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Grand Canyon

September 3, 1999

U.S. Department of Transportation Dockets
Docket No. FAA 99-5926 - 38
400 Seventh Street SW, Room Plaza 401
Washington, DC 20590

RE: Comment to Docket No. FAA 99-5926, Notice 99-11, "Comment on Modification of the Dimensions of the Grand Canyon National Park Special Flight Rules Area and Flight-Free Zones."

Dear Ladies and Gentleman:

The referenced NPRM addresses four issues: 1) the Desert View Boundary, 2) Bright Angel Flight-Free Zone (Future Quiet Technology Aircraft Corridor), 3) Changes to the Sanup Flight-Free Zone, and 4) Adding an additional commercial route over the Northern Sanup Plateau. I will address these issues in order.

1. <u>Desert View Flight-Free Zone</u>
   There is no reason to extend the eastern boundary of the Desert View Flight-Free Zone by 5 miles.
   a. There are no tour flights that operate within the 5 nautical mile extension.
   b. The only reason that an aircraft would come through that area would be weather related or for safety reasons. A flight-free zone can be transgressed anywhere for these reasons.
   c. 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 a legal requirement. There has furthermore been precedence set where flight routes extend over alleged so-called Native American cultural and religious sites over their protest.
   d. The unnecessary expansion of a flight-free zone five miles to the east is an unwarranted taking of airspace that is not necessary to protect the Grand Canyon National Park (GCNP) from sound impact. **The eastern end of the present Desert View FFZ should be maintained at its present location.**

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2. Bright Angel Flight-Free Zone

There has been discussion about establishing national standards for quiet technology aircraft. One such standard was presented some time ago by the National Park Service (NPS). It seems unreasonable that we cannot at this time establish standards for quiet technology aircraft. Manufacturers need to incorporate those standards into their research and development process. The standards are urgently needed.

There are certain types of aircraft, which are inherently quiet, and in some cases carry significantly more passengers. Namely these aircraft are: the Twin Otter with quiet propellers, the Boeing 900N, the Boeing 500N, the Cessna 209 Caravan, and the S55QT Whisper Jet. There may be other quiet aircraft. It would be a fairly simple review process to establish which aircraft are significantly more quiet than others. Until a national standard is established, it is reasonable to allow these significantly quieter aircraft to operate in the incentive corridors described in this NPRM.

As stated by the FAA on page 9 and repeated on page 18 of the NPRM, the benefits would be as follows:

- First, there would be fewer aircraft flying over the northern rim of Saddle Mountain, which is obviously a noise sensitive area.
- Second, tour aircraft would be dispersed reducing the level of concentrated aircraft along any one route.
- Third, opening the corridor at this time would provide a valuable and tangible incentive for operators to convert to quieter aircraft.

If the goal is to truly reduce sound in the Grand Canyon, it seems that getting an incentive into place as soon as possible would be beneficial toward the end goal. In that regard, the Bright Angel incentive corridor should be available to certain aircraft immediately.

3. Sanup Flight-Free Zone

Is ineffective since tour aircraft are controlled by routes and the top of the proposed Sanup FFZ is 8,000msl, or approximately 1,000 feet agl. The only reason FAA/NPS wants a Sanup FFZ is to aid in mathematically determining if enough land is included to meet the arbitrary formula for natural quiet. Note: the Shivwits Plateau (which is a large part of the Sanup FFZ) is not part of Grand Canyon National Park—it is part of Lake Mead National Recreation Area.

4. Additional Commercial Routes over Northern Sanup Plateau

These routes are not tour routes--they are a form of a direct route.

This NPRM represents a significant regulatory action and will be reviewed by the Office of Management and Budget.

Contrary to the statement on page 12 of the NPRM, it does have a significant economic impact on a substantial number of small entities. The economic impact study that has been prepared is invalid because it is arbitrary, erroneous, and incomplete, therefore inconclusive.

This NPRM will have an impact on the international balance of trade.

For evidence of the economic impact of this NPRM, please see the enclosed report, "An Analysis of Proposed Flight Restrictions at the Grand Canyon National Park. Estimating the Costs, Benefits, and Industry Impact of the Proposed Regulation" by Mary Riddel, Ph.D. and R. Keith Schwer, Ph.D. of University of Nevada, Center for Business and Economic Research hereby made part of this response by reference.

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 reasons 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.

The NPS in its own Report to Congress dated September 12, 1994 in Section E2.2.3, Page E.6 "Impacts on Natural Quiet" defines "natural quiet" as an intangible quality which is an important component of the visitors' overall enjoyment of parks, "and are thus valued resources." Resource Management Guideline NPS-77, chapter 2 is the reference and it is titled NPS-77, Chapter 2, "Protection of Aesthetic Values". If the resource of "natural quiet" is an aesthetic value (a human reaction or sensitivity to art or beauty) then the substantial restoration of "natural quiet" should also be measured by visitor response. The visitor response was overwhelming, as shown by the reduction of complaints received by the NPS. Prior to SFAR 50-2, 1,000 complaints per year (out of 2.9 million visitors) were received by NPS. In the past few years there have been approximately 35 complaints out of 5 million visitors, or about 1 complaint per 130,000 visitors. If you gave away 130,000 free lunches you would undoubtedly receive more than 1 complaint.

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.

Past studies have used the threshold of noticeability as "background plus 3dba" as a criterion of natural quiet. Th 1996 FAA study used ambient sound level plus 3dba 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 (1 I dba below the threshold of noticeability) as their criteria for natural quiet. This is inconsistent and unacceptable.

There should he 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 should be established as the threshold for noticeability. The threshold of 29 is in fact a realistic level of noticeability. Anything established below that amount is punitive in nature, arbitrary and capricious by design.

By reference I am incorporating the Report of JR Engineering dated July 25, 1997, "Analysis of National Park Service Data on Air Tour Overflight Sound at Grand Canyon National Park" and the September 3, 1999 revisions to that report, as part of this response. For convenience I have enclosed a copy of the report along with a copy of Mr. Alberti's testimony before the U.S. House of Representatives Committee on Resources, May 25, 1999.

Very truly yours,

Elling Halvorson
Chairman

EH/cg
Enclosures

The Center for Business and Economic Research
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An Analysis of Proposed Flight Restrictions at the Grand Canyon National Park: Estimating the Costs, Benefits, and Industry Impact of the Proposed Regulation

Prepared by

Mary Riddel, Ph.D.
R. Keith Schwer, Ph.D.

August 18, 1999

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Executive Summarv

This study assesses the draft regulatory evaluation presented in the FAA's Initial Regulatory Evaluation and Regulatory Flexibility Analysis (RFA) of the Notice of Proposed Rulemaking for commercial air tour limitation in the Grand Canyon National Park special flight rules area. Special attention is paid to the cost-benefit analysis contained in the RFA, long-run economic impacts resulting from the proposed ruling, and the credibility of the analysis and methods contained in the report.

We find that the cost-benefit analysis is lacking in methodological rigor, the data used and the scope of the analysis. With respect to net benefits of the proposed regulation, the most glaring omission from the report is the failure to account for losses in benefits to air tour customers due to suggested fare increases resulting from restrictions on the number of flights. Also, a combination of suspect studies and conjecture is used to estimate the economic damages incurred by ground visitors to the Grand Canyon. Under different and equally reasonable sets of assumptions. the estimated lo-year benefits of the noise-reduction program are reduced by half to less than $17 million. The cost estimates also suffer from equally unfounded assumptions. Demand projections of the air tour industry, perhaps the most critical aspect of costs, are based on data that encompass all tower operations from the five airports that serve air tour operators, including commercial point to point flights and general aviation.

There are also problems with the base year chosen for the allocations, May 1997 to April 1998. The year is not representative of the long-run industry demand due to the large drop in Asian tourism during that time. In addition. weather conditions during the base-year precluded air operations for 45 days. These were the worst weather conditions in the history of Grand Canyon air tour operations. Evidence suggests that demand during that period was between 15 and 22% below long-run expected demand. Limiting flights to those flown in an unusually poor year puts all operators at risk of not being able to meet their capital obligations. There is the potential for many firms to fail, leaving the market to only a few firms. This possibility is not considered in any detail in the report. Costs of altering the fleet to a more competitive mix under the regulations are also not considered. All in all, the base year assumption and the failure to consider important economic impacts places the industry on a permanent recession footing.

Another problem with the proposed regulations is that they alter the long-run investment decisions of the air tour companies in a manner that is inconsistent with reducing noise levels in the Canyon. Since the allocations are not protected as a property right, the proposed rules induce a high degree of uncertainty into the future of the industry, which in turn distorts investment decisions of the firm operators concerning long-term investments, thereby raising capital costs. In particular, because the proposal does not include any incentive for acquiring quiet technology aircraft, higher capital costs associated with the uncertainty have the adverse impact of deterring investment in quiet aircraft.

Finally, the proposed regulations don't consider any truly different alternatives to flight quotas. Quotas are inherently inefficient in the long run when attempting to control environmental problems. Incentive-based strategies are preferred to quota systems because they almost always offer *the same level of benefits at a reduced cost.* Under incentive systems for managing environmental problems, industries have a constant incentive to reduce the amount of noise through technological changes and innovations in an effort to capture the cost savings from reducing noise. Regulatory strategies based on incentives rather than quotas must be included in any final analysis.

I. *Overview of the proposed regulations*

The proposed rulemaking is a response to statutory mandate following from Public Law 100-91 requiring "substantial restoration of natural quiet to the Grand Canyon". The purpose of regulations is to restore natural quiet to the Grand Canyon National Park (GCNP). Natural quiet is defined as 50% of the Park experiencing no audible aircraft for 75-l 00% of the day. The focal point of the proposed regulations is a limitation on, and subsequent allocation of, commercial air tours to the Grand Canyon and establishment of new sightseeing flight paths. Specifically, the regulation modifies the dimensions of the GCNP Special Flight Rules Area by establishing new and modified flight free zones, adding curfews in some flight corridors, and raising minimum altitudes. Further noise reduction is achieved by limiting the number of sightseeing flights to the GCNP to 88,000 by proportionate allocation of reported flights to air tour companies operating during the base-year of May 1997 to April 1998.

Under the proposed regulation, flights will be allocated to companies based on their number of flights in the base year. Four types of allocations exist:

a. Peak season Dragon/Zuni flights

b. Peak season other area flights

c. Off-peak Dragon/Zuni flights

d. Off peak other area flights

Companies will receive one allocation for each flight they reported during the base year. Allocations will be adjusted for mergers and acquisitions occurring between the base year and the present. For example, if Company 1 flew 172 type a. flights during the base year, they will receive 172 allocations for that type each year for the next two years. Allocations are not a property right, and cannot be permanently transferred without the approval of the FAA. However, allocations may be transferred between companies (but not between types) on a temporary basis.

Federal laws mandate that when a significant number of small entities is impacted that the agency (the FAA in this case) must prepare a regulatory flexibility analysis (RFA). The law requires agencies to evaluate flexible regulatory proposals and explain the rational for their proposals. Prior to the Notice of Proposed Rulemaking (NPRM), an RFA was prepared to investigate regulatory alternatives to restore natural quiet in the Grand Canyon. It is to these two documents, the NPRM and the RFA, that the following discussion refers.

II. Calculation of Benefits

Reported benefits of the proposed regulation accrue only to ground GCNP visitors. Benefits to individual park users are estimated using a standard economic measure termed "consumer surplus" defined as the difference between what a person is willing to pay for a good and what they actually pay for the good (Zerbe & Dively, 1994). Total benefits are calculated using what the report terms "the benefit transfer approach", whereby data from similar sites are used to estimate consumer surplus in lieu of collecting site-specific data. Benefits are estimated for three groups: river-users, backpackers, and others, including sightseers, hikers. and campers. Visitor days for each group during 1997 are 99,137, 182,48 1 and 5,788,187, respectively, giving total visitation during that year of 6,069,805.

Calculation of the total economic benefit of the regulation, in terms of consumer surplus, proceeds in several steps.

1) Using three different external willingness to pay studies, visitor day values are multiplied by total visitation in each category and total annual willingness to pay for recreation in the Park, without the regulation, is calculated.

2) Using an external study that provides qualitative information concerning recreationists' exposure to aircraft noise in the Park, varying levels of benefit reduction are applied to each category of visitor depending on their exposure to aircraft noise. Due to the lack of information concerning actual reductions in willingness to pay for recreation in the Park, benefit reduction is chosen arbitrarily as follows: 20% for those slightly impacted, 40% for those moderately impacted, 60% for those impacted very much, and 80% for those extremely impacted. A sensitivity analysis is reported that uses ½ of the benefit-reduction levels. The estimated total lost consumer surplus from aircraft noise for 1997 using the full-benefit reduction is $34,453,000.

3) Next, a linearized noise measure is calculated for the base year. Expected noise measures are calculated given that no action is taken to limit aircraft in the Canyon. For a given year. the percentage change between noise levels in the base year is applied to the lost consumer surplus. For example, the base-year linearized noise measure is estimated to be 1219.23 and 1577.47 in 2000. This is a change of 22.71% in noise levels, so undiscounted costs are reduced by 34,453,000*.2271=$7.82

million, meaning that benefits attributable to the regulation in that year are $7.82 million.

Criticisms of the methodology.

The estimation of the benefits of the proposed restriction on commercial air tours in the Grand Canyon has a considerable number of methodological flaws. These flaws include the choice of valuation technique for the nonmarket benefits, unfounded assumptions concerning economic damages, and failure to account for benefits of an entire consumer group - the air tour consumers. Due to the nature of nonmarket valuation, the results are highly sensitive to the data and assumptions used, making methodological rigor of the utmost importance. Below, we discuss each error or omission in detail, and where appropriate, recalculate benefits based on alternative assumptions to that made in the analysis in question.

Choice of valuation technique and study selection criteria

The “benefits transfer method” of valuing a nor-market good - such as recreation in a national park - is subject to large amounts of error as a result of deviation of the good in question from those used in the related studies, compounding of error from the original studies, and differences in the data available from the related study and that needed for the research at hand. Due to its inaccuracy, the benefits transfer method is not mentioned as a reliable valuation method in standard environmental economics texts such as Freeman (1993). If the criteria listed on page 43 of the RFA are indeed met, then the results serve only as a rough estimate of the site-specific recreational value and should not be taken as being consistent with the industry standard for nonmarket valuation.

Four valuation techniques are currently recognized as "state of the art" for estimating the economic value of nonmarket goods (Freeman, 1993). These are contingent valuation, hedonic studies, travel cost studies, and meta-analysis. Of these four. meta-analysis most closely approximates the benefits transfer method. With meta-analysis, the value of a nonmarket good is estimated using a set of past studies that value similar goods. A set of studies is used because the estimate, essentially an average of the values contained in the previous studies, is more precise than if only one study is used. Generally speaking, the precision increases as more studies are used.

Ironically, the meta-analysis approach has come under heavy fire from both economists and statisticians with critics claiming that the results are subject to large amounts of error due to small sample sizes. The benefits transfer method then, can be seen as the worst case of a highly suspect methodology.

The criteria outlined on pg. 43 of the RFA provide a basis for the selection of studies that should be included in a meta-analysis. Unfortunately, the study selection criterion, "selected economic studies must use appropriate valuation methodologies" is not adequately met for the HEIRS, Inc and Harris, Miller, Miller, & Hanson, Inc. (1993) study (pg. 43 RFA). The study reports the percentage of visitors by category that are impacted either "not at all", "slightly", "moderately", "very much", or "extremely". Ordinal categorizations such as this are absolutely useless for valuing the impact of the noise. A simple example illustrates this point. One person may respond that they were only slightly affected by the noise, but if questioned further, may be willing to pay $20 for the experience without noise. Another individual may be disturbed "extremely" by the noise, but only willing to pay $5 for relief. Therefore, the data neither economic damages from overflights or can any economic benefits of noise reduction be deduced from it. The estimated damages are entirely determined by the values chosen by the report authors for the benefit reductions assigned to each of the impact categories.

In essence, the report uses a poorly designed study (HBRS) in a suspect methodology (benefits transfer) and formulates conclusions that are not based on standard methods. The results concerning baseline losses in consumer surplus from aircraft noise, therefore, are untenable and cannot stand the test of scientific assessment. To illustrate this shortcoming, let's assume that the visitor-day value for those affected slightly is reduced by 1%, those affected moderately by 3%, those affected very much by 8%, and those affected extremely by 10%. Then the reduction in consumer surplus attributable to aircraft noise in 1997 is reduced by almost ten times from S34.6 million to S3.6 million. It is important to note here that no empirical evidence exists allowing us to choose behveen these two estimates of S34.6 million and S3.6 million. In short, pure conjecture unsupported by any theory or evidence provides no basis for reputable rulemaking.

Assumptions concerning economic damages from noise

Further problems exist in the study concerning the benefits to Grand Canyon visitors from reducing aircraft noise. The calculations assume that the percentage reductions in noise result in a one to one percentage increases in benefits to the affected parties. Empirically, there is no reason to believe this, and indeed, economic theory posits the concept of diminishing marginal benefit, that is, additional units of a good provide less and less satisfaction for the individual. Typically, environmental damages are very low or zero at low levels of an externality due to the environment's assimilative capacity. As the level of damage. noise in this case, increases, economic costs increase to reflect higher damages from each additional decibel. In the framework of willingness to pay, the concept of increasing marginal cost of noise (or diminishing marginal benefit of quiet) means reducing the first unit of noise will have the greatest benefit to the individual, and the added benefit from each consecutive unit of noise will be smaller.

As before, we change the assumptions of the model and recalculate the benefits assuming that the first 6% of noise reduction increases benefits by 10%, the next 6.4% of noise reduction increases benefits by 8%, the next 6.8% of noise reduction is paired with a benefit increase of 5%, and the final 7% of noise reduction increases benefits by 1%. Using these assumptions, year 2000 benefits fall from S7.82 million in the FAA model to S3.7 million in our model. Again, we find large variations in program benefits resulting from changes in model assumptions. Accurate estimation of the consumer surplus of each activity and the noise damage function is needed in lieu of arbitrary assumptions about these critical parameters outlined in the report.

Benefit losses to air tour consumers

Probably the most glaring omission from the report is the failure to account for consumer surplus losses due to fare increases resulting from restrictions on the number of flights. The report concedes that as demand for flights increases, the airlines will be able to raise prices to recoup the lost revenues associated with more flights. If this is true, then for each dollar increase in the flight, each passenger loses a dollar in consumer surplus.

In a properly conducted cost- benefit analysis. this loss in consumer surplus should be subtracted from the consumer surplus for air tour passengers estimated for those visiting the Grand Canyon on the ground. There is no methodological reason for excluding the air passengers from the analysis, in fact. standard industry analysis of the impacts from regulation include estimation of the increase in costs to a firm and the lost consumer surplus to consumers in the industry.

Many substitutes exist for Grand Canyon flights. These substitutes include flights to other sightseeing destinations, travel by bus or car to the Canyon, or visiting another site altogether, then consistent with economic theory, we expect elasticity of demand to be higher than for leisure travel in general. Estimates of the elasticity of demand for leisure travel indicate that the value is approximately 2 (Shaw, 1988). Using a constant elasticity of demand estimate of 2 and an illustrative flight cost of $100, estimated losses in consumer surplus exceed $18.4 million for the ten years investigated in the report if the industry would have grown at 3.3% per year absent the regulation.

The report may also be criticized in how it presents other studies to support its findings. For example, though not offering any specific values, the report alludes to nonuse benefits that may accrue to the general public from Grand Canyon quiet. Specifically, the report refers to a study done for the Bureau of Reclamation concerning the non-use value of changes in flow levels in the Grand Canyon and makes the claim that the study provides evidence of “potentially significant non-use benefits from noise reduction in the Grand Canyon”. One of the primary motivations of changing flow levels in the Canyon was to aid several species of native endangered fish. Endangered species derive their economic value from their contribution to biodiversity and are typically associated with high non-use values. Therefore, the high non-use value of changing dam operations is most likely associated with the endangered species that would be affected, and not any inherent value of returning the Grand Canyon to a “natural state”.

Another example of misrepresentation is the report’s claim that a discount rate of 3% is supported by economic theory. In fact, their chosen rate for discounting consumer surplus is not supported by economic justification. Though Freeman (1993) is cited, Freeman's actual discussion concerning choice of discount rates states that discount rates should reflect the opportunity costs of funds. However, numerous factors such as taxes, inflation, and some aggregation of the individual's rate of time preference, preclude a definitive answer on the choice of the discount rate. Choosing a rate that reflects the actual cost of borrowing for consumers is one practical solution. The chosen rate of 3 % is not a function of these variables and instead, seems to be chosen arbitrarily.

III. Calculation of Costs

Typically, calculating the costs of a regulation involves estimating the difference in net operating revenue with and without the regulation. The report does this in **a** detailed fashion, using variable costs by aircraft published in Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs, including fuel. oil, maintenance, and labor as variable operating costs. Future industry demand is estimated using tower operations for the five airports associated with Grand Canyon air tours and published fares are used to estimate prices over the ten years under study. The number of passengers under the proposed regulation assumes planes will fly at full capacity, given adjustments for seasonal load factors.

Criticisms of methodology.

Examination of the cost analysis and the underlying assumptions reveals several potential problems with the assumptions, analysis, and findings. These include assumptions concerning firm revenues, growth rates, the choice of the base year as an accurate assessment of current industry equilibrium, and the impact on the firms of increased capital and transaction costs. Each of these points is discussed in turn.

Calculating baseline m-ices

When calculating baseline prices for estimating baseline revenues, “published prices” were used. However, as conceded in the report, the bulk of the passengers are booked either through the casinos or through tour agencies, and bulk discounts often apply, implying total industry revenues may be lower than those reported in the document.

Another potential problem with the tour prices used in the report is that they reflect current unregulated routes. Proposed changes in the flight paths requiring higher minimum altitudes and limited viewing of certain areas of the Canyon could impact customers’ willingness to pay for flights if the length of viewing time or aesthetic experience is diminished. This possibility, and any probable adjustment in prices, is not included in the analysis.

Forecasting industrv growth rates

A shortcoming in the cost analysis involves the estimation of air tour industry growth rates. The industry growth rates (absent the regulation) assumed in the report appear to be based on operations of all commercial and general aviation flights using the five airports used by Grand Canyon air tour operators. There is no reason to believe that the air tour industry will grow at the same rate as other air travel at the airports. In fact, general aviation and business-travel would be expected to grow with total employment and population, while leisure-travel growth is most likely to follow growth in hotels, casinos, and other attractions. Moreover. the most critical component of demand for the air tour market is foreign travel. The recent Asian crisis resulted in significantly different growth rates between commercial point to point, general aviation, and the Grand Canyon operators. Therefore, use of aggregate growth rates is likely to bias estimates of growth in the air tour industry alone. The direction of bias may not be determined without statistical and economic modeling directed at the commercial air tour industry instead of the transportation airline and general aviation industries.

Choice of base year

Perhaps the most problematic assumption in the analysis is that the base year chosen is an accurate picture of air tour industry demand. In fact, the year is not representative of long-run industry equilibrium either presently or historically. The collapse of several Asian currencies in the third quarter of 1997 had an enormous impact on Asian visitation to Las Vegas and other American cities, with Asian tourism into Las Vegas declining by 24.3 percent according to the Las Vegas Convention and Visitors Authority.

A survey of Southern Nevada-based air tour passengers done by the Center for Business and Economic Research at UNLV indicates that in recent years, over 90% of clients for the Southern Nevada based operators are international visitors. See Table 1. According to the *RFA*, Asian visitors have historically accounted for 60 to 90% of the demand for air tours to the Canyon. If 60 to 90% of the customer base is reduced by 24.3%, then this can translate into a demand shock of 15 to 22%. See Table 2. The consensus among economists is that the economic impact of the Asian Crisis, while temporarily undermining Asian service exports such as commercial air tours, is a temporary phenomenon and not a long-run feature of international trade. Given the financial assistance granted by the International Monetary Fund to Korea and Japan's current stimulus package, the Asian economies are expected to resume economic growth this year. implying a return to more favorable conditions.

Table 1. Flights, passengers, and origin of passengers
from a survey of Southern Nevada Grand Canyon air tour operators

	1995	1996
Number of flights	37,649	60,029
Number of passengers	369,205	436,925
American	30,831	35,051
Foreign	338,374	401,874
Percent American	8.4	8.0
Percent foreign	91.6	92.0

Table 2. Asian visitation to Las Vegas, 1997 and 1998
Source: Las Vegas Visitors Convention Authority

	1997	1998	% change
Japan	403,000	342,000	-15.1
S. Korea	122,000	61,000	-50.0
Singapore	26,000	14,000	-46.2
Taiwan	79,000	60,000	-24.1
Total	630,000	477,000	-24.3

It is important to note that the rapid devaluation of Asian currencies was a completely unexpected event, both from the position of international currency traders and air tour industry forecasters. As such, the subsequent fall in demand for Grand Canyon air tours was also unexpected and unforecastable. Since capital investment decisions are based on expected demand, using a historically low year for allocations endangers the operator's ability to cover capital costs. The regulations would force firms to produce at a level well below their capacity. Failure to cover long-run capital and other fixed costs will eventually lead to firm closure and increased industry concentration.

Capital and transaction costs

Air tour operators chose airplanes by weighing the operational costs of the aircraft, seating capacity, and viewing experience. Larger aircraft may have lower average operating costs, but don't provide the same viewing experience as smaller aircraft. Since airplanes have a 20-year usable life, the number of aircraft purchased by the firm is a long-run decision that is based on long-run demand for air tours. Flight restrictions, especially those based on deviations from long-run demand, will alter the size and number of aircraft that enable firms to be efficient, forcing firms to alter their fleet in an attempt to remain competitive. These costs are not included in the report.

Changing their fleet will incur two costs to the firms that are not included in the report. Transaction costs, those costs incurred by selling old aircraft or purchasing new ones, will be substantial for firms that have fleets of smaller aircraft. Net capital costs, the per passenger difference between the cost of the old airplane and its replacement, will also be high for those firms that must alter their fleet to remain competitive. Neither of these costs is included in the report.

IV. General Criticisms of the regulation from an efficiency perspective

The preceding sections have focused on the failures of the cost-benefit analysis contained in the RFA. Though benefit-cost analysis, when done correctly, may successfully assist policymakers in ranking alternatives, it provides little insight into the relative efficiency of alternatives that are not discussed. Further, long-run economic impacts are generally not accounted for in a cost-benefit analysis. The following paragraphs discuss the long-run economic implications of the proposed rulemaking, and the shortcomings of the FAA analysis with respect to long-run substitution effects among ground and air visitors to the Canyon.

<u>Firm exit. industry concentration. and consumer welfare</u>

The report does not analyze air tour industry impacts in terms of firm failure and downsizing in any meaningful fashion. To be sure, the report admits that since some operators were operating at a loss during the base year, that these firms and others may be put out of business. Given the meager amount of data used in the analysis, however, one cannot test the hypothesis of profitability or viability. A clear picture of the industry after hvo years of regulation is conspicuously absent from the report.

As operating costs rise from new reporting requirements and increased fuel and labor costs associated with new flight paths, it is highly probable that some firms will not be able to cover overhead costs and will be forced to exit the industry. This will have two negative social impacts. First, the industry will become more concentrated, inducing losses in consumer surplus as prices rise. Second, firm closures will result in unemployment of ground and flight crews for the affected firms.

Though short-run production decisions are correctly based on short-run profits (total revenue less total variable cost), the decision of whether to continue to produce or exit the industry is based on long-run economic profits (expected future revenues net of total operating and fixed costs). The regulatory cost analysis focused on the variable costs, due to the availability of data. To understand the long-run impacts to the industry as a whole, such as industry concentration, firm revenues, and economic profit, one must look to fixed costs. As one might expect, the fixed costs borne by air tour operators are substantial. According to Schwer et al. (1999), fixed costs. including insurance. aircraft, facilities rental, and other leases are 19% of the total air tour industry expenditures for Southern Nevada.

The report acknowledges that of the six operators for which they have profit data hvo suffered financial losses during the base year. However, the report fails to discuss this topic in a quantitative fashion. If firms are restricted to output levels that caused them to suffer losses, their future viability is in doubt. It may be unreasonable to extrapolate from the sample and suggest that 1/3 of the firms will go out of business due to the proposed rule, especially since there is a strong indication that the mandates will cause firm failures.

Though the report recognizes that firms will fail as a result of the regulation, they don't allow for the possibility that the eventual outcome may be only a handful of firms supplying the entire market. In the extreme, the regulation could create a monopoly, or eradicate the industry altogether.

These adverse possibilities are given short thrift in the report. Market concentration is associated with higher prices and restricted output if firms gain market power through increased market share. Though higher prices and restricted output may seem to naturally benefit those seeking quiet, they result in another round of losses to consumers of air tours, and the net benefit may be negative. Firm downsizing means unemployment for redundant employees. If all firms fail, the collapse of the industry will mean large losses in consumer welfare, as well as unemployment and associated social problems.

In summary, the final result cannot be determined without further investigation into the elasticity of demand for commercial air tours and a reasonable forecast of industry size in the future, given that some firms leave the industry. The study is clearly incomplete concerning this very important issue.

Adverse impacts from noise reoulation

Another problem with the proposed regulations is that they alter the long-run investment decisions of the air tour companies in a manner that is inconsistent with reducing noise levels in the Canyon. Since the allocations are not protected as a property right, the proposed rules induce a high degree of uncertainty into the future of the industry, which in turn distorts investment decisions of the firm operators concerning capital and other long-term investments and raises capital costs. In particular, because the proposal does not include any incentive for acquiring quiet technology aircraft, higher capital costs associated with the uncertainty have the adverse impact of deterring investment in quiet aircraft. Quiet aircraft could provide a permanent solution to the noise externality while still allowing the air tour industry to grow at a modest pace.

Substitution effects. environmental degradation, and social efficiency

A major shortcoming of the study is its failure to account for substitution effects between those tourists visiting the Canyon by air and those tourists visiting using ground transportation. Clearly, some of those deterred by rising prices for air tours will opt to visit the Canyon by ground. According to a survey of air tour passengers for tours originating in Southern Nevada done by the Center for Business and Economic Research at UNLV, 27% of air tour consumers stated that they would still consider visiting the Grand Canyon if air tours where eliminated. Using the 3.3% expected growth in the air tour industry projected in the *RFA*, the regulations will turn away 230,146 air visitors benveen 2000 and 2010, resulting in increased demand for ground visitation of 62.139.

Ground visitors impact air quality, strain camping, service and waste disposal resources in the Park, and contribute to the already congested environment. These impacts should be considered in the rulemaking.

Foreign trade impacts of the proposed regulation

The report acknowledges that due to the high percentage of foreign patronage of Grand Canyon air tour services, foreign trade may be affected by disruption of marketing of the tours. A survey of Southern Nevada based air tour passengers done by the Center for Business and Economic Research at UNLV indicates that in recent years. over 90% of clients are international visitors. See Table 1.

Though this is a possible source of declining demand, the more likely foreign trade impact is the loss in service exports of flights that would be demanded but cannot be sold due to the regulation. This is not considered at all in the report.

V. *Alternatives to the proposed regulation*

The Regulatory Flexibility Act and the Small Business Act require regulators to consider alternatives to the proposed regulation when a significant number of small entities are affected by the regulation. The proposed regulation is in essence, a quota on the number of flights that may be flown to the Grand Canyon. The two alternatives listed, allowing for a three month peak season or allowing for permits to be used any time of the year, though offering some variation in policy, are not the most economically based alternatives to the regulation. An entire class of alternatives – incentive based systems for moving to quite technology aircraft -has been completely ignored in the document. This is a distressing oversight.

For example, the report does not consider in any detail economically more efficient alternatives to the proposed quota system providing subsidies to the air tour operators to encourage a switch to noise efficient aircraft. A subsidy would provide incentives to replace older, noisier aircraft with more noise efficient aircraft while reducing losses to consumer surplus for both air and ground visitors to the Canyon in the long-run. The thinking is to allow air tour operators the latitude to determine the least cost method to reduce noise, instead of having a central authority, unfamiliar with their industry, make that determination.

Amongst economists, incentive-based strategies are preferred to quota systems like the one proposed for the GCNP because incentive-based strategies almost always offer *the same level of benefits at a reduced cost* (Field, 1997). This is because quota systems are an all or nothing proposition – overflights and noise are reduced one time, and benefits stagnate. Under incentive systems for managing environmental problems, industries have a constant incentive to reduce the amount of noise through technological changes and innovations in an effort to capture the cost savings from reducing noise. Therefore, benefits of the program will increase over time, as the marginal costs of the program eventually decrease.

The failure to investigate the benefits and costs of an incentive-based program for reducing aircraft in the Grand Canyon is a major flaw in the proposed rulemaking. Given that the same benefits could be achieved at a lower cost to producers, the omission restricts policymakers to consideration of a few very similar and inefficient methods for reducing aircraft in the Grand Canyon is a major flaw in the proposed rulemaking. Given that the same benefits could be achieved at a lower cost to producers, the omission restricts policymakers to consideration of a few very similar and inefficient methods for addressing the issue.

VI. *Suggestions for re-evaluation of the costs and benefits*

The final results concerning the level of benefit from the program are highly sensitive to the methodology used. and as such, the benefits attributed to the pro-gram are highly suspect. Though many noneconomists are unfamiliar with the standard methods for nonmarket valuation, a consensus has been reached in the economic research community concerning the appropriate techniques for nonmarket valuation. These procedures were almost entirely disregarded in the analysis. The final results concerning the level of benefit from the program are highly sensitive to the methodology used. and as such, the benefits attributed to the program are highly suspect. Given the very large economic impact suffered by the air tour operators conceded by the report, a rigorous and scientifically based assessment of the economic benefits of the program should be performed to justify such large industry impacts. Therefore, we suggest a more appropriate approach to estimating economic benefits and *costs* that relies primarily on site-specific data and direct observation by people actually affected by the noise.

For assessing the economic benefit to people on the ground of the proposed regulation, the appropriate estimation technique is contingent valuation. Another method, the travel cost method, deduces an individual's willingness to pay for a visit to a site from the costs of their travel to the site, is inappropriate in this situation because visitors to the Canyon often visit other sites as part of their total trip. When this is the case, it is misleading to attribute the entire expense of the trip as willingness to pay for only one site.

In contingent valuation, visitors to the Canyon are questioned, either in person, my mail, or over the telephone, concerning the impact of aircraft noise on their visit. Specifically, various hypothetical scenarios are posed to each respondent involving varying levels of aircraft noise and their willingness to pay for a Grand Canyon trip, given that level of noise. Survey respondents are also questioned about their activities in the Canyon and other visitor-specific characteristics such as income that may affect their demand for Grand Canyon trips. Using the information obtained from the survey, a demand curve may be estimated and the loss in consumer welfare may be calculated.

Estimation of the costs of the proposed regulation must also be addressed before the study has any credibility. A demand curve may be estimated using industry data over time obtained from the air tour operators and consumer and producer surplus losses can be derived from that. However, given the variability of the demand for Grand Canyon air tours. caution must be taken when projecting demand for flights over the next ten years.

A credible forecast model will use industry-specific data in conjunction with national forecasts of international trade with respect to Asian countries, as well as growth in the Las Vegas hotel sector. Given a reasonable projection of growth in demand for Grand Canyon air tours, estimation of the consumer surplus loss to the consumers proceeds in a relatively straightforward fashion.

VII. Conclusion

The RFA contains serious methodological flaws that cast doubt on the results concerning the benefits and costs of the regulation. Suspect modeling techniques are used to calculate benefits to GCNP visitors. The lost benefits to an entire consumer group, Grand Canyon air tour customers, are not included in the analysis. With respect to costs, industry growth rates are based on inappropriate data, and almost certainly understate the long run growth rate. Also, the cost of altering the air tour fleet mix necessitated by the new regulation is not included.

The base-year chosen for the allocation was 15 to 22% below long-run expected demand for the industry. Therefore, the allocations force the operators into a period of permanent recession, which will lead to the closing of several firms, losses to consumers, and unemployment in the industry. Industry concentration is also a likely result.

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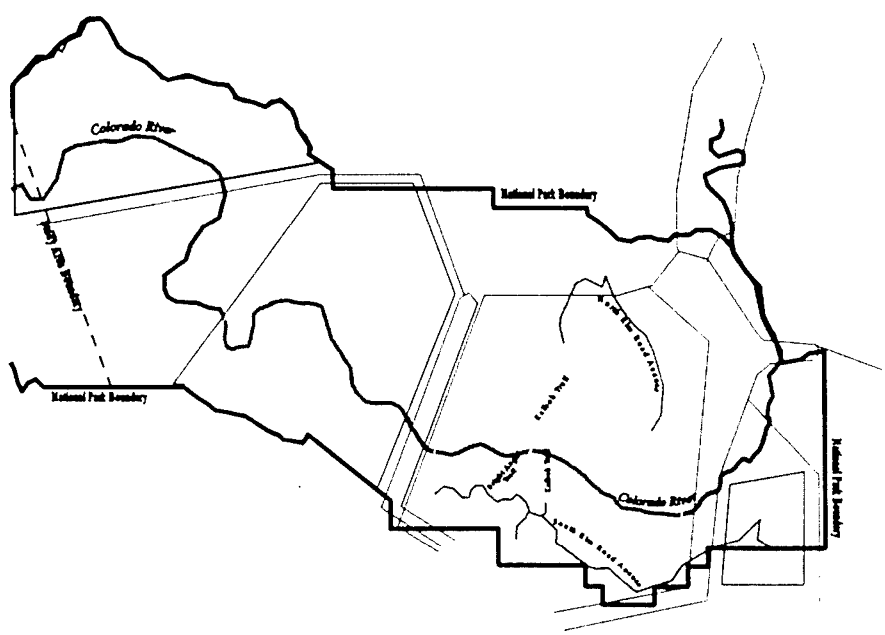

ANALYSIS OF NATIONAL PARK SERVICE DATA ON AIR TOUR OVERFLIGHT SOUND AT GRAND CANYON NATIONAL PARK

Prepared for:

Helicopter Association International
On behalf of:
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July 25, 1997

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REFERENCES:

1. *"Draft Environmental Assessment -- Special Flight Rules in the Vicinity of Grand Canyon National Park"*, Jeff Griffith (ATA-1), FAA/BIA/NPS, 8/20/96

2. NPOA Report *No.* 93-1, *'Evaluation of the Effectiveness of SFAR 50-2 in Restoring Natural Quiet to Grand Canyon National Park -- Final Report"*, S. Fidell, K. Pearsons, M. Sneddon, BBN Systems and Technologies, 6/23/94.

3. *"Draft Environmental Assessment – Noise Limitations for Aircraft Operations in the Vicinity of Grand Canyon National Park"*, Jeff Griffith (ATA-1), FAA/NPS, 12/24/96

4. Noise-Con 96 Paper, *"'Barrier Diffraction and Sound Propagation in USDOT's New Traffic Noise Model"* , C.W. Menge, et al, Harris, Miller, Miller & Hanson, 6/96

1.0 INTRODUCTION

1.1 Summary

New restrictions on flight operations have been imposed on tour aircraft in Grand Canyon National Park. The basis for this change is government studies claiming that aircraft noise would be audible in large areas of the park under existing rules.

Our analysis shows, however, that the government studies were biased and misleading due to several invalid and unscientific assumptions that overstate the sound levels and sound detectability. For example, their studies zero out the sound attenuating effects of trees, loose soil and other surface features. Their studies further assume a threshold of detectability that is lower than that shown by the government's own research.

When these errors are corrected, the result is that over 95% of the Park will meet the Park Services own definition of "natural quiet" in the busiest month for air tours (July).

We have evaluated this hypothesis from two different analytical perspectives:

Study A: The INM 5.0 study commissioned by the National Park Service (NPS) and performed by the Federal Aviation Administration (FAA), as reported in the Draft Environmental Assessment, Reference 1. This study was used by the NPS to justify more restrictive flight rules.

Study B: Our INM 5.1 study of operations in the Eastern end of the Park using actual 1996 aircraft operations as reported by the operators. This reflects what actually happened in 1996.

Even tested against the NPS's rather extreme and controversial definition of "substantial restoration of natural quiet," each of these analyses demonstrates that "natural quiet" has been restored under SFAR 50-2. These results are particularly compelling in the case of Study A since:

(a) This study, was conducted on behalf of NPS, using the NPS's and FAA's data, and;

(b) This study was not a neutral analysis and based on generally accepted practices in evaluating aircraft noise. Certain assumptions were made in the methodology of this study. These assumptions systematically bias the results in a manner that has the effect of obscuring the fact that "natural quiet" had been restored under SFAR 50-2.

1.2 Objective

The objective of this report is to explore and illuminate the assumptions underlying the government study of noise in Grand Canyon National Park, and to provide a technically neutral evaluation of the "restoration of natural quiet" therein.

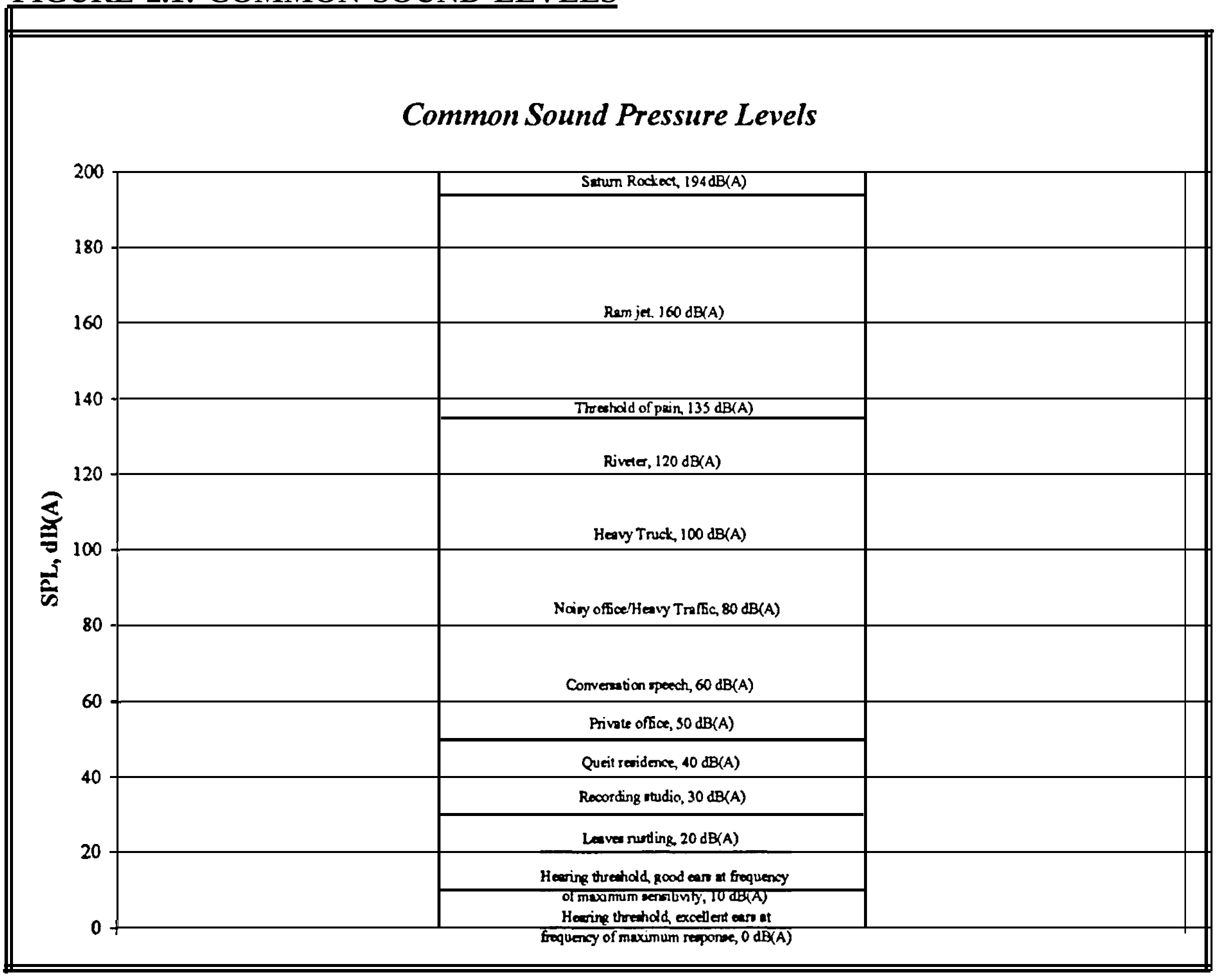
2.0 ANALYSIS

2.1 What Is "Natural Quiet?"

The National Park Service (NPS) in its 1994 Report to Congress, stated that "substantial restoration of natural quiet" will have occurred when at least **50%** of the park is free of noticeable noise from sightseeing flights at least 75% of the time. (This definition has been challenged in court as too extreme, but our analysis shows that even this very demanding standard for "natural quiet" has been and is being met. It is being met, in fact, in far more than 50% of the Park.)

The Draft Environmental Assessment that accompanied the new Grand Canyon rules (Reference 3) indicates that the NPS has defined "noticeability" to mean a 3 dB(A) increase above the ambient sound level at any particular location. It has, further, assigned ambient noise levels in the neighborhood of 15 dB(A) to 17 dB(A) to most of the Park. These levels barely exceed the threshold of hearing (See Figure 2.1) and would be exceeded by rustling leaves, any hint of wind, or hikers' footsteps.

FIGURE 2.1: COMMON SOUND LEVELS



The BB&N study conducted in 1994 under NPS contract and reported in Reference 2 provides a more useful data set. This study found that 30 dB(A) is the average level at which observers sent into the Canyon first detected aircraft noise above the ambient level (onset), and were no longer able to detect the aircraft sound (offset). This is shown in Figure 2.2 (Figure E-4 from Reference 2)[1].

Reference 2 also correctly observes (Section 4.8) that noticeability of aircraft noise for someone not specifically engaged in listening for aircraft noise would occur at a 10 dB higher signal to noise ratio than for a vigilant observer. In our INM studies; we, conservatively, used the 30 dB(A) "observed" onset, offset level for vigilant observers.

FIGURE 2.2: MEAN SOUND LEVEL AT ONSET AND OFFSET OF DETECTABILITY
(Figure E-4 from Reference 2)

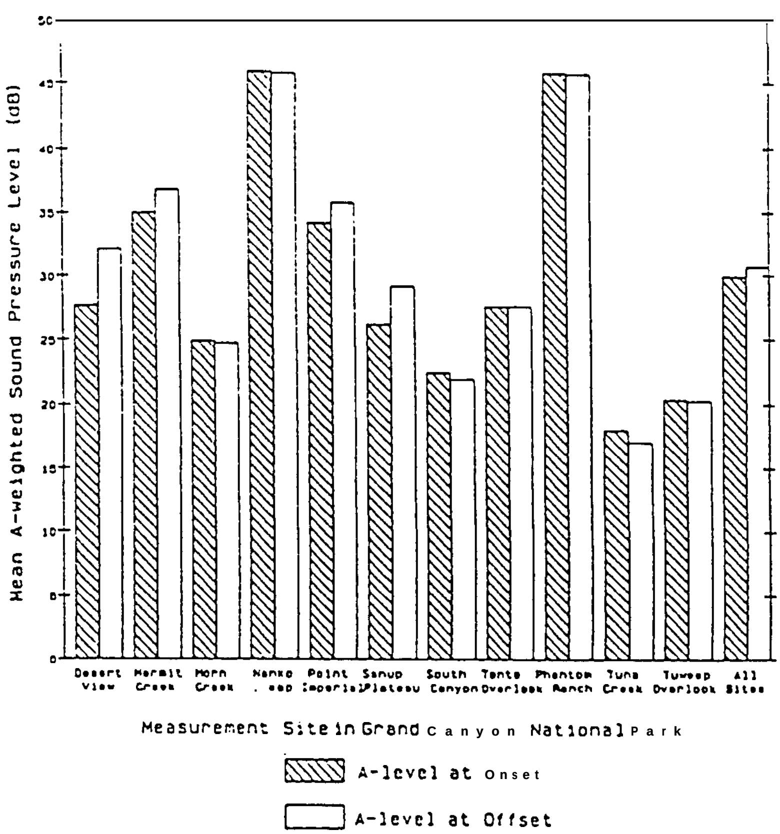


Figure E-4 Mean A-weighted sound pressure levels by site at onset and offset for air tour aircraft.

[1] Note that 30 dB(A) is the average level for onset and offset of detectability, individual sites having higher or lower levels. Since, the NPS criterion for "substantial restoration of natural quiet" requires that a "natural quiet" exist in 50% of the park, an average level is appropriate.

2.2 Noise Projections Using Integrated Noise Model (INM)

FAA developed the Integrated Noise Model (INM) for use in calculating community noise impacts in the vicinity of airports. This model is inherently conservative for application at the Grand Canyon because it does not fully account for the blocking effect of terrain between the source and observer. Version 5.1 is the most recent release of INM.

2.2.1 Study A: FAA INM 5.0 Study (Reference 1): Assumptions Leading to Overstatement of Noise Impact

The INM 5.0 noise analysis commissioned by the NPS incorporates a number of unusual and erroneous assumptions that consistently cause overstatement of noise impact. These biasing errors include:

2.2.1.1 Incorrect Helicopter Speed Correction

Reference 3, Table 4.1.2a, shows that the government **increased** helicopter sound levels taken from the Helicopter Noise Model (HNM)[2] by 1.1 to 1.5 dB. This ostensibly corrects the Sound Exposure Level (SEL) from test speed (116 – 128 kt) to Grand Canyon tour cruise speed (90 kt)[3].

The HNM, however, shows SEL **decreasing** as airspeed decreases to 90 kt[4]. The effect of this error is to overstate helicopter sound levels in the Grand Canyon.

---

[2] HNM is an FAA developed program for computing sound from helicopters. FAA states that it plans to incorporate the HNM in the Integrated Noise Model (INM). The present INM Version 5.1 data base contains only fixed wing aircraft.

[3] This appears to be a correction for sound duration based on 10LOG(Vref/V). It ignores the more powerful effect of advancing tip mach number on helicopter sound. The reduction in advancing tip mach number at lower air speed causes the time integrated sound level, Sound Exposure Level (SEL), to decrease or remain the same, as airspeed decreases.

[4] We computed and averaged SEL directly under the flight path and 500 ft to either side, for a 500 ft flyover using HNM version 2.2. This produced the following:

- Aerospatial AS350D, SEL = 83.2 dB at 116 kt, 83.0 dB at 90 kt, a 0.2 dB reduction.
- Bell 206L, SEL = 82.2 dB at all speeds, no speed correction provided..

2.2.1.2 Elimination of Lateral Ground Sound Attenuation from the INM.
(This is sound absorption by ground and attenuation through disturbed air near the ground, not blocking by a barrier.)

The government **altered the code of INM Version** 5.0 to remove the computation of lateral over-ground attenuation'. This alters the program's basic computational method in a way that is inconsistent with all other sound studies conducted with this program, including those conducted under FAA regulation. The effect of this alteration is to overstate sound levels of all aircraft in the Grand Canyon.

The reason given for this alteration of the INM is that lateral over-ground attenuation *"is oriented toward acoustically soft, grassy terrain unlike that found at the Grand Canyon".* This assertion is difficult to reconcile with the following:

1) As noted in Reference 3, much of the terrain above 2000 meters (6560 ft) is covered with conifer forest or other vegetation. These areas are very "soft", acoustically. Further, lateral over-ground attenuation occurs mainly in these higher elevation areas where sound propagation from an aircraft at 7500 to 9500 ft is more nearly horizontal compared with propagation to lower elevation points[6].

---

[5] The final EA, Reference 3, states (Section 4.1.2) that *"The INM is the FAA's standard computer methodology for assessing and predicting aircraft noise impacts. It's use in regulatory actions is governed by FAA Order 1050.1D, 'Policies and Procedures for Considering Environmental Impacts', under the National Environmental Policy Act (NEPA)."*

As provided to the acoustical engineering community by the FAA, INM version 5.0 (or the latest version, 5.1) does not have a user selectable input to turn lateral attenuation **OFF.** Thus, when used pursuant to Order 1050. 1D, lateral attenuation is always ON.

[6] The INM lateral over-ground attenuation model produces maximum attenuation for horizontal propagation, decreasing to zero as elevation angle increases to 60° or more.

- Thus, for an aircraft flying at 9000 ft, MSL, the elevation angle from an observer on the canyon floor (3800 ft, MSL), 3000 ft to the side would be arcTAN((9000-3800)/3000) = 60° and the INM would have calculated zero lateral over-ground attenuation, altered or not.
- For an observer on the forested north rim at 8000 ft, MSL (and 3000 ft to the side), the elevation angle would be arcTAN((9000-8000)/3000) = 18.4° and the unaltered INM would (quite correctly) have calculated a 3.6 dB lateral over-ground attenuation. The FAA-altered INM would, thus, overstate the noise level by 3.6 dB, in this example.

2) Loose, dry dirt and gravel (in addition to grass, shrub and other vegetation) are common in areas of the canyon where people are likely to be (i.e. places other than sheer canyon walls). This terrain is nearly as "soft" acoustically as a grass lawn.'
3) In addition to the impedance match of earth and air, lateral over-ground attenuation is affected by disturbance of the atmosphere by the ground, including wind turbulence and temperature gradients.
4) If it is correct to alter the INM such that lateral over-ground attenuation is disabled whenever some acoustically "hard" terrain exists in the area of interest, then: this alteration should be required when the INM is used, under FAA oversight, to predict sound around urban and suburban airports where parking lots, freeways, buildings, bodies of water or other acoustically "hard" areas may be present. This alteration is, of course, never done (outside of the Grand Canyon) and cannot be done by an engineering user outside of FAA.
5) The EA (Reference 1) offers Appendix C (an 8/9/94 Memo from Gregg Fleming) to prove the validity of eliminating of lateral over-ground attenuation in this application. Appendix C compares measured levels in the Grand Canyon with predictions by the altered INM.
6) The data presented in Appendix C, however, shows that the INM predictions (without lateral ground attenuation) usually exceeded the corresponding measurements. Figure 2.3 (Figure 2 from Reference 1, Appendix C) shows this for DHC-6 Twin Otters. The text of Appendix C acknowledges the following over-predictions:

(a) A 3 dB average over-prediction in this case (DHC-6) at sites 1 and 2[8];
(b) A 2 dB average over-prediction for a mix of Cessna 182, 207 and 4 14A aircraft at sites 1 and 2[9];
(c) A 0.5 dB average over-prediction of a mix of Bell models 206 and 206L and Aerospatiale models 350 and 355 helicopters at sites 1 and 2.[10]
(d) A 1.7 dB average over prediction for 13 hourly L_{EQ} measurements and predictions at two sites (3 and 15)
(e) A 9.9 dB average over-prediction for 9 hourly L_{EQ} measurements and predictions at Site 16.

---

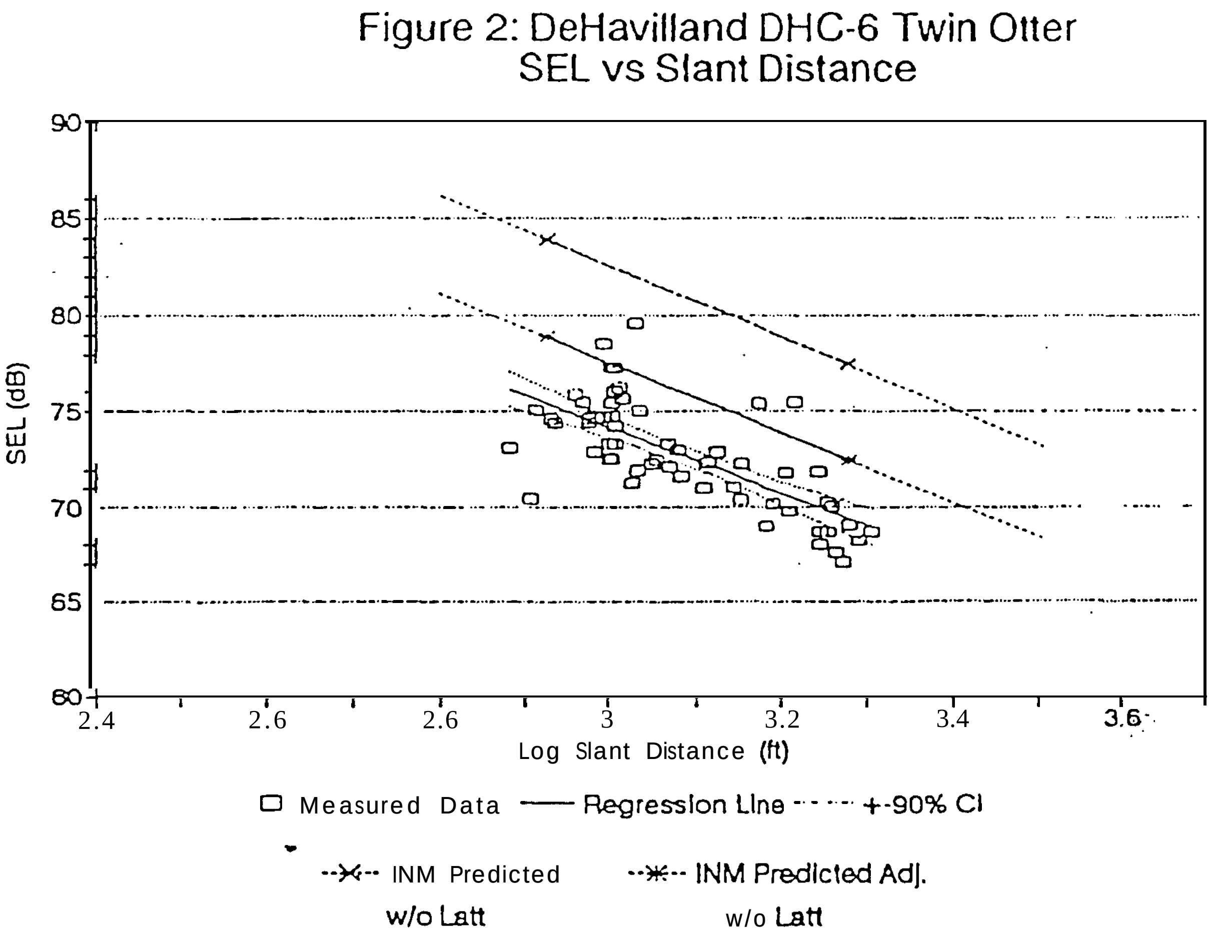
[7] The US Department of Transportation's TNM (Traffic Noise Model), used to compute over-ground sound propagation around highways, assigns a 300 cgs Rayl effective impedance to lawn grass and 500 cgs Rayls to loose soil and gravel. For comparison granular snow is assigned 40 cgs Rayls (very soft) and pavement or water 20,000 cgs Rayls (very hard). From Reference 4.
[8] Slant range varied from about 500 ft to 2000 ft. Elevation angles were not given, but it is probable that many data points were at high elevation angles where the unaltered INM would have calculated little or no lateral over-ground attenuation, Thus the over-prediction could be greater at larger lateral distances.

[9] Slant range varied from about 700 ft to 2500 ft. Comment from footnote 8 applies.

[10] Slant range varied from about 300 ft to 3000 ft, with most of the data points between 300 ft and 1000 ft. Comment from footnote 8 applies.

FIGURE 2.3: COMPARISON OF MEASURED DHC-6 SOUND LEVEL WITH PREDICTION INM 5.0 WITH LATERAL OVER GROUND ATTENUATION DISABLED

(Figure 2 from Reference I, Appendix C)



2.2.1.3 Assumption of 12-Hour Day

The NPS's INM 5.0 study assumes that a day is 12 hours long, rather than 24 hours long. This assumption increases LAEQ values 3 dB above their 24-hour day values. This also doubles the percent time above a threshold sound level (%TA) values compared with a 24 hour day.

24 - hour users of the Park such as, back country hikers and river corridor users are the most noise sensitive groups.

2.2.1.4 "Natural Quiet" Restored in Spite of Bias

Table 2.1 (Table 4.6 from Reference 1) shows that, even with the biasing effects of the above assumptions, the tour aircraft noise level was below 30 dB(A) 75% of the time in 2267 – 322 = 1945 square miles of the 2267 square mile study area. In other words, 86% **of the park was free of noticeable tour aircraft noise 75% of the time.** This more than meets the NPS definition of "substantial restoration of natural quiet."

TABLE 2.1: AREAS WITHIN 25% TIME ABOVE CONTOURS FROM GOVERNMENT INM 5.0 STUDY
(Table 4.6 from Reference 1)

Table 4.6

% Time Above Contour Areas

	1995 Base Case		1995 Alternative		% Change from Base Case
	%TA Contour Area (Sq. Mi.)	% of Analysis Area (2,267 Sq. Mi.)	%TA Contour Area (Sq. Mi.)	% of Analysis Area (2,267 Sq. Mi.)	
10	758.12	33.4%	901.77	39.8%	15.9%
20	549.04	24.2%	516.99	22.8%	-6.2%
25	465.55	20.5%	415.76	18.3%	-12.0%
30	321.67	14.2%	282.59	12.5%	-13.8%
40	136.50	6.0%	149.76	6.6%	8.9%
50	80.03	3.5%	99.91	4.4%	19.9%
60	65.25	2.9%	57.53	2.5%	-13.4%
70	52.77	2.3%	42.82	1.9%	-23.2%

One would have to assume a threshold of noticeability below 10 dB(A) in absolute terms to find that "natural quiet" had been "substantially restored" to less than half of the park. Any reasonable understanding of the science of acoustics cannot support such a low threshold.

2.2.2 Study B: INM 5.1 Study of 1996 Tour Aircraft Operations Using Actual Operations Data

This study was conducted in the eastern end of the Park and encompassed the Fossil Canyon, Dragon, Zuni and Marble Canyon Corridors, an area of 1058 square miles bordered by a line running 2-5 miles east of Route Blue 1 to the east end of the Park. We did not evaluate noise from the Blue 1 route.

Tour operators provided aircraft operations data for the months of January through July. Appendix A provides contours of the time above the threshold of noticeability (30 dB(A)) for each month. Note that the largest time above contour is for 180 minutes (3 hours). The smaller, 360 minute (6 hours) contour is the significant one, representing 25% of 24 hours. Appendix A also details the underlying assumptions and sources of this information.

Table 2.2 shows that actual 1996 air tour operations in the Eastern end of the Park easily met the NPS definition of “substantial restoration of natural quiet.” (At least 50% of the Park free of noticeable tour aircraft noise at least 75% of the time.)

TABLE 2.2: COMPUTED IMPACT OF TOUR AIRCRAFT ON “NATURAL QUIET” IN EASTERN GRAND CANYON NATIONAL PARK BASED ON 1996 OPERATIONS WITH 1996 AIRCRAFT

MONTH	Percent Area Above 30 dB(A)	Percent Area “Naturally Quiet”[11]
JANUARY	0%	100%
FEBRUARY	0%	100%
MARCH	0%	100%
APRIL	<0.1%	>99.9%
MAY	2.0%	98.0%
JUNE	3.1%	96.9%
JULY	4.6%	95.4%

Appendix B provides clear overlays showing these contours with respect to the park topographical contours and the areas where visitors actually spend time in the park. Overlaying the latter on the contours of Appendix A shows that, even in the busiest months, only that fraction of back country users (0.7% of visitor days) who choose to use the Dragon Corridor and River Corridor users (2.6% of visitor days), while crossing the Dragon Corridor would experience anything other than “natural quiet” as a result of air tour operations.

[11] Sound level from tour aircraft below 30 dB(A) at least 75% of day.

3.0 CONCLUSIONS

1. The government study shows that “substantial restoration of natural quiet” has occurred under SFAR 50-2 in spite of numerous invalid assumptions tending to bias the result in the opposite direction.

2. A technically neutral study shows that “substantial restoration of natural quiet” has occurred by an overwhelming margin under SFAR 50-2

APPENDIX A: Grand Canyon INM Noise Study

Study Conditions

- Temperature 59° F
- Noise associated with airport activities is not included in test data
- 80% of flights are on flight track, 20% are ± .05 nmi off flight track

Summary of operations on *Average Daily Operations* for 1996 table

Flight Profiles

- Per diagram and Tables
- Speed is constant at 90 KCAS (approx. 101.5 KTAS)
- Altitudes per FAA SFAR 50-2 chart

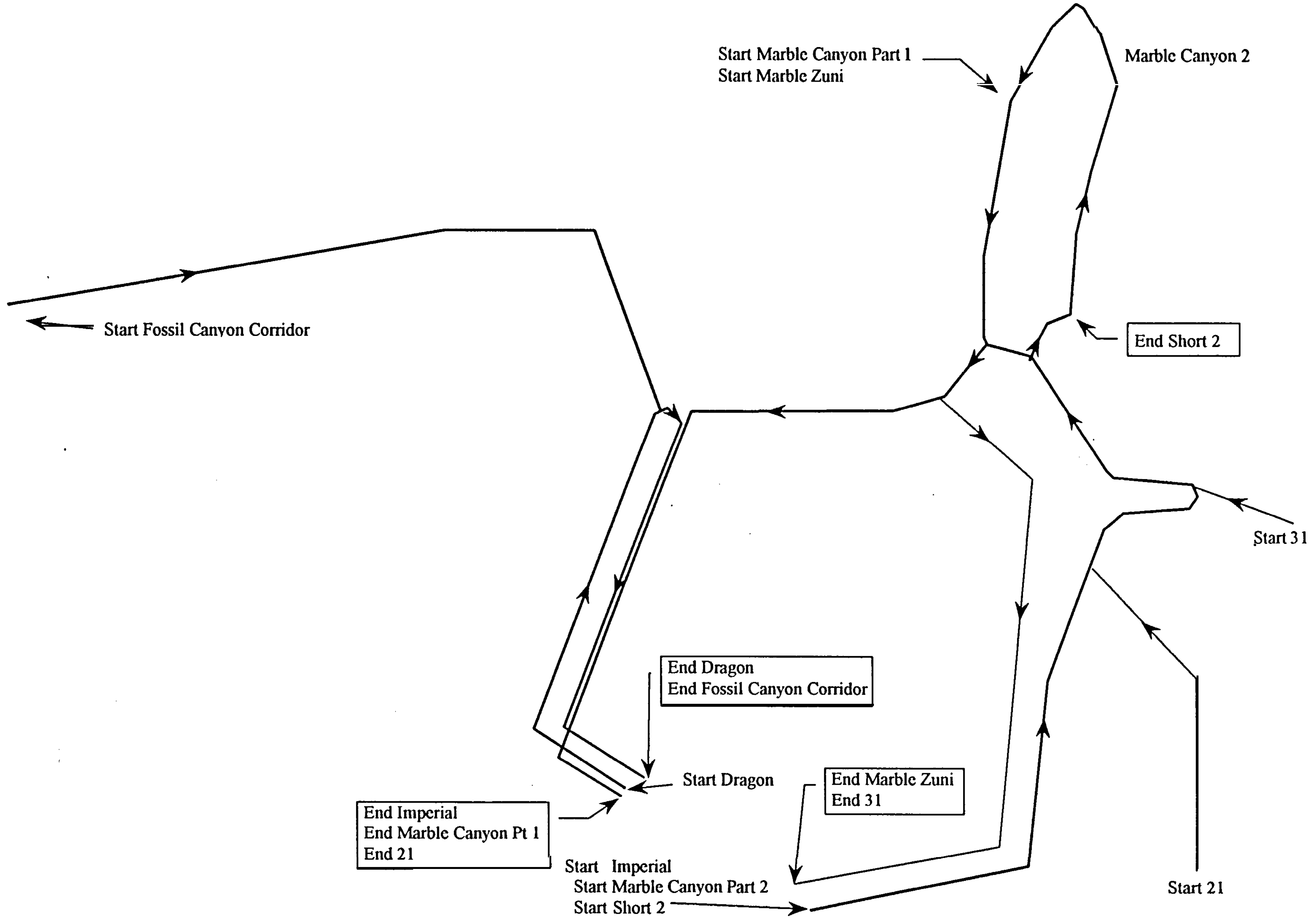
Aircraft Selection and Noise Data Base

A list of the aircraft in use as of 1996 was provided by the tour group operators. The helicopters are the Bell 206B, the Bell 206L-1, the Bell 206L-3, the Bell 206L-4, and the Aerospatiale SA350D. The airplanes were the Cessna 172, 172R, 177, 182, 182R, 207,208 and the DeHavilland DHC6Q.

Not all of the above aircraft are in the INM database so some aircraft data and noise profiles had to be created. The Cessnas were available as an approved substitute aircraft in INM. No changes were made to its database. The noise curves for the Bell 206B, 206L-1, and 206L-3 were provided by John Daprile of the Volpe National Transportation Systems Center. The 206L-4 was incremented +.6 dB above the 206B.

The DHC6Q noise curves were based on the noise curves in the INM for the DHC6 and reduced 5.1 dB based on data provided by Raisbeck Engineering, the makers of the quiet propellers. Noise data for the SA350D was obtained from the HNM version 1 user's guide. (An average of left, right and center sound levels was used and the advancing tip mach correction was applied to correct to 90 KCAS).

For the NPD data used, see the following tables. Note that the noise identifier for the Cessna 172, 172R, 177, 208 and 210 is GASEPF. That for the Cessna 182, 182R is GASEPVP. That for the Cessna 207 is CT207A.


Start Marble Canyon Part 1
Start Marble Zuni
Marble Canyon 2
Start Fossil Canyon Corridor
End Short 2
Start 31
End Dragon
End Fossil Canyon Corridor
Start Dragon
End Marble Zuni
End 31
End Imperial
End Marble Canyon Pt 1
End 21
Start Imperial
Start Marble Canyon Part 2
Start Short 2
Start 21

Grand Canyon Noise Study with Current Aircraft

Average Daily Operations
Includes Operations by Scenic

GASEPF = sum ofoperations by Cessna 172,172R,177,208,210
GASEPV = sum of operations by Cessna 182,182R

Plane/	Routes				January					
Helicopter	Imperial	Dragon	FCC	Marble1	Marble2	Short M2	MarZuni	21.01	31.0	Totals
B206B,L	3.8	21.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]
B206L-4	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
GASEPF	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.31	0.1	2.0
GASEPV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0
CT207A	6.0	0.0	0.0	0.0	0.0	0.2	0.8	0.4	0.1	7.5
DHC6Q	4.0	0.0	0.01	0.0	0.0	0.0	0.4	0.4	0.0	4.8
MDH600										0.0
S55QT										0.0
SA350B	0.5	2.9	0.0	0.0	0.0	0.0	0.0	0.01	0.0	3.4
Totals	14.4	25.2	0.7	0.0	0.0	0.3	1.71	2.1	0.2	44.6

Plane/	Routes				February					
Helicopter	Imperial	Dragon	FCC	(Marble1	Marble2	Short M2	MarZuni	21.01	31.0	Totals
B206B,L	3.01	16.91	0.5	0.01	0.01	0.0	0.0	0.0	0.0	20.4
B206L-4	0.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
GASEPF	0.0	0.0	0.0	0.1	0.1	0.1	0.5	1.2	0.0	2.0
GASEPV	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
CT207A	6.6	0.0	0.0	0.0	0.0	0.2	0.5	0.3	0.1	7.7
DHC6Q	4.4	0.0	0.0	0.0	0.0	0.0	0.6	0.3	0.0	5.4
MDH600										0.0
S55QT										0.0
SA350B	0.5	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4
Totals	15.0	22.8	0.5	0.1	0.1	0.3	1.7	1.8	0.2	42.5

Plane/	Routes				March					
Helicopter	Imperial	Dragon	FCC	Marble1	Marble2	Short M2	MarZuni	21.0	31.0	Totals
B206B,L	7.6	43.0	1.1	0.0	0.0	0.0	0.0	0.01	0.0	51.7
B206L-4	1.7	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
GASEPF	0.0	0.01	0.0	0.1	0.1	0.1	0.7)	1.61	0.21	2.7
GASEPV	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.11	0.2
CT207A	17.4	0.0	0.0	0.0	0.0	0.2	1.2	0.6	0.2	19.7
DHC6Q	7.4	0.0	0.0	0.0	0.0	0.2	1.1	0.5	0.1	9.3
MDH600										0.0
S55QT										0.0
SA350B	2.1	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2
Totals	36.2	65.9	1.1	0.1	0.1	0.6	3.1	2.7	0.6	110.3

Plane/	Routes				April					
Helicopter	Imperial	Dragon	FCC	(Marble1	Marble2	Short M2	MarZuni	21.0	31.0	Totals
B206B,L	12.bi	71.21	1.61	0.0	0.0	0.0	0.0	0.0	0.0	85.4
B206L-4			---	0.0	0.0	0.0	0.0	0.0	0.0	15.8
GASEPF	2.4 0.0	13.4 0.0	0.0	0.31	0.3	0.41	0.91	1.61	0.3	3.8
GASEPV	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2
CT207A	20.2	0.0	0.0	0.0	0.0	0.5	1.1	0.9	0.4	23.1
DHC6Q	11.11	0.0	0.0	0.0	0.0	0.3	1.5	0.2	0.2	13.2
MDH600										0.0
S55QT										0.0
SA350B	2.1	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2
Totals	48.4	96.7	1.6	0.4	0.4	1.2	3.6	2.7	0.8	155.7

Grand Canyon Noise Study with Current Aircraft

Plane/	May									
Helicopter	Imperial	Dragon	FCC	Marble1	Marble2	Short M2	MarZuni	21.0	31.0	Totals
B206B,L	17.4	99.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	118.9
B206L-4	1.9	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8
GASEPF	0.0	0.0	0.0	0.4	0.4	1.2	1.6	1.1	1.4	6.1
GASEPV	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.2	1.1
CT207A	25.0	0.0	0.0	0.4	0.4	0.7	1.0	0.8	1.2	29.5
DHC6Q	9.4	0.0	0.0	0.3	0.3	0.6	1.9	0.0	0.6	13.0
MDH600										0.0
S55QT										0.0
SA350B	2.1	12.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2
Totals	55.8	122.0	2.5	1.3	1.3	2.6	4.7	2.0	3.4	195.5

Plane/	June									
Helicopter	Imperial	Dragon	FCC	Marble1	Marble2	Short M2	MarZuni	21.0	31.0	Totals
B206B,L	18.1	102.8	2.8	0.0	0.0	0.0	0.0	0.0	0.0	123.7
B206L-4	1.8	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2
GASEPF	0.0	0.0	0.0	0.6	0.6	0.8	0.9	0.5	1.5	4.9
GASEPV	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.0	0.0	0.8
CT207A	26.8	0.0	0.0	0.1	0.1	0.6	0.7	0.5	1.6	30.5
DHC6Q	14.9	0.0	0.0	0.0	0.0	0.9	2.1	0.0	0.5	18.5
MDH600										0.0
S55QT										0.0
SA350B	3.6	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
Totals	65.2	133.4	2.8	1.0	1.0	2.4	3.8	1.0	3.6	214.3

Plane/	July									
Helicopter	Imperial	Dragon	FCC	Marble1	Marble2	Short M2	MarZuni	21.0	31.0	Totals
B206B,L	19.7	111.3	3.0	0.0	0.0	0.0	0.0	0.0	0.0	134.0
B206L-4	1.7	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
GASEPF	0.0	0.0	0.0	0.5	0.5	0.9	1.1	0.4	2.0	5.5
GASEPV	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.4	0.2	1.3
CT207A	33.1	0.0	0.0	0.3	0.3	0.7	0.5	0.4	1.8	37.2
DHC6Q	26.5	0.0	0.0	0.0	0.0	0.9	2.0	0.0	0.7	30.0
MDH600										0.0
S55QT										0.0
SA350B	3.6	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8
Totals	84.6	141.3	3.0	1.1	1.1	2.6	3.7	1.2	4.7	243.3

Only the above routes flow by Papillon,GCA,AGC,Scenic,Airstar, and Kenai are included in study.
All other flights are exlcuded.
Flights for Native Americans are not included.

See attached map for flight path starting and ending points.

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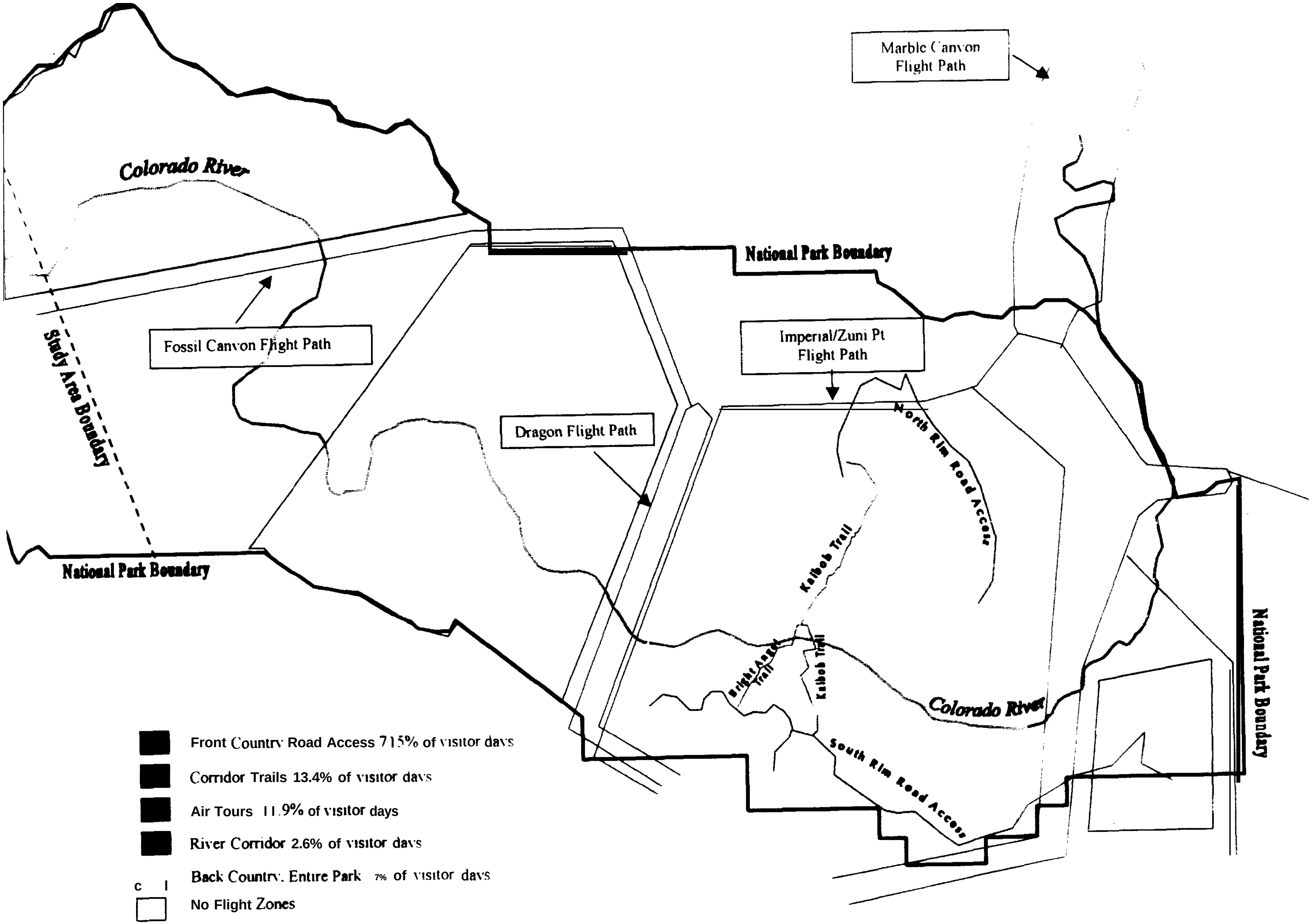
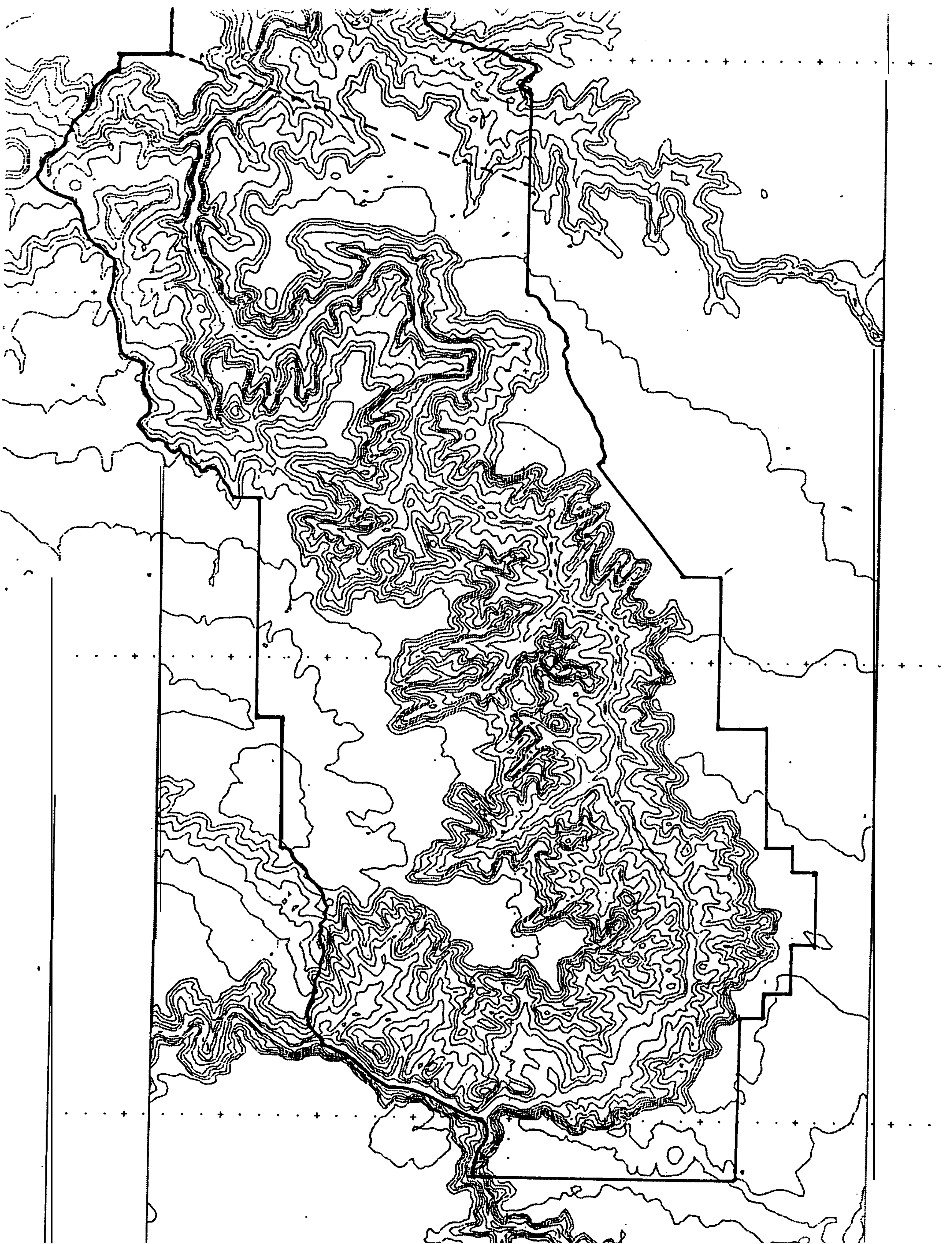
APPENDIX B:

OVERLAYS FOR SOUND LEVEL CONTOURS

1. Grand Canyon Topographical Contours
2. Areas Used by Park Visitors

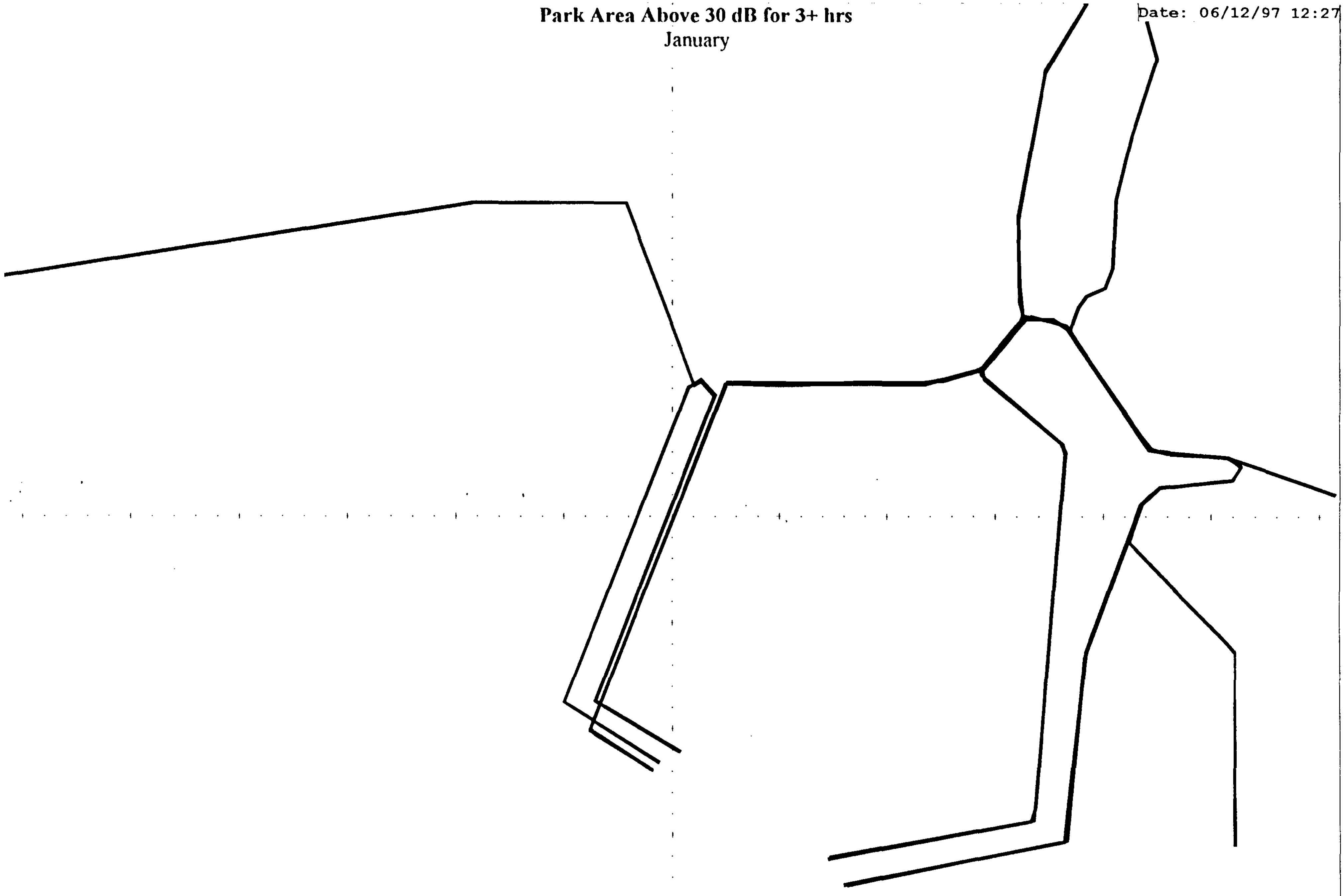

Marble Canyon Flight Path
Colorado River
National Park Boundary
Fossil Canyon Flight Path
Study Area Boundary
Imperial/Zuni Pt Flight Path
Dragon Flight Path
North Rim Road Access
Kaibab Trail
National Park Boundary
Bright Angel Trail
Kaibab Trail
Colorado River
South Rim Road Access
National Park Boundary
Front Country Road Access 715% of visitor days
Corridor Trails 13.4% of visitor days
Air Tours 11.9% of visitor days
River Corridor 2.6% of visitor days
Back Country, Entire Park 7% of visitor days
No Flight Zones



Park Area Above 30 dB for 3+ hrs

January

Date: 06/12/97 12:27



(no area with more than 3 hrs of exposure)

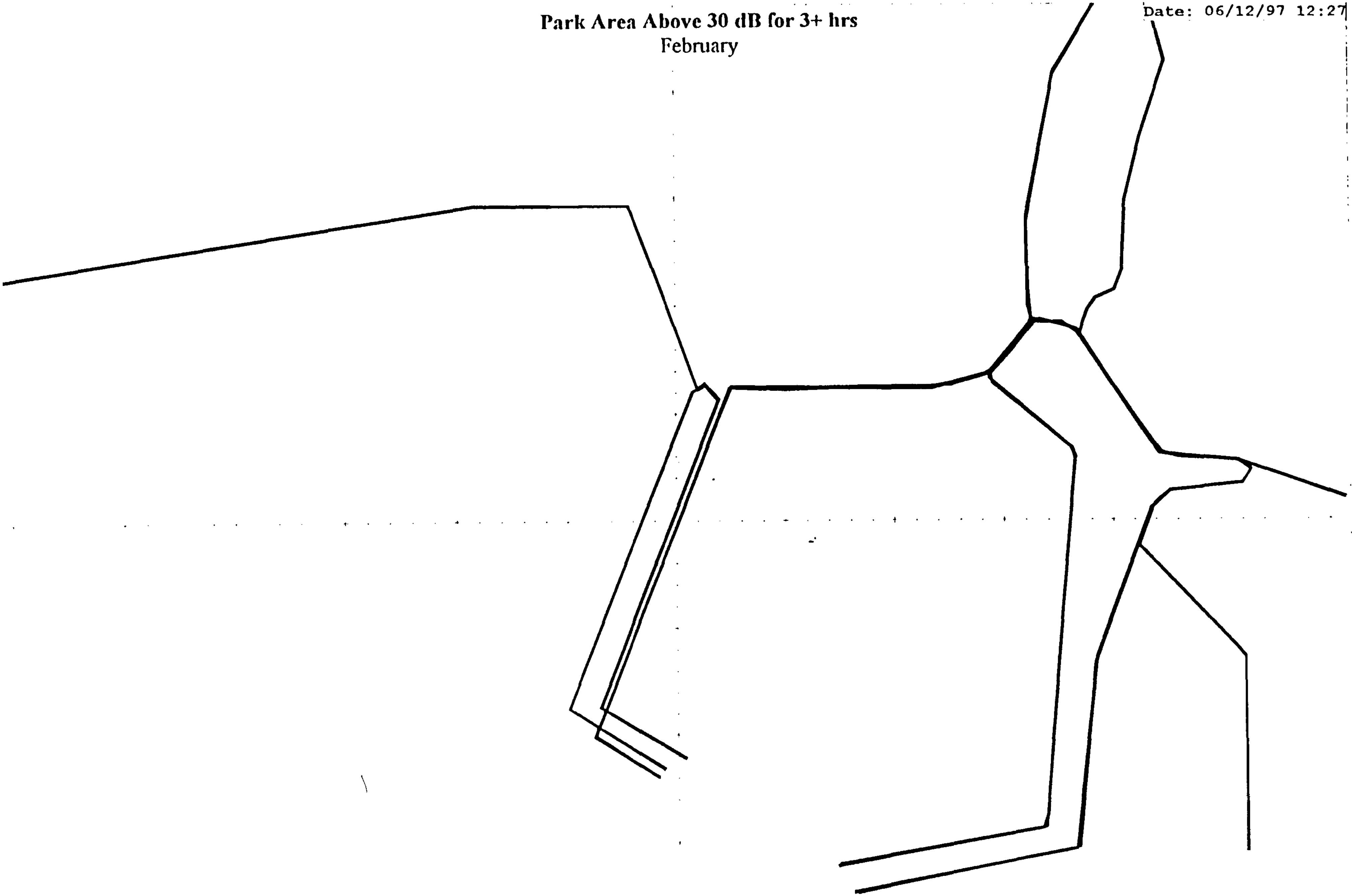
GRANDCAN\CASE2

Scale: 1 in = 4 nmi

Metric: TALA

Date: 06/12/97 12:27

Park Area Above 30 dB for 3+ hrs
February



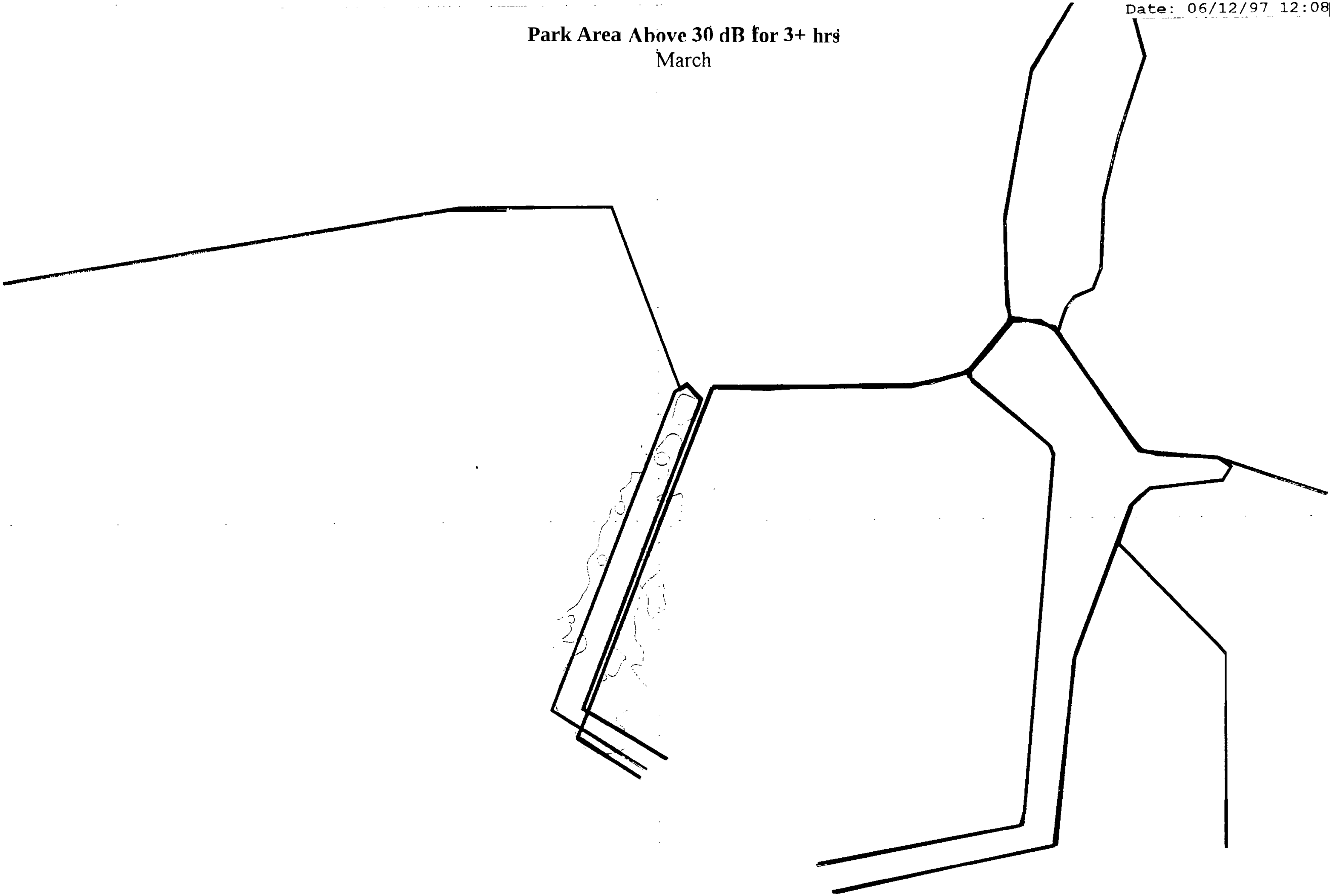
(no area with more than 3 hrs of exposure)

RANDCAN\CASE2
cale: 1 in = 4 nmi
etric: TALA

Date: 06/12/97 12:08

Park Area Above 30 dB for 3+ hrs

March

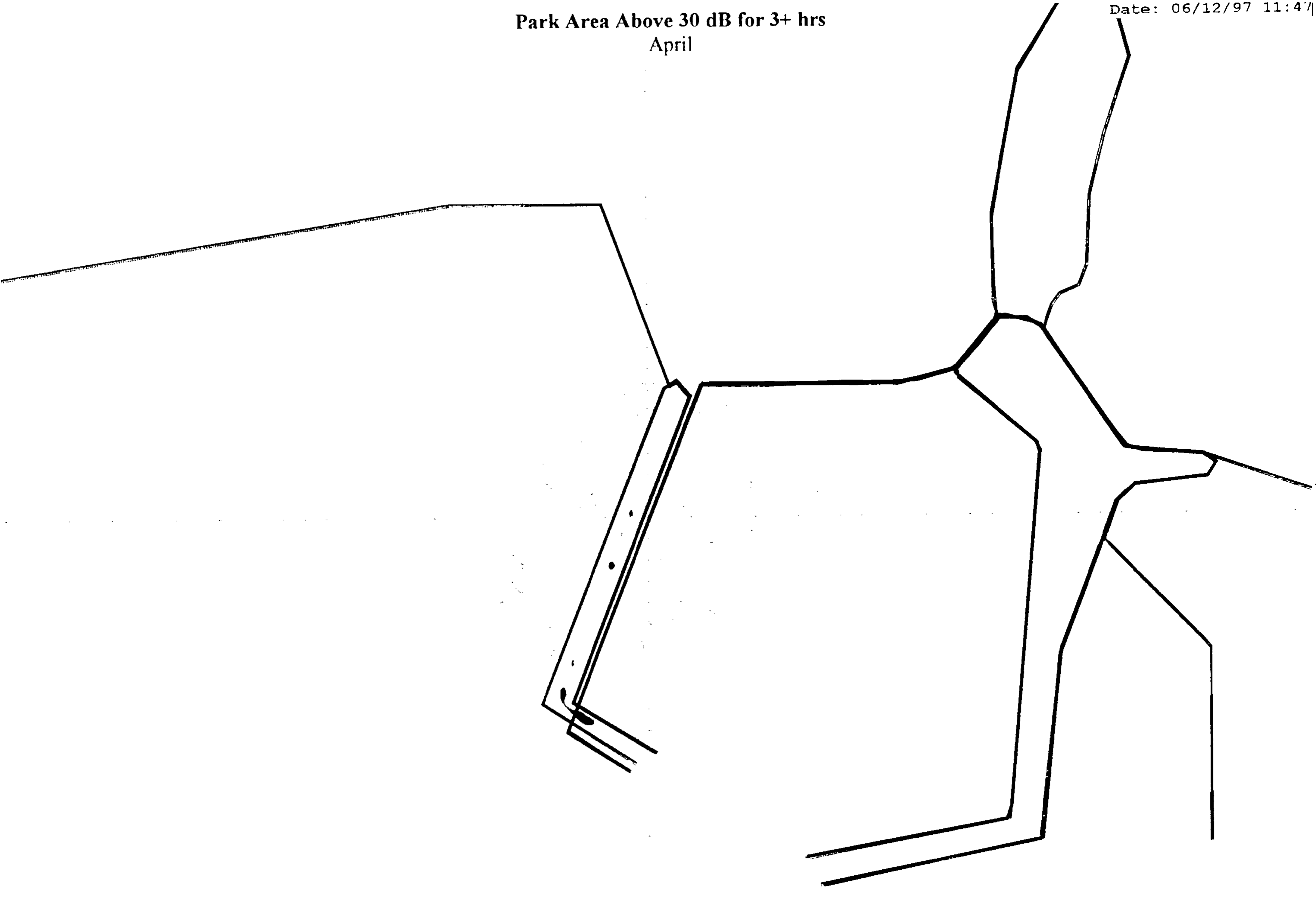


RANDCAN\CASE2 Level 180.0
cale: 1 in = 4 nmi Sq.mi 34.21
etric: TALA Color

Date: 06/12/97 11:47

Park Area Above 30 dB for 3+ hrs

April

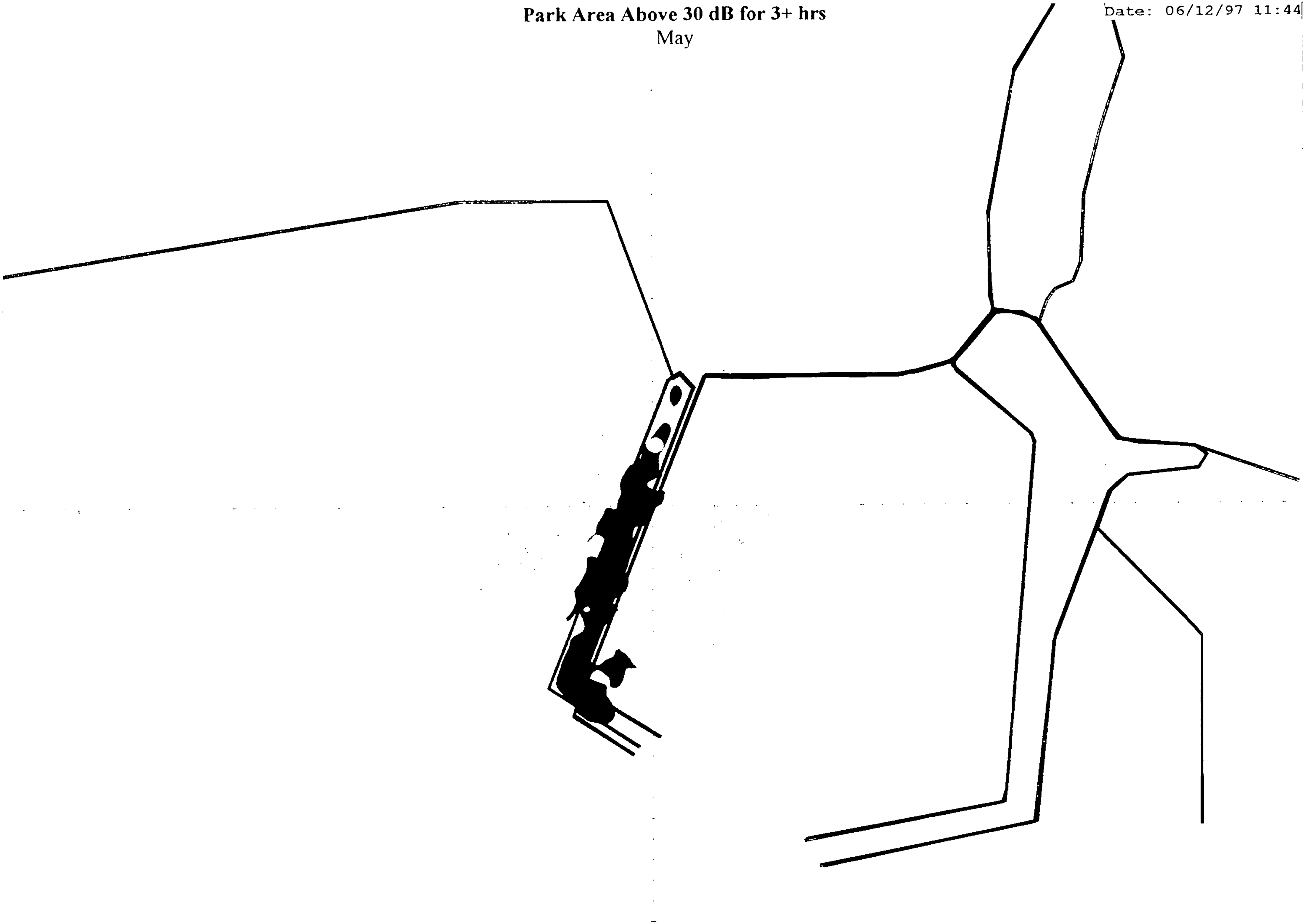


RANDCAN\CASE2	Level	180.0	360.0
cale: 1 in = 4 nmi	Sq.mi	95.29	0.69
etric: TALA	Color		

Park Area Above 30 dB for 3+ hrs

May

Date: 06/12/97 11:44



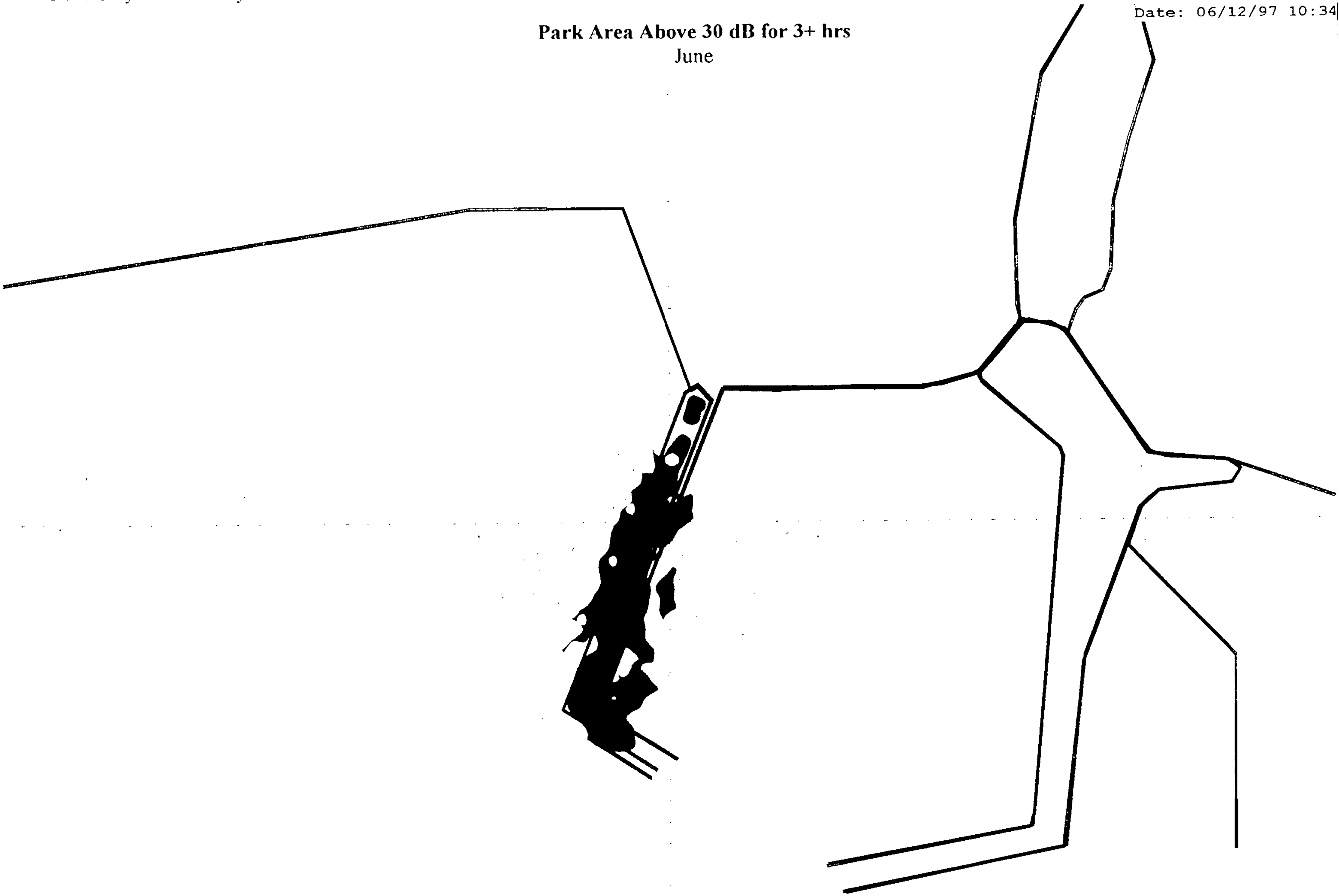
GRANDCAN\CASE2 Level 180.0 360.0

Scale: 1 in = 4 nmi Sq mi 123.37 21.22

Date: 06/12/97 10:34

Park Area Above 30 dB for 3+ hrs

June

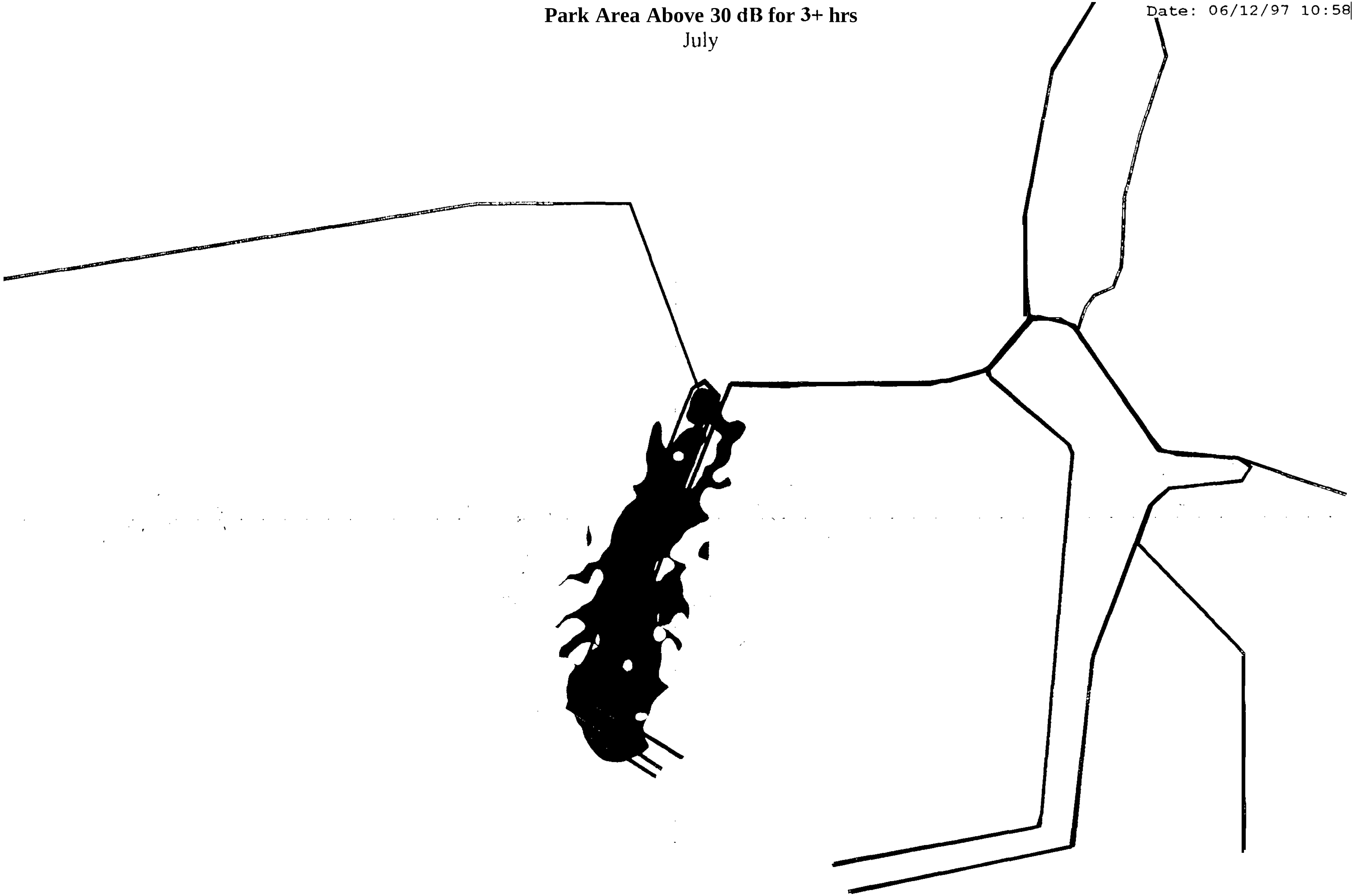


GRANDCAN\CASE2 Level 180.0 360.0

Park Area Above 30 dB for 3+ hrs

July

Date: 06/12/97 10:58



GRANDCAN\CASE2 Level 180.0 360.0

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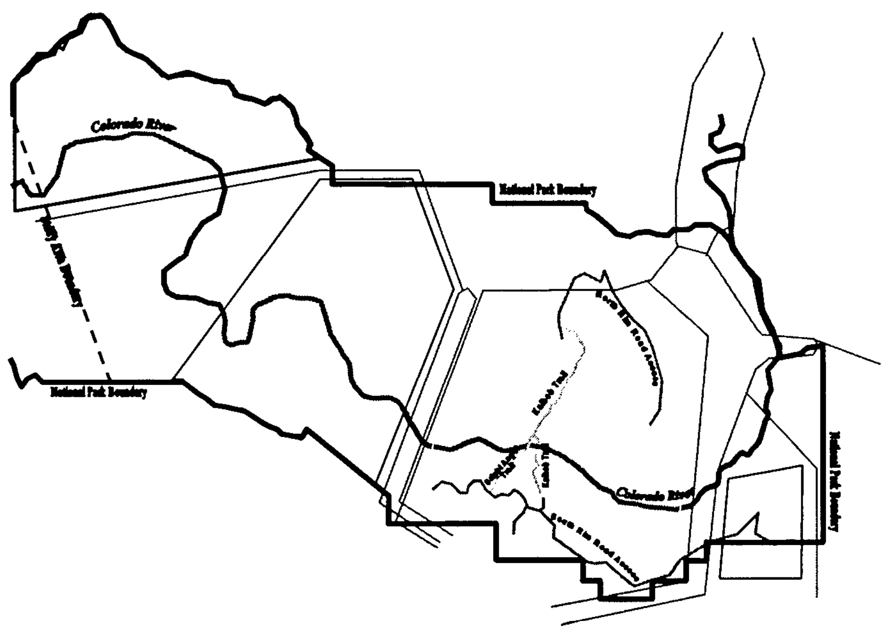
ANALYSIS REPORT

JRE DOCUMENT JR 182
Revision A



ANALYSIS OF NATIONAL PARK SERVICE DATA ON AIR TOUR OVERFLIGHT SOUND AT GRAND CANYON NATIONAL PARK

Prepared for.

Helicopter Association International
On behalf of:
Papillon Airways, Inc.
12515 Willows Road, N.E.
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September 3, 1999

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ANALYSIS REPORT

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Initial release, July 25, 1997
Revision A, September 3, 1999

LOG OF REVISIONS

Rev	Date	Affected Pages / Changes	Initial
A	3SEP1999	Generally: Updated sound contours to cover the entire Park and incorporate INM 5.2. FAA discovered that INM 5.1 (used in the original release) did not correctly compute the time above metric, and has corrected that error in INM 5.2. The threshold of noticeability was changed from 30 dB(A) to 29 dB(A) based on a conservative analysis. Added or Replaced Pages: Cover, i, ii: Rev A iii: Changed Titles of Sections 2.2.2 Apndx A iv: Added Table 2.0, deleted Table 2.2 1.1 Updated numbers 2.2 Deleted last sentence 2.2a, 2.2b: Added Pages: Develop threshold of noticeability 2.3, 2.4: Changed footnotes to INM 5.2 2.8: Updated numbers, replaced Table 2.2 w/ bulleted list.	JRA

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LIST OF FIGURES

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REFERENCES:

1. *"Draft Environmental Assessment -- Special Flight Rules in the Vicinity of Grand Canyon National Park': * Jeff Griffith (ATA-1), FAA/BIA/NPS, 8/20/96

2. NPOA Report *No.* 93-1, *"Evaluation of the Effectiveness of SFAR 50-2 in Restoring Natural Quiet to Grand Canyon National Park -- Final Report"*, S. Fidell, K. Pearsons, M. Sneddon, BBN Systems and Technologies, 6/23/94.

3. *'Draft Environmental Assessment – Noise Limitations for Aircraft Operations in the Vicinity of Grand Canyon National Park",* Jeff Griffith (ATA-1), FAA/NPS, 12/24/96

4. Noise-Con 96 Paper, *'Barrier Diffraction and Sound Propagation in USDOT's New Traffic Noise Model"* , C.W. Menge, et al, Harris, Miller, Miller & Hanson, 6/96

1.0 INTRODUCTION

1.1 Summary

New restrictions on flight operations have been imposed on tour aircraft in Grand Canyon National Park. The basis for this change is government studies claiming that aircraft noise would be audible in large areas of the park under existing rules.

Our analysis shows, however, that the government studies were biased and misleading due to several invalid and unscientific assumptions that overstate the sound levels and sound detectability. For example, their studies zero out the sound attenuating effects of trees, loose soil and other surface features. Their studies further assume a threshold of detectability that is lower than that shown by the government's own research.

When these errors are corrected, the result is that 94% of the Park will meet the Park Services own definition of "natural quiet" in the busiest month for air tours (July).

We have evaluated this hypothesis from two different analytical perspectives:

Study A: The INM 5.0 study commissioned by the National Park Service (NPS) and performed by the Federal Aviation Administration (FAA), as reported in the Draft Environmental Assessment, Reference 1. This study was used by the NPS to justify more restrictive flight rules.

Study B: Our INM 5.2 study of operations in the Park using actual 1996 aircraft operations as reported by the operators and FAA. This reflects what actually happened in 1996.

Even tested against the NPS's rather extreme and controversial definition of "substantial restoration of natural quiet," each of these analyses demonstrates that "natural quiet" has been restored under SFAR 50-2. These results are particularly compelling in the case of Study A since:

(a) This study, was conducted on behalf of NPS, using the NPS's and FAA's data, and;

(b) This study was not a neutral analysis and based on generally accepted practices in evaluating aircraft noise. Certain assumptions were made in the methodology of this study. These assumptions systematically bias the results in a manner that has the effect of obscuring the fact that "natural quiet" had been restored under SFAR 50-2.

1.2 Objective

The objective of this report is to explore and illuminate the assumptions underlying the government study of noise in Grand Canyon National Park, and to provide a technically neutral evaluation of the "restoration of natural quiet" therein.

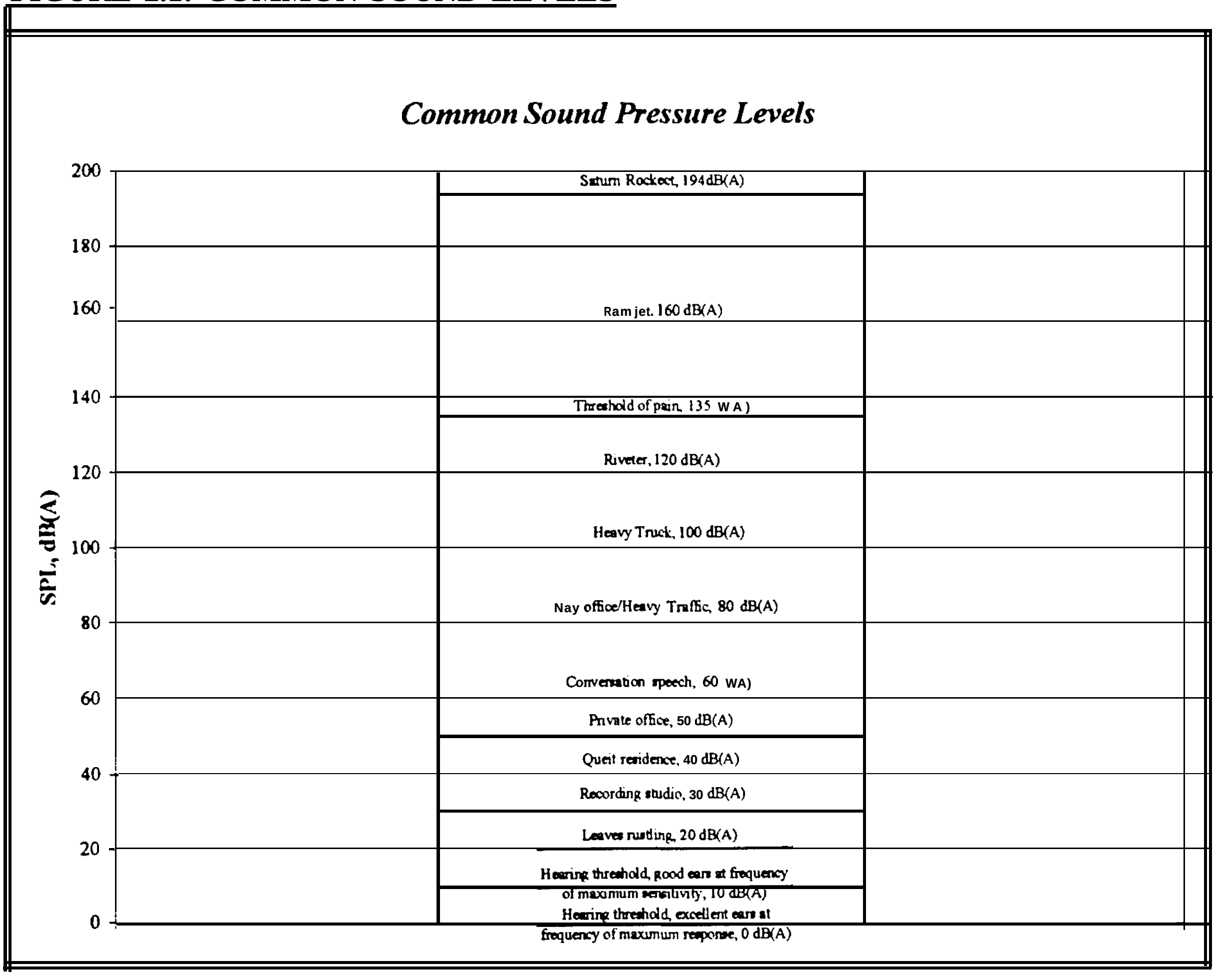
2.0 ANALYSIS

2.1 What Is "Natural Ouiet?"

The National Park Service (NPS) in its 1994 Report to Congress, stated that "substantial restoration of natural quiet" will have occurred when at least 50% of the park is free of noticeable noise from sightseeing flights at least 75% of the time. (This definition has been challenged in court as too extreme, but our analysis shows that even this very demanding standard for "natural quiet" has been and is being met. It is being met, in fact, in far more than 50% of the Park.)

The Draft Environmental Assessment that accompanied the new Grand Canyon rules (Reference 3) indicates that the NPS has defined "noticeability" to mean a 3 dB(A) increase above the ambient sound level at any particular location. It has, further, assigned ambient noise levels in the neighborhood of 15 dB(A) to 17 dB(A) to most of the Park. These levels barely exceed the threshold of hearing (See Figure 2.1) and would be exceeded by rustling leaves, any hint of wind, or hikers' footsteps.

FIGURE 2.1: COMMON SOUND LEVELS



The BB&N study conducted in 1994 under NPS contract and reported in Reference 2 provides a more useful data set. This study found that 30 dB(A) is the average level at which observers sent into the Canyon first detected aircraft noise above the ambient level (onset), and were no longer able to detect the aircraft sound (offset). This is shown in Figure 2.2 (Figure E-4 from Reference 2)[1].

Reference 2 also correctly observes (Section 4.8) that noticeability of aircraft noise for someone not specifically engaged in listening for aircraft noise would occur at a 10 dB higher signal to noise ratio than for a vigilant observer.

FIGURE 2.2: MEAN SOUND LEVEL AT ONSET AND OFFSET OF DETECTABILITY
(Figure E-4 from Reference 2)

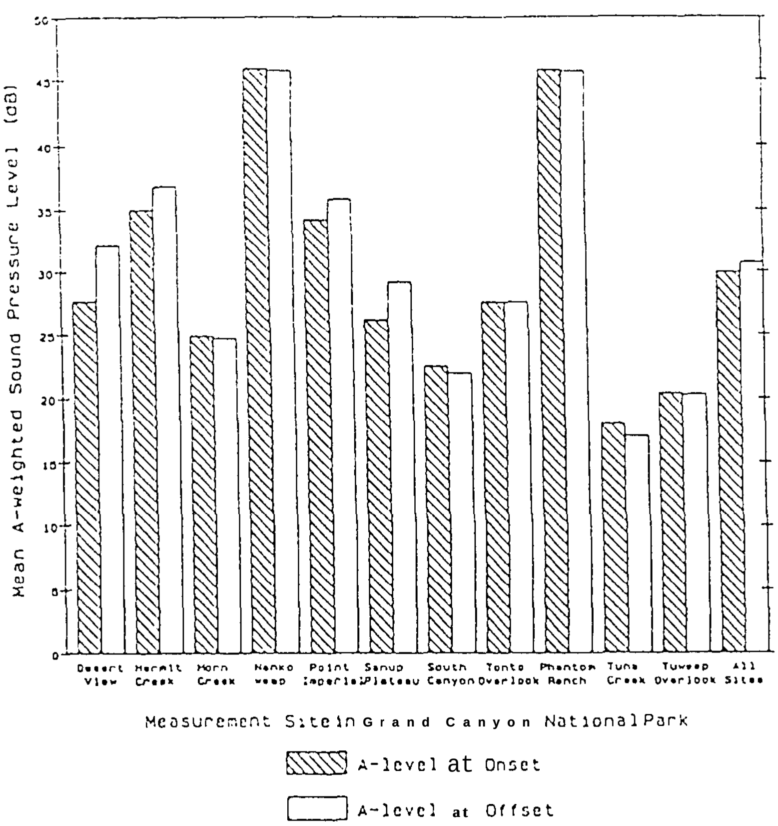


Figure E-4 Mean A-weighted sound pressure levels by site at onset and offset for air tour aircraft.

[1] Note that 30 dB(A) is the average level for onset and offset of detectability, individual sites having higher or lower levels. Since, the NPS criterion for "substantial restoration of natural quiet" requires that a "natural quiet" exist in 50% of the park, an average level is appropriate.

2.1.1 DETERMINING THE THRESHOLD OF NOTICEABILITY

2.1.1.1 Notes on Sound *Detectability* (or Audibility) and *Noticeability*

- The detection of aircraft sound by humans (or sound analyzers) requires some increase in sound level above the ambient level with no aircraft present. That is the Signal to Noise Ratio, S/N, must be greater than zero.
  - For example, the sound measurements conducted in GCNP in Reference 2 found that observers at 13 different sites in GCNP (intently listening for aircraft) were able to detect aircraft at an average S/N of 1 dB(A).
  - This A-weighted Overall S/N=1 dB(A) is consistent with detectability of aircraft sound 6 dB(A) below ambient. Reference 2 acknowledges that one cannot reliably measure broadband sound levels (such as dB(A)) that are below ambient.
- Reference 2 also made use of a commonly used measure of acoustical detectability in the presence of masking sound known as "d-prime" or bandwidth adjusted signal to noise ratio,

  $d' = \eta * S/N * \sqrt{(W)}$,

  where,

  d' is computed for every 1/3 Octave band

  η = detector efficiency (set to 40%, in *Reference 2)*

  W = critical bandwidth of the ear (~100Hz to -150 Hz in the area of interest)
  - For convenience the decibel equivalent, 10LOG(d') is often used. Typically, a prop or rotor blade passage tone will betray the presence of an aircraft. The band containing that tone typically has the highest d'.
  - The observers in Reference 2 found *detectability* at 10LOG(d') = 7 and *noticeability* at 10LOG(d') = 17

2.1.1.2 Computation of Threshold of Noticcability

- We based our computations on the observations reported in Reference 2.
- We accepted the 3 dB above ambient definition of the threshold of noticeability used by NPS in its previous studies.
  - The NPS's definition of "substantial restoration of natural quiet" requires that 50% or more of the Park be free of noticeable aircraft sound 75% or more of the time. To determine the corresponding threshold of noticeability:
  - We determined the lower quartile sound level at which aircraft were detected at each site. Thus the detection level was higher 75% of the time.
  - We then computed the median of those site-specific, lower quartile sound levels. Thus the detection level was higher 75% of the time at 50% of the sites.
- The finding in Reference 2 that S/N = 1 dB(A) at detection means that the ambient level was 1 dB(A) below the detection level. Thus, subtracting 1 dB(A) and adding 3 dB(A) to the median lower quartile detection level yields the threshold of noticeability.
- Table 1 shows the computations. The median lower quartile threshold of noticeability is 28.93 dB(A) at onset and 28.796 dB(A) at offset. Averaging and rounding yields 29 dB(A). This is the correct aircraft sound criterion level for evaluating "substantial restoration of natural quiet". If aircraft sound is less than 29 dB(A) 75% or more of the time in 50% or more of the Park, then, by the NPS's definition and the NPS's data, "substantial restoration of natural quiet has occurred".

TABLE 2.0: COMPUTATION OF THRESHOLD OF NOTICEABILITY

	La at Onset of Detectability			La at Offset of Detectability		
	Mean		25%ile La	Mean		25%ile La
Site	La, dB(A)	std dev, s	=La-.67s	La, dB(A)	std dev, s	=La-.67s
Horn Cr.	24.9	2.3	23.359	24.7	3.2	22.556
Nankoweap	45.9	7.8	40.674	45.8	7.8	40.574
Pt Imperial	34.2	4.3	31.319	35.8	5.8	31.914
S. Canyon	22.5	3	20.49	22	3.7	19.521
Hermit Cr.	35	8.3	29.439	36.8	9.4	30.502
Sanup Plateau	26.2	4.9	22.917	29.2	7.5	24.175
Tonto Overlook	27.6	1	26.93	27.6	1.2	26.796
Phantom Ranch	45.8	1.2	44.996	45.7	1.6	44.628
Tuna Cr.	18	1.2	17.196	17.1	1.8	15.894
Toroweap Overlook.	20.4	2.6	18.658	20.3	1.7	19.161
Desert View	27.7	0.7	27.231	32.1	4.5	29.085
MEDIAN, dB(A)	27.6		26.93	29.2		26.796
Ambient, SNR=1 dB(A)	26.6		25.93	28.2		25.796
Noticeability Threshold						
= amb + 3 dB(A)	29.6		28.93	31.2		28.796
Data from NPOA Report 93-1, Table E-3						

2.2 Noise Projections Using Integrated Noise Model (INM)

FAA developed the Integrated Noise Model (INM) for use in calculating community noise impacts in the vicinity of airports. This model is inherently conservative for application at the Grand Canyon because it does not fully account for the blocking effect of terrain between the source and observer. Version 5.1 is the most recent release of INM.

2.2.1 Study A: FAA INM 5.0 Study (Reference 1): Assumptions Leading to Overstatement of Noise Impact

The INM 5.0 noise analysis commissioned by the NPS incorporates a number of unusual and erroneous assumptions that consistently cause overstatement of noise impact. These biasing errors include:

2.2.1.1 Incorrect Helicopter Speed Correction

Reference 3, Table 4.1.2a, shows that the government **increased** helicopter sound levels taken from the Helicopter Noise Model (HNM)[2] by 1.1 to 1.5 dB. This ostensibly corrects the Sound Exposure Level (SEL) from test speed (116 – 128 kt) to Grand Canyon tour cruise speed (90 kt)[3].

The HNM, however, shows SEL **decreasing** as airspeed decreases to 90 kt[4]. The effect of this error is to overstate helicopter sound levels in the Grand Canyon.

[2] HNM is an FAA developed program for computing sound from helicopters. FAA states that it plans to incorporate the HNM in the Integrated Noise Model (INM). The present INM Version 5.2 data base contains only fixed wing aircraft.

[3] This appears to be a correction for sound duration based on 10LOG(Vref/V). It ignores the more powerful effect of advancing tip mach number on helicopter sound. The reduction in advancing tip mach number at lower air speed causes the time integrated sound level, Sound Exposure Level (SEL), to decrease or remain the same, as airspeed decreases.

[4] We computed and averaged SEL directly under the flight path and 500 ft to either side, for a 500 ft flyover using HNM version 2.2. This produced the following:

- Aerospatial AS350D, SEL = 83.2 dB at 116 kt, 83.0 dB at 90 kt, a 0.2 dB reduction.
- Bell 206L, SEL = 82.2 dB at all speeds, no speed correction provided..

2.2.1.2 Elimination of Lateral Ground Sound Attenuation from the INM.
(This is sound absorption by ground and attenuation through disturbed air near the ground, not blocking by a barrier.)

The government **altered the code of INM Version** 5.0 to remove the computation of lateral over-ground attenuation[5]. This alters the program's basic computational method in a way that is inconsistent with all other sound studies conducted with this program, including those conducted under FAA regulation. The effect of this alteration is to overstate sound levels of all aircraft in the Grand Canyon.

The reason given for this alteration of the INM is that lateral over-ground attenuation *"is oriented toward acoustically soft, grassy terrain unlike that found at the Grand Canyon"*. This assertion is difficult to reconcile with the following:

1) As noted in Reference 3, much of the terrain above 2000 meters (6560 ft) is covered with conifer forest or other vegetation. These areas are very "soft", acoustically. Further, lateral over-ground attenuation occurs mainly in these higher elevation areas where sound propagation from an aircraft at 7500 to 9500 ft is more nearly horizontal compared with propagation to lower elevation points[6].

---

[5] The final EA, Reference 3, states (Section 4.1.2) that *"The INM is the FAA's standard computer methodology for assessing and predicting aircraft noise impacts. It's use in regulatory actions is governed by FAA Order 1050. ID, 'Policies and Procedures for Considering Environmental Impacts', under the National Environmental Policy Act (NEPA)."*

As provided to the acoustical engineering community by the FAA, INM version 5.0 (or the latest version, 5.1) does not have a user selectable input to turn lateral attenuation **OFF.** Thus, when used pursuant to Order 1050. 1D, lateral attenuation is always ON.

[6] The INM lateral over-ground attenuation model produces maximum attenuation for horizontal propagation, decreasing to zero as elevation angle increases to 60° or more.

- Thus, for an aircraft flying at 9000 ft, MSL, the elevation angle from an observer on the canyon floor (3800 ft, MSL), 3000 ft to the side would be arcTAN((9000-3800)/3000) = 60° and the INM would have calculated zero lateral over-ground attenuation, altered or not.
- For an observer on the forested north rim at 8000 ft, MSL (and 3000 ft to the side), the elevation angle would be arcTAN((9000-8000)/3000) = 18.4° and the unaltered INM would (quite correctly) have calculated a 3.6 dB lateral over-ground attenuation. The FAA-altered INM would, thus, overstate the noise level by 3.6 dB, in this example.

2) Loose, dry dirt and gravel (in addition to grass, shrub and other vegetation) are common in areas of the canyon where people are likely to be (i.e. places other than sheer canyon walls). This terrain is nearly as "soft" acoustically as a grass lawn.'
3) In addition to the impedance match of earth and air, lateral over-ground attenuation is affected by disturbance of the atmosphere by the ground, including wind turbulence and temperature gradients.
4) If it is correct to alter the INM such that lateral over-ground attenuation is disabled whenever some acoustically "hard" terrain exists in the area of interest, then: this alteration should be required when the INM is used, under FAA oversight, to predict sound around urban and suburban airports where parking lots, freeways, buildings, bodies of water or other acoustically "hard" areas may be present. This alteration is, of course, never done (outside of the Grand Canyon) and cannot be done by an engineering user outside of FAA.
5) The EA (Reference 1) offers Appendix C (an 8/9/94 Memo from Gregg Fleming) to prove the validity of eliminating of lateral over-ground attenuation in this application. Appendix C compares measured levels in the Grand Canyon with predictions by the altered INM.
6) The data presented in Appendix C, however, shows that the INM predictions (without lateral ground attenuation) usually exceeded the corresponding measurements. Figure 2.3 (Figure 2 from Reference 1, Appendix C) shows this for DHC-6 Twin Otters. The text of Appendix C acknowledges the following over-predictions:

(a) A 3 dB average over-prediction in this case (DHC-6) at sites 1 and 2[8];
(b) A 2 dB average over-prediction for a mix of Cessna 182, 207 and 4 14A aircraft at sites 1 and 2[9];
(c) A 0.5 dB average over-prediction of a mix of Bell models 206 and 206L and Aerospatiale models 350 and 355 helicopters at sites 1 and 2.[10]
(d) A 1.7 dB average over prediction for 13 hourly L_{EQ} measurements and predictions at two sites (3 and 15)
(e) A 9.9 dB average over-prediction for 9 hourly L_{EQ} measurements and predictions at Site 16.

[7] The US Department of Transportation's TNM (Traffic Noise Model), used to compute over-ground sound propagation around highways, assigns a 300 cgs Rayl effective impedance to lawn grass and 500 cgs Rayls to loose soil and gravel. For comparison granular snow is assigned 40 cgs Rayls (very soft) and pavement or water 20,000 cgs Rayls (very hard). From Reference 4.

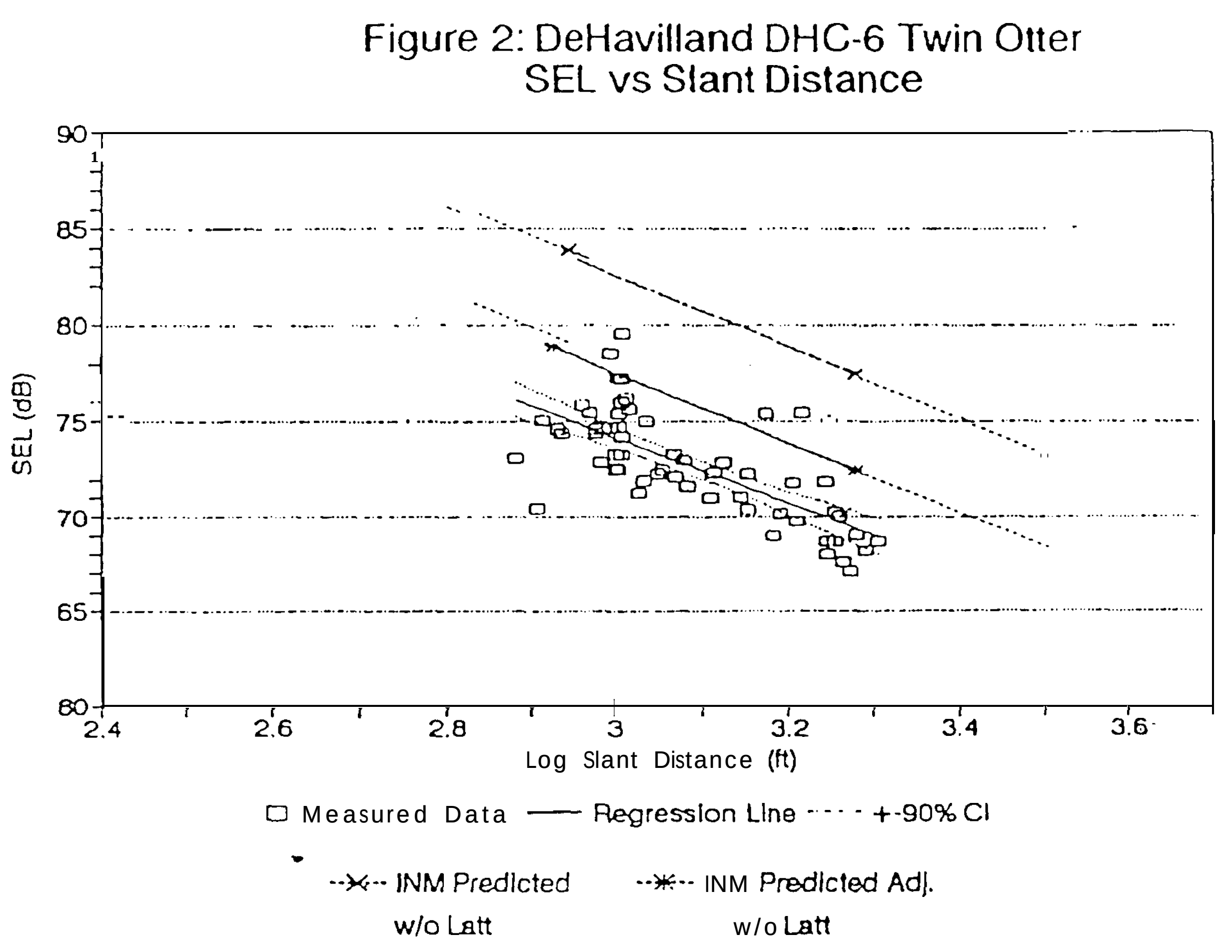
[8] Slant range varied from about 500 ft to 2000 ft. Elevation angles were not given, but it is probable that many data points were at high elevation angles where the unaltered INM would have calculated little or no lateral over-ground attenuation. Thus the over-prediction could be greater at larger lateral distances.

[9] Slant range varied from about 700 ft to 2500 ft. Comment from footnote 8 applies.

[10] Slant range varied from about 300 ft to 3000 ft, with most of the data points between 300 ft and 1000 ft. Comment from footnote 8 applies.

FIGURE 2.3: COMPARISON OF MEASURED DHC-6 SOUND LEVEL WITH PREDICTION INM 5.0 WITH LATERAL OVER GROUND ATTENUATION DISABLED

(Figure 2 from Reference 1, Appendix C)



2.2.1.3 Assumption of 1 Z-Hour Day

The NPS's INM 5.0 study assumes that a day is 12 hours long, rather than 24 hours long. This assumption increases LAEQ values 3 dB above their 24-hour day values. This also doubles the percent time above a threshold sound level (%TA) values compared with a 24 hour day.

24 - hour users of the Park such as, back country hikers and river corridor users are the most noise sensitive groups.

2.2.1.4 "Natural Quiet" Restored in Spite of Bias

Table 2.1 (Table 4.6 from Reference 1) shows that, even with the biasing effects of the above assumptions, the tour aircraft noise level was below 30 dB(A) 75% of the time in 2267 – 322 = 1945 square miles of the 2267 square mile study area. In other words, 86% **of the park was free of noticeable tour aircraft noise 75% of the time.** This more than meets the NPS definition of "substantial restoration of natural quiet."

TABLE 2.1: AREAS WITHIN 25% TIME ABOVE CONTOURS FROM GOVERNMENT INM 5.0 STUDY
(Table 4.6 from Reference 1)

Table 4.6

% Time Above Contour Areas

	1995 Base Case		1995 Alternative		% Change from Base Case
	%TA Contour Area (Sq. Mi.)	% of Analysis Area (2,267 Sq. Mi.)	%TA Contour Area (Sq. Mi.)	% of Analysis Area (2,267 Sq. Mi.)	
10	758.12	33.4%	901.77	39.8%	15.9%
20	549.04	24.2%	516.99	22.8%	-6.2%
25	465.55	20.5%	415.76	18.3%	-12.0%
30	321.67	14.2%	282.59	12.5%	-13.8%
40	136.50	6.0%	149.76	6.6%	8.9%
50	80.03	3.5%	99.91	4.4%	19.9%
60	65.25	2.9%	57.53	2.5%	-13.4%
70	52.77	2.3%	42.82	1.9%	-23.2%

One would have to assume a threshold of noticeability below 10 dB(A) in absolute terms to find that "natural quiet" had been "substantially restored" to less than half of the park. Any reasonable understanding of the science of acoustics cannot support such a low threshold.

2.2.2 Study B: INM 5.2 Study of 1996 Tour Aircraft Operations Using Actual Operations Data

This study was conducted over the entire Park, but is broken into 3 overlapping sectors, East, Central and West, due to software limitations.

Tour operators provided aircraft operations data for the East end for the months of January through July. The FAA 1996 study provided operations data for the remainder of the Park. Appendix A provides contours of the time above the threshold of noticeability (29 dB(A)) for each month.

Our study used July operations data, the busiest month for which we had complete data and one of the busiest months of the year.

Note that the largest time above contour is for 180 minutes (3 hours). The smaller, 360 minute (6 hours) contour is the significant one, representing 25% of 24 hours. Appendix A also details the underlying assumptions and sources of this information.

Appendix A shows that actual July 1996 air tour operations throughout the Park easily met the NPS definition of “substantial restoration of natural quiet.” (At least 50% of the Park free of noticeable tour aircraft noise at least 75% of the time.)

- NPS gives Grand Canyon National Park as encompassing 1.2 million acres, or 1875 square miles.
- Air tour sound exceeded 29 dB(A) more than 360 minutes per day (25% of 24 hours) in 110 square miles, or 6% of that area.
  - Thus 94% of GCNP met the NPS's definition of “natural quiet”.
- Even using the incorrect assumption that a day is 12 hours, we find that air tour sound exceeded 29 dB(A) more than 180 minutes per day (25% of 12 hours) in 400 square miles or 21% of the Park.
  - Thus 79% of GCNP met the NPS's definition of “natural quiet” using a 12 hour day.
- A larger study area would show similar area percentages.

Appendix B provides clear overlays showing these contours with respect to the park topographical contours and the areas where visitors actually spend time in the park. Overlaying the latter on the contours of Appendix A shows that, even in the busiest months, only a fraction of back country users (0.7% of visitor days) and River Corridor users (2.6% of visitor days), would experience anything other than “natural quiet” as a result of air tour operations. Hiking away from the Dragon Corridor (where most tours are conducted) would further minimize air tour sound impacts.

3.0 CONCLUSIONS

1. The government study shows that "substantial restoration of natural quiet" has occurred under SFAR 50-2 in spite of numerous invalid assumptions tending to bias the result in the opposite direction.

2. A technically neutral study shows that "substantial restoration of natural quiet" has occurred by an overwhelming margin under SFAR 50-2

APPENDIX A: GRAND CANYON INM NOISE STUDY SUMMARY

1.0 INTRODUCTION

In the fall of 1996, J R Engineering started looking at air tour noise in the Grand Canyon which included use of the FAA's Integrated Noise Model (INM) 5.0 which calculates noise levels produced by aircraft. Since then, the FAA has made numerous changes to the INM including changes in the way the Time Above noise metric is calculated. The Time Above metric is the unit used when checking that 50% of the park is quiet for 75% of the time. The most current version of INM, version 5.2, was used to calculate noise contours in this study.

The original study was limited in scope to the east end of Grand Canyon National Park. The average number of daily flights, aircraft type, and routes flown were provided by the tour operators who primarily flew over the eastern portion of the park. The air tour operators who provided data to us were Papillon, AGC, GCA, Scenic, Airstar, and Kenai. The contours shown in the east end of the park use these operators flight data from 1996.

Later on, the model was expanded to include flights over the western portion of GCNP. Since no flight data was provided, the number of operations that the FAA used in its 1996 study was used in J R Engineering's study of the west end of the canyon.

2.0 SFAR AIR TOUR FLIGHT PROFILES

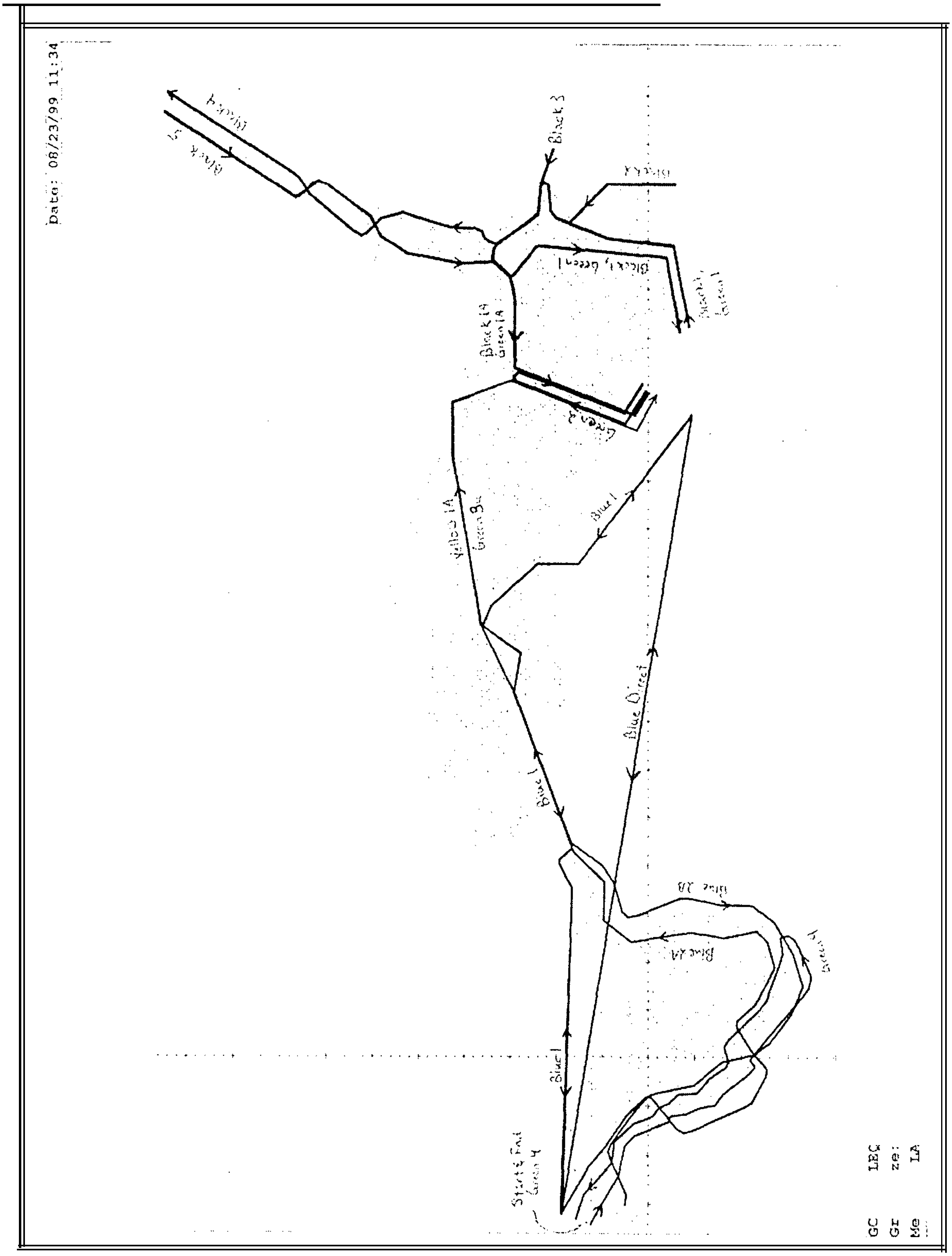
The air tour flight paths and minimum altitudes are shown in the GCNP SFAR Aeronautical Chart. These were the flight paths input to INM to calculate noise contours. Minimum deviation from these flight paths was assumed. In some cases, the SFAR chart listed more than one altitude over a particular section of an air tour flight path. In these instances, it was assumed that the aircraft was on the lower flight path.

Figure 1 shows the flight paths taken from the SFAR chart.

All flight profiles in INM were created using the profile points method. Typically, aircraft used 60% thrust during cruise, 100% thrust during climb, and 20% thrust during descent. Cruise speed was assumed to be 90 KCAS.

JR ENGINEERING

FIGURE 1: SFAR FLIGHT PATHS USED IN INM STUDY



3.0 AIRCRAFT NOISE LEVELS

The airplanes operating over the eastern portion of the park included the Cessna 172, 172R, 177, 18, 182R, 207, 208, and the DeHavilland DHC6Q. The helicopter operations on this end of the canyon included the Bell 206B, 206L-1, 206L-3, 206L-4, and the Aerospatial SA350D.

The DeHavilland DHC6Q, the Beech Baron 58P and various types of small single engine aircraft were used by the FAA in its study of noise in the western portion of GCNP. The Bell 206 was the only helicopter that was used in the FAA study covering the west end.

Most of the aircraft in the study had their NPD curves already included in the INM database. Some did not and NPD curves had to be calculated. Usually this was accomplished by adding a reasonable increment to the NPD of an existing similar aircraft.

The Cessna 207 was available as an approved substitute aircraft in INM. No changes were made to its database.

The noise curves for the Bell 206B, 206L-1, and 206L-3 were provided by John D'Aprile of the Volpe National Transportation Systems Center. The 206L-4 was incremented +.6 dB above the 206B. The DHC6Q noise curves were based on the noise curves in the INM for the DHC6 and reduced 5.1 dB based on data provided by Raisbeck Engineering, the makers of the quiet propellers.

Noise data for the SA350D was obtained from the Helicopter Noise Model (HNM) version 1 user's guide. An average of left, right and center sound levels was used and the advancing tip mach correction was applied to correct to 90 KCAS.

FIGURE 2: NON-STANDARD INM NOISE CURVES

NOISE_ID	NOISE_TYPE	THR_SET	CURVE_TYPE	L_200	L_400	L_630	L_1000	L_2000	L_4000	L_6300	L_10000	L_16000	L_25000
B206L	S	100.00	N	89.3	85.6	83.0	80.2	75.3	69.6	65.3	60.3	52.9	43.3
N206L4	S	1.00	N	89.9	86.3	83.4	80.8	76.0	70.5	65.3	60.9	56.3	52.1
N206L4	S	2.00	N	89.6	85.9	83.0	80.5	75.8	70.4	65.9	61.7	57.5	53.5
N206L4	S	3.00	N	94.8	91.5	88.9	86.8	82.8	78.0	73.8	69.7	65.6	61.6
NC206	S	1.00	N	89.3	85.7	82.8	80.2	75.4	69.6	64.7	60.3	55.7	51.5
NC206	S	2.00	N	89.0	85.3	82.4	79.9	75.2	69.8	65.3	61.1	56.9	52.9
NC206	S	3.00	N	94.2	90.9	88.3	86.2	82.2	77.4	73.2	69.1	65.0	61.0
NC350D	S	1.00	N	82.9	79.2	76.6	73.8	68.9	63.0	58.6	53.3	45.7	35.6
NC350D	S	2.00	N	82.6	78.8	76.2	73.5	68.7	63.2	59.4	54.1	46.9	37.0
NC350D	S	3.00	N	67.8	84.4	82.1	79.1	75.7	70.8	67.1	62.1	55.0	45.1
NDHC6Q	E	30.00	N	89.3	84.9	81.8	78.4	72.9	66.5	61.7	55.9	48.9	39.8
NDHC6Q	E	100.00	N	94.1	89.9	87.0	84.0	79.2	73.7	69.3	64.2	58.1	50.3
NDHC6Q	M	30.00	N	85.8	79.5	75.3	70.9	64.0	56.5	50.9	44.7	37.5	28.9
NDHC6Q	M	100.00	N	90.6	84.4	80.2	75.9	69.2	61.9	56.5	50.5	43.9	36.3
NDHC6Q	S	30.00	N	86.2	82.1	79.3	76.5	71.8	66.6	62.5	57.8	52.1	44.9
NDHC6Q	S	100.00	N	90.8	86.9	84.2	81.4	76.9	71.9	68.0	63.5	58.1	52.3

4.0 FLIGHT OPERATIONS

Figure 2 shows a summary of an average day flight operations for July 1996. July is typically the busiest month for air tours and has the most impact on visitors and the environment.

FIGURE 3: AVERAGE TOUR OPERATIONS JULY 1996

Flight Ops (By Flight Path)

Aircraft Type	Flight Path	# of Ops
CT207A	21	0.4
GASEPF	21	0.4
GASEPV	21	0.4
CT207A	31	1.8
DHC6Q	31	0.7
GASEPF	31	2
GASEPV	31	0.2
BEC58P	B1AE	0.08
CT207A	B1AE	1.79
FWQ	B1AE	0.93
BEC58P	B1B2	0.1
FWQ	B1B2	0.03
BEC58P	B1Y1	24.87
CT207A	B1Y1	1.84
DHC6Q	B1Y1	27.16
FWQ	B1Y1	8.9
BEC58P	B2B1	0.09
FWQ	B2B1	0.03
BEC58P	BDE	24.46
CT207A	BDE	1.85
DHC6Q	BDE	26.64
FWQ	BDE	9.1
BEC58P	BDW	25.55
CT207A	BDW	3.64
DHC6Q	BDW	26.64
FWQ	BDW	10.03
B206	DRA	111.3
B206L4	DRA	9.8
SA350D	DRA	20.2
B206	FCC	3
B206	G4	5.75
SA350D	G4	25.58
B206	GC	19.7
B206L4	GC	1.7
CT207A	GC	33.1
DHC6Q	GC	26.5
SA350D	GC	3.6
CT207A	MAZU	0.5
DHC6Q	MAZU	2
GASEPF	MAZU	1.1
GASEPV	MAZU	0.2
CT207A	MC	0.3
GASEPF	MC	0.5
GASEPV	MC	0.2
CT207A	MC2	0.3
CT207A	MC2	0.7
DHC6Q	MC2	0.9
GASEPF	MC2	0.5
GASEPF	MC2	0.9
GASEPV	MC2	0.2
GASEPV	MC2	0.1
BEC58P	Y1B1	24.87
CT207A	Y1B1	1.84
DHC6Q	Y1B1	27.16
FWQ	Y1B1	8.9

Flight Path Legend	
21	Black 2 to Black 1 to Black 1a
31	Black 3 to Black 1
B1AE	Blue 1A Eastbound
B1B2	Blue 1 to Blue 2
B1Y1	Blue 1 to Yellow 1
B2B1	Blue 2 to Blue 1
BDE	Blue Direct East
BDW	Blue Direct West
DRA	Green 2 (Dragon Corridor)
G4	Green 4
GC	Black 1 to Black 1a (Zuni Pt. To Dragon)
MAZU	Black 5 to Black 1 (Marble Canyon to Zuni Point)
MC	Black 5 to Black 1a (Marble Canyon to Dragon)
MC2	Black 1 to Black 4 (Zuni Pt. To Marble Canyon)
Y1B1	Yellow 1 to Blue 1

Aircraft Legend	
B206	Bell 206B, 206L-1, or 206L-3 Helicopter
B206L4	Bell 206L-4 Helicopter
BEC58P	Beech Baron 58P
CT207A	Cessna 207A
DHC6Q	DeHavilland DHC6 with Quiet Propeller
FWQ	Unknown Plane that FAA used in its Study
GASEPF	General Aviation Plane Single Fixed Pitch Prop
GASEPV	General Aviation Plane Single Variable Pitch Prop
SA350D	Airstar SA350D Helicopter

5.0 TIME ABOVE 29 dB CONTOURS FOR JULY 1996

The following figures show the time that aircraft noise is above 29 dBA in July. This represents a worst case scenario in that July is the busiest time of year for air tours. Previous INM computations of the eastern portion of the canyon showed considerably less noise was produced in the fall, winter, and early spring months.

With the terrain feature turned on, INM can only handle a 1 degree latitude by 1 degree longitude study area. Since GCNP is over 2 degrees in width, the INM analysis was broken up into three areas. Since there is some overlap of area, the areas above 29 dBA shown at the bottom of each figure cannot be added directly.

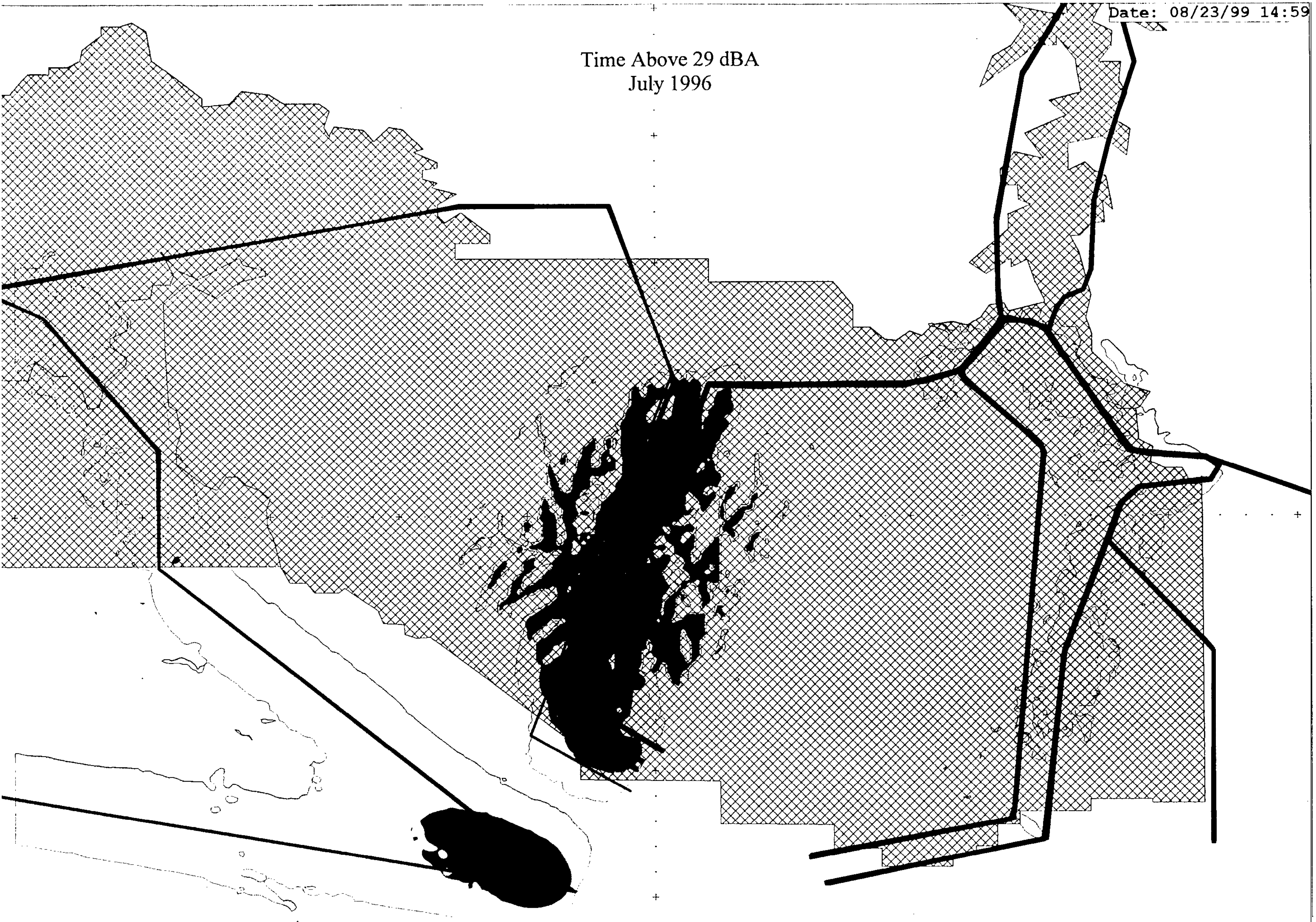
For a typical July day (1996 operations) the total area above 29 dBA for more than 3 hours is approximately 930 square miles. About 190 square miles are above 29 dBA for 6 or more hours.

Of the 930 square miles that receive 3 or more hours of 29 dBA+ exposure only about 400 square miles is actually in GCNP[1]. About 110 square miles of the park are above 29 dBA for 6 or more hours.

The above numbers are based on an average day of operation. A weekday may have less flights while a weekend may have more.

Flights numbers have also increased somewhat since 1996 which may lead to more air tour noise in the canyon.

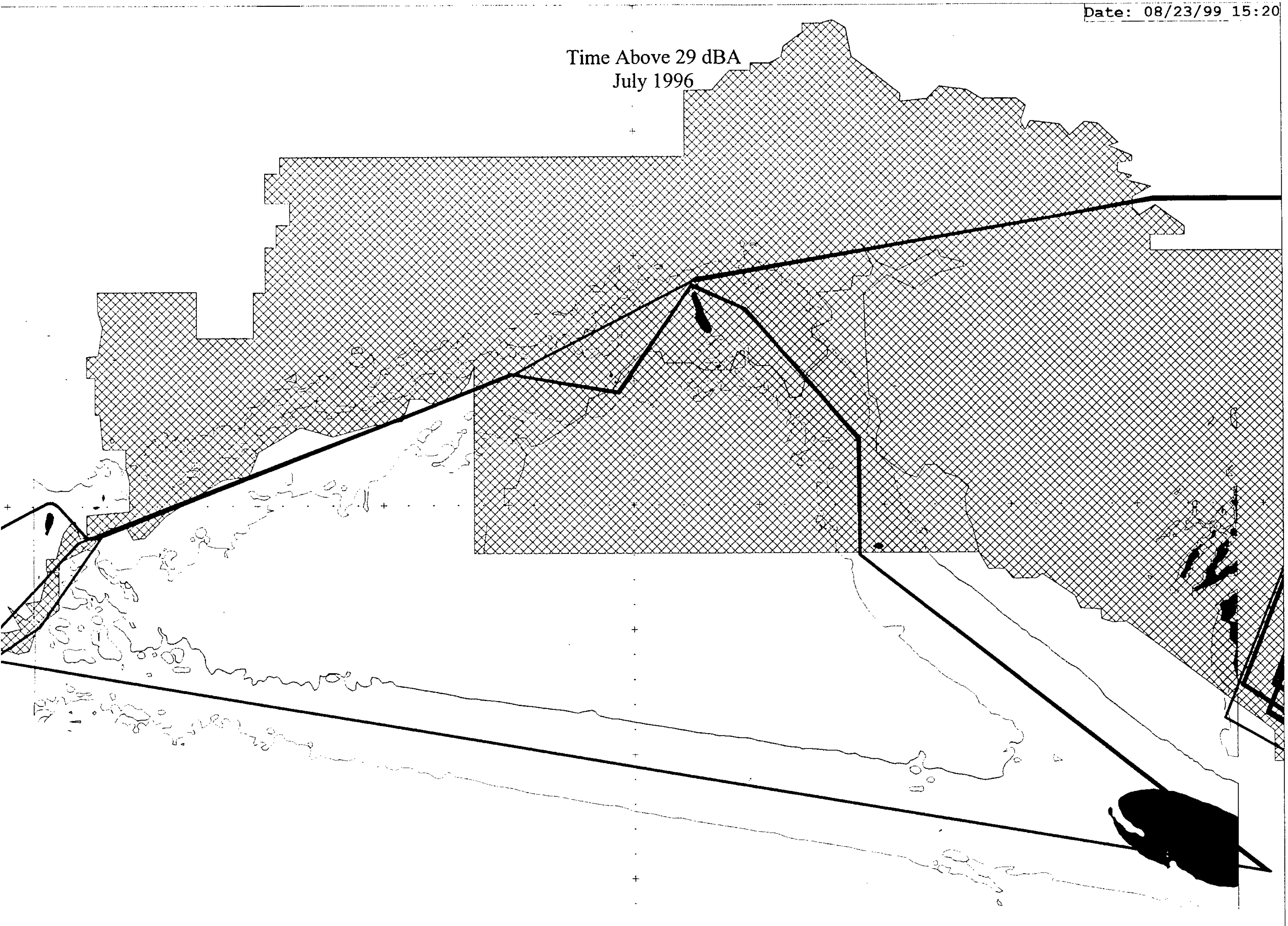
[1] The GCNP boundary near the Havasupai Indian Reservation varies from map to map. For conservatism, we have assumed that a large portion of this area is within the park boundaries. If it is not within the park boundary, the amount of the park above 29 dBA would be less than calculated above.



RANDCAN\TA29DB	Level	180.0	360.0
cale: 1 in = 29165 ft	Sq.mi	409.39	99.23
etric: TALA	Color		

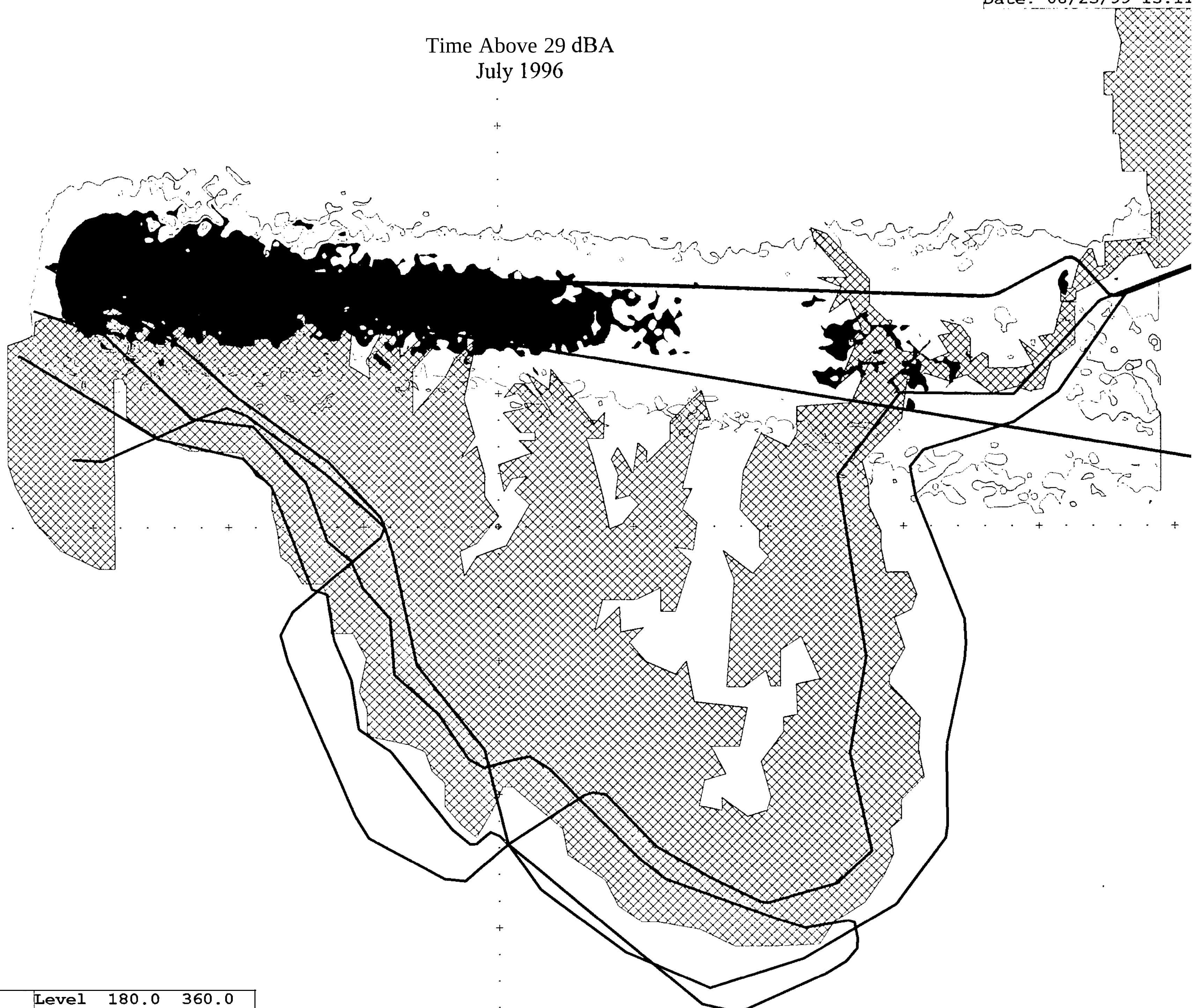
Date: 08/23/99 15:20

Time Above 29 dBA
July 1996

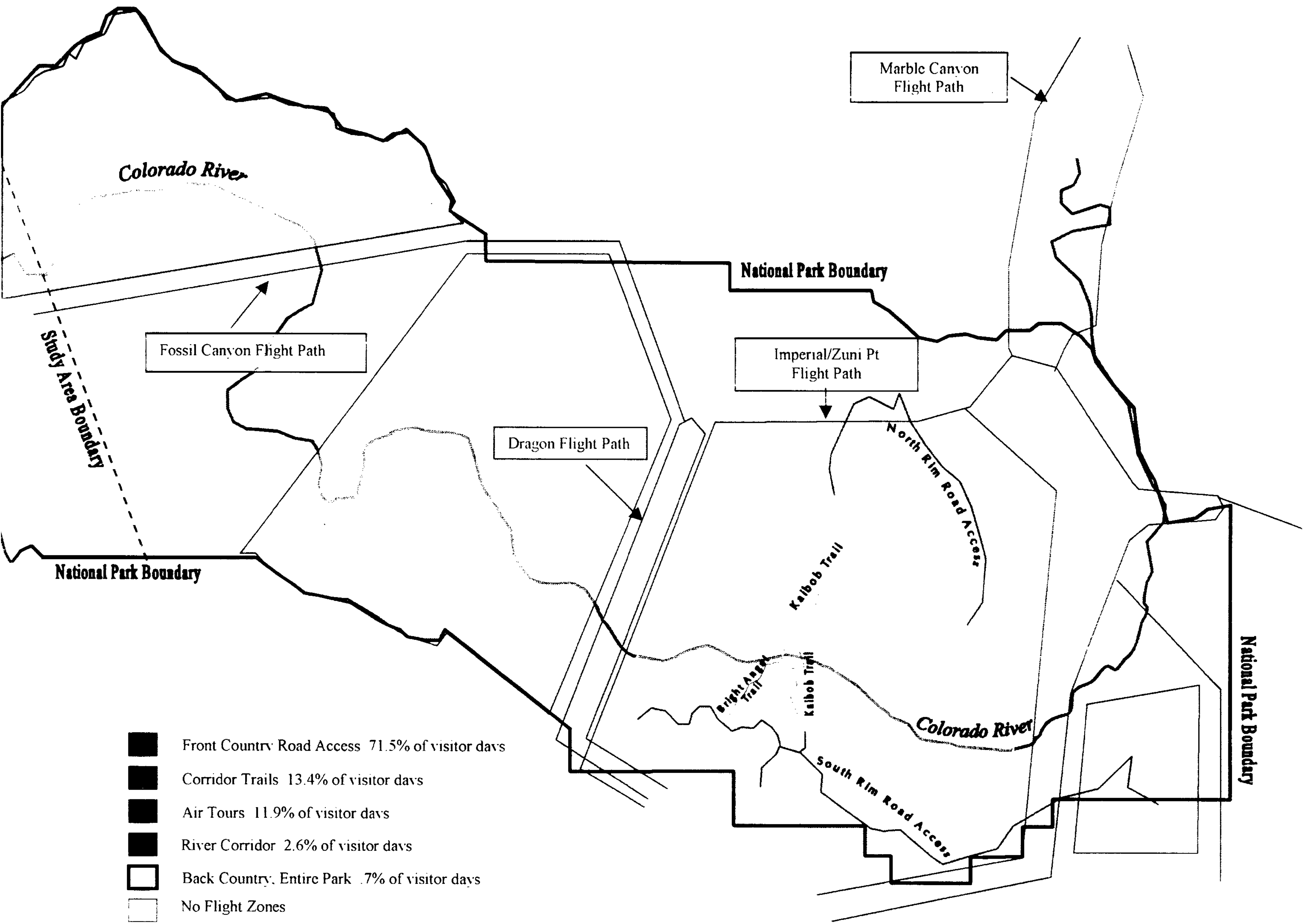


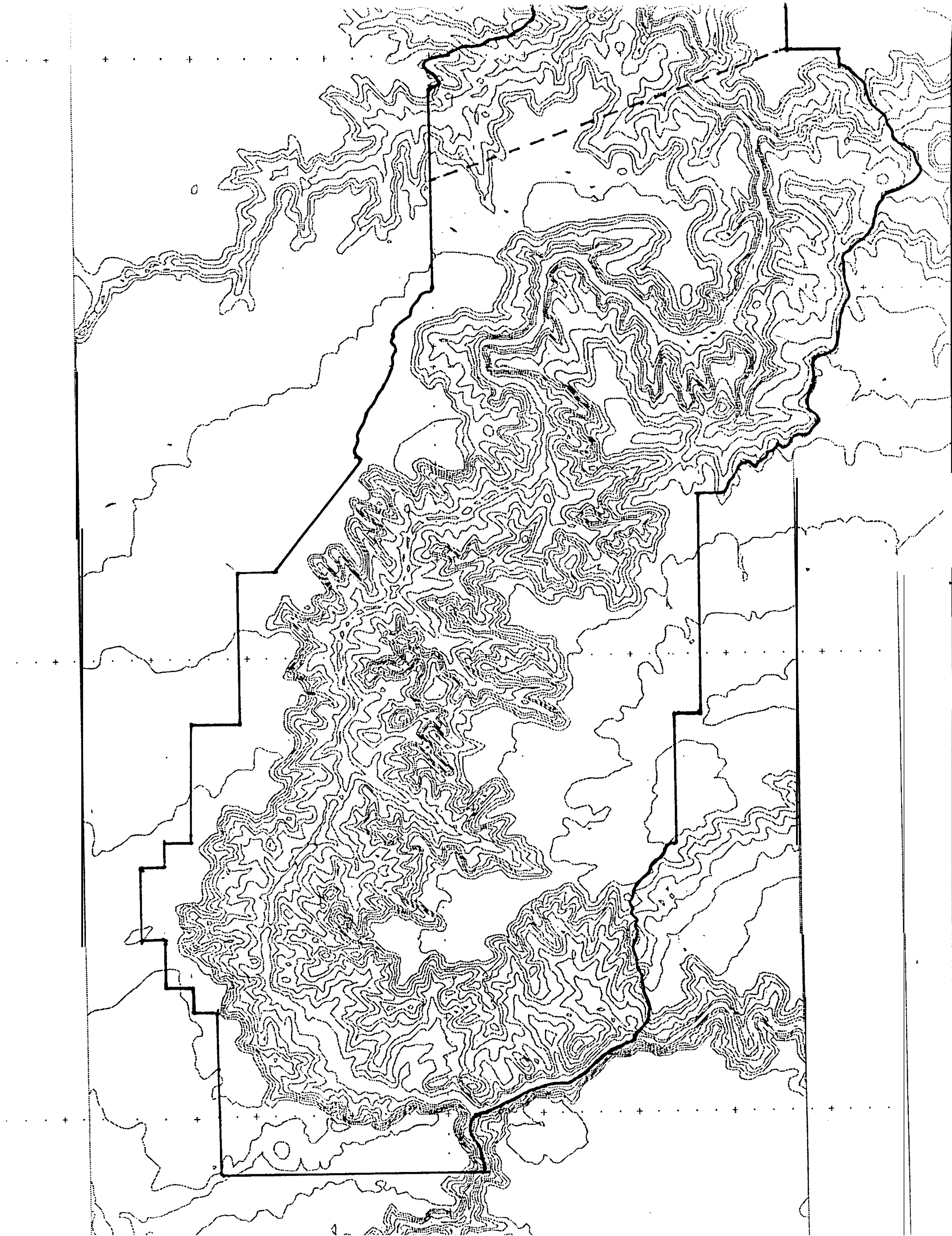
CMIDDLE\TA29DB	Level	180.0	360.0
cale: 1 in = 29165 ft	Sq.mi	467.96	19.90
etric: TALA	Color		

Time Above 29 dBA
July 1996



CWEST\TA29DB	Level	180.0	360.0
cale: 1 in = 29165 ft	Sq.mi	337.89	88.47
etric: TALA	Color		


Marble Canyon Flight Path
Colorado River
National Park Boundary
Fossil Canyon Flight Path
Study Area Boundary
Imperial/Zuni Pt Flight Path
Dragon Flight Path
North Rim Road Access
Kaibob Trail
National Park Boundary
Bright Angel Trail
Kaibob Trail
Colorado River
South Rim Road Access
National Park Boundary
Front Country Road Access 71.5% of visitor days
Corridor Trails 13.4% of visitor days
Air Tours 11.9% of visitor days
River Corridor 2.6% of visitor days
Back Country, Entire Park .7% of visitor days
No Flight Zones



TESTIMONY BEFORE THE U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON RESOURCES -- May 25, 1999

SUBJECT: CRITIQUE OF ACOUSTICAL BASIS FOR, ***"Change in Noise Evaluation Methodology for Air Tour Operations over Grand Canyon National Park" 64 Fed. Reg. 3969 (Jan. 26, 1999) –*** (hereinafter ***"the Notice").***

DELIVERED BY: John R. Alberti, Tuesday, May 25, 1999

1. INTRODUCTION

It is a pleasure to address this committee again. My name is John Alberti, owner of Quietly Superior, Inc. doing business as J R Engineering. My company specializes in acoustics, particularly aircraft noise.

For 33 years, the main thrust of my career has been the reduction of aircraft noise. My company's involvement in Grand Canyon noise began working with Papillon Grand Canyon Helicopters to develop a large, ultra-quiet helicopter for air tour use.

We are authorized by FAA to perform noise certification tests on all categories of aircraft, I have been appointed a Designated Engineering Representative (DER), authorized to represent FAA in the fields of acoustics and performance (flight analyst).

Last September I had the honor of discussing the 1994 NPS Report to Congress[1] with you. The discussion enumerated serious flaws in that report and demonstrated that, contrary to NPS claims, *"substantial restoration of natural quiet"* had been achieved under SFAR-50-2.

Today we address an attempt by NPS to chance the ground rules by which *"natural quiet"* is defined. They seek to substitute *detectability* in place of *noticeability.*

- *Noticeability* occurs when a disinterested observer, such as a hiker pausing to enjoy the view (or doing something other than listening for aircraft), becomes aware of aircraft sound.
- *Detectability* (sometimes called *audibility)* occurs when observers actively and intently listening for aircraft are just able to detect aircraft sound. The notice defines aircraft sounds 8 dB(A) below the background sound level to be *detectable*
- All recent studies of aircraft sound in GCNP have used *noticeability*, defined as 3 dB(A) above the background sound level as the threshold of *"natural quiet"*.

[1] CRITIQUE OF ACOUSTICAL INFORMATION PRESENTED ***IN, "Report To Congress --*** *Report On Effects Of Aircraft Overflights On The National Park System"*, NPS, 9/12/1994, delivered by: John R. Alberti, Thursday, September 24, 1998

- The direct effect of *the notice* is to change the definition and lower the threshold of *"natural quiet"* by 11 dB(A). Any tour aircraft operating near the Grand Canyon would exceed that threshold, as would airliners 40 miles away.

2. SUMMARY

2.1. In *the Notice,* NPS cites the failure to achieve *"substantial restoration of natural quiet"* in GCNP. They define this as more than half the park free of aircraft sound 75% to 100% of the time.

2.1.1. This assertion is untrue as we demonstrated in our 1997 analysis.[2] I presented these findings to the House National Parks and Public Lands Subcommittee last September.

2.1.1.1. Not only did our analysis show that more than half of the park was free of aircraft sound more than 75% of the time (based on actual 1996 operations under SFAR 50-2), but observers hired by NPS found the same thing in 1992. (See Attachment 1)

2.1.1.2. Their own survey shows that when specifically asked, only 5% of visitors were annoyed by aircraft sound or thought it interfered with their enjoyment of GCNP. 66% reported that they did not notice any aircraft sound at all.

2.1.2. Conclusion: There is no acoustical emergency in GCNP that justifies the imposition of more economically burdensome regulations, as proposed in *the Notice*.

2.2. In the Notice, NPS cites *"additional information"*, that requires NPS to *"refine its methodology"* used to evaluate the achievement of its *"natural quiet restoration standard."*. Further to this *"additional information"*, the narrative continues. *"The technicians identified aircraft noise at A-weighted levels 8-12 decibels below the average A-weighted natural ambient sound levels." the Notice* begs us to conclude that new research now dictates that the threshold of "natural quiet" be changed from 3 dB(A) above ambient to 8 dB(A) below ambient. Applying this to the minimum ambient levels (15 to 17 dB(A)) that NPS has (incorrectly) used in past studies would result in a "natural quiet" criterion of 7 to 9 dB(A) for most of GCNP.

2.2.1. This assertion is untrue. The engineering report by HMMH containing the claimed *"additional information"*[3], hereinafter *"HMMH Report")* is both flawed and irrelevant.

2.2.1.1. There were no new measurements or observations: only some arithmetic performed on some old measurements and studies. HMMH's arithmetic indicates that aircraft sound meets their detectability criterion at levels as low as 5.6 dB(A).

2.2.1.2. At no time did any observer actually detect aircraft sounds at anything close to these levels -- in the Grand Canyon, or anywhere else.

2.2.1.3. Their detectability criterion was based on aircraft sounds that were detected by vigilant observers in GCNP at an average threshold level of 30 dB(A).

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[2] Analysis report, JR ***182, "Analysis Of National Park Service Data On Air Tour Overflight Sound At Grand Canyon National Park"***, John R. Alberti, et al of J R Engineering, 7/25/1997.

[3] HMMH Memorandum, ***"A- Weighted Differences Compared with Detectability"***, N.P Miller of Harris Miller Miller & Hanson, Job # 294530.22, 5/15/1997

2.2.1.4. In several cases, aircraft sound spectra, adjusted to meet their detectability criterion, are below the threshold of human hearing at every frequency and could not possibly be detected, by an observer with normal hearing, no matter how intently he or she strained to listen.

2.2.1.5. In *the Notice,* NPS is not *"refining its methodology"*. It is attempting to switch from *noticeability* to *detectability* as the principle upon which aircraft noise criteria are set.

2.2.1.5.1. In so doing NPS is expressing a political opinion not supported by *the HMMH Study* or any other scientific study.

2.2.1.5.2. *the HMMH Study* is an arithmetic exercise that attempts to quantify detectability in units of dB(A) and makes some serious errors, in the attempt.

2.2.1.6. To their credit, HMMH admits that their study *"...is likely to produce results that differ considerably from what a listener on the ground would experience."*

2.2.2. Conclusion: The *"additional information"* cited in *the Notice* is flawed and would offer no credible scientific support for the proposed change from *noticeability* to *detectability* as a criterion for *"natural quiet"* even if it had been done right. The fact is, this proposed change reflects a political desire on the part of NPS and is not supported by any scientific study.

2.3. *The notice* does not specify background sound levels. We find a consistent pattern of under-stating the ambient sound level by NPS, however, that will add a further bias in the direction of an unreasonably low threshold of *"natural quiet"*.

2.4. Our analysis of observations commissioned by NPS demonstrates that the correct tour aircraft sound criterion level for evaluating *"substantial restoration of natural quiet"* is 29.0 dB(A). This is 3dB(A) above the background sound level when aircraft were actually detected by vigilant human observers. We based this on the quietest 25% of detections at the quietest 50% of locations.

3. ANALYSIS OF *THE HMMH STUDY*

3.1. *The HMMH Study* uses as its audibility index, a masking parameter called *bandwidth adjusted signal to noise ratio,* d' (pronounced "d-prime"). Though not attributed in *the HMMH Study,* this derives from a 1994 study conducted under NPS contract by BBN in 1994 (hereinafter *"the BBN Study"*)[4].

3.1.1. BBN observers intently listening for aircraft were able to detect them at an average 10LOG(d') of about 7.

3.1.2. *The HMMH Study* fails to mention that the average sound level at onset and offset of detection in the BBN study was 30 dB(A).

3.1.3. *the BBN Study* also observed that noticeability, the level at which a typical visitor, not actively listening for aircraft, might become aware of aircraft noise occurs at about 10LOG(d') = 17, typically about 3 dB(A) above ambient.

[4] NPOA Report No. 93-1/BBN Report 7197, ***"Evaluation of the Effectiveness of SFAR 50-2 in Restoring Natural Quiet to Grand Canyon National Park -- Final Report",*** S. Fidell, K. Pearsons, M. Sneddon, BBN Systems and Technologies, 6/23/1994. We have cited *the BBN Study* in several of our studies, including JR 182 HMMH contributed Appendix F to *the BBN Study*

3.1.4. BBN recommends the noticeability criterion, 10LOG(d') = 17, as the appropriate criterion for "natural quiet" in GCNP and uses it in developing the acoustic map presented in *The BBN Study 3.*

3.1.5. In Table 2 of *the HMMH Study* confirms that 3 dB(A) above ambient corresponds to an average 10LOG(d') ≅ 17

3.2. *The HMMH Study* compares various aircraft sound spectrum shapes (Four at maximum sound level and four just after detection) with various natural ambient sound levels measured in GCNP (under unstated circumstances). In each comparison they subtract enough from the aircraft spectrum that it meets their audibility criterion (10LOG(d')=7), then compute the A-weighted sound levels – as low as 5.6 dB(A) for aircraft #1 at Hermit basin.

3.2.1. Table 1 shows the ambient and aircraft A-scale sound levels that we computed from the spectra in *the HMMH Study.*

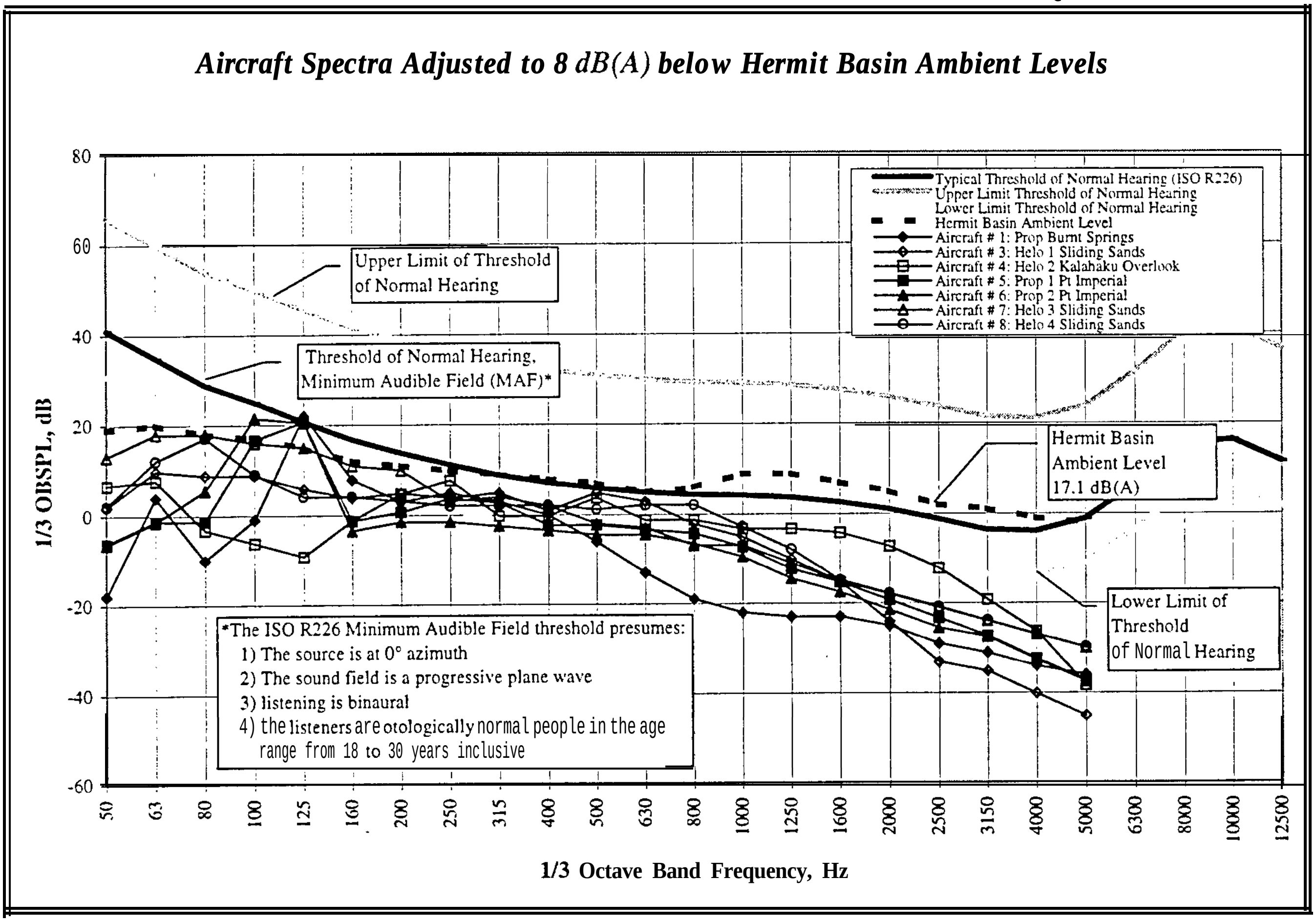
TABLE 1: SOUND LEVELS USED IN **HMMH** STUDY

Aircraft #	/Description	LA. dB(A)
Ambient	Pt. Imperial	25.2
Ambient	1117.4 Mile	146.6
Ambient	Toroweep	20.2
Ambient	Hermit Basin	17.1
1	Prop Burnt Spring – maximum level	62.6
2	Jet Toroween – maximum level	32.8
3	Helo 1 Sliding Sands – maximum level	42.7
4	Helo 2 Kalahaku Overlook – maximum level	59.8
5	Prop 1 Pt. Imperial – detection level	39.9
6	Prop 2 Pt. Imnerial – detection level	40.1
7	Helo 3 Sliding Sands – detection level	29.6
8	Helo 4 Sliding Sands – detection level	30.4

3.2.2. Observe that the levels for aircraft 5 through 8, measured just after detection, range from 29.6 dB(A) to 40.1 dB(A).

3.2.3. We also adjusted the 1/3 octave sound pressure level spectra for the various aircraft studied in *the HMMH Study* (excluding the jet, #2) to produce a computed sound level 8 dB(A) below ambient at Hermit Basin. This is the level that NPS proposes as a standard for "natural quiet".

FIGURE 1: SOUND SPECTRA AT NPS PROPOSED "NATURAL QUIET"



3.2.3.1 .Note that four of the spectra lie below the threshold of human hearing at every frequency. It is not possible for any observer, no matter how attentive, to detect aircraft sound that is below the threshold of hearing – by definition.

3.2.3.2. Further, the threshold of hearing shown is an average value for young people without hearing loss. Many young people and most adults have higher thresholds, as noted by the upper gray line.

3.2.3.3. Further still, it is doubtful (and certainly not proven by NPS) that sounds slightly above the threshold of hearing could be detected at 10LOG(d') = 7. The ear's ability to detect the small changes that reveal a new sound source is greatly degraded near the threshold of hearing.

3.2.3.4. The fact remains that actual aircraft sound detection in GCNP (by attentive observers) occurs at an average sound level of 30 dB(A). The 7 to 9 dB(A) levels that would follow from *the Notice* are nonsensical. would require super-human hearing and have certainly not been demonstrated.

3.3. NPS and FAA studies since 1996 derive from a criterion for aircraft sound of 3 dB(A) above ambient. based on noticeabilitv. That is the de-facto standard used by both FAA and NPS. (notwithstandin g NPS's habit of using the term "audibility"). The NPS's proposed 11 dB(A) reduction in the criterion level is not a "*refinement*". It represents a major and unjustified change in philosophy from *noticeability* to *detectability.*

4. DETERMINING THE THRESHOLD OF NOTICEABILITY

4.1. Notes on Sound *Detectability* (or Audibility) and *Noticeability*

4.1.1. The detection of aircraft sound by humans (or sound analyzers) requires some increase in sound level above the ambient level with no aircraft present. That is the Signal to Noise Ratio, S/N, must be greater than zero.

4.1.1.1 .For example, the sound measurements conducted in GCNP in ***the BBN Study*** found that observers at 13 different sites in GCNP (intently listening for aircraft) were able to detect aircraft at an average S/N of 1 dB(A).

4.1.1.2. This A-weighted Overall S/N=1 dB(A) is consistent with detectability of aircraft sound 6 dB(A) below ambient. *the **BBN** Study* acknowledges that one cannot reliably measure broadband sound levels (such as dB(A)) that are below ambient.

4.1.2. *The **BBN** Study* also made use of a commonly used measure of acoustical detectability in the presence of masking sound known as "d-prime" or bandwidth adjusted signal to noise ratio,

$$d' = \eta * S/N * \sqrt{(W)},$$

where,

d' is computed for every 1/3 Octave band

η = detector efficiency (set to 40%, in *the **BBN Study)***

W = critical bandwidth of the ear (~100Hz to -150 Hz in the area of interest)

4.1.2.1 .For convenience the decibel equivalent, 10LOG(d') is often used. Typically, a prop or rotor blade passage tone will betray the presence of an aircraft. The band containing that tone typically has the highest d'.

4.1.2.2. The observers in ***the BBN Study*** found ***detectability*** at 10LOG(d') = 7 and *noticeability* at 10LOG(d') = 17

4.2. Computation of Threshold of Noticeability

4.2.1. We based our computations on the observations reported in *the **BBN Study.***

4.2.2. We accepted the 3 dB above ambient definition of the threshold of noticeability used by NPS in its previous studies.

4.2.3. The NPS's definition of "substantial restoration of natural quiet" requires that 50% or more of the Park be free of noticeable aircraft sound 75% or more of the time. To determine the corresponding threshold of noticeability:

4.2.3.1 .We determined the lower quartile sound level at which aircraft were detected at each site. Thus the detection level was higher 75% of the time.

4.2.3.2. We then computed the median of those site-specific, lower quartile sound levels. Thus the detection level was higher 75% of the time at 50% of the sites.

4.2.3.3.The finding in *the* ***BBN Study*** that S/N = 1 dB(A) at detection means that the ambient level was 1 dB(A) below the detection level. Thus, subtracting 1 dB(A) and adding 3 dB(A) to the median lower quartile detection level yields the threshold of *noticeability*.

4.2.3.4.Table 1 shows the computations. The median lower quartile threshold of noticeability is 28.93 dB(A) at onset and 28.796 dB(A) at offset. Averaging and rounding yields 29 dB(A). This is the correct aircraft sound criterion level for evaluating "substantial restoration of natural quiet". If aircraft sound is less than 29 dB(A) 75% or more of the time in 50% or more of the Park, then, by the NPS's definition and the NPS's data, "substantial restoration of natural quiet has occurred".

TABLE 1: COMPUTATION OF THRESHOLD OF NOTICEABILITY

	La at Onset of Detectability			La at Offset of Detectability		
	Mean		25%ile La	Mean		25%ile La
Site	La, dB(A)	std dev, s	=La-.67s	La, dB(A)	std dev, s	=La-.67s
Horn Cr.	24.9	2.3	23.359	24.7	3.2	22.556
Nankoweap	45.9	7.8	40.674	45.8	7.8	40.574
Pt Imperial	34.2	4.3	31.319	35.8	5.8	31.914
S. Canyon	22.5	3	20.49	22	13.7	19.521
Hermit Cr.	35	a.3	29.439	36.8	9.4	30.502
Sanup Plateau	26.2	4.9	22.917	29.2	7.5	24.175
Tonto Overlook	27.6	1	26.93	27.6	1.2	26.796
Phantom Ranch	***45.8***	1.2	44.996	45.7	1.6	44.628
Tuna Cr.	18	1.2	17.196	17.1	1.8	1 5.894
Toroweap Overlook.	20.4	2.6	I 8.658	20.3	1.7	19.161
Desert View	27.7	0.7	27.231	32.1	4.5	29.085
MEDIAN, dB(A)	27.6		26.93	29.2		26.796
Ambient, SNR=1 dB(A)	26.6		25.93	28.2		25.796
Noticeability Threshold						
= amb + 3 dB(A)	29.6		28.93	31.2		28.796
Data from NPOA Report 93-1, Table E-						

5. COSCLUSIONS
   5.1. NPS has expressed its political desire to lower the criterion for *"natural quiet"* from 3 dB(A) above ambient, based on *noticeability* to 8 dB(A) below ambient based on *detectability.*
   5.2. The *"additional information"* that NPS cites as justification for this change in ground rules is a sham.
      5.2.1. The HMMH report contains no new sound measurements or observations, only computations based on some old ones.
      5.2.2. These computations attempt to quantify detectability in terms of dB(A). Even if that had been done correctly, it would not have substantiated the proposed change in ground rules.
      5.2.3. The computations are flawed and lead to the absurd conclusion that aircraft sound levels that are below the threshold of human hearing at every frequency exceed their proposed threshold of *"natural quiet".*
      5.2.4. The detectability criterion used by HMMH was developed in a 1994 BBN study. In that study, the average sound level at which vigilant observers could detect aircraft in GCNP was 30 dB(A).
      5.2.5. NPS has submitted no data to substantiate aircraft sound detection at the 7 to 9 dB(A) levels that would result from their proposed new definition of *"natural quiet"*. Indeed, such detection would be impossible for humans with normal, unaided hearing.
   5.3. NPS has offered no credible scientific justification for their proposed change in ground rules. There is no justification other than their desire to justify more destructive regulation of the air tour industry.
   5.4. The threshold of *"natural quiet"* should be set to protect ordinary park visitors whose interest is to enjoy the park, not activists straining to hear an aircraft so they can complain about it.
   5.5. The correct tour aircraft criterion level for evaluating *"substantial restoration of natural quiet"* is 29.0 dB(A).

6. RECOMMENDATIONS

6.1. 29.0 dB(A) should be adopted as the aircraft sound criterion level for evaluating *"substantial restoration of natural quiet"* is 29.0 dB(A).

6.2. The threshold of noticeability (ambient + 3 dB(A)), as used in previous studies, is the level at which normal visitors would first notice aircraft sound. This should continue to be the standard.

6.3. The current, publicly available, version of the FAA/DOT developed Integrated Noise Model (INM) program should be used until or unless another program is determined, by peer reviewed field validation, to be superior. Any such software or enhancements, thereto should be available to all interested parties.

6.4. The following criteria should be adopted for acoustical standards and rulemaking

6.4.1. Positive Net Gain: Any acoustical standard should lead to rules that do more good than harm. Specifically, measures that decrease tour aircraft sound should not cause more harm to the air tour industry and the 17% of park visitors who make use of them, than the harm done by the sound that would be eliminated.

6.4.1.1. An NPS survey showed that only 5% of Park visitors said they were annoyed by air tour noise or thought it interfered with their enjoyment – when specifically asked – and 66% did not notice aircraft noise at all! Thus, any standard that leads to the shutdown, or large-scale curtailment of the air tour industry cannot be justified.

6.4.1.2. The air tour industry should, however, incorporate economically reasonable quiet aircraft technology and quiet flying techniques and operating practices.

6.4.2. Good Faith: Any acoustical standard and the rules deriving, therefrom should provide a stable, reliable and clear basis for compliance and equally clear and reliable incentives for further sound reduction.

6.4.2.1. The development and acquisition of quiet aircraft is both desirable and enormously costly and time-consuming. No sane business owner, who expects to be ambushed at any time by ever more extreme requirements that will nullify any good faith effort, would make that investment.

6.4.2.2. The pattern of proposed standards and regulations from NPS, including *the* Notice, suggest an adversarial and counter-productive intent to regulate the air tour industry out of existence.

6.4.3. Common Sense: Acoustical standards should reflect common sense and the perceptions and sensitivities of typical park visitors, not activists, or others consciously seeking the sound of aircraft. Similarly, thresholds of *noticeability* should derive from typical daytime levels at which actual aircraft are observed, not minimum ambient noise values, hand-picked for low noise, as we have seen in past studies. *Noticeability* is the correct measure to apply to a normal visitor who is not looking for something to complain about.

6.4.4. <u>Equal Protection:</u> Any acoustical standard applied to tour aircraft should be comparable to standards to which other sound sources could reasonably be held.

6.4.4.1. Specifically, air tour aircraft should not be held to standards that commercial transport and general aviation aircraft could not meet.

6.4.4.2. Conversely, onerous standards imposed on the air tour industry can and will be applied to other activities, with disastrous effects (particularly on the nation's air transportation system). If an audibility standard of 7 dB(A) is established for national parks and monuments, then even popular stage 3 aircraft such as the MD-SO, would be deemed audible at a slant range of 44 miles at climb power. (Data extrapolated from INM 5.2 database).

6.4.5. **<u>Scientificallv</u>** <u>Valid:</u> Any acoustical standard should derive from scientifically valid measurements and analyses that are open to peer review by <u>all</u> interested parties:

6.4.5.1. Measurements and analysis to determine aircraft sound levels should conform to FAA and industry standards.

6.4.5.2. Software and methodology used to determine aircraft sound contours should be subjected to field validation and both the software and field validation data should be available for peer review by all interested parties. At this time only the publicly available version of INM meets that standard.

6.5. We have already demonstrated, in JR 182, that the NPS's definition of "restoration of natural quiet" has been met under SFAR 50-2, but propose the following sound reduction measures in the interest of further, progressive sound reduction:

6.5.1. SFAR 50-2 should remain in effect, but aircraft should be operated to produce minimum sound consistent with safety of flight and approved operating limits. This includes minimum prop and rotor RPM and adjusting helicopter descent paths to avoid blade slap and fixed wing climb gradients to minimize use of high RPM.

6.5.2. Decreased operating fees and other strong incentives should be offered for "quiet aircraft" and should provide further incentives for ultra-quiet aircraft. These incentives should be binding on NPS and other regulatory agencies for an extended period to justify the large, long-term investment required to obtain 'quiet aircraft".

Table F-3 Estimated Aircraft Audibility by Operator

Site	Measured Percentage of Time Aircraft are Audible*		Estimated Percentage of Time Aircraft are Audible by Operator				
			Tour	Commercial	G/A	Military	
1	12.8	✓	5.4	7.4	0.0	0.0	< 25%
2.1	18.8	✓	7.4	11.3	0.0	0.0	< 25%
2.2	11.2	✓	7.6	3.5	0.0	0.0	< 25%
3	51.9	+	50.8	1.4	0.0	0.0	
5	5.7	✓	2.1	3.6	0.0	0.0	< 25%
6.1	8.7	✓	1.6	7.1	0.0	0.0	< 25%
6.2	6.6	✓	3.9	0.0	2.7	0.0	< 25%
7	12.3	✓	9.3	0.8	1.9	0.4	< 25%
8	20.0	✓	19.5	0.6	0.0	0.0	< 25%
9	19.5	✓	16.3	3.4	0.3	0.0	< 25%
10	19.8	✓	5.9	12.9	1.0	0.0	< 25%
12	20.4	✓	13.8	5.9	0.7	0.0	< 25%
13	49.6	+	47.0	2.6	0.0	0.0	
14	53.7	+	43.6	11.3	0.0	0.5	
15	66.2	+	61.0	7.8	0.8	0.0	
16	82.9	+	78.8	17.8	0.6	0.0	
17	43.3	+	30.4	14.3	1.2	0.0	
18	11.5	✓	5.0	6.6	0.0	0.0	< 25%
19	76.4	+	69.3	11.7	0.0	0.8	
20	4.1	✓	0.0	3.5	0.0	0.6	< 25%
21	50.4	+	47.6	2.8	0.0	0.0	
23	12.9	✓	6.7	1.9	0.0	4.3	< 25%
31	7.4	✓	1.2	6.2	0.0	0.0	< 25%

* Estimated percentages by operator may not sum to measured percentage due to overlap between aircraft of different operators.

23 SITES (MOST UNDER FLIGHT CORRIDORS)

15 SITES: TOUR AIRCRAFT AUDIBLE < 25% OF TIME

8 SITES: TOUR AIRCRAFT AUDIBLE > 25% OF TIME

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1992 NPS SPONSORED STUDY

DISCLOSURE REQUIREMENT
Required by House Rule XI, clause 2(g)
and Rules of the Committee on Resources

A. This part is to be completed by all witnesses:

1. Name: John R. Alberti

2. Business Address: 815 - 6th St. S. Suite 107
Kirkland, WA 98033

3. Business Phone Number: 425-827-0324

4. Organization you are representing: USATA

5. Any training or educational certificates, diplomas or degrees or other educational experiences which add to your qualifications to testify on or knowledge of the subject matter of the hearing:
BS, Physics, U. of Washington
33 Years experience, aircraft noise

6. Any professional licenses, certifications, or affiliations held which are relevant to your qualifications to testify on or knowledge of the subject matter of the hearing:
Licensed Professional Engineer (PE), Aeronautical, WA State $19791
Appointed Designated Engineering Representative (DER) by FAA
Acoustics, Part 36 & Flight Analyst Parts 25 & 29 #DERT-635008-NM

7. Any employment, occupation, ownership in a firm or business, or work related experiences which relate to your qualifications to testify on or knowledge of the subject matter of the hearing:
Owner, Principal Engineer, Quietly Superior, Inc. dba J R Engineering

S. Any offices, elected positions, or representational capacity held in the organization on whose behalf you are testifying:
NO

B. To be completed by non-governmental witnesses only:

1. Any federal grants or contracts (including subgrants or subcontracts) which you have received since October 1, 1994, from the Department of the Interior, the source and the amount of each grant or contract:

NO

2. Any federal grants or contracts (including subgrants or subcontracts) which were received since October 1, 1994, from the Department of the Interior by the organization(s) which you represent at this hearing, including the source and amount of each grant or contract:

No

3. Any other information you wish to convey to the committee which might aid the members of the Committee to better understand the contest of your testimony:

No