experience and expect that game animals and other wildlife will not be disturbed by aircraft noise.	13f. See Response to Comments 10c and 10e.
			13g. Recreational visitors or tourists to the Hualapai Reservation can be assumed to have similar expectations to visitors of similar areas of the GCNP. Thus, visitors to Grand Canyon West can be assumed to have similar expectations as visitors to the visitor center and lodge facilities at GCNP on the North Rim, which is less crowded than the South Rim. Hikers, river rafters and hunters can be assumed to have similar expectations to back country visitors at GCNP. Those expectations are discussed above in Section 3.8.1 of this document.	13g. See Response to Comments 10c and 10e. Traditional Recreational Activities listed under 14 CFR Part 150 include, Outdoor sports arenas and spectator sports; Outdoor music shells, amphitheaters, Nature exhibits and zoos; Amusements, parks, resorts, and camps; Golf courses, riding stables and water recreation. The FAA appropriately cites 14 CFR 150 in the FSEA. Native American traditional cultural activities are described in Chapters 3 and 4 of the FSEA to the extent allowed pursuant to confidentiality considerations.
			13h. The term "traditional recreation activities" should be defined by listing the specific land uses within the study area that are encompassed by the term. FAA informs us that term refers to activities listed under 14 C.F.R. Part 150 Land Use Compatibility Guidelines. The recreational land uses covered by Part 150, such as stadium events, are not reflective of land uses in the study area. Moreover, the term "traditional recreation activities" is likely to be misunderstood by the public to include Native American traditional activities or historical back country recreation neither of which are covered by the Part 150 land use guidelines. Since FAA advises us that power boating on Lake Mead is the traditional recreational activity for which the Part 150 land use guidelines were used, that activity should be	13h. See Responses to Comments 10c, 10e, and 13g. While FAA indicated that boating is an example of a traditional recreational activity in the study area, FAA does not agree that a list is necessary to avoid a risk of confusing the public.

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			inserted for clarity.	
			13i. In the Section 106 consultation with the Hualapai Tribe, the FAA made a determination of adverse effect, not potential adverse effect. The adverse effect determination is the basis for the mitigation and monitoring provided for in the PA. The PA includes a stipulation that the FAA, in cooperation with NPS, and in consultation with the Tribe, will initiate a program of financial and technical assistance to the Hualapai Tribe in monitoring the auditory, visual and other effects of the Undertaking on TCPs.	13i. The Programmatic Agreement signed by the FAA, DOI, Advisory Council and Hualapai Tribe and THPO stipulates that the "FAA has determined that the Undertaking may alter, directly or indirectly, the characteristics of at least some of the TCPs that qualify them for inclusion in the National Register of Historic Places in a manner that would diminish their integrity." FAA has determined that six of the 40 TCPs are adversely effected by the Preferred Alternative. This conclusion is stated clearly in both Sections 4.2 and 4.3 of the Final SEA. Regarding cumulative effects of the Proposed Action, see Response to Comment 10e above.
			13j. The PA addresses adverse effects, not possible adverse effects.	13j. See response to Comment 13i.
			13k. The FAA is required by 36 CFR Part 800 to resolve the adverse effects of the Proposed Action, including the cumulative effects. 36 CFR §800.5(a)(1); 64 Fed. Reg. 27044, 27064 (May 18, 1999). As the Tribe has always stressed in its written comments and consultation with the FAA, the cumulative effects of the Proposed Action include the current level of aircraft noise which is the result of the past actions of FAA in establishing the current routes and of non-federal entities in developing the air tour industry over the Grand Canyon.	13k. See Response to Comment 10e.
			13l. The discussion of park visitors in Section 4.7 should be deleted as it is not an environmental justice population.	13l. NPS has determined that a majority of park visitors are foreign nationals, predominantly from Asia, therefore this discussion is included in the Environmental Justice Section of the FSEA as impacts on this minority population is considered an environmental justice issue.
			13m. The sections on Impacts to Native Americans and Impacts to Native American Subsistence Hunting and Gathering need to	13m. See Response to Comment 10l.

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			acknowledge that the commercial air traffic over the Grand Canyon has adverse environmental justice impacts on Native Americans, including the Hualapai Tribe. Although these environmental justice impacts are partially mitigated by the modifications to the Proposed Action, the impacts should be disclosed and the mitigation measures explained.	
			13n. The first paragraph of the Section on Native American Communities in Chapter 4 for the FSEA continues to inappropriately discuss impact in terms of unspecified "established thresholds of significant impact," which apparently refer to the inapplicable Part 150 standards, and a supposed lack of "interference with normal outdoor speech communication." "Normal" outdoor communications and activities for traditional Hualapai include prayers and ceremonial activities at TCPs. As documented in the ethnographic reports and consultations, aircraft activity interferes with these communications and activities.	13n. See Response to Comment10e.
			13o. The Cumulative Impacts Section of the FSEA continues to ignore the cumulative impacts of the past actions (and failures to act) by the FAA, the NPS, and air tour operators that have brought about the current high levels of commercial air tour activity in the SFRA.	13o. See Response to Comment 10e.
14	Hualapai Tribe, Teresa Leger and Susan G. Jordan		14a. As previously commented, the term "traditional recreational activities" is misleading and should be parenthetically explained if it is used. The statement that noise thresholds for traditional recreational activities would not be exceeded "at any of these representative locations" misleadingly suggests that the relevant activities at all of the representative locations are traditional recreational activities.	14a. See Response to Comment 10e and 13g.
			14b. A considerable amount of time in the consultation during the drafting of the Programmatic Agreement (PA) was devoted to deciding whether the impacts were potential or simply adverse effects. The PA does not use the word potential and it should	14b. See Response to Comments 10p and 13i.

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			likewise be removed from Chapter 4 of the FSEA. Instead, the FAA found that the Undertaking had an adverse effect on "at least some of the TCPs." This was the basis for taking the mitigation measures set forth in the PA. It is inconsistent and dangerous to state that there was only a potential for adverse affects in the SEA when the PA and the FAA's actions are based on adverse effects on at least some of the TCPs. In addition, the statement that "there is no use under Section 4(f) in these areas" needs to be clarified so that it only applies to the areas for which no adverse effect was found.	
			14c. For clarification purposes, the 30 additional representative locations provided by the Tribe during Phase II(A) of the Ethnographic Study do not encompass all of the 40 TCPs and were provided for noise modeling purposes only. A portion of these locations and the locations within the Reservation selected by FAA are within the boundaries of approximately 22 of the 40 TCPs identified in the Phases I and II(A) reports. There are no modeled representative locations for the remaining 18 TCPs on the reservation.	14c. Section 4.2 of the Final SEA was revised to respond to this comment (see Endnote 43).
			14d. The ethnographic reports prepared by the Hualapai Department of Cultural Resources indicate that at least 40 TCPs are adversely affected by the undertaking. Of the 22 TCPs for which there are representative locations, the FAA has determined that six experience a 3 dB or greater increase in noise under the Preferred Alternative.	14d. Portions of the 30 representative locations provided by the Hualapai Tribe and THPO are within the boundaries of the 40 TCPs identified by the Tribe. See Section 4.2, endnote 41 of the Final SEA for more detail.
			14e. The SEA limits the comparison of the noise increase to the year 2000 and does not include the noise increase that would occur by the year 2008 as modeled. This is the foreseeable and modeled noise increase and the FAA gives no justification for modeling it but then ignoring it. As we have previously commented, the relevant comparison is to the 20 dB ambient noise level. Therefore, Table 4.18 and the text discussion should be revised to include the 2008 noise data and the differences from	14e. Table 4.18 includes data for the No Action and the Preferred Action for 2000, 2003 and 2008. The Table properly compares the No Action with the Preferred Action for each year. For a discussion of the appropriate baseline and noise thresholds, see Response to Comments 10e and 10f

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			the ambient noise level.	
			14f. We have confidentiality concerns with listing activities for each TCP (especially since the FAA has chosen to treat the wide range of activities undertaken in these sites as identical). We recommend instead summarizing the activities and focusing on the reasons why these activities are noise sensitive as set forth in the ethnographic study.	14f. Activities listed for the six TCPs adversely impacted are summarized from the Phase I and Phase IIA Ethnographic Study Reports. FAA has maintained the confidentially of these TCPs by renumbering the TCPs and keeping their locations confidential.
			14g. As we have advised you, we do not understand how FAA can conclude in the FSEA that aircraft noise is compatible with the traditional uses of Hualapai TCPs. As amply demonstrated by the ethnographic reports and information presented in the consultation, the current levels of aircraft noise are not compatible with these uses and are substantially impairing them. A finding of no constructive use is not stated outright here, but appears to be the intent of the discussion in the FSEA. For the reasons we have discussed in consultation, the Tribe does not concur in FAA's finding of no constructive use.	14g. See Response to Comments10e and 10p.
			14h. For the reasons we have discussed in consultation, the Tribe does not concur in FAA's finding of no constructive use. The reevaluation required by the PA is not conditioned on "significant new information."	14h. Comment noted. See Response to Comments 10e and 10p.

Public Hearing Comments (Comments 16-28), Flagstaff, AZ, August 17, 1999				
15	Jeri Ledbetter Grand Canyon River Guides	8/17/99	15a. Air tours should be subject to a 4-month curfew.	15a. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, H6.
			15b. Move air routes away from the river.	15b. Comment Noted.
			15c. New routes should not be considered until the minimum goal is met for substantial restoration of natural quiet.	15c. There are no new routes in the Preferred Alternative, which eliminates portions of some existing routes and the route known as Blue-1. It also would modify the dogleg in the Dragon Corridor to

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				reduce noise over the Hermit's Rest Area, as explained in the proposed Final Commercial Routes for GCNP.
			15d. The "dogleg" seems like it's been moved still farther west, extended into a flight-free zone. "Flight-free" should be just that.	15d. See proposed Final Commercial Routes for the GCNP.
16	Brenda Halverson Papillon Helicopters	8/17/99	16a. The NPS has manipulated key noise data in their computer model, including: the elimination of lateral attenuation; incorrectly adjusting the speed of helicopter flight; the failure to fully account for the blocking effect of terrain between the source and observer of sound, and measuring aircraft sound using vigilant observers listening actively for aircraft noise.	16a. See Appendix D for details.
			16b. Air routes should direct aircraft over the most unused trails and lookout points and not over campsites on the river.	16b. Comment noted.
			16c. Papillon supports the proposed "dogleg" on the Green 2 because it significantly reduces air tour traffic over the Hermit's Rest Area.	16c. See proposed Final Commercial Routes for the GCNP.
			16d. Air touring is the most environmentally safe and clean way to visit the Grand Canyon National Park.	16d. Noted.
17	Jim Gullyes Arizona Tourism Industry Association	8/17/99	17. The Natural Wonder of the World helps the economy without jeopardizing anything noticeably for our citizens.	17. Noted.
18	Dick Hingson Public Lands Committee of the Sierra Club, Utah Chapter	8/17/99	18a. The Sierra Club conditionally supports the FAA capping the number of flight operations at a lower level than heretofore; in this case, 88,000 annually.	18a. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, H8.
			18b. The Sierra Club recommends ratcheting down the cap	18b. See proposed Final Rule for Commercial Air Tour Limitation in

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			schedule, steadily decreasing say, five percent a year, until operations are returned to approximately 1975 levels.	the GCNP SFRA, Section III, H8.
			18c. The Sierra Club supports the definition of "peak season" as May 1 to September 30 (rule says September 15), and supports the ban on moving allocations from off-peak to peak within an individual firm's overall allocation.	18c. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, H7.
			18d. The Sierra Club recommends the closure of the Dragon Corridor.	18d. See proposed Final Commercial Routes in the GCNP, pages 11.
			18e. The Sierra Club recommends the closure of the Zuni-Dragon Connector corridor because of the impact on the visitor experience of forests, meadows, and trails along the North Rim and in Saddle Peak Wilderness.	18e. The Zuni-Dragon Corridor connector will be considered as an incentive corridor as part of any future rulemaking to require the use of quiet technology and will be subject to appropriate environmental review as part of that next action. This SEA does not evaluate potential impacts from use of the incentive corridor, as it is subject to future rulemaking to define and establish requirements for use of quiet technology. See also proposed Final Commercial Routes in the GCNP.
			18f. The "dogleg" will actually increase the aircraft noise levels there by a full decibel.	18f. Although noise levels will increase at Representative Location 46 (The Ranch) due to the "dogleg" configuration, areas such as Hermits Rest, Tower of Ra, and Point Sublime will experience a reduction in noise levels. See also proposed Final Commercial Routes in the GCNP.
			18g. The Sierra Club does not support the proposed North rim incentive route, in that it continues a still noisy derogation of prime North Rim sites such as Point Imperial, Vista Encantada, the Ken Patrick Trail, and even the North Rim Campground.	18g. See proposed Final Commercial Routes in the GCNP, page 9.
			18h. The Sierra Club does not support any North Rim tour routes as proposed across the Saddle Mountain Wilderness.	18h. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA Section III, C.

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			18i. The FAA ought to correct and reevaluate its modeling data for North Rim's Point Imperial. 18j. The Sierra Club requests that a set of L90 data be published in the Final Supplemental EA for all sites. 18k. L90 is more sensitive to the protracted low-end ambient intervals and stunning quiet experienced at Grand Canyon.	18i. See response to similar comment earlier in summary. 18j. The FAA selected the L_{50} noise levels, which is the ambient sound exceeded 50 percent of the time, to represent the full range of natural sound levels. 18k. See response to Comment 18j.
19	Andy Cebula Vice President National Air Transportation Association	8/17/99	19. NATA supports the comments and conclusions reached by the air tour industry as to the impacts of this proposal and urge the FAA to reexamine the principles these actions are based upon to ensure that there is truly a balancing of the needs for all visitors to the Grand Canyon.	19. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, C.
20	P.J. Connolly	8/17/99	20. The Hualapai Nation and the Navajo Nation should be involved in the process.	20. See Appendix H for a list of Native American participation in this process.
21	Cliff Muzzio Assistant Chief Pilot Papillon	8/17/99	21. I protest the proposed rule because it does not work.	21. See Response to Comment 6a. t.
22	Jim McCarthy Sierra Club – Grand Canyon Chapter	8/17/99	22. This chapter supports the proposal to extend the Grand Canyon SFAR east on the Navajo Nation.	22. See proposed Final Rule for Modification of the Dimensions of the GCNP SFRA and FFZs. See discussion of extending the SFRA east and modifying Desert View FFZ.
23	Jonathon Raye	8/17/99	23. I oppose any – any further restrictions on the air tour industry.	23. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, C.
24	Geoff Barnard Grand Canyon Trust	8/17/99	24. The Grand Canyon Trust supports the capping of air tour operations at 88,000.	24. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, H8.
25	Craig Sanderson Sunrise Airlines	8/17/99	25. My proposal is that there's two alternatives, where the Black 2E, as it's labeled comes form its current location where the "2" is shown, goes down towards the "Y" shape where – at Gunthers	25. See proposed Final Commercial Routes in the GCNP.

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			Castle at 10,000 feet. Then from there we veer off, turning south, going through the Zuni the way we do now, or going north and joining the Black 1 and continuing on through and coming down the Dragon Corridor. Now either way, I'm only going through one corridor as opposed to two.	
26	Dennis Bromridge	8/17/99	26. We need to cut off the top of the Zuni Corridor.	26. Comment Noted.
27	Jane Dee Hull Governor State of Arizona	8/17/99	27a. The FAA and NPS have failed in their obligation to provide incentives for quiet technology aircraft.	27a. Quiet Technology was considered in the 1996 Noise Limitations for Aircraft Operations in the vicinity of the Grand Canyon National Park Notice of Proposed Rule Making and accompanying EA. This rule will be considered again once the Special Flight Rules and Route rulemaking has been concluded. See proposed Final Rule for Modification of the Dimensions of the GCNP SFRA and FFZs, discussion of Bright Angel FFZ; proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III, D.
			27b. I have serious reservations about the proposed rulemaking because it limits the access for a large group of people to the wonder of the Grand Canyon through the air, with little or no accompanying benefit for an extremely small portion of the overall Park visitor population.	27b. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, pages 33-34. .
28	Brenda Burns President Arizona State Senate	8/17/99	28a. I commend the efforts of the NPS and the FAA.	28. Comment Noted.
			28b. I urge the FAA to please reconsider its proposed rules and examine the success of the current regulations on air-tour operations before imposing any new restrictions.	28b. See Response to Comment 4c and Comment 6a.
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29	David Young Scenic Airlines CEO	8/19/99	29a. Noise from aircraft is not a problem and we challenge you to prove otherwise.	29a. See Response to Comment 6a. Public Law 100-91 tasked the NPS with restoring natural quiet to the Grand Canyon. The NPS Report to Congress on the Effects of Aircraft Overflights on the National Park System found that aviation noise is a problem, specifically in the GCNP.

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			29b. I submit to you that the 400,000 visitors a year from Las Vegas to the Grand Canyon who travel by air and cause no environmental impact whatsoever be considered as 5,263 times more important.	29b. See Response to Comment 2c.
30	Bob McCune Grand Canyon Air Tour Council	8/19/99	30a. Our council continues to disagree with this position and believes that any effort other than a complete environmental impact statement will not meet compliance with the NEPA.	30a. See Response to Comment 2a.
			30b. Do not expand Desert View Flight Free Zone.	30b. The Desert View FFZ is expanded to the GCNP boundary only. See Section 2.1 of the Final SEA for a discussion. See also, proposed Final Rule for Modification of the Dimensions of the GCNP SFRA and FFZs, discussion of extending the SFRA east and modifying Desert View FFZ.
			30c. "Proposed actions, the environmental impact of which is likely to be highly controversial, should be covered in all cases."	30c. See Response to Comment 2a.
31	Art Gallenson Lake Mead Air	8/19/99	31a. Figure 3-1 says ambient noise level in Grand Canyon noise study area. Now, I thought ambient sound level was natural quiet. Now we're calling natural quiet noise.	31a. Ambient Noise Level is the total of all noise in the environment, other than noise from the source of interest. This term is used interchangeably with background noise. Therefore, ambient noise is considered a form of noise. Natural ambient sound level (or natural quiet) is not noise in context, nor is it silence. It includes all the sounds of nature, but only the sounds of nature. Ambient or background noise level includes the natural ambient sounds plus human-caused sounds.
			31b. In the Environmental Assessment, Table 3-2, visitors of Grand Canyon rated natural quiet as extremely important, but that's not true.	31b. The information provided within the table is survey information developed by the NPS and taken from the NPS Report to Congress in July 1995.
			31c. When we do airplane studies I think we need to listen to the plane and then identify it by looking at it.	31c. The Integrated Noise Model (INM) is the FAA's standard computer methodology for assessing and predicting aircraft noise impacts. The INM has met the standards of the Society of Automotive

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				Engineers (SAE), Aerospace Information Report 1845 (AIR 1845, FAA Noise.
32	Randall Walker Director of Aviation Clark County Department of Aviation	8/19/99	32a. The FAA cannot credibly use its available noise model to make precise determination of the percentage of the Grand Canyon experiencing natural quiet under the current air tour operating scenario, let alone attempt to accurately establish the level to which operations must be limited to achieve the NPS's natural quiet standard. 32b. I wonder if the FAA will allow us to go ahead and do a study after we determine what the impacts are going to be. 32c. I hope the FAA does not use the same faulty scientific foundations when it's conducting its safety and security regulations because if you are, heaven help us all.	32a. The FAA chose to use the INM for the GCNP analysis because of its widespread scientific acceptance, use of methodology that conforms to industry and international standards, measurement-derived noise and performance data, the ability to calculate noise exposure over varying terrain elevation and adaptability and reliability for assessing a variety of situations, including GCNP noise impacts. 32b. Comment noted. 32c.Comment noted
33	Edgar Walema Vice-Chairman Hualapai Tribe	8/19/99	33a. After reading the Draft, we are forced to state once again that the FAA and the Interior Department have largely disregarded our recommendation about evaluating the environmental impact. We urge these agencies to admit that their actions will have a significant environmental, social, and economic impact on the Hualapai. 33b. The Draft wrongly applies the residential noise standard of eight decibels to our reservation. 33c. The Draft ignores the socioeconomic impact of overflights on the Hualapai Tribe. 33d. The Draft wrongly concludes that none of the environmental impacts will be sufficient. Although the tribe is still evaluating	33a. See Response to Comments 10e, 10h, and 10k, above. 33b. See Response to Comment 10e. 33c. See Response to Comment 10k. 33d. Using standard Federal Guidelines for assessing impact on the Tribe except for TCPs, the Draft EA did not identify any

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			the proposal, it is already clear that the proposal will have a significant impact.	environmental areas that would be subjected to a significant impact due to the Proposed Action. The FAA determined that there will be adverse effects to some Hualapai TCPs and some endangered species. See also, Responses to Comments 2c and 10e.
34	Loretta Jackson Hualapai Tribe	8/19/99	34a. It has to be an EIS.	34a. See Response to Comment 2a.
			34b. The traditional culture properties that are out there being affected and that some may think, you know, why or who determined these places to be traditional are kept in high esteem.	34b. The concerned Tribe or Nation provided information on the TCPs considered in this study. Because TCPs are highly confidential, the potentially affected Tribe assisted the FAA in evaluating effects due to the Proposed Action and reasonable alternatives.
			34c. This Environmental Assessment being what it is doesn't carry any meat and that it should be an Environmental Impact Statement.	34c. See Response to Comment 2a.
35	Aaron Mapatis Vice-Chair Hualapai Tribe	1/25/00	35. Hualapai Tribe does not concur with FAA determination that there is no constructive use from the Undertaking to TCPs. Stated that ethnographic reports and information presented in the consultation showed that current levels of aircraft noise are not compatible with the traditional uses of, and are substantially impairing, all 40 Hualapai TCPs. Aircraft noise is out of character with the quiet natural setting, audible air tour noise significantly impacts traditional cultural activities including praying and medicinal plant gathering. FAA's 3dB criteria is inappropriate. FAA's noise analysis fails to account for cumulative noise impacts.	35. See Section 4.3, which has been updated to include the results of Section 106 consultation with the Hualapai Tribe and the additional noise and visual analyses. Because Hualapai TCPs in the vicinity of the blue direct routes already experience aircraft noise and visual intrusion from fixed wing air tour overflights, and noise exposure levels remain below urban noise levels under the Preferred Alternative, and based upon the immediate and long term mitigation measures included in the NHPA Section 106 PA, FAA has concluded that the Preferred Alternative does not result in constructive use. There would be adverse noise impacts on six of the 40 TCPs identified by the Hualapai Tribe and THPO during Section 106 consultation however these were not significant and do not constitute a constructive use. Alternatively, FAA has determined that there is no feasible and prudent alternative and that the Preferred Alternative includes all possible planning to minimize the harm. For more detail, see Response to Comment 10p. In the SEA the FAA properly used not ambient noise levels or the NPS noise thresholds for natural quiet, but the existing project baseline to compare environmental consequences of the Preferred Alternative and Alternatives 3 and 4. Use of this baseline did not preclude the FAA from properly considering effects of

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				past actions and other cumulative noise impacts on Hualapai TCPs.
36	Southwest Safaris	10/7/99	36a. FAA claims to be reducing aircraft sound over the canyons of the Little Colorado River for two reasons, "foreign noise spilling over into the Park from aircraft flying along the canyons of the Little Colorado River and protecting Native Americans from noise impacts. Both justifications are flawed. A visitor standing at Desert View lookout simply can not hear a plane flying as far away as the Little Colorado River. The distance is too great. Furthermore, the prevailing wind is from the west. Not only does the sound of the ever-present breeze, blowing through the pines and across the cliffs as Desert View, muffle any aircraft noise generated fifteen miles away, but also the wind carries the sounds of aircraft to the east [outside the park]. In the second place, no Indians live in the bottom of the canyons of the Little Colorado River, or even venture down inside the dangerous canyons. FAA is trying to protect Native Americans from aircraft noise even though the Indians "adversely affected" are not themselves physically impacted, but rather culturally annoyed. The FAA has no way of measuring degrees of "cultural annoyance" or of providing that it even exists. The issue of actual sound has become one of "theoretical mystical intrusion," which has no regulatory relevance to the FAA's mission.	36a. Following comments received on the NPRM, the proposed eastern boundary of the Desert View FFZ has been moved westward to the eastern boundary of the GCNP (see Final SEA, Section 1.4). The Little Colorado River confluence is a very popular attraction for the approximately 16,000 river runners permitted on the Colorado River, plus a number of backpackers in that general area and across the river in the Nankoweap area. The area also contains numerous cultural sites protected under Section106 and other laws. See also Proposed Final Rule Modification of the Dimensions of the GCNP SFRA and FFZs, discussion on Extending the SFRA East and Modifying Desert View FFZ.
			36b. The FAA is holding air tour operators to a much higher standard than the NPS is holding commercial rafting companies. The raft companies are allowed a greater physical presence in the confluence of the Big and Little Colorado Rivers without objection. The double standard for one group of sightseers versus another reveals the hypocrisy of the FAA's professed desire to protect the canyons of the Little Colorado from "noise damage."	36b. This comparison is inappropriate. Raft companies operate under concession contracts with GCNP. These contracts strictly limit the number and timing of launches available for each company as well as the maximum number of passengers per launch. The raft companies conform to additional regulations not applicable to air tour operators, including restrictions on where boats are permitted to land and where people are permitted to camp and even walk in the vicinity of the Little Colorado River. The noise from motorized rafts is limited to a small area near the confluence, and three months of each year motorboats at not permitted at all on the river. See Proposed Final Rule Commercial Air tour Limitations in the GCNP SFRA, Section III.G.
			36c. Congress has not empowered the FAA to set aside special	36c. In exercising its authority to manage the navigable airspace FAA

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			use, restricted, or prohibited airspace in order to protect unidentified "Traditional Cultural Properties." The National Park Overflights Act of 1987 does not even mention TCPs.	is obligated to comply with statutes and Executive Orders governing cultural resources (see FSEA Section4.2 and 4.3 for further discussion and analysis). The SFRA is not special use, restricted or prohibited airspace.
			36d. Nowhere have the courts upheld that aircraft sounds anywhere impinge upon freedom of worship. Accordingly, the FAA has no authority from Congress to regulate airspace so to provide for the spiritual protection of Native Americans, or any other American, for that matte, especially as pertains to unidentified sites.	36d. See Section4.2 and response to 36c above.
			36e. The NPS's definition of "natural quiet" is arbitrary. The NPS interprets Pub. L. 100-91 to mean that total quiet must be restored to at least 50% of the Park for at lest 75% of the day. The level of "natural quiet" the FAA is trying to enforce is a noise level that is substantially below the ambient sound of wind, animals, and other naturally occurring noise.	36e. "Natural quiet" is the "ambient sound of wind, animals, and other naturally occurring noise." Natural quiet does not equate to "total quiet" as this comment asserts. See FSEA at Section1.2 and 4.1 for discussion of natural quiet and other terms used in analyzing noise.
			36f. The concept of "substantial restoration of natural quiet" is meaningless where there is no one on the ground to perceive the change. The point of Pub. L. 10-91 was to eliminate aircraft noise where it is bothersome to people in the Park.	36f. The definition of substantial restoration of natural quiet was determined to be "reasonable" in the U.S. Court of Appeals case, Grand Canyon Air Tour Coalition v. Federal Aviation Administration, 154 F.3d 455 (D.C Cir. 1998). Natural quiet is one of the resources that GCNP is mandated to preserve in an unimpaired condition. Impacts upon resources and values depend upon impacts to the resources and values, not whether people are "bothered" or not. "Bother" is a possible factor in assessing impacts upon people's opportunities to experience and appreciate resources and values. See the Proposed Final Rule Commercial Air Tour Limitations in the GCNP, Section III.C.
			36g. The concept of quiet technology is premature, biased, and largely irrelevant. Standards simply do not exist. Nor are they likely to in the near future.	36g. See response to Comment 27a, and the Proposed Final Rule Commercial Air Tour Limitations in the GCNP, Section III.D.

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			36h. The FAA has implied in the NPRM that it is inappropriate for aircraft to fly over several "Traditional Cultural Properties" regardless of the noise level of the aircraft. So the FAA has, once again, artfully changed the argument against air tour planes flying over the Grand Canyon. Ten years ago, the issue was safety. Now it is noise. Next it will be the mere visual presence of aircraft over "sacred national land." Ultimately the issue will become privacy for those on the ground.	36h. See Response to Comment 36c, above. See also SEA Section 4.2 and 4.3.
			36i. SFAR 50-2 has already achieved "substantial restoration of natural quiet" in the Grand Canyon at large, irrespective of the noise generated on the east side of the Park. The goal of Pub. L. 100-91 has already been accomplished.	36i. Acoustic modeling indicates that, for 1998, 32.0% of GCNP had achieved substantial restoration of natural quiet on an average annual day (Final SEA, Table 4.11, 1998 No Action). Modeling under the conditions described in the Preferred Alternative shows 43.6% substantial restoration achieved for an average annual day (Final SEA, Table 4.11, 1998 Alternative 2).
37	Environmental Coalition	9/7/99	37a. NPS defined natural quiet as "the absence of man-made sounds" (FAA 1996b.60308). The term "natural quiet" is defined and has been defined for a significant time. The definition makes common sense and is scientifically quantifiable. It is noted that natural quiet is not necessarily the absence of sound; it is the absence of unnatural sound. Because GCNP is naturally very quiet, natural quiet is a valuable resource worthy of legal protection.	37a. Comment noted.
			37b.The NPS defined substantial restoration of natural quiet in its report to Congress (NPS1995, 182). "Substantial restoration requires that 50% or more of the park achieve 'natural quiet' (i.e., no aircraft audible) for 75-100 percent of the day." (The phrase "no aircraft audible" is from the original.) The NPS uses the term "day," as opposed to night, to mean twelve hour daylight period, specifically, 7:00a.m. to 7:00p.m. Under this definition, substantial restoration could exist with 50 percent of the park naturally quiet only3/4 of the day; the other 50 percent of the park could completely lack natural quiet and could be pervaded ceaselessly by very high noise levels throughout the entire day.	37b. The interpretation of "day" and "no aircraft audible" are correct, and are what was intended in the NPS definition. The NPS definition in the 1995 Report to Congress only specifies what must occur in the 50% or more of the park where natural quiet should be restored at least 75% of the day; it does not specify what should occur in the rest of the park. The definition also does not specify what should occur at night. This comment implies that his lack of specificity should be addressed. The suggestion will be considered as part of the initial scoping for the Comprehensive Noise Management Plan. See Natural Park Service, U.S. Department of Interior, Report on the Effect of Aircraft Overflights on the National Park System (1995).

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			37c. The FAA definition of substantial restoration of natural quiet is the same as the NPS definition with one important difference. The FAA uses the phrase "tour aircraft" where the NPS uses the word "aircraft" (FAA 1996a, 4.2). Thus, the FAA intends to ignore the effects of military, commercial aviation and general aviation aircraft. Review of the Overflights Act reveals no authority to exempt certain aircraft types from the noise calculations.	37c. In the 1994 Report to congress, the NPS identified air tour aircraft as a significant contributor of aircraft noise in GCNP. (See National Park Service, U.S. Department of Interior, Report on the Effect of Aircraft Overflights on the National Park System (1995). Noise generated by air tour aircraft conducting commercial air tour operations in GCNP present a specific type of problem because they tend to operate repeatedly at low altitudes over the same routes. It is recognized that other aircraft operate in the vicinity of the GCNP. The noise generated by these other aircraft has not been included in the noise models used to obtain the estimates contained in the analysis because the FAA has determined that the amount of noise produced by these aircraft is minimal compared to that of commercial air tour aircraft. (GA traffic accounts for about 3 percent of all aircraft in the GCNP according to the Las Vegas FSDO.) The FAA does not believe that this amount of noise will affect the accuracy of its estimates. The FAA will monitor future operations in the Park to determine the actual level of natural quiet that is restored. In addition, in his Memorandum for the Heads of Executive Departments and Agencies, April 22, 1996, President Clinton called for the issuance of proposed regulations "to place appropriate limits on sightseeing aircraft over the Grand Canyon National Park to reduce the noise immediately and make further substantial progress toward restoration of natural quiet, as defined by the Secretary of the Interior, while maintaining aviation safety in accordance with the Overflights Act (Pub. L. 100-91)." See also the Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
			37d. In this case, restoration should be to a natural condition or to a condition that prevailed before Congress dictated action. Congress formally addressed aircraft noise at GCNP in the Grand Canon National Park enlargement Act, which was enacted on 3 January 1975. The Enlargement Act calls for "appropriate action to protect the park and visitors" from "a significant adverse effect on the natural quiet and experience of the park." Thus, restoration should be at least to the levels of 1975.	37d. Pub. L. 100-91 does not set a baseline or mandate restoration to 1975 levels. The reporting requirements for commercial air tour operators will enable FAA and NPS to collect the necessary data to determine the next steps required to achieve substantial restoration of natural quiet.

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			37e. The definition of "natural quiet" used by the NPS is appropriate; however, the current definition of "substantial restoration" is flawed. Half the park lacking natural quiet 25 percent of the day and the other half of the park totally without natural quiet is not substantial restoration. A more appropriate definition would require natural quiet throughout the day in 50 percent of the park, as a minimum. Natural quiet for at least 80 percent of the day in the other half of the park would be appropriate. This would result in a time-area proportion of 90 percent natural quiet. The essence of the word substantial is certainly closer to 90 percent than it is to the 37.5 percent (50 percent of the area x ¾ of the time, +50 percent of the area x zero time).	37e. A similar argument was presented in Grand Canyon Air Tour Coalition v. Federal Aviation Administration, 154 F.3d 455 (D.C Cir. 1998. The U.S. Court of Appeals for the District of Columbia Circuit found that the term "substantial restoration of natural quiet" is "…more than sufficiently elastic to support the agency's definition as reasonable" (1998 WL 558805, *16 (D.C.Cir., p.14). See also, National Park Service, U.S. Department of Interior, Report on the Effect of Aircraft Overflights on the National Park System (1995); Response to comment 37b above.
			37f. The agencies' proposed action does not represent an improvement. It instead represents an acknowledgement that – not only have the agencies failed to implement the statutory mandate – but they have permitted conditions at the Park to worsen rather than to improve since the Overflights Act was implemented. This is nothing short of a deplorable flouting of congressional intent. Moreover, the proposed actions would not, by the agencies' admission, meet the requirement, and they would not constitute reasonable progress towards the requirement.	37f. Federal agencies have discretion to address problems using a phased approach. The proposed action is a step in a process to achieve substantial restoration of natural quiet. In all the steps, FAA and NPS are using the best available data and methods to estimate the effects of proposed measures on the restoration of natural quiet in the park as well as impacts on adjacent lands and the air tour industry. The routes and corridors established subsequent to Pub. L. 100-91 for air tour traffic have provided both safety and acoustic improvements to the park. Those improvements however, have diminished over time due to the growth in the number of air tour flights; this growth is being addressed by this action. The proposed final Rule Commercial Air Tour Limitation limits operations to approximately 90,000 a year for all except air tour operators under contract with the Hualapai Tribe. FAA and NPS are taking a reasoned approach to assess the effects of steps in the process, as they are taken and adjusting as necessary with subsequent steps. The agencies seek to ensure that any measures taken achieve sufficient gains in restoration of natural quiet commensurate with any impacts they might impose on the air tour industry or others.
			37g. The SEA also indicates that 41 percent of the GCNP would be substantially restored to natural quiet if the preferred alternative were implemented. A closer review indicates that the	37g. Pub. L. 100-91 and the NPS definition of substantial restoration did not specify the time period of interest, other that "day". Effects of different time periods (i.e., annual average, shoulder season, summer

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			number during the high visitor period (summer day) would be 31 percent of the park area (Table F2, page F4). Additionally, on a peak day the number would drop further to 19 percent. If the impact of commercial jets and general aviation aircraft ere taken into account, which they should be, the percent of the park area meeting the requirement would be even lower.	season, peak day) were evaluated in the SEA (see Final SEA, Appendix F). See also the response to comment 37b, 37c and the Proposed final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
			37h. Each visitor experiences the park on the day he or she is there. If there are few flights on a day six months after a visitor leaves, it provides no noise relief for the visitor. Every park visitor should have the opportunity to experience substantial restoration of natural quiet, regardless of what day they visit the park.	37h. There are opportunities for visitors to experience almost no aircraft noise even during the summer season.
			37i. The plain language of the definition of substantial restoration of natural quiet requires that the substantial restoration test be met every day, regardless of the season. Averaging "substantial restoration" over the course of a year to allow higher noise levels during the summer is clearly contrary to the intent of the Overflights Act, which meant that substantial restoration of natural quiet occur year round, not simply at certain seasons. The intent was not just to substantially restore natural quiet to some arbitrary definition; it was to protect the opportunity for all park visitors to experience natural quiet.	37i. See response to comment 37b, 37e, and 37g.
			37j. Noise modeling must reflect the noise on a peak summer day, not on some "average" or "annual" day. The North Rim is closed by snow from October to May, and most visitors are unable to visit the park in the off season. Additionally, an "average" or "annual" day is contrary to the NPS definition of substantial restoration. The definition states that the park would "achieve 'natural quiet' (i.e., no air craft audible) for 75-100 percent of the day." It says "75-100 percent of the day." It does not say "on average, 75-100 percent of the day."	37j. See response to comment 2b and 37g.

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			37k. The ambient (natural background) sound level must be measured by the L90 method, not L50. As the NPS has stated, "The quiet to be preserved is the lower end of the ambient sound level range that occurs regularly between wind gusts, animal sounds, etc., not just the average sound level." (NPS 1995, Sec. 3.4)	37k. See responses to comment 18j.
			37l. The standard for noise modeling must be audibility, not an artificial noticeability level. Natural quiet is defined by NPS and FAA as "no aircraft audible," not "no aircraft noticeable." The NPS policy definition of substantial restoration is based on audibility. Therefore, use of an arbitrary and unscientific noticeability standard in the models is tantamount to a deliberate falsification of data. While there might be some justification for noticeability standard in certain highly developed portions of the village area, there is no justification in the Marble Canyon and Sanup Plateau area because they are undeveloped.	37l. See the Federal Register notices related to the NPS change in noise evaluation methodology (64 FR 3969, January 26, 1999; and 64 FR 38006, July 14, 1999).
			37m. Monitoring and modeling must incorporate all types of aircraft, including commercial jets and general aviation. Because non-tour aircraft fly directly over the so-called "flight-free zones," they are often much closer and louder than air tours, and therefore have a greater noise impact. Monitoring must include the evening hours, when jet traffic often peaks. As NPS monitoring has shown jets contribute a significant fraction of the park noise.	37m. See response to 37b and 37c above. See also the Proposed Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
			37n. Noise maps and models should show the cumulative hours of aircraft noise that a location would experience on a peak summer day. "Percent of time audible" is ambiguous and misleading. For example, 2.8 hours of air tour noise computed for a 12 hour day would be represented as "23% TA" but as "28% TA" if computed for a 10 hour day, while the same 2.8 hours of et noise spread over a 24hour period would be shown as only "12% TA". To be meaningful to a reader, the maps should show the range of values calculated by the model, with four or	37n. Noise modeling for this environmental analysis is based on a 12-hour computational day. Cumulative time can be easily derived from Percent Time Audible (e.g., 3 hours of aircraft noise computed on a 12-hour day would equal 25% TA. The tables and figures in the SEA provide adequate information.

#	Commentor	Date	Comment	Response
			five well-chosen choropleths (categories) of cumulative time-audible. The following categories would correlate well with the response given in the visitor surveys: (a) Natural quiet (no aircraft audible); (b) 1 to 15 minutes of aircraft noise per day; (c) 15 minutes to 3 hours of aircraft noise per day; (d) more than 3 hours of aircraft noise per day.	
			37o. We support the NPS plan to hire a consultant to verify the noise model results.	37o. Comment noted.
			37p. Monitoring sites should include panoramic location on the open "floor" of the outer Canyon, which are exposed to sounds from all directions. These plateaus make up most of the Canyon's area, contain most of the trail mileage, and generally have the lowest ambient sound levels. They are therefore the areas where backcountry visitors are most likely to seek natural quiet. The 23 monitoring sites used in the past are not representative of the park soundscape, since nearly all were in the confined, inner gorge near the river or at developed rim points having vehicle and wind noise.	37p. Monitoring sites have included a wide variety of environments, both within the canyon and on the rims, close o and far from flight corridors, etc. The data indicate that there are a number of "park soundscapes" and care is being taken to ensure the monitoring sites are representative of large areas. See Section4.1.1 Ambient Sound Levels of the Final SEA. The noise analysis included 72 noise sensitive locations, which adequately represent the range of locality characteristics (terrain, elevation, activity, etc.), found in the study area.
38	Gary W. Todd, PE	9/01/99	38a. Propose adjustments to the northern border of the SFRA to match the northern border of the GCNP. Neither the 1996 nor the 1999 GCNP SFRA environmental assessment have shown a need to include areas north of this line [the northern border of the GCNP] in the GCNP SFRA. All references to aircraft noise and other environmental issues clearly indicate the area North of this line does not need the "restoring natural quiet" protection offered by the GCNP SFRA per Pub.L.100-91.	38a. The northern boundary of the SFRA was established in 1986 as part of SFAR 50-2. It was established north of GCNP to create an area of controlled airspace in which VFR air tour aircraft could safely navigate the GCNP air routes, portions of which lie outside the park. FAA expanded the Toroweap/Shinumo FFZ to include the entire area of the park consistent with Pub. L. 100-91 (see 61 FR 69302).
			38b. Propose elimination of the proposed expansion to the western border of the GCNPSFRA in the vicinity of Grand Canyon West airport. The proposed extension of the western border of the GCNP SFRA will have no effect on improving the natural quiet within the GCNP. The proposed area was not included in the 1996 GCNP SFRA rule and the 1999 GCNP	38b. The GCNP SFRA was expanded to the west in the vicinity of the Grand Canyon West airport as part of the December 31, 1996 Special Flight rules in the Vicinity of Grand Canyon National Park, Section 93.301 (see FR 69302). The extension of the SFRA was necessary to correct an inadvertent omission of Grand Wash Cliffs, which are part of the GCNP, and to aid in the substantial restoration of natural quiet at

#	Commentor	Date	Comment	Response
			SFRA environmental assessment clearly indicates this area does not have a noise issue. Including this area solely because it lies within the GCNP does not meet the mandate of Pub. L. 100-91. The FAA and the NPS need to prove this area is "endangered" due to encroachment of noise. Their environmental assessment stud does just the opposite, it proves there is no noise issue, therefore this area does not need the protection offered by the GCNP SFRA.	GCNP as mandated by Pub. L. 100-91. Additionally, the FAA wanted positive control of the entire airspace over the GCNP in order to insure the safe navigation of commercial air tour aircraft. Therefore, this portion of the Park had to be included in the SFRA boundary. The expansion was reflected in the 1996 FEA.
39	Robert Witzeman, M.D., Maricopa Chapter of the National Audubon Society	8/04/99	39a. The FAA proposal falls short of even the weak standard for restoration of the natural quiet. The agency says that only 41% (improved from 32%) of the Park will be quiet 75% of the day. All the rest of the Park has aircraft noise up to 100% of the day! This does not even meet the weak Park Service standard of 50-% of the Park with aircraft noise "only" 25% of the day (with no noise limits in the other 50% of the park). Substantial restoration of natural quiet should mean most of the Park most of the time, for example 75% of the Park, 100% of the time. 39b. The Grand Canyon is one of the naturally quietest places on Earth. It is a place where visitors expect to get in touch with nature and enjoy the "natural quiet", including the sound of the wind, trickling streams, or the call of the condor. They should not have to listen to aircraft up to every three minutes as occurs in many locations. Quiet deserves as much protection as other park resources.	39a. See response to comment 37e. See also National Park Service, U.S. Department of Interior, Report on the Effect of Aircraft Overflights on the National Park system (1995). 39b. See Response to comment 37h.
40	Kenneth A. Walters	9/03/99	40a. The number of air tours must be reduced to the number present in 1977 - when air tour noise was not a problem. 40b. The FAA proposal to amend the special operating rules for air tour flights in the Grand Canyon is a total flouting of the law. Substantially restoring natural quiet requires that at least 94% of the Park be entirely noise free 100% of the time and the other 6% must be noise free 75% of the time. Ninety four percent of Grand Canyon National Park is proposed wilderness. It must sound like wilderness. That is, no aircraft noise.	40a. See proposed Final Rule for Commercial Air Tour Limitation in the GCNP SFRA, Section III.H.8. See also response to comment 37d. 40b. Comment noted. See also response to 37e.

#	Commentor	Date	Comment	Response
41	Andrea Leigh, Public Lands Com. Angeles Chapter of the Sierra Club	9/01/99	41a. "Substantial restoration of natural quiet" is not being met. Over 94% of Grand Canyon National Park is proposed wilderness. The FAA claims that 41% of the Park will be quiet 75% of the day. This is unacceptable. This does not even meet the weak NPS standard of 50% of the Park with aircraft noise 25% of the day. On a peak summer day, the noise level rises where 19% of the Park is "substantially restored". This means that an incredible 81% of the park would have audible air noise. This does not take into account unmeasured noise from jets and other aircraft extending into the night.	41a. See response to comments 37c and 37e., and the Proposed Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
			41b. It should be the long term goal of the NPS and FAA to reduce the number of air tour operations to the level prevailed in 1975. At the very least, the number of flights should be rolled back to the 1987 level to meet the directive of Congress in the National Parks Overflights Act.	41b. See Proposed Final Rule Commercial Air Tour Limitation in the GCNP SFRA, Section III. H.8. See also response to comment 37d.
			41c. The L90 rather than the L50 methodology should be used to determine natural ambient levels. L90 is more sensitive to the natural conditions experienced at Grand Canyon and is, therefore, preferred the NPS as is stated in the 1994 report to Congress.	41c. See response to comment 18j.
42	Eiemer A. Katinszky	8/31/99	42. Those who oppose commercial flight tours in the GCNP under the aegis of Pub. L. 100-91 are simply chasing the rainbow and reveal their ignorance or total lack of practical sense. If one declares natural quiet as a noise level of twenty (20) dB, than that means banning every live human being from the park, because the presence of one means a noise level of twenty-seven (27) dB. The legislative process occasionally creates laws that are at best impractical and our representatives are perfectly capable to either amend or abolish them.	42. Comment noted.
43	Rob Elliott, President Arizona Raft	9/03/99	43a. As many other have asserted, 50% of Grand Canyon National Park naturally quiet 75 to 100% of the day is an	43a. See response to comment 37b and 37e.

#	Commentor	Date	Comment	Response
	Adv.(AzRA)		inadequate standard. This means that the relatively quiet half of the park can experience aircraft noise one minute in every four, and the remainder of the park could experience aircraft noise virtually all day long, non-stop. If substantial restoration of natural quiet is averaged over longer time periods, say a month or a year, then the standard is further flawed, especially for the visitor who comes to the Canyon hitting only the noisier days. This standard simply fails even to approximate the substantial restoration of natural quiet as mandated by the National Parks Overflights Act of 1987.	
			43b. FAA claims that they will achieve natural quiet 42% of the time but that is averaged over an unacceptably long period of time. Congress intended that a visitor to the Grand Canyon should be able to experience a substantial restoration of natural quiet regardless of which day(s) the visitor decides to visit the ark. Each visitor should have the opportunity to experience natural quiet regardless of the day, the month, or the season he or she elects to visit.	43b. See responses to comments 37g and 37h.
			43c. The L90 rather than the L50 methodology should be used to determine natural ambient levels of sound.	43c. See response to comments 18j.
44	Steven Szymanski Planet Bluegrass	9/08/99	44a. The FAA proposal falls short of even their weak standard for substantial restoration of natural quiet. The agency says that during the tourist season, only 31 percent of the park will be quiet ¾ of the day. The rest of the park could have aircraft noise all day. This is totally unacceptable.	44a. See response 37b, 37c, 37e and 37g. See also the Proposed Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
			44b. The Grand Canyon is one of the naturally quietest places on Earth. It is a place where visitors expect to get in touch with nature and enjoy peace and quiet. They expect to hear the sounds of the wind, trickling streams, or the call of native birds. They should not have to listen to aircraft while listening to natural sounds.	44b. Comment noted. See also response to comment 37h.

#	Commentor	Date	Comment	Response
45	Jim Pratt	8/29/99	45a. The FAA and NPS have made no effort to determine the effect, if any, general aviation is having on the GCNP and its neighbors. The noise impact from commercial air tours is the only aviation activity addressed in the study. 45b. The FAA and the NPS have failed to present any evidence that indicated the need to restrict general aviation aircraft from flying in the vicinity of or over GCNP. There is no evidence that general aviation has contributed to the loss of natural quiet within the GCNP.	45a. See response to comment 37c. See also the Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation. 45b. The Tuckup and Fossil Canyon Corridors have been open to general aviation. FAA did not clarify this in the chart that accompanied the June 1999 Notice of Proposed Commercial Air Tour Routes. See proposed Airspace Modification Final Rule, Modification of Dimensions of GCNP SFRA and FFZs, AOPA comment/petition for reconsideration.
46	R. Glen Woods and John R. Erickson Woods and Erickson Counsel for Grand Canyon Airlines	9/07/99	46a. The FAA has failed to distinguish between noise created by air tours and other flights. The FAA admits there is noise from other flights in the SFRA exists but has not bothered to measure that noise because it "believes the amount of noise produced by these aircraft is very small compared to that of commercial air tour aircraft." This unsupported conclusion is typical of the sloppy scientific method applied by the FAA. 46b. The FAA has ignored the impact that Park Service flights and other commercial flights occurring within the flight-free zones have on park visitors. The proposed rule does not address limiting any flights other than air tours. This leads to a perverse situation whereby the Park Service could conduct annoying flights in FFZs (where visitors are more likely to be encountered) and then use this annoyance to justify further limitations on air tours that did not cause the annoyance.	46a. See response to comment 37c. See also the Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation. 46b. The NPS definition of substantial restoration was not based upon annoyance. However, NPS flights are already subject to regulation by NPS to reduce impacts. NPS flights are subject to new proposed reporting requirements. See also the Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
47	Pappilon Grand Canyon Helicopters Elling Halvorson	9/07/99	47a. There are areas sacred to every tribe, race, and religion all over this nation. It is inconceivable that no aircraft should transgress airspace over cultural or religious sites. This is not only a dangerous precedent but unfounded as al legal requirement. There has furthermore been precedence set where flight routes extend over alleged so-called Native American cultural and religious sites over the protest.	47a. See response to comments 8g, 36c and 36d.

#	Commentor	Date	Comment	Response
			47b. The new proposed NPS plan provides for a double standard of sound level in the Grand Canyon. For the eastern end of the Canyon it is proposed that the measure of audibility be 8 decibels below ambient sound. For reason that have been stated over and over again, this is not only an over-ambitious target but it is unachievable and therefore ludicrous. The target is significantly less than the human ability to hear.	47b. See responses to comment 12b. See also the NPS Federal Register Notices related to the change in noise evaluation methodology (64 FR 3969, January 26, 1999; and 64 FR 38006, July 14, 1999.
			47c. The Resource Management Guideline NPS-77, Chapter 2, "Protection of Aesthetic Values", includes natural quiet as one of the "valued resources" of national parks. The Guideline does not define natural quiet as 3, 5, or in this case 8 decibels below natural ambient. Public Law 100-91 emphasizes that the reduction in sound should be for the visitors benefit not some arbitrary value many times below which the human ear can hear or perceive. Visitor complaints at GCNP are greatly reduced since the implementation of SFAR 50-2.	47c. See response to comment 12b and the NPS Notices related to the change in noise evaluation methodology (64 FR 3969, January 26, 1999; and 64 FR 38006, July 14, 1999.
			47d. Past studies have used the threshold of noticeability as "background plus 3 dba" as a criterion of natural quiet. The 1996 FAA study used ambient sound level plus 3 dba as its measure of natural quiet. The 1998 GCATA vs. FAA court decision again reinforced this definition, explicitly citing background noise plus 3 dba as the threshold for natural quiet. NPS has requested a level of 8 dba below background (11 dba below the threshold of noticeability) as their criteria for natural quiet. This is inconsistent and unacceptable. There should be one standard of sound level for the entire GCNP. The average onset and offset of detectability by trained observers with good hearing in the Grand Canyon was slightly below 30 decibels. In consideration of this, a decibel level of 29 is in fact a realistic level of noticeability. Any thing established below that amount is punitive in nature, arbitrary and capricious by design.	47d. See response to comment 12b and the NPS Notices related to the change in noise evaluation methodology (64 FR 3969, January 26, 1999; and 64 FR 38006, July 14, 1999.

#	Commentor	Date	Comment	Response
48	Henry Schneiker	9/01/99	48a. People have talked about restoring the "Natural Quiet". I think the concept of natural quiet is a very poor concept and should be discarded. From the perspective of a person out in the wilderness, as long as society sounds are reduced to a fraction of the natural sounds, they go unnoticed and are no longer bothersome.	48a. Comment noted.
			48b.The reduction in society sounds can come in two ways. First, reducing the time of exposure, including the total number of exposure. Second, reducing the intensity of the exposure. If we assume that the aircraft are going to stay, this leads us to the conclusion that the aircraft should be quieter and fly at sufficient distance from people so as to not generate excessive noise.	48b. Comment noted.
			48c. The Park Service should be included as one of the commercial operators and they should live within whatever structure the commercial operations live. The main reason for this is that a tourist makes no distinction between Park Service and Commercial aircraft—they are equally annoying.	48c. Comment Noted. See response to comment 46b and the Proposed Final Rule Commercial Air Tour Limitation in the GCNP SFRA Regulatory Evaluation.
49	Roy Resavage President Helicopter Association Int'l	9/07/99	49a. It is incomprehensible that the FAA would move forward with the proposed new, harsh restriction of GCNP air tours until the forthcoming research work is complete [Noise Model Validation].	49a. See response to comments 2b, 8d, and 8e.
			49b. HAI strongly urges NPS and FAA to undertake a rigorous, peer-reviewed, publicly-observed study of ambient sound levels, particularly in the areas of GCNP designated as "Zone Two" by NPS in its notice of July 14, 1999, "Change in Noise Evaluation Methodology for Air tour Operations Over Grand Canyon National Park," 64 Fed. Reg. 38006 (July 14, 1999); see also 64 Fed. Reg. 3969 (January 26, 1999), before adopting these or any other further restrictions on aircraft overflight at GCNP.	49b. Comment noted. See also responses to comments 8d and 8e.
			49c. The National Parks Overflight Act directed NPS to	49c. See response to comment 37c. See also the Proposed Final Rule

#	Commentor	Date	Comment	Response
			"distinguish between the impacts caused by sightseeing aircraft, military aircraft, commercial aviation, general aviation and other forms of aircraft which affect" the Park. To date, NPS has failed to report this information.	Commercial Air tour Limitation in the GCNP SFRA Regulatory evaluation and the NPS Report to Congress, Chapter 2 (1995).
			49d. Human activity on the ground has characteristics that may influence acceptable overflight noise thresholds, and the presence or absence of such activity should be taken into account.	49d. See National Park Service, U.S. Department of Interior, Report on Effect of aircraft Overflights on the National Park System (1995).
			49e. In areas of GCNP where NPS asserts the "ambient level" to be 20 dB, a proposed "noise threshold" of 8 dB below ambient would bar overflying aircraft if the overflight resulted in 12 dB on the ground. This is a sound level below the threshold of average human perception, much less human "noticeability."	49e. See response to comment 12b and the NPS Notices related to the change in noise evaluation methodology (64 FR 3969, January 26, 1999; and 64 FR 38006, July 14, 1999.
			49f. A proper balance was struck in SFAR 50-2. Natural quiet was restored under SFAR 50-2. The current proposals are not necessary, not appropriate, and not acceptable.	49f. See response to comment 4c.
50	Kenton D. Jones Attorney, Windrock Aviation, L.L.C. and Air Grand Canyon Inc.	9/07/99	50a. The "Standard" for determining "Substantial Restoration of Natural Quiet" remain so subjective that it is incapable of review. The issue of monitoring and evaluating "substantial restoration" should be given over to a neutral, non-governmental entity, with substantial expertise in the area of acoustics, whose determinations as to whether the mandates of PL 100-91 had been reached would be binding upon both the government and the tour operators.	50a. Comment Noted. As to the definition of substantial restoration, see Response to comment 37b and 37e.
51	Arnie Gruner Papillon	9/07/99	51. Natural quiet has already been achieved by SFAR 50-2 beyond the NPS standards. Furthermore, even the current conditions could be improved upon with quiet aircraft incentives to where 70-80% or more of the Park could have natural quiet 75 to 100% of the time.	51a. See response to comment 4c.

APPENDIX H

CONSULTATION

FEDERAL AVIATION ADMINISTRATION (FAA)
NATIVE AMERICAN CONSULTATION
as of January 2000

The following listing is a record of consultation relating to the Native American Tribes and/or Nations having traditional cultural ties to the Grand Canyon. These consultations were conducted in accordance the DOT Order 5301.1, "Department of Transportation Programs, Policies, and Procedures Affecting American Indians, Alaska Natives, and Tribes" implementing Executive Order 13084, "Consultation and Coordination with Indian Tribal Governments," the National Environmental Policy Act of 1969, as amended, the National Historic Preservation Act, Section 106 requirements and related laws, regulations, executive and departmental orders.

These consultations addressed the proposed modifications to the airspace, commercial air tour routes, and procedures utilized in Special Federal Aviation Regulation Number 50-2 (SFAR 50-2) in the vicinity of Grand Canyon National Park (GCNP). These modifications were contained in Federal Aviation Administration (FAA) Notice of Proposed Rulemaking (NPRM) and Final Rulemaking documents.

The consultations included representatives from: (1) the Havasupai Tribe; (2) the Hopi Tribe; (3) the Hualapai Tribe; (4) the Kaibab Paiute Tribe; (5) the Navajo Nation at Window Rock; (6) the Navajo Nation Gap/Bodaway Chapter; (7) the Navajo Nation Cameron Chapter; (8) the Paiute Tribe of Utah; (9) the Pueblo of Zuni Tribe; and, (10) the San Juan Southern Paiute Tribe.

The Hualapai Tribe and the Navajo Nation have an official Tribal Historic Preservation Office (THPO). In addition to tribal representatives, the Arizona State Historic Preservation Office (SHPO) represented the remaining Tribes for Section 106 compliance.

1996

February 22, 1996 - Letter to the Native Americans inviting participation in the environmental assessment (EA) process.

March 18, 1996 - Meeting with Hualapai Tribal representatives in the Department of Transportation (DOT) Secretary's office, also in attendance was the FAA's Assistant Administrator for Policy, Planning and International Aviation (API).

March 25 - Letter to the Hualapai Tribe regarding a meeting with the DOT Secretary.

March 29 - Letter from the Hualapai Tribe Chairman to the DOT Secretary, requesting among other things that SFAR 50-2 and any proposed changes be removed from the airspace over Hualapai lands.

April 3 - Letter from the Hualapai Tribe.

April 4 - Letter from the Hualapai Chairman to the DOT Secretary, requesting compensation and involvement in the EA and NPRM process for SFAR 50-2. The Tribe also requested to enter into a Memorandum of Agreement (MOA) to participate in the conduction of the EA and an socio-economic impact study on the proposed changes.

April 5 - Letter from the FAA Western-Pacific Regional Office (AWP-530) advising of four tribes connected to GCNP, that the Nations were now independent and would want to be contacted individually. Also advising who the Bureau of Indian Affairs (BOIA) Phoenix Area Office contact point was.

April 8 - Telephone call from AWP-530 advising that the Hualapai Tribe would be most concerned. This according to the BOIA Truxton Canyon Agency representative.

April 9 - Telephone call with the Hualapai Tribe and the BOIA Truxton Canyon Agency.

April 9 - FedEx copy of the draft EA to the Hualapai Tribe.

April 16 - Letter from the Hualapai Tribe regarding the telephone call of April 9.

April 17 - Letter from the Havasupai Tribe to the DOT Secretary concerning SFAR 50-2.

April 24 - Letter from the Hualapai Tribe to President Clinton, advising that the Department of Interior (DOI) and DOT was not honoring the commitment to work on a government-to-government basis with the Tribe.

May 3 - Letter from the Hualapai Tribe to API, questioning why the Tribe was not invited to participate in the meeting Thursday, May 2, in the Old Executive Office Building with representatives from the air tour industry, National Park Service (NPS), the Grand Canyon Trust, and the FAA discussing flight restrictions over the Hualapai reservation.

May 3 - Letter from the Hualapai Tribe requesting cooperating agency status.

May 10 - Telephone call with the BOIA Truxton Canyon Agency representative regarding the Havasupai Tribe.

May 10 - Telephone call with the Hualapai Tribe Chairman regarding funding for a socio-economic impact study, the comment period on the NPRM and draft EA, and the upcoming meeting.

May 16 - Meeting between the FAA and the Hualapai Tribe in Peach Springs, Arizona (AZ).

May 23 - Letter to the Hualapai Tribe regarding the Grand Canyon NPRM.

June 3 - Letter from the Hualapai Tribe commenting on EA.

June 6 - Courtesy copy for FAA of a letter to the Hualapai Tribe from the Environmental Protection Agency (EPA), Region IX, advising that EPA will be also reviewing and commenting on the draft EA and NPRM.

June 7 - Letter from the White House to the Hualapai Tribe advising that concerns were passed to the DOI and DOT Secretaries.

June 12 - Telephone call with the Governor of the Pueblo of Zuni Tribe.

June 14 - Courtesy copy for FAA of a letter from the Pueblo of Zuni Tribe to BIA Phoenix Area Office requesting cooperating status.

June 17 - Meeting with the Hualapai and Havasupai Tribes in Peach Springs, AZ.

June 18 - Meeting between the FAA, BOIA and Native Americans in Phoenix, AZ.

June 27 - Letter from the Kaibab Paiute Tribe to the DOT Secretary concerning SFAR 50-2.

June 28 - Telephone call with the Navajo Nation Gap/Bodaway representative.

July 3 - Telephone calls with the Navajo Nation at Window Rock, the Paiute of Utah, the Hualapai, and the Pueblo of Zuni Tribes advising that the Flagstaff meeting was being postponed.

July 3- Letter from the Kaibab Paiute Tribe requesting cooperating status.

July 31 - Copies of the NPRM mailed to Tribes.

August 1 - Telephone calls with the Havasupai, the Paiute of Utah, the Pueblo of Zuni, the Kaibab Paiute, and the Hopi Tribes.

August 2 - Telephone calls with the Attorney for the Havasupai, the Paiute of Utah, and the Attorney for the Hualapai Tribe.

August 5 - Telephone call with the Navajo Nation Historic Preservation Officer.

August 7 - Letter faxed to the Native Americans inviting them to participate in meetings in Flagstaff, AZ on August 27 and 28. August 7 - Telephone call to and fax to the BOIA Phoenix Area Office regarding the Flagstaff meetings.

August 12 - Telephone call to BOIA Phoenix Area Office regarding comments on the Memorandum of Understanding (MOU) from the BOIA and the Havasupai Tribe.

August 12 - Telephone call with the San Juan Southern Paiute Tribe regarding the Flagstaff meetings.

August 13 - Telephone call with the Paiute Tribe of Utah regarding the Flagstaff meetings.

August 13 - Telephone call with the Kaibab Paiute Tribe regarding the Flagstaff meetings.

August 16 - Letter from the Hualapai Tribe advising acceptance of invitation to Flagstaff meeting and questioning non-receipt of funding for socio-economic impact study.

August 16 - Telephone call with the Hualapai Tribe regarding attendance at Flagstaff meetings.

August 19 - Telephone call with the Paiute Tribe of Utah regarding the Flagstaff meetings.

August 19 - Telephone call with the Navajo Nation at Window Rock regarding the Flagstaff meetings.

August 19 - Telephone call with the Pueblo of Zuni Tribe regarding Flagstaff meetings.

August 19 - Telephone call with the Hopi Tribe regarding the Flagstaff meetings.

August 20 - Telephone call with the Attorney for the Havasupai Tribe regarding the Flagstaff meetings.

August 20 - Telephone call with the Hopi Tribe regarding Flagstaff meetings.

August 20 - Telephone call with the Navajo Nation EPA Office regarding Flagstaff meetings.

August 20 - Telephone call with the Pueblo of Zuni Tribe regarding the Flagstaff meetings.

August 22 - Telephone call with the Navajo Nation Gap/Bodaway Chapter regarding Flagstaff meetings.

August 22 - Telephone call with the Hopi Tribe regarding Flagstaff meetings.

August 22 - Telephone call with the Pueblo of Zuni Tribe regarding the Flagstaff meetings.

August 27 and 28 - Meeting in Flagstaff, AZ with the Tribes and Nations hosted by the FAA. Among topics discussed were the Cooperating Agency status and the matter of funding for conduction of the socio-economic impact study. Draft copies of the MOU were distributed for Native American review and comment.

September 11 - Faxed letter containing the draft minutes from the August Flagstaff meetings to the attendees for review and comment.

September 16 - Telephone call with the Pueblo of Zuni regarding public meetings.

September 16 - Telephone call with the Hualapai Tribe regarding public meetings.

September 16 through 20 - Public meetings in Las Vegas, NV and Scottsdale, AZ.

September 17 - Telephone call with the Hualapai Tribe regarding public meetings.

September 17 - Letter from the Hualapai Tribe to DOI and DOT Secretaries, and the DOI Solicitor listing concerns of the Tribe regarding the proposal to shift flights from GCNP to Hualapai tribal lands.
September 18 - Meeting at the BOIA Phoenix Area Office in with Native Americans.

September 19 - Mailed the documents requested by the Native Americans at the August Flagstaff meetings.

September 24 - Telephone call with the Kaibab Paiute Tribe regarding the Flagstaff meetings.

October 7 - Faxed letter to the Native Americans containing a signed copy of the minutes from the Flagstaff August 27 and 28 meetings.

October 7 - Received a letter identifying the official Hualapai Tribal Preservation Office representative.

October 7 - Telephone call with the Hualapai Tribe.

October 7 - Telephone call with the Pueblo of Zuni Tribe.

October 7 - Telephone call with the Navajo Nation at Window Rock EPA office.

October 7 - Telephone call with the Attorney for the Hopi Tribe.

October 7 - Telephone call with the Havasupai Tribe.

October 7 - Telephone call with the Kaibab Paiute Tribe.

October 8 - Telephone call with the Pueblo of Zuni Tribe.

October 8 - Telephone call with the San Juan Southern Paiute Tribe.

October 8 - Telephone call with the Attorney for the Hopi Tribe.

October 8 - Telephone call with the Paiute Tribe of Utah.

October 8 - Telephone call with the Navajo Nation EPA at Window Rock.

October 9/10, 1996 - Participated with Senator McCain in the public hearing in Phoenix, AZ.

October 10 - Telephone call with the San Juan Southern Paiute Tribe.

October 14 - Meeting in Window Rock, AZ between FAA and Navajo Nation representatives. In attendance was David Kelly, Navajo Air Quality/NNEPA representative.

October 15 - Meeting in Zuni, New Mexico, between FAA and the Pueblo of Zuni Tribe. In attendance were representatives from the Heritage Historic Preservation Office.

October 16 - Meeting in Flagstaff, AZ, between FAA, the Hopi Tribe and their Attorney.
October 17 - Meeting in Fredonia, AZ, between FAA and the Kaibab Paiute tribal council members.

October 21 - Meeting in Supai, AZ, between the FAA, BOIA, the Havasupai Tribe Chairman, Vice-Chairman, Attorney, and tribal council members.

October 21 - Meeting in Peach Springs, AZ with the Hualapai Tribe Historic Preservation Officer, the Tribe Attorney, and tribal council members.

October 22 - Meeting in Cedar City, Utah, between the FAA and Paiute Tribe of Utah Historic representative.

October 23 - Meeting in Phoenix, AZ, between the FAA, the Hualapai Tribe representatives and the Hualapai Attorney.

October 23 - Received a copy of a Draft Cooperating Management Agreement between the NPS and the Hualapai Tribe.

October 28 - Letter from the Havasupai Tribal Council to FAA advising of their decision not to enter into a MOU.

October 31 - Letter to the Hualapai Tribe granting cooperating agency status.

November 6 - Letter to the Hualapai Tribe regarding environmental justice and the NPRM.

December 11 - Letter from the Hualapai regarding helicopter operations at Grand Canyon West.

December 20 - Letter from the Hualapai THPO regarding the EA.

1997

January 2 - Mailed copies of the Final EA, the NPRM and Draft EA relating to the Noise Limitations for Aircraft Operations in the Vicinity of GCNP, and the Notice of Route Determination via Federal Express (all except San Juan Southern Paiute - no FedEx address available).

January 9 - Letter from the Navajo Nation THPO regarding the consultation under Section 106.

January 13 - Letter advising of FAA's intent to fund travel costs for two representatives from each tribe to attend meetings in Las Vegas, NV and Phoenix, AZ during the week of February 3.

January 14 - Telephone call with the Attorney for the Havasupai Tribe.

January 16 - Telephone call with the Paiute Tribe of Utah.

January 16 - Letter to the Navajo Nation THPO regarding Section 106 consultation.

January 23 - Telephone call with the Navajo Nation THPO.

January 27 - Telephone call with the Hopi Tribe Attorney.

January 27 - Telephone call with the Hualapai Tribe.

January 28 - Telephone call with the Kaibab Paiute Tribe.

January 28 - Telephone call with the Havasupai Tribe.

January 28 - Telephone call with the Pueblo of Zuni Tribe.

January 30 - Received comments from the Hualapai Tribe on the December 1996 Rulemaking and environmental documents.

February 3 & 4 - Meeting with following Native American representatives in Las Vegas:

Havasupai Tribe - Lester Crooke, Roland Manakaja, and Mike Shiel.
Hopi Tribe - Franklin Hoover and Leigh Jenkins.
Hualapai Tribe - Cisney Havatone, Earl Havatone, Everett Manakaja, Jr., Edgar Walema, and Rob Yoxall.
Kaibab Paiute tribe - Brenda Drye and Laura Rae Perez.
Navajo Nation - Greg Bowen.
Paiute Tribe of Utah - Eleanor Tom.

February 4 - Letter from the Hualapai THPO regarding traditional cultural properties (TCPs).

February 6 - Meeting with the Pueblo of Zuni Tribe in Phoenix, AZ.

February 7 - Letter from the Havasupai Attorney regarding Freedom of Information Act (FOIA) request for copies of all written comments by tour operators in response to the Noise Limitations NPRM.

February 14 - Telephone call with the Havasupai Tribe

February 14 - Letter from the Navajo Nation Gap/Bodaway Chapter regarding the appointment of Official Liaisons between the Chapter, NPS and other Federal Agencies in discussions of regional management issues.

February 19 - Meeting with the Havasupai Tribal council members in Supai Village.

February 19 - Mailed via Federal Express FOIA documentation to the Havasupai Attorney.

February 25 - Received confirmation from the Hualapai THPO regarding attendance at the meeting in Washington, D.C.

March 4 - Meeting with Hualapai Tribe representatives and the Tribe Attorney in Washington, D.C. Discussed Section 106 consultation and other issues.

March 4 - Received comments from the Havasupai Tribe on FAA's proposed air tour routes for GCNP.

March 4 - Letter to the Navajo Nation Gap/Bodaway Chapter regarding consultation.

March 6 - Participated in Inter Tribal Council of Arizona, Inc., Cultural Resources Working Group meeting in Tucson, AZ.

March 17 - Letter from the Hualapai Tribe Attorney concerning Section 106 and air tour routes.

March 24 - Telephone call with the Navajo Nation Cameron Chapter.

March 24 - Telephone call with the Havasupai Attorney.

March 26 - Telephone call with the Hualapai Attorney.

March 26 - Faxed response letter to the Hualapai Attorney concerning Section 106, the proposed re-route of commercial air tour routes and a proposed meeting April 9 in Flagstaff, AZ.

March 26 - Faxed letter to the Havasupai Tribe and their Attorney regarding the proposed meeting of April 9, in Flagstaff, AZ for additional Section 106 consultation.

April 8 - Meeting with the Navajo Nation representatives from Window Rock, Gap/Bodaway Chapter and Cameron Chapters in Flagstaff, AZ regarding Section 106 and the proposed commercial air tour routes.

April 8 - Meeting with the Pueblo of Zuni Historic Preservation Officer in Flagstaff, AZ regarding Section 106 and proposed air tour routes.

April 8 - Letter to DOT Secretary from the Hualapai Attorney forwarding comments on Section 106.

April 9 (morning) - Meeting with Havasupai Tribe and BOIA representatives in Flagstaff, AZ regarding Section 106 and the proposed commercial air tour routes.

April 9 (afternoon) - Meeting with Hualapai Tribe and BOIA representative in Flagstaff, AZ regarding Section 106 and the proposed commercial air tour routes.

May 7 - Meeting and flight on the proposed commercial air tour routes over Hualapai lands by FAA, NPS and Hualapai Tribe representatives.

May 9 - Letter from the Hualapai Attorney to FAA Dockets memorializing the meeting of April 9, between the Hualapai Tribe and FAA representatives.

May 14 - Letter from the Hualapai Attorney regarding a list of studies requested by the Hualapai Tribe.

May 23 - Letter from the Hualapai Tribe regarding comments on the commercial air tour routes.

May 28 - Letter from the Hualapai Attorney to FAA Dockets regarding the meeting and overflight of Tribal lands on May 7.

June 3 - Received the Hualapai Scope of Work for a Cultural Resources study.

June 20 - Letter from the Hualapai Attorney regarding information needed to assess the NPRM.

June 20 - Letter to the Hualapai THPO agreeing to fund an Ethnographic/Archeological Study to identify TCPs.

June 24 - Meeting in Peach Springs, AZ with FAA, DOI and Hualapai Tribe representatives.

June 27 - Letter from the Hualapai Attorney regarding the proposed commercial air tour routes.

July 8 - Letter from the Hualapai Tribe forwarding some 1986 documents.

July 10 - Letter from the Hualapai Attorney regarding the TCP study.

July 23 - Letter to the Hualapai Attorney forwarding some current Grand Canyon charts.

August 5 - Letter to the FAA Docket from the Havasupai Tribe regarding a revised commercial air tour route through National Canyon.

August 12 - Letter to the Hualapai Tribe regarding the formal Section 106 study.

August 12 - Letter to the Hualapai THPO forwarding proposed revisions to Statement of Work (SOW) for the TCP study.

August 26 - Mailed the No Adverse Effect Determination letters to all Native Americans except the Hualapai Tribe.

August 26 - Received a courtesy copy of the Hualapai Tribe testimony before the Senate Aviation Subcommittee on the National Parks Overflights Act.

September 5 - Letter from the Hualapai THPO forwarding changes to the SOW.

September 17 - Telephone call with the Hualapai Attorney.

September 22 - Meeting with the Hualapai Tribe representatives in Washington, D.C.

September 26 - Letter to the Hualapai THPO regarding the meeting on September 22.

September 30 - Letter to the Hualapai Attorney forwarding 5 (five) copies of the proposed commercial air tour routes.

October 24 - Letter from the Hualapai Attorney requesting information needed for the October 28/29 meetings.

October 27 - Letter from the Hualapai Office of Cultural Resources (OCR) regarding comments on the SOW.

October 28 and 29 - Meeting in Las Vegas, NV with FAA, DOI, NPS, GCNP, BOIA and Hualapai representatives.

October 30 (morning) - Meeting in Las Vegas, NV with FAA, GCNP and Navajo Nation Window Rock, Gap/Bodaway and Cameron Chapter representatives.

October 30 (afternoon) - Meeting in Las Vegas, NV with FAA, GCNP and Arizona SHPO representatives.

December 5 - Letter (via fax) to the Hualapai OCR and Attorney forwarding the latest draft of the SOW.

December 16 - Informal meeting with the Hualapai OCR and their contractor regarding the SOW.

December 22 - Letter from the Hualapai OCR containing the revised Phase I budget and schedule for the SOW.

December 24 - Letter forwarded from the Department of Justice regarding concerns of the Havasupai Tribe relating to overflights of the Grand Canyon.

1998

January 13 - Letter from the Hualapai Tribe transmitting comments on the December 17, 1997 Rule.

January 16 - Letter from the Hualapai Attorney containing revisions to the SOW.

January 21 - Meeting in Flagstaff, AZ with FAA, NPS, BOIA, and Hualapai Tribe representatives.

January 23 - Meeting in Flagstaff, AZ with representatives from the FAA, NPS, BOIA, Havasupai, Hopi and Zuni Tribes, and the Arizona SHPO.

January 24 - Meeting in Gap, AZ with FAA, GCNP and Navajo Nation Gap/Bodaway Chapter representatives.

January 28 - Letter from the Hualapai Attorney regarding the SOW and proposed contract.

January 29 - Letter (via fax) to the Hualapai OCR and Attorney regarding the SOW.

February 5 - Letter to the Hualapai Tribe regarding the September 1997 meeting and Hualapai sensitive canyons.

February 25 - Letter from the Hualapai Attorney regarding Section 106 studies.

March 3 - Letter from the Hualapai Attorney regarding funding of the SOW.

March 13 - Letter to FAA Southwest Regional Office (ASO) from the Pueblo of Zuni Tribe regarding a no flight designation for the Zuni Indian Reservation.

March 19 - Letter from the Hualapai Tribal Council regarding a resolution authorizing the signing of the SOW for conduction and FAA funding of the Ethnographic-Archeological Study.

March 20 - Letter from the Hualapai Attorney forwarding the revised subcontract between the Hualapai Tribe and PRC Inc.

March 24 - FAA signed the SOW with the Hualapai Tribe.

March 24 - Letter to the Hualapai Attorney forwarding the signed SOW.

March 25 - Letter (via fax) to the Hualapai Attorney forwarding the signed SOW.

April 17 - Letter to the Pueblo of Zuni Tribe from ASO regarding their request for a no flight zone designation for the Zuni Indian Reservation.

April 28/29 - Meeting in Flagstaff, AZ with FAA, NPS, Native Americans, Environmentalists, and Tour Operators.

May 15 - FAA assisted the Hualapai Tribe in getting the Hualapai Airport changed from a Private to Public Use facility.

May 28 - Letter from the Hualapai Attorney advising that relations between the Tribe and FAA are now proceeding consistent with Executive Order, dated May 14, 1998, on Consultation and Coordination with Indian Tribal Governments.

July 15 - Meeting with Hualapai Tribe representatives in Peach Springs, AZ regarding the proposed commercial air tour routes on the West End of GCNP.

July 23 - Letter from the Hualapai OCR transmitting the status report on the Study.

July 29 - Meeting with the Navajo Nation THPO representative in San Diego, CA.

September 9 - Letter to the Hualapai Attorney regarding the commercial air tour route proposals and the July meeting.

September 11 - Letter from the Hualapai Attorney regarding the Hualapai response to the proposed commercial air tour routes on the West End.

September 15 - Courtesy copy for FAA of a letter from the Hualapai Attorney regarding the August 20 meeting between the Hualapai Tribe and the Air Tour Operators.

October 22 - Letter to the Hualapai Attorney regarding the Hualapai proposed commercial air tour route structure.

November 5 - Letter from the Hualapai OCR transmitting the preliminary list of Traditional Cultural Properties from the Ethnographic Study.

November 13 - Letter (via e-mail) to Arizona SHPO and the Advisory Council on Historic Preservation representatives regarding the status of GCNP rulemaking actions.

November 16 - Letter from the Hualapai Tribe to the DOT Secretary requesting a meeting.

December 2 - Courtesy copy for FAA of the Hualapai Tribes' economic development plan for Grand Canyon West Airport.

December 11 - Meeting between the FAA Airports Division and Office of Policy, Planning and International, and the Hualapai Tribe in Washington, DC concerning development of Grand Canyon West.

December 16 - Meeting with the Hualapai Tribe in Las Vegas, NV regarding the Study and proposed commercial air tour routes.

1999

January 25 - Letter to the Hualapai OCR regarding the Study.

February 5 - Letter to the Native Americans inviting participation in a joint tribal meeting March 9 and 10, in Mesa, AZ.

February 11 - Letter to the Arizona SHPO inviting participation in the joint tribal meeting.

February 24 - Letter to the Hualapai Tribe inviting participation in the environmental process with cooperating agency status.

February 25 - Letter from the Havasupai Tribe advising of attendance by their attorney at the meeting in Mesa, AZ.

March 9/10 - Meeting in Mesa, AZ with FAA, BOIA, GCNP, Native American representatives from the Havasupai, Hualapai, Kaibab Paiute Tribes, and the Navajo Nation, and the Arizona SHPO.

March 30 - Telephone call with the Hualapai OCR.

March 31 - Letter from the Hualapai OCR transmitting the Final Ethnographic Study Report for Phase I of the SOW.

April 1 - Letter to the Hualapai Attorney forwarding the requested information as to how the FAA developed routes.

April 8 - Telephone call with the Havasupai Tribe Attorney.

April 8 - Telephone calls with the Paiute Tribe of Utah.

April 12 - Telephone call with the Hualapai Tribe OCR.

April 14 - Telephone call with the Hualapai Attorney.

April 20 - Telephone calls with the Hualapai THPO and Attorney.

April 30 – Meeting with Paiute Tribe of Utah in Cedar City, Utah regarding current status of Grand Canyon rulemaking actions.

May 3 – Meeting with Hualapai tribal representatives in Santa Fe, NM regarding, among other things, the Cooperating Agency agreement.

May 5 – Telephone call with Hualapai OCR regarding meeting in Washington DC week of May 19 and 20.

May 12- Telephone call with Hualapai attorney regarding proposed commercial air tour routes and Cooperating Agency agreement.

May 13 – Telephone call with Hualapai OCR and attorney regarding Cooperating Agency agreement.

May 13 – Conference call with Hualapai attorney regarding Cooperating Agency agreement and process.

May 14 – Telephone call with Hualapai attorney regarding status of document.

May 18 – Faxed latest changes to Cooperating Agency agreement to Hualapai attorney.

May 19 and 20 – Meeting in Washington DC with Hualapai tribal representatives and attorneys.

May 26 – FedEx map to Hualapai OCR.

June 1 – Conference call with Hualapai OCR and attorneys regarding FAA route development, noise modeling, Rulemaking process, and other matters.

June 4 – Telephone call with Hualapai attorney regarding schedule for completion, request by OCR for meeting, endangered species and wildlife.

June 8 – Telephone call with Hualapai attorney and DOI representative regarding cumulative impacts and development of Grand Canyon West Airport.

June 10 – Telephone call with Hualapai attorney regarding changes to Cooperating Agency agreement.

June 11 - Telephone call with Hualapai attorney regarding Cooperating Agency agreement, area of potential effect (APE) for ethnographic study and request for meeting.

June 14 – Telephone call with Hualapai THPO regarding meeting.

June 15 – Telephone call with Hualapai attorney regarding Draft SEA table 2.1 and US Fish and Wildlife correspondence.
June 16 – Telephone call with Hualapai attorney regarding final phase I ethnographic study report and meeting in Santa Fe, NM.

June 17 – Telephone call with Hualapai attorney regarding APE for phase II and interim budget for study.

June 29 – Telephone call with Hualapai attorney regarding meeting.

July 1 – Conference call with Hualapai Tribe, THPO, attorney, and representatives of FAA regarding Phase II, APE, funding, noise modeling and meeting.

July 7 – Letter to each Tribe, Navajo Nation and Arizona SHPO transmitting the Draft Supplemental Environmental Assessment (DSEA). The letter also advised that the FAA had found that the Undertaking (as currently proposed) would have no adverse effect on properties of traditional cultural or religious significance (for all except the Hualapai Tribe), in accordance with the National Historic Preservation Act (NHPA), Section 106. Letters sent via FedEx.

July 8 - Telephone call with Hualapai THPO regarding phase II of study.

July 9 – Telephone call with Hualapai attorney regarding latitude/longitudes of proposed routes.

July 12 – Telephone call with Hualapai attorney regarding noise modeling.

July 13 – Meeting with Hualapai Tribal representatives, attorney and FAA regarding APE discussion, noise modeling and other matters.

July 22 – Telephone calls with Navajo Nation THPO representative an, Tribal member regarding DSEA and meeting. Telephone call with Hualapai attorney regarding Cooperating Agency agreement.

July 28 – Telephone calls with Navajo Nation, Gap/Bodaway and Cameron Chapter representatives regarding meeting.

August 3 – Telephone call with Hualapai attorney regarding Hualapai support operations.

August 4 – Conference call with Hualapai attorney regarding economic impact to tribe from allocations.

August 9 – Telephone call with Navajo Nation Chapter representatives regarding economic impact and meeting. Telephone call with Arizona SHPO regarding Section 106 consultation.

August 10 – Telephone calls with Navajo Nation Chapter representatives regarding economic impact and meeting in Gap, AZ.

August 11 – Telephone call with Navajo Nation THPO representative regarding Section 106. Telephone call with Hualapai attorney regarding amended statement of work (SOW) and other matters.

August 12 – Telephone call with Hualapai THPO regarding meeting.

August 19 – Telephone call with Navajo Nation Chapter representative regarding meeting at Gap/Bodaway Chapter office.

August 21 – Traveled to Gap, AZ for meeting with Navajo Nation Cameron and Gap/Bodaway representatives. No Tribal representatives showed up, left box with materials by Chapter office door with 'to contact FAA' information.

August 24 – Telephone call with Navajo Nation Gap/Bodaway Chapter representative regarding missed meeting, economic concerns and their ability to get concerns addressed anyway.

August 27 – Telephone call with Hualapai attorney regarding submission of comments to docket and meeting in Santa Fe.

September 7 – Telephone calls with Hualapai attorney regarding Hualapai amended SOW.

September 8 – Telephone calls with Hualapai attorney regarding SOW and meeting. Telephone call with Hualapai THPO regarding SOW and contract for invoicing.

September 9 – Letter to the Navajo THPO, Hopi and Zuni Tribes, and the Arizona SHPO advising of the proposed change to the Desert View Flight-Free Zone (FFZ) in response to comments received during the public comment period from representatives of the Navajo Nation Cameron and Gap/Bodaway Chapters. The letter also advised that although the FAA was proposing to further modify the Desert View FFZ, the finding of no adverse effect issued in July 1999 remained valid.

September 10 – Telephone call with Navajo Nation Department of Transportation representative regarding economic impact from allocations.

September 15, 16 and morning of 17 – Meeting with Hualapai THPO, Tribal representatives, Resort Corporation, and attorneys in Santa Fe regarding SOW, Cooperating Agency agreement, and economic impact from allocations.

September 21 – Telephone call with Hualapai attorney regarding Hualapai support operations numbers.

September 22 – Telephone call with Hualapai Resort Corporation representative regarding support operation numbers.

September 23 – Conference call with Hualapai Tribal representatives and attorney regarding APE, support operations, routes, aircraft altitudes, TCPs and other matters.

September 27 – Telephone call with Hualapai attorney regarding SOW and support operations. Telephone call with Hualapai OCR representative regarding support operation numbers. Conference call with Hualapai OCR representatives and attorneys regarding SOW and APE.

September 30 – Telephone call with Hualapai attorney regarding request for information relating to breakdown of number of flights per route and revised SOW.

October 7 – Telephone call with Hualapai attorney regarding McCain rider and meeting for SOW. Telephone call with Havasupai attorney regarding status of legislation and GCNP rulemaking actions.

October 10 – Letter from the Arizona SHPO concurring with the FAA finding, contingent upon tribal concurrence (letter attached).

October 13 and 14 – Meeting with Hualapai THPO, attorney and DOI representatives regarding economic impact, support operations, APE, noise threshold, and other matters.

October 14 – Telephone call with Hualapai Corp. representative regarding support operation numbers.

October 15 – Telephone call with Navajo Nation THPO representative regarding Section 106 finding. Telephone call with Hualapai attorney regarding support operation numbers.

October 18 – Mail copy of Hualapai maps to THPO.

October 21 – Telephone call with Hualapai OCR representative regarding proposed route Blue Direct South. FedEx five extra copies of Hualapai map to OCR.

October 25 – Telephone call with Hualapai attorney regarding support operation numbers and SOW.

October 26 – Telephone call with Hualapai OCR representative regarding noise analysis and support operations. Telephone call with Hualapai attorney regarding SOW changes.

October 27 – Telephone call with Hualapai attorney regarding SOW, support operations exit points.

November 8 – Telephone call with Hualapai attorney regarding SOW.

November 9 – Telephone call with Hualapai attorney regarding SOW.

November 10 – Conference call with Hualapai attorney regarding SOW.

November 12 – Telephone call with Hualapai attorney regarding SOW.

November 17 – Telephone call with Hualapai Corp. representative regarding support operation numbers. Telephone call with Hualapai attorney regarding final report for Phase II, support operation numbers, SOW and other matters.

November 18 – FedEx SOW to Hualapai Tribe for signing.

November 19 – Telephone call with Hualapai attorney regarding meeting and phase II report.

November 23 – Telephone call with Hualapai attorney regarding meeting, noise modeling and visual analysis.

November 24 – Telephone call with Advisory Council on Historic Preservation (ACHP) regarding Hualapai Programmatic Agreement (PA). Telephone call with Hualapai attorney regarding PA. Telephone call with Hualapai Corp. representative regarding dates of airport closure.

November 29 – Telephone call with Hualapai attorney regarding FedEx package. Telephone call with Hualapai THPO and attorney regarding final phase II report, and other matters.

November 30 – Telephone call with Hualapai attorney regarding PA and meeting in Washington, DC.

December 1 – Telephone call with ACHP regarding PA. Telephone call with Hualapai Tribe regarding tribal election results. Telephone call with Hualapai attorney regarding supplemental noise data.

December 6 – Conference call with Hualapai Tribe, OCR, Resort Corporation, attorney, NPS and DOI representatives regarding support operations and other matters.

December 7 – Telephone call with ACHP regarding Hualapai PA.

December 8 – Telephone call with Hualapai THPO regarding authority to copy Phase IIA report. Conference call with Hualapai Tribe, OCR, THPO, attorney, Resort Corp., ACHP, DOI, and GCNP representatives regarding PA.

December 9 – Telephone call with ACHP regarding Hualapai PA.

December 14-16 – Meeting in Washington D.C. with representatives of Hualapai Tribe, THPO, OCR, attorney, DOI, GCNP, and ACHP representatives regarding PA.

December 17 – Telephone call with Hualapai attorney regarding contract amendment.

December 18 – Fax draft PA to Hualapai THPO, attorney and other participants.

December 20 – Telephone call with Hualapai attorney regarding PA.

December 22- Telephone call with ACHP regarding Hualapai PA. Conference call with Hualapai attorneys regarding PA and cooperating agency consultation on draft final supplemental environmental assessment (FSEA).

December 27 – Conference call with Hualapai Tribe, THPO, Tribal attorney, DOI, GCNP, and ACHP regarding PA.

2000

January 3 – Telephone call with Hualapai attorney regarding PA.

January 4 – Conference call with Hualapai Tribe, THPO, Tribal attorney, DOI, GCNP, and ACHP regarding PA.

January 5 – Conference call with Hualapai Tribe, THPO, Tribal attorney, DOI, GCNP, and ACHP regarding PA.

January 7 – Telephone call with Hualapai attorney regarding PA and cooperating agency consultation on draft FSEA.

January 7 – NPS representative signs PA relating to Hualapai Tribe.

January 10 – ACHP and FAA representatives sign PA relating to Hualapai Tribe. Meeting scheduled for January 13 for Hualapai Tribe and THPO to sign PA postponed due to Hualapai THPO emergency.

APPENDIX I

CONTACT LIST

FINAL MAIL-LIST FOR GRAND CANYON

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