2

3

reduced 14% Base Year and 17% Ten-Year Forecast, which represent minor to moderate beneficial changes in impacts compared to Alternative A.

For areas near Blue-2 and Green-4 routes (West End's northern portion), localized long- and short-term
impacts would be moderate to major adverse (from Figures 4.5 to 4.12, Average Sound Level would be 40 to 50
dBA, Percent Time Audible would be greater than 65%), with negligible change in impacts compared to
Alternative A. In West End's southern portion, localized long-term impacts would be negligible to minor
adverse (from Figures 4.10 to 4.17, Average Sound Level would be 10 to 20 dBA, Percent Time Audible would
be less than 20%), with negligible change in impacts compared to Alternative A.

	0010000000000000000000000000000000000	in negligiere enange in impuets compared to ritternative	1.					
10								
11	West End	Alternative E	Soundscape					
12	Base Year and Ten-Year I	Forecast Off-Peak Season						
13	For West End Locati	on Points, results for Base Year and Ten-Year Forecast	t Off-Peak Season are very similar,					
14	and also similar to Pea	k Season. Because operation growth is anticipated Ten-	-Year Forecast, and Alternative E					
15	quiet-technology incentives and conversion requirements would provide some mitigation with a decrease in							
16	affected area size, tho	se areas still affected would see an increase in localized	impacts. Overall impacts would					
17	see reduction in Perce	nt Time Audible of 5 to 10% and one dBA Average Sou	ind Level reduction compared to					
18	Base Year, and a reduction in Percent Time Audible of 12 to 17% and 2 to 4 dBA Average Sound Level							
19	compared to Alternati	ve A. There would be moderate to major adverse impact	ts in West End's northern					
20	portion near air-tour i	outes (a minor beneficial change in impacts from Altern	native A), and negligible to minor					
21	adverse impacts in W	est End's southern portion away from routes (a neglig	ible to moderate beneficial change					
22	from Alternative A).							
23	NIDO LL-SAR OED A		S					
24	NPS Units in SFRA	Alternative E	Soundscape					
25	Outside Grand Canyon	National Park						
20	For NDS lands dimestly w	nday and within five wiles of Dive Direct Dive 2 and	Crean A restan (Laka Maad					
21	National Pecreation Area	and Grand Canyon Parashant National Monument) im	Green-4 routes (Lake Meau					
20	(Average Sound Level 40	to 50 dBA impacts to these lands as a result of modifi	and Blue Direct routes would shift					
30	from more remote and set	witive Wilderness areas in Grand Canyon-Parashant Na	tional Monument's southern					
31	nortion to somewhat less	sensitive areas in the Monument's more northern areas	Also due to elimination of Blue					
32	Direct South some aircra	ft would likely fly outside the SFRA south along existin	g airways Because growth in					
33	operations is anticipated 7	Cen-Year Forecast and although Alternative E quiet-tec	hnology incentives and conversion					
34	requirements would provi	de some mitigation with decreased affected area size, th	ose areas still affected would see					
35	an increase in localized in	npacts. The remainder of the SFRA outside GCNP we	ould experience Average Sound					
36	Level less than 25 dBA. I	localized long- and short-term impacts would be minor	adverse. As with GCNP, the SFRA					
37	as a whole would benefit	from Alternative E quiet-technology incentives and con	version requirements.					
38		1 0.	*					

39 Cumulative Impacts

Noise from aircraft flying over 18,000 feet and/or outside the SFRA, when combined with 1) noise from other
sources on the ground as discussed in Alternative A, and 2) noise generated from aircraft under Alternative E as
discussed above, would continue to have long-term moderate to major adverse cumulative impacts on Soundscape
throughout all four areas (Marble Canyon, East End, Central, and West End), similar to cumulative impacts
described for Alternative A. Quiet-technology incentives and conversion requirements under Alternative E would
mitigate a small amount of those impacts over the Ten-Year Forecast period.

Alternative E

48 Conclusion

49 50 As further explained in Chapter 4's Socioeconomic Environment, fewer flight operations are expected in Alternative

Alternative E

51 E than in other Alternatives, so Soundscape would also benefit from less noise from fewer operations. Because 52 Alternative E includes quiet-technology incentives and conversion requirements, noise impacts would decrease

Alternative E includes quiet-technology incentives and conversion requirements, noise impacts would decrease resulting in negligible to moderate beneficial changes in impacts Base Year to Ten-Year Forecast in the park as a

- 54 whole.
- 55

Soundscape

Soundscape

- 1 Base Year would achieve Substantial Restoration of Natural Quiet in 75% of the park Peak Season, and 78% Off-
- 2 Peak Season. These represent moderate beneficial changes in impacts compared to Alternative A with a 20%

3 increase in park area restored Peak Season, and a 23% increase Off-Peak Season.

Ten-Year Forecast, Substantial Restoration of Natural Quiet would be achieved in 84% of the park Peak Season, and
86% of the park Off-Peak Season. These represent major beneficial changes in impacts compared to Alternative A
with a 31% increase in park area restored Peak Season, and a 33% increase Off-Peak Season.

8 9 **Conclusion by Zone** Alternative E Soundscape 10 Ten-Year Forecast Peak Season Wilderness Zone (about 94% of GCNP; area of moderate to major adverse impacts would be 11 to 24% of the 11 Zone, a major beneficial change in impacts (32 to 37% reduction in area of moderate to major adverse impacts) 12 13 compared to Alternative A. 14 15 Non-Wilderness Zone (about 4% of GCNP); area of moderate to major adverse impacts would be 15 to 39% of the Zone, a major beneficial change in impacts (47 to 74% reduction in area of moderate to major adverse 16 17 impacts) compared to Alternative A. 18 19 Developed Zone (about 2% of GCNP); area of moderate to major adverse impacts would be 12 to 58% of the 20 Zone, a major beneficial change in impacts (37 to 86% reduction in area of moderate to major adverse impacts) 21 compared to Alternative A. 22 23 **Conclusion by Area Alternative E** Soundscape 24 Base Year and Ten-Year Forecast 25 In Marble Canyon, Central, and West End (southern portions), localized long- and short-term adverse impacts 26 would generally be negligible to minor adverse with negligible to moderate beneficial changes in impacts 27 compared to Alternative A. Greatest noise exposure would occur in East End where long- and short-term impacts 28 would generally be moderate to major adverse in areas under and near air-tour routes in the seasonally active 29 Corridor, with negligible change in impacts compared to Alternative A. However, in East End areas near 30 seasonally inactive air-tour routes and amid Flight-free Zones, there would be negligible to minor adverse 31 impacts with moderate to major beneficial change in impacts compared to Alternative A. In West End's northern 32 portion with air-tour routes, there would be moderate to major adverse impacts with minor beneficial changes in 33 impacts compared to Alternative A. 34 35 **Alternative E** Soundscape **Cumulative Impacts Summary** 36 37 Cumulative impacts from all actions would be long-term moderate to major adverse, due primarily to high levels of 38 aircraft audibility. 39 40 ALTERNATIVE F **MODIFIED CURRENT CONDITIONS** SOUNDSCAPE 41 42 Base Year Peak and Off-Peak Season, Alternative F modifies West End tour routes to alleviate noise at Eagle and 43 Guano Point Location Points, and seasonally shifts Dragon Corridor routes. Alternative F would achieve Substantial 44 Restoration of Natural Quiet in 51% of the park Peak Season, and 59% of the park Off-Peak Season, as shown in 45 Table 4.23. These represent negligible changes in impacts from Alternative A with a 4% decrease in park area 46 restored Peak Season, and a 4% increase Off-Peak Season. 47 48 Ten-Year Forecast Peak and Off-Peak Season Substantial Restoration of Natural Quiet would be achieved in 66% of 49 the park Peak Season, and 75% of the park Off-Peak Season as shown in Table 4.24. These represent moderate 50 beneficial changes in impacts from Alternative A with a 13% increase in park area restored Peak Season, and a 22% 51 increase Off-Peak Season. 52 53 Mapped results of Alternative F noise modeling for Percent Time Audible and Average Sound Level are shown in 54 Figures 4.18 to 4.25. Tables 4.11 to 4.16 present Contour Analysis and Location Point results computed for 55 Alternative F Peak and Off-Peak Seasons, respectively, and include comparisons with Alternative A. 56



FIGURE 4.19 ALTERNATIVE F PERCENT TIME AUDIBLE TEN-YEAR FORECAST PEAK SEASON









FIGURE 4.21 ALTERNATIVE F PERCENT TIME AUDIBLE TEN-YEAR FORECAST OFF-PEAK SEASON





FIGURE 4.23 ALTERNATIVE F AVERAGE SOUND LEVEL TEN-YEAR FORECAST PEAK SEASON





FIGURE 4.24 ALTERNATIVE F AVERAGE SOUND LEVEL BASE YEAR OFF-PEAK SEASON

FIGURE 4.25 ALTERNATIVE F AVERAGE SOUND LEVEL TEN-YEAR FORECAST OFF-PEAK SEASON



TABLE 4.11	ALTER Peak S	NATIVE F SEASON ^{abc}	PERCENT TIME AUD		DIBLE	DIBLE CONTOUR ANALYSIS RESULTS				
	Base Year (Percent of Zone)			Ten-`	Year Forecast	(Percent of Z	lone)			
Percent Percent Time Audible	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP		
Percent Park Restored				51%				66%		
≥ 25	89%	80%	47%	49%	29%	30%	34%	34%		
10 to < 25	6%	7%	8%	8%	26%	19%	12%	13%		
5 to < 10	3%	4%	5%	5%	24%	19%	5%	6%		
> 0 to < 5	2%	10%	40%	38%	21%	31%	47%	46%		
		% of Zone D	ifference in T	AUD Contour	Results with	Alternative A				
≥ 25	-1%	-1%	-4%	-3%	61%	50%	11%	13%		
10 to < 25	0%	1%	3%	3%	-21%	-13%	-2%	-3%		
5 to < 10	-2%	-1%	1%	1%	-23%	-17%	0%	-1%		
> 0 to < 5	2%	1%	0%	0%	-17%	-20%	-8%	-9%		

^aDue to rounding differences, totals in this table may differ from Appendix D by up to 2%

^bBecause limited ambient data were available outside GCNP, contours for Percent Time Audible were computed only in GCNP boundaries; Average Sound Level contours were computed in the entire SFRA

^cColumns do not always sum to 100% because contours include blank areas to indicate where aircraft noise was not audible or was below 0 dBA

1 2

FABLE 4.12	ALTERNATIVE F	Average Sound Level	CONTOUR ANALYSIS RESULTS
	PEAK SEASON ^{ab}		

		Base Year (F	Percent of Zo		Ter	1-Year Forec	ast (Percent	of Zone)		
Average Sound Level	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	In SFRA	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	In SFRA
≥35	10%	21%	17%	17%	15%	5%	13%	14%	14%	13%
25 to < 35	58%	38%	15%	16%	15%	19%	23%	14%	14%	14%
15 to < 25	30%	28%	20%	20%	27%	67%	37%	20%	21%	26%
> 0 to < 15	3%	14%	45%	44%	41%	10%	27%	49%	48%	44%
	Percen	t of Zone Diff	ference in Av	verage So	ound Lev	vel Contour 1	Results with A	Alternative A		
≥35	0%	0%	-2%	-2%	-1%	19%	19%	8%	9%	1%
25 to < 35	-4%	-1%	-3%	-2%	1%	56%	35%	12%	14%	7%
15 to < 25	4%	1%	2%	2%	0%	-65%	-27%	19%	16%	14%
> 0 to < 15	0%	0%	2%	2%	-1%	-10%	-27%	-36%	-35%	-20%

^aDue to rounding differences, totals shown in this table may differ from Appendix D by up to 2%.

^bColumns do not always sum to 100% because contours include blank areas to indicate where aircraft noise was not audible or was below 0 dBA

TABLE 4.13AI		TERNAT	IVE F	LOC	JLTS PEAK SEASON						
Taatia	Da:			Base Year	•		Ten-Year Forecast				
Grou	i Point ping	TAUD ^b	LAeq12 ^c	TALA35 dBA ^d	TALA45 dBA ^d	TALA55 dBA ^d	TAUD	L _{Aeq12}	TALA35 dBA	TALA45 dBA	TALA55 dBA
Markla	Max	3%	24 dBA	1%	0%	0%	3%	24 dBA	1%	0%	0%
Convon	Median	2%	14 dBA	0%	0%	0%	2%	15 dBA	0%	0%	0%
Callyon	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
	Max	100%	49 dBA	100%	51%	5%	98%	46 dBA	100%	38%	3%
East End	Median	64%	28 dBA	5%	0%	0%	25%	24 dBA	0%	0%	0%
	Min	0%	7 dBA	0%	0%	0%	0%	2 dBA	0%	0%	0%
	Max	12%	25 dBA	2%	0%	0%	21%	26 dBA	4%	0%	0%
Central	Median	1%	8 dBA	0%	0%	0%	1%	9 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
West End	Max	91%	47 dBA	66%	24%	4%	85%	46 dBA	60%	23%	3%
	Median	17%	17 dBA	0%	0%	0%	14%	18 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
All	Max	100%	49 dBA	100%	51%	5%	98%	46 dBA	100%	38%	3%
Location	Median	4%	17 dBA	0%	0%	0%	3%	16 dBA	0%	0%	0%
Points	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
			Differen	ce in Loca	tion Points	Results w	ith Alterr	native A			
Markla	Max	0%	0 dBA	0%	0%	0%	0%	1 dBA	0%	0%	0%
Canyon	Median	0%	0 dBA	0%	0%	0%	0%	1 dBA	0%	0%	0%
Callyon	Min	0%	0 dBA	0%	0%	0%	0%	2 dBA	0%	0%	0%
	Max	0%	0 dBA	0%	0%	0%	2%	3 dBA	0%	19%	2%
East End	Median	0%	0 dBA	0%	0%	0%	42%	5 dBA	6%	0%	0%
	Min	0%	-1 dBA	0%	0%	0%	0%	4 dBA	0%	0%	0%
	Max	10%	2 dBA	2%	0%	0%	5%	1 dBA	1%	0%	0%
Central	Median	0%	2 dBA	0%	0%	0%	1%	1 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
	Max	2%	1 dBA	6%	4%	0%	10%	2 dBA	21%	10%	2%
West End	Median	1%	4 dBA	0%	0%	0%	7%	4 dBA	1%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
All	Max	0%	0 dBA	0%	0%	0%	2%	3 dBA	0%	19%	2%
Location	Median	5%	0 dBA	0%	0%	0%	7%	2 dBA	0%	0%	0%
Points	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%

^aMax refers to maximum Location Point value for a Location Point grouping for each respective specific metric; conversely, Min refers to minimum Location Point value. The median characterizes the central tendency of the results. That is, 50% of results are above the median; 50% below. The median, as opposed to the arithmetic mean, is more appropriate for data not normally distributed

^bTAUD = Percent Time Audible

 $^{c}L_{Aeq12}$ = Average Sound Level

 $d^{T}ALA35 dBA$, TALA45 dBA, and TALA55 dBA = Percent of time during the 12-hour day used in this analysis that aircraft sounds exceed 35, 45, and 55 dBA, respectively

1 TABLE 4.14 ALTERNATIVE F PERCENT TIME AUDIBLE CONTOUR ANALYSIS RESULTS 2 OFF-PEAK SEASON^{ab} Percent Time Audible Contour Analysis Results

	E	Base Year (Pe	rcent of Zone)		Ten-Year Forecast (Percent of Zone)				
Percent ?ercent Time Audible	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	
% Park				59%				75%	
Restored				0770				1070	
≥ 25	51%	43%	41%	41%	4%	10%	25%	25%	
10 to < 25	28%	35%	13%	14%	35%	18%	17%	17%	
5 to < 10	11%	10%	7%	7%	28%	23%	8%	8%	
> 0 to < 5	10%	13%	39%	37%	33%	48%	50%	49%	
	Percent of	f Zone Differe	nce in Percen	t Time Audibl	le Contour Re	sults with Alt	ernative A		
≥25	37%	36%	3%	4%	86%	70%	19%	22%	
10 to < 25	-22%	-27%	-3%	-4%	-30%	-12%	-6%	-7%	
5 to < 10	-10%	-7%	-1%	-1%	-27%	-21%	-2%	-3%	
> 0 to < 5	-5%	-2%	1%	1%	-28%	-38%	-11%	-12%	

^aDue to rounding differences, totals in this table may differ from Appendix D by up to 2%

^bBecause limited ambient data were available outside GCNP, contours for Percent Time Audible were computed only in GCNP boundaries; Average Sound Level contours were computed in the entire SFRA

TABLE 4.15 Alternative F Average Sound Level Contour Analysis Results OFE-PEAK SEASON^a OFE-PEAK SEASON^a

	UFI	-I EAK SEAS								
		Base Year (I	Percent of Zon		Ten-Year Forecast (Percent of Zone)					
Average Sound Level	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	In SFRA	Developed Zone	Non- Wilderness Zone	Wilderness Zone	In GCNP	In SFRA
≥ 35	3%	7%	15%	14%	14%	2%	5%	11%	11%	11%
25 to < 35	18%	23%	15%	15%	13%	7%	13%	14%	14%	13%
15 to < 25	65%	34%	18%	19%	21%	62%	39%	18%	19%	22%
> 0 to < 15	15%	36%	47%	46%	47%	30%	42%	51%	51%	48%
	Perce	nt of Zone Di	fference in Av	verage So	ound Lev	vel Contour Re	sults with Alte	ernative A		
\geq 35	7%	14%	0%	1%	1%	22%	28%	11%	12%	3%
25 to < 35	37%	14%	-2%	-1%	2%	68%	44%	12%	14%	8%
15 to < 25	-32%	-6%	3%	3%	6%	-60%	-30%	21%	18%	19%
> 0 to < 15	-12%	-22%	1%	0%	-6%	-30%	-42%	-38%	-38%	-23%

^aDue to rounding differences, totals in this table may differ from Appendix D by up to 2%

TABLE 4.1	6 A	LTERNAT	ATIVE F LOCATION POINT RESULTS				ULTS	LTS OFF-PEAK SEASON ^a			
				Base Year				Ten	-Year Fore	ecast	
Location Group	Location Point Grouping		L _{Aeq12} (dBA) ^c	TALA35 dBA (%) ^d	TALA45 dBA (%) ^d	TALA55 dBA (%) ^d	TAUD (%)	L _{Aeq12} (dBA)	TALA35 dBA (%)	TALA45 dBA (%)	TALA55 dBA (%)
M. 11.	Max	1%	13 dBA	0%	0%	0%	1%	13 dBA	0%	0%	0%
Canyon	Median	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
Callyon	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
	Max	95%	49 dBA	37%	14%	5%	83%	47 dBA	36%	11%	4%
East End	Median	28%	21 dBA	0%	0%	0%	11%	17 dBA	0%	0%	0%
	Min	0%	3 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
	Max	25%	24 dBA	2%	0%	0%	17%	26 dBA	3%	0%	0%
Central	Median	1%	7 dBA	0%	0%	0%	1%	9 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
West End	Max	90%	46 dBA	68%	23%	4%	81%	45 dBA	62%	21%	3%
	Median	15%	17 dBA	0%	0%	0%	11%	17 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
All	Max	95%	49 dBA	68%	23%	5%	83%	47 dBA	62%	21%	4%
Location	Median	5%	13 dBA	0%	0%	0%	2%	13 dBA	0%	0%	0%
Points	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
			Differen	ce in Loca	tion Point	s Results v	with Altern	native A			
Markla	Max	2%	11 dBA	1%	0%	0%	2%	12 dBA	1%	0%	0%
Canyon	Median	1%	14 dBA	0%	0%	0%	2%	16 dBA	0%	0%	0%
Callyon	Min	0%	0 dBA	0%	0%	0%	0%	2 dBA	0%	0%	0%
	Max	5%	0 dBA	63%	37%	0%	17%	2 dBA	64%	46%	1%
East End	Median	36%	7 dBA	5%	0%	0%	56%	11 dBA	6%	0%	0%
	Min	0%	3 dBA	0%	0%	0%	0%	7 dBA	0%	0%	0%
	Max	-3%	3 dBA	2%	0%	0%	8%	2 dBA	1%	0%	0%
Central	Median	0%	2 dBA	0%	0%	0%	0%	2 dBA	0%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
	Max	3%	1 dBA	3%	6%	1%	14%	2 dBA	20%	12%	3%
West End	Median	4%	5 dBA	0%	0%	0%	11%	5 dBA	1%	0%	0%
	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%
All	Max	5%	0 dBA	32%	28%	0%	17%	2 dBA	38%	36%	1%
Location	Median	3%	3 dBA	0%	0%	0%	8%	5 dBA	0%	0%	0%
Points	Min	0%	0 dBA	0%	0%	0%	0%	0 dBA	0%	0%	0%

^aThe average used in this context is characterized by the media—the central tendency of the results. That is, 50% of results are above the median; 50% are below. The median, as opposed to the arithmetic mean, is more appropriate for data not normally distributed

^bTAUD = Percent Time Audible

 $^{c}L_{Aeq12} = Average Sound Level$

 d TALA35 dBA, TALA45 dBA, and TALA55 dBA = Percent of time during the 12-hour day used in this analysis that aircraft sounds exceed 35, 45, and 55 dBA, respectively

Developed Zone (about 2% of GCNP) Alternative F

Soundscape

6 With exception of a very small Developed Zone area at Tuweep, all GCNP Developed Zone areas are in East End.
7 Audibility calculations for the Developed Zone included 10 dBA added to natural ambient sound levels due to the
8 Dual-Zone System acoustic approach explained in Chapter 4, Methodology. As such, analysis considers Developed
9 Zone management objectives which accept presence of many non-natural sound sources (increased background
10 ambient sound levels) including most of the park's visitors and their activities, presence of paved roads and
11 motorized transportation, and developed facilities.

1 Alternative F Developed Zone Soundscape 2 Base Year Peak Season 3 Average Sound Level would generally be 25 dBA or more in 68% of the Developed Zone; that is, Average 4 Sound Level would be 25 to 35 dBA in 58% of the Zone (moderate adverse impact), and greater than 35 dBA in 5 10% of the Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 95% of the 6 Zone; that is, 10 to 25% in 6% of the Zone (moderate adverse impact), and greater than 25% in 89% of the Zone 7 (major adverse impact). This would represent a negligible change of 4% in area with Average Sound Level of 25 8 dBA or more and a negligible change of one percent in area of 10% or more Percent Time Audible compared to 9 Alternative A (a negligible change in areas of moderate to major adverse impact), resulting in a negligible 10 change in impacts compared to Alternative A. 11 12 Developed Zone Alternative F Soundscape 13 Base Year Off-Peak Season 14 Average Sound Level would generally be greater than 25 dBA in 34% of the Zone; that is, Average Sound Level 15 would be 25 to 35 dBA in 37% of the Zone (moderate adverse impact), and greater than 35 dBA in 7% of the Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 79% of the Zone; that 16 17 is, 10 to 25% in 28% of the Zone (moderate adverse impact), and greater than 25% in 51% of the Zone (major 18 adverse impact). This would represent a reduction of 44% in area with Average Sound Level of 25 dBA or more 19 and a reduction of 15% in area of 10% or more Percent Time Audible compared to Alternative A (a 15 to 44% 20 reduction in areas of moderate to major adverse impacts), resulting in a moderate to major beneficial change in 21 impacts compared to Alternative A. 22 23 Alternative F Developed Zone Soundscape 24 Ten-Year Forecast Peak Season 25 Average Sound Level would generally be greater than 25 dBA in 24% of the Zone; that is, Average Sound Level 26 would be 25 to 35 dBA in 19% of the Zone (moderate adverse impact), and greater than 35 dBA in 5% of the 27 Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 55% of the Zone; that 28 is, 10 to 25% in 26% of the Zone (moderate adverse impact), and greater than 25% in 29% of the Zone (major 29 adverse impact). This would represent a reduction of 75% in area with Average Sound Level of 25 dBA or more, 30 and a reduction of 40% in area of 10% or more Percent Time Audible compared to Alternative A (a 40 to 75% 31 reduction in areas of moderate to major adverse impact), resulting in a major beneficial change in impacts 32 compared to Alternative A. 33 34 Developed Zone Alternative F Soundscape Ten-Year Forecast Off-Peak Season 35 36 Average Sound Level would generally be greater than 25 dBA in 9% of the Zone; that is, Average Sound Level 37 would be 25 to 35 dBA in 7% of the Zone (moderate adverse impact), and greater than 35 dBA in 2% of the 38 Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 39% of the Zone; that 39 is, between 10 and 25% in 35% of the Zone (moderate adverse impact), and greater than 25% in 4% of the Zone 40 (major adverse impact). This would represent a reduction of 90% in area with Average Sound Level of 25 dBA 41 or more, and a reduction of 56% in area of 10% or more Percent Time Audible compared to Alternative A (a 56 42 to 90% reduction in areas of moderate to major adverse impact), resulting in a major beneficial change in 43 impacts compared to Alternative A. 44 45 Non-Wilderness Zone (6% of GCNP) Alternative F Soundscape 46 47 Almost all Non-Wilderness Zone areas are located in East End (exceptions are a few Central area dirt road

48 corridors). A portion of the Non-Wilderness Zone is in the Dual-Zone System area where 10 dBA is added to natural
 49 ambient sound levels for audibility calculations; this portion is generally close to Developed Zone areas with
 50 motorized noise sources, although there is a strip of Non-Wilderness Zone on Marble Canyon's east side. The

51 majority of the Non-Wilderness Zone is in the area where natural ambient sound levels are used directly as the basis

for audibility calculations, consistent with Non-Wilderness Zone management objectives that call for mostly natural conditions to prevail in the Zone.

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1	Non-Wilderness Zone	Alternative F	Soundscape
2	Base Year Peak Season		
3	Average Sound Level would ge	enerally be 25 dBA or more in 59% of the	he Zone; that is, Average Sound Level
4	Zono (mojor odvorco impost)	Doroant Time, Audible would concrethe h	, and greater than 55 dBA in 21% of the
5	z_{one} (major adverse impact). I	referent Time Audible would generally b	be 10% of more in 87% of the Zone, that
07	is, 10% to 25% in 7% of the Zo	one (moderate adverse impact), and great	ater than 23% in 80% of the Zone (inajor
0	25 dPA or more and in area of	10% or more Percent Time Audible cov	marad to Alternative A (a nagligible
0	change in areas of moderate to	nove adverse impact) resulting in a ne	adjugible change in impacts compared to
10	Alternative A	major adverse impact), resulting in a ne	egngible change in impacts compared to
11	Alternative A.		
12	Non-Wilderness Zone	Alternative F	Soundscape
13	Rase Year Off-Peak Season	211101 mattive 1	Soundscupe
14	Average Sound Level would ge	enerally be greater than 25 dBA in 30%	of the Zone: that is Average Sound Level
15	would be 25 to 35 dBA in 23%	of the Zone (moderate adverse impact)	and greater than 35 dBA in 7% of the
16	Zone (major adverse impact).	Percent Time Audible would generally h	be 10% or more in 78% of the Zone: that
17	is, 10 to 25% in 35% of the Zo	ne (moderate adverse impact) and great	er than 25% in 43% of the Zone (major
18	adverse impact). This would re	epresent a reduction of 28% in area with	Average Sound Level of 25 dBA or more
19	and a reduction of 9% in area of	of 10% or more Percent Time Audible co	ompared to Alternative A (a 9 to 28%
20	reduction in areas of moderate	to major adverse impact), resulting in a	minor to moderate beneficial change in
21	impacts compared to Alternativ	ve A.	-
22			
23	Non-Wilderness Zone	Alternative F	Soundscape
24	Ten-Year Forecast Peak Season		
25	Average Sound Level would g	enerally be greater than 25 dBA in 36%	of the Zone; that is, Average Sound Level
26	would be 25 to 35 dBA in 23%	of the Zone (moderate adverse impact)	and greater than 35 dBA in 13% of the
27	Zone (major adverse impact). I	Percent Time Audible would generally b	be 10% or more in 49% of the Zone; that $\frac{1}{2}$
28	18, 10 to 25% in 19% of the Zo	ne (moderate adverse impact) and greate	er than 25% in 30% of the Zone (major
29	adverse impact). This would re	epresent a reduction of 54% in area with	Average Sound Level of 25 dBA of more
30	reduction in areas of moderate	to major adverse impact) resulting in a	major beneficial change in impacts
32	compared to Alternative A	to major adverse impact), resulting in a	major beneficial change in impacts
33	compared to Attendative At.		
34	Non-Wilderness Zone	Alternative F	Soundscape
35	Ten-Year Forecast Off-Peak Seaso	on	1
36	Average Sound Level would g	enerally be greater than 25 dBA in 18%	of the Zone; that is, Average Sound Level
37	would be 25 to 35 dBA in 13%	of the Zone (moderate adverse impact)	and greater than 35 dBA in 5% of the
38	Zone (major adverse impact). I	Percent Time Audible would generally b	be 10% or more in 28% of the Zone; that
39	is, 10 to 25% in 18% of the Zo	ne (moderate adverse impact) and greate	er than 25% in 10% of the Zone (major
40	adverse impact). This would re	present a reduction of 72% in area with	Average Sound Level of 25 dBA or more
41	and a reduction of 58% in area	of 10% or more Percent Time Audible	compared to Alternative A (a 58 to 72%
42	reduction in areas of moderate	to major adverse impact), resulting in a	major beneficial change in impacts
43	compared to Alternative A.		
44	W'll leave and 7 and (all and 0.40/ all	C(ND) Alternative F	
45	wilderness Zone (about 94% of	GCNP) Alternative F	Soundscape
40	In the Wilderness Zone, results var	ry to a greater degree than in Developed	and Non-Wilderness Zones due to the
47	Wilderness Zone's increased size	and geographic extent as compared to the	and Non- white mess Zones due to the
49	in the area where natural ambient	sound levels are used directly in audibili	ity calculations in the Dual-Zone System
50	acoustic approach to noise modeli	ng Exceptions are West End and Marbl	e Canvon
51			
52	Wilderness Zone	Alternative F	Soundscape
53	Base Year Peak Season		*
54	Average Sound Level would ge	enerally be greater than 25 dBA in 32%	of the Zone; that is, Average Sound Level
55	would be 25 to 35 dBA in 15%	o of the Zone (moderate adverse impact)	and greater than 35 dBA in 17% of the
56	Zone (major adverse impact). I	Percent Time Audible would generally b	be 10% or more in 55% of the Zone; that

Wilderness Zone

Wilderness Zone

Marble Canyon

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39 40 Soundscape

Soundscape

Soundscape

is, 10 to 25% in 8% of the Zone (moderate adverse impact) and greater than 25% in 47% of the Zone (major adverse impact). This would represent an increase of 5% in area with Average Sound Level of 25 dBA or more and an increase of one percent in area of 10% or more Percent Time Audible compared to Alternative A (a one to 5% increase in areas of moderate to major adverse impact), resulting in a negligible to minor adverse change in impacts compared to Alternative A.

Alternative F

Base Year Off-Peak Season
Average Sound Level would generally be greater than 25 dBA in 30% of the Zone; that is, Average Sound Level would be 25 to 35 dBA in 15% of the Zone (moderate adverse impact) and greater than 35 dBA in 15% of the Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 54% of the Zone; that is, 10 to 25% in 13% of the Zone (moderate adverse impact) and greater than 25% in 41% of the Zone (major adverse impact). This would represent a negligible change (2 dBA and 3%) in area with Average Sound Level of 25 dBA or more and in area of 10% or more Percent Time Audible compared to Alternative A (a negligible change in areas of moderate to major adverse impact), resulting in a negligible change in impacts compared to Alternative A.

18 Wilderness Zone Alternative F Soundscape 19 Ten-Year Forecast Peak Season 20 Average Sound Level would generally be 25 dBA or more in 28% of the Zone; that is, Average Sound Level 21 would be 25 to 35 dBA in 14% of the Zone (moderate adverse impact) and greater than 35 dBA in 14% of the 22 Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 46% of the Zone; that 23 is, 10 to 25% in 12% of the Zone (moderate adverse impact) and greater than 25% in 34% of the Zone (major 24 adverse impact). This would represent a 20% reduction in area with Average Sound Level of 25 dBA or more 25 and a reduction of 9% in area of 10% or more Percent Time Audible compared to Alternative A (a 9 to 20% 26 reduction in areas of moderate to major adverse impact), resulting in a minor beneficial change in impacts 27 compared to Alternative A. 28

Alternative F

Ten-Year Forecast Off-Peak Season Average Sound Level would generally be greater than 25 dBA in 25% of the Zone; that is, Average Sound Level would be 25 to 35 dBA in 14% of the Zone (moderate adverse impact) and greater than 35 dBA in 11% of the Zone (major adverse impact). Percent Time Audible would generally be 10% or more in 42% of the Zone; that is, 10 to 25% in 17% of the Zone (moderate adverse impact) and greater than 25% in 25% of the Zone (major adverse impact). This would represent a reduction of 23% in area with Average Sound Level of 25 dBA or more and a reduction of 13% in area of 10% or more Percent Time Audible compared to Alternative A (a 13 to 23% reduction in areas of moderate to major adverse impact), resulting in a minor to moderate beneficial change in impacts compared to Alternative A.

Marble Canyon's west side is located in the Wilderness Zone; the east side in the Non-Wilderness Zone. It is also
entirely in the Dual-Zone System noticeability area in which 10 dBA is added to natural ambient sound levels in
calculating Percent Time Audible (Chapter 4, Methodology). Modifications to air-tour routes in Alternative F would
have minimal effect in Marble Canyon

Alternative F

47 Marble Canvon Alternative F Soundscape 48 Base Year and Ten-Year Forecast Peak Season 49 Localized long- and short-term adverse impacts would be similar to Alternative A Base Year and Ten-Year 50 Forecast. Marble Canvon Location Points, Base Year Peak Season, range zero to 3% Percent Time Audible (median 2%), and Average Sound Level zero to 24 dBA (median 14 dBA). Impacts would generally be 51 negligible to minor adverse in these areas (from Figures 4.18 to 4.25, Average Sound Level would generally be 52 53 less than 15 dBA and Percent Time Audible less than 5%). There would be negligible increases (Percent Time Audible of one percent and Average Sound Level one dBA) Base Year to Ten-Year Forecast, a negligible 54 55 change from Alternative A. 56

1	Marble Canvon	Alternative F	Soundscape					
2	Rase Year and Ten-Year F	orecast Off-Peak Season	Soundscupe					
3	Percent Time Audible a	and Average Sound Level would be less than Peak Sea	ason with Marble Canvon					
4	Location Points experi	iencing Percent Time Audible of zero to one percent (1	median zero percent) and Average					
5	Sound Level zero to 13	dBA (median zero dBA), with almost no change betw	veen Base Year and Ten-Year					
6	Forecast. These values	represent negligible impacts in Marble Canvon and ne	gligible to minor beneficial changes					
7	in impacts compared to	Alternative A (one percent less median Percent Time	Audible and 14 to 16 dBA lower					
8	Average Sound Level).							
9	-							
10	East End	Alternative F	Soundscape					
11								
12	Under Alternative F, greate	est exposure to noise and visual impacts would continu	ue in East End. Dragon Corridor's					
13	seven-mile western shift O	off-Peak Season would shift impacts seven-miles west.	East End contains all three					
14	Management Zones: Devel	loped, Non-Wilderness, and Wilderness.						
15								
16	East End air-tour aircraft P	ercent Time Audible would vary zero to 100% of the	day, and Average Sound Level 3					
17/ 10	dBA to 49 dBA, depending	g on how close a Location Point is to East End air-tour	routes, and whether it is Peak					
18	Season when routes are the	e same as Alternative A, or Off-Peak Season when Dra	agon Corridor routes shift seven-					
19	miles west.							
20	Fast Fnd	Alternative F	Soundscape					
21	Base Year Peak Season	Allemative T	Soundscupe					
23	East End Location Po	ints Percent Time Audible would range zero to 100%	(median 64%) and 7 to 49 dBA					
24	(median 28 dBA). At se	ome locations, aircraft events would exceed 35 dBA for	or 100% of the day, 45 dBA for					
25	51% of the day, and 55	dBA for 5% of the day. Localized long- and short-ter	m major adverse impacts would					
26	continue in areas close to Zuni Point and Dragon Corridor routes, and routes over North Rim (from Figures 4 18							
27	to 4.25, aircraft Average Sound Level would be 40 to 50 dBA, and Percent Time Audible would be greater than							
28	65%). Although the majority of Location Points do not experience Average Sound Level greater than 35 dBA,							
29	several Location Points (96-mile Camp, The Basin, Eremita Mesa, Ten X Meadow, Tower of Ra) show							
30	Average Sound Level a	as high as 45 to 55 dBA for 5 to 51% of the day. Impac	cts would be long-term negligible to					
31	minor adverse amid Br	ight Angel Flight-free Zone. Values for Alternative F	Base Year Peak Season represent					
32	negligible change in im	pacts compared to Alternative A.						
33			~ · ·					
34	East End	Alternative F	Soundscape					
35	Base Year Off-Peak Season	n • • • • • • • • • • • • • • • • • • •						
36	East End Location Po	ints Percent Time Audible would range zero to 95% (median 28%), and 3 to 49 dBA a_{2}					
20 20	(illegial 21 gBA). At so	for 50/ of the day. Decause this represents a reduction	of 37% of the day, 43 dBA for 14%					
30	Audible and a 5% redu	action in maximum Percent Time Audible due to Drag	on Corridor's western shift Off-					
40	Peak Season this woul	d be a minor to major beneficial change in East End ir	mpacts compared to Alternative A					
41	Localized long- and sh	ort-term impacts would be major adverse in areas near	the shifted Dragon Corridor Zuni					
42	Point Corridor and rou	ites across North Rim (from Figures 4 18 to 4 25 aircr	aft Average Sound Level would be					
43	40 to 50 dBA, and Perc	cent Time Audible would be greater than 75%), and ne	egligible to minor adverse amid					
44	Bright Angel Flight-fre	e Zone. Bright Angel Flight-free Zone's eastern portic	on would experience markedly					
45	reduced air-tour sounds	s Off-Peak Season, while locations closer to Dragon C	orridor (near Point Sublime and					
46	Pasture Wash Locatio	n Points) would see only modest reductions.						
47		-						
48	East End	Alternative F	Soundscape					
49	Ten-Year Forecast Peak Se	eason						
50	East End Location Po	ints Percent Time Audible would range zero to 98% (median 25%); Average Sound					
51	Level would range 2 dl	3A to 46 dBA (median 24 dBA). This represents a red	uction of 39% in median Percent					
52	I ime Audible from Ba	se year to Ten-Year Forecast, and a reduction of 42%	in median Percent Time Audible					
55 54	compared to Alternativ	e A, que in large part to Alternative F quiet-technolog	y conversion requirements. There					
54	would be moderate to r	najor adverse impacts under and near Dragon and Zun	IT FORT COTTIONS and across morth					

would be moderate to major adverse impacts under and near Dragon and Zuni Point Corridors and across North
 Rim (a moderate to major beneficial change from Alternative A), and negligible to minor adverse impacts away

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from active routes and amid Bright Angel Flight-free Zone (a negligible to minor beneficial change from Alternative A).

3 4 East End Alternative F Soundscape 5 Ten-Year Forecast Off-Peak Season 6 East End Location Point Percent Time Audible would range zero to 83% (median 11%), and Average Sound 7 Level zero to 47 dBA (median 17 dBA); compared to Base Year Off-Peak Season, an 11% reduction in median 8 Percent Time Audible, and a 12% reduction in maximum Percent Time Audible, but only a 4 dBA reduction in 9 median Average Sound Level. Compared to Alternative A, this represents a 56% reduction in median Percent 10 Time Audible, a 17% reduction in maximum Percent Time Audible, and an 11% reduction in median Average 11 Sound Level, due in large part to Alternative F quiet-technology conversion requirements. There would be moderate to major adverse impacts under and near Dragon and Zuni Point Corridors and across North Rim, 12 13 moderate to major beneficial change in impacts from Alternative A in areas where Dragon Corridor is shifted 14 from, but moderate to major adverse change in areas the Corridor is shifted to). There would also be negligible to 15 minor adverse impacts away from active routes and amid Bright Angel Flight-free Zone (negligible to moderate 16 beneficial change in impacts from Alternative A). 17 18 Central Alternative F Soundscape 19 20 The Central area is located in the Wilderness Zone, with exception of a few Non-Wilderness Zone dirt road 21 corridors, and a very small Developed Zone area at Tuweep. The Central area is entirely in the Dual-Zone System 22 audibility area in which natural ambient sound levels are used directly in audibility calculations. This area comprises 23 most of the Toroweap/Shinumo Flight-free Zone, and is transected by two general-aviation corridors. 24 25 In Central areas, as shown in Figures 4.18 to 4.25, aircraft Average Sound Level would be less than 10 dBA, and 26 Percent Time Audible would be less than 5%). 27 28 Central Alternative F Soundscape 29 Base Year Peak Season 30 Central area Location Points would range zero to 12% Percent Time Audible (median one percent), and zero 31 to 25 dBA (median 8 dBA). At some locations, aircraft events would exceed 35 dBA for 2% of the day. 32 Compared to Alternative A, Alternative F values represent a 10% reduction in maximum Percent Time Audible 33 (no change in median Percent Time Audible, and only a 2 dBA change in maximum and median Average Sound 34 Level). This represents negligible to minor adverse impacts with a negligible to minor beneficial change in 35 impacts compared to Alternative A. 36 37 Alternative F Central Soundscape 38 Base Year Off-Peak Season 39 Central area Location Points would range zero to 25% Percent Time Audible (median one percent), and 40 Average Sound Level zero to 24 dBA (median 7 dBA) representing negligible to minor adverse impacts with a 41 negligible change in impacts compared with Alternative A (3% and 3 dBA). 42 43 Central Alternative F Soundscape 44 Ten-Year Forecast Peak Season 45 Central area Location Points would range zero to 21% Percent Time Audible (median one percent), and zero 46 to 26 dBA (median 9 dBA). At some locations, aircraft events would exceed 35 dBA for 4% of the day. These 47 values represent negligible to minor adverse impacts with a negligible to minor beneficial change in impacts 48 compared to Alternative A. 49 50 Alternative F Central Soundscape 51 Ten-Year Forecast Off-Peak Season 52 Central area Location Points would range zero to 17% Percent Time Audible (median one percent), and 53 Average Sound Level zero to 26 dBA (median 9 dBA). At some locations, aircraft events would exceed 35 dBA 3% of the day. The values represent negligible to minor adverse impacts with a negligible to minor beneficial 54 55 change in impacts compared with Alternative A (8% and 2 dBA). 56

West End

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Alternative F

Soundscape

West End is located in the Wilderness Zone, and entirely in the Dual-Zone System noticeability area in which 10 dBA is added to natural ambient sound levels in audibility calculations. Impacts to West End areas tend to be very localized. Specifically, impacts range negligible to major depending on proximity to Blue Direct and Blue-2/Green-4 routes. Beneficial impacts to Soundscape would be provided for locations where Green-4's southern portion would be eliminated and where Blue Direct South shifts to avoid Eagle and Guano Points.

8 9 West End

Alternative F

Soundscape

Soundscape

10 Base Year Peak and Off-Peak Season

11 Base Year Peak Season, West End Location Points Percent Time Audible would range zero to 91% (median 12 17%), and Average Sound Level zero to 47 dBA (median 17 dBA). At some locations, aircraft events would 13 exceed 35 dBA 66% of the day, 45 dBA 24% of the day, and 55 dBA 4% of the day. Values for Base Year Off-14 Peak Season are within 2% and one dBA of Base Year Peak Season. For areas near Blue Direct and Blue-15 2/Green-4 routes (West End's northern portion), localized long- and short-term impacts would be major 16 adverse (from Figures 4.18 to 4.25, Average Sound Level would be 40 to 50 dBA, Percent Time Audible would 17 be greater than 65%). In West End's southern portion, localized long-term impacts would be negligible to 18 minor adverse (from Figures 4.18 to 4.25, Average Sound Level would be 10 to 20 dBA, Percent Time Audible 19 would be less than 20%). Minor beneficial changes in impacts from Alternative A would occur where Green-4's 20 southern portion would be eliminated. There would be an average decrease in Percent Time Audible throughout 21 this area (approximately 10%), but impacts would increase in the localized area at Horse Flat Canyon Location 22 Point with non-quiet-technology operations exiting the route (also Percent Time Audible approximately 10%). 23 There would also be localized short-term moderate adverse changes in impacts for locations such as Granite 24 **Peak** Location Point (Percent Time Audible would increase approximately 20%), with Blue Direct South's 25 southern shift to avoid Eagle and Guano Point Location Points. Conversely, there would also be localized 26 moderate beneficial changes in impacts for locations such as Andrus Canyon Location Point (Percent Time 27 Audible would decrease approximately 20%). These values represent negligible change in impacts compared to 28 Alternative A (a one to 4% reduction in median Percent Time Audible, and a 4 to 5 dBA reduction in median 29 Average Sound Level).

31 West End

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32 Ten-Year Forecast Peak Season

West End Location Points Percent Time Audible would range zero to 85% Percent Time Audible (median 14%), and Average Sound Level zero to 46 dBA (median 18 dBA). At some locations, aircraft events would exceed 35 dBA 60% of the day, 45 dBA 23% of the day, and 55 dBA 3% of the day. Similar levels and differences between **West End's northern and southern portions** would be as described for Base Year Peak Season. These values are generally slightly less than Base Year Peak Season. Compared to Alternative A, they represent a 7% reduction in median Percent Time Audible, and a 10% reduction in maximum Percent Time Audible, as well as a 4 dBA reduction in median Average Sound Level, due to quiet-technology conversion requirements in Alternative F. There would be moderate to major adverse impacts in the **northern area** near airtour routes (minor beneficial change in impacts from Alternative A), and negligible to minor adverse impacts in the **southern area** away from routes (negligible to minor beneficial change from Alternative A).

Alternative F

43 44 Alternative F West End Soundscape 45 Ten-Year Forecast Off-Peak Season 46 West End Location Points Ten-Year Forecast Off-Peak Season results are slightly lower than Ten-Year 47 Forecast Peak Season (3 to 4% less Percent Time Audible, one dBA lower Average Sound Level). Similar levels 48 and differences between West End's northern and southern portions would be as described for Base Year 49 Peak Season. Compared to Alternative A, they represent an 11% reduction in median Percent Time Audible, and 50 a 14% reduction in maximum Percent Time Audible, as well as a 5 dBA reduction in median Average Sound 51 Level. There would be moderate to major adverse impacts in the northern area near air-tour routes (minor 52 beneficial change in impacts from Alternative A), and negligible to minor adverse impacts in the southern area 53 away from routes (negligible to moderate beneficial change from Alternative A). 54

1 2 2	NPS Units in the SFRA Outside Grand Canyon Nation	Alternative F al Park	Soundscape
5 6 7 8 9 10 11 12 13	Blue Direct South's southern shift short-term moderate beneficial in Mead National Recreation Area a Audible would decrease approxin would provide some mitigation b increase in localized impacts due would experience Average Sound be considered minor adverse over technology incentives and conver	It to avoid Eagle and Guano Point Location P apacts for lands directly under and within f and Grand Canyon-Parashant National Monu- nately 20%. Alternative F quiet-technology in y decreasing affected area size; however, tho to growth in operations. The remainder of t d Level less than 25 dBA. Localized long- an rall to these lands. As with GCNP, the SFRA resion requirements Ten-Year Forecast.	Points provides localized long- and five miles of Blue Direct routes (Lake ment); specifically, Percent Time ncentives and conversion requirements areas still affected would see an the SFRA outside GCNP boundaries d short-term impacts would generally as a whole would benefit from quiet-
14 15	Cumulative Impacts	Alternative F	Soundscape
16 17 18 19 20 21	Noise from aircraft flying over 18 above, would continue to have lo all four park areas (Marble Canyo described for Alternative A. Quie mitigate a small amount of those	3,000 feet and/or outside the SFRA from airc ng-term moderate to major adverse cumulation, East End, Central, and West End), and SF et-technology incentives and conversion requi impacts Ten-Year Forecast.	raft under Alternative F as discussed we impacts on Soundscape throughout FRA similar to cumulative impacts irements under Alternative F would
22	Conclusion	Alternative F	Soundscape
23 24 25 26 27	Because Alternative F includes q decrease from Base Year to Ten- Percent Time Audible and Avera	uiet-technology incentives and conversion re Year Forecast in the park as a whole. Benefic ge Sound Level.	quirements, noise impacts would cial impacts would occur in both
28 29 30	Base Year Alternative F would as and 59% of the park Off-Peak Se decrease in park area restored Pea	chieve Substantial Restoration of Natural Qui ason. These represent negligible changes in i ak Season, and a 4% increase Off-Peak Seaso	iet in 51% of the park Peak Season, mpacts from Alternative A with a 4% on.
31 32 33 34	Ten-Year Forecast Substantial Re 75% of the park Off-Peak Season a 13% increase in park area resto	estoration of Natural Quiet would be achieved These represent moderate beneficial change red Peak Season, and a 22% increase Off-Pea	d in 66% of the park Peak Season, and es in impacts from Alternative A with ak Season.
35 36 37	Conclusion	Alternative F	Soundscape
37 38 39	Conclusion by Zone Ten-Year Forecast Peak Season	Alternative F	Soundscape
40 41 42 43	Wilderness Zone (about 94% Zone, a minor beneficial chan compared to Alternative A.	of GCNP); area of moderate to major adverse ge in impacts (9 to 20% reduction in area of	e impact would be 28 to 46% of the moderate to major adverse impacts)
44 45 46 47	Non-Wilderness Zone (about the Zone, a major beneficial c impacts) compared to Alterna	4% of GCNP); area of moderate to major adv hange in impacts (37 to 54% reduction in are tive A.	verse impact would be 36 to 49% of ea of moderate to major adverse
48 49 50 51	Developed Zone (about 2% of Zone, a major beneficial chan compared to Alternative A.	f GCNP); area of moderate to major adverse ge in impacts (40 to 75% reduction in area of	impact would be 24 to 55% of the f moderate to major adverse impacts)
52 53	Conclusion by Area Base Year and Ten-Vear Forces	Alternative F	Soundscape
55 54 55 56	In Marble Canyon, Central ard negligible to minor adverse (a Time Audible would be less th	 teas, West End (southern portions), localized incraft Average Sound Level would generally than 5%) with negligible to moderate beneficier 	long- and short-term impacts would be y be less than 15 dBA, and Percent ial changes in impacts compared to

SOUNDSCAPE

Alternative A depending on specific location. Greatest exposure to noise and visual impacts occur in East End 2 and West End's northern portion where long- and short-term moderate to major adverse impacts would occur (aircraft Average Sound Level would be 40 to 50 dBA, and Percent Time Audible would be greater than 65%), 4 with moderate to major beneficial changes in impacts compared to Alternative A East End, and minor beneficial changes in impacts compared to Alternative A West End. Negligible to minor adverse impacts would occur away 6 from active routes and amid Flight-free Zones with negligible to moderate beneficial change in impacts compared to alternative A East End. Beneficial impacts to Soundscape East End due to Dragon Corridor's sevenmile western shift Off-Peak Season are clearly seen in modeled results.

10 Alternative F Soundscape **Cumulative Impacts** 11 12 Cumulative impacts from all actions would be long-term moderate to major adverse, due primarily to high levels of

13 aircraft audibility.

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15 **NPS PREFERRED ALTERNATIVE**

17 The NPS Preferred Alternative includes quiet-technology incentives, a modified allocation system, modified tour 18 routes to avoid sensitive resources, and curfews. 19

20 Base Year, the NPS Preferred Alternative would achieve Substantial Restoration of Natural Quiet in 53% of the park 21 Peak Season, and in 63% of the park Off-Peak Season, as shown in Table 4.23. These represent a negligible change 22 in impacts compared to Alternative A Peak Season with a 2% decrease in park area restored, and a moderate 23 beneficial change in impacts compared to Alternative A Off-Peak Season with an 8% increase.

24 25 Ten-Year Forecast Substantial Restoration of Natural Quiet would be achieved in 67% of the park Peak Season, and

26 77% of the park Off-Peak Season, as shown in Table 4.24. These represent moderate beneficial changes in impacts

27 compared to Alternative A with a 14% increase in park area restored Peak Season, and a 24% increase Off-Peak 28 Season.

29

30 Mapped results of noise modeling for the NPS Preferred Alternative for Percent Time Audible and Average Sound

31 Level are shown on Figure 4.26 to 4.33. Table 4.17 to 4.22 present Contour Analysis and Location Point results

32 computed for the NPS Preferred Alternative Peak and Off-Peak Seasons, respectively, and include comparisons with 33 Alternative A.



FIGURE 4.26 NPS PREFERRED PERCENT TIME AUDIBLE









FIGURE 4.28 NPS PREFERRED PERCENT TIME AUDIBLE BASE YEAR OFF-PEAK SEASON



FIGURE 4.29 NPS PREFERRED PERCENT TIME AUDIBLE TEN-YEAR FORECAST OFF-PEAK SEASON







FIGURE 4.31 NPS PREFERRED AVERAGE SOUND LEVEL TEN-YEAR FORECAST PEAK SEASON





FIGURE 4.32 NPS PREFERRED AVERAGE SOUND LEVEL BASE YEAR OFF-PEAK SEASON





