3.11 AIR QUALITY

3.11.1 INTRODUCTION

Adoption of interim surplus criteria would not involve new construction or physical activities that would result in air emissions within the area of potential effect considered in this FEIS. Air quality effects discussed in this FEIS are limited to changes in fugitive dust emissions that could result from changes in exposed reservoir shoreline as a result of potential changes in Lake Mead and Lake Powell water surface elevations.

3.11.2 FUGITIVE DUST FROM EXPOSED SHORELINE

This air quality analysis provides an overview of ambient air quality in the project area, as well as a qualitative review of the potential changes in fugitive dust emissions associated with the project alternatives when compared to fugitive dust emissions that may occur under baseline projections.

3.11.2.1 METHODOLOGY

Variations in fugitive dust emissions can result from changes in the area of exposed shoreline due to changes in water operating levels. The amounts of fugitive dust generated per acre of exposed shoreline vary depending upon soil characteristics and other factors such as moisture content, wind speed, direction, and local topography. In developing a methodology for reviewing fugitive dust emission potential from exposed shoreline around Lake Powell and Lake Mead, the following assumptions were made:

- The incremental changes in exposed shoreline area are related to incremental changes in water surface elevation as indicated by existing reservoir area - elevation data. However, the true area of exposed shoreline terrain is also affected by the slope of the terrain along the shoreline. To account for sloping terrain, an average shoreline slope of 30 degrees and 45 degrees from horizontal was assumed for Lake Mead and Lake Powell, respectively.

- Incremental changes in fugitive dust emissions are directly proportional to the changes in exposed shoreline area. Although some portions of exposed area would have varying potential to generate fugitive dust, it is assumed that these areas are distributed proportionally throughout the potential range of reservoir surface elevations. Therefore, exposed areas were assumed to have a similar emission rate for a given amount of exposed shoreline. It should be noted, however, that estimated fugitive dust emissions were not calculated for this analysis, and it is likely that certain areas of the exposed shoreline would be expected to have higher emission rate factors than others. For example, delta areas with high amounts of fine sediment deposit would be a more likely source of fugitive dust generation than more compact or rocky soils at other exposed locations.

Based on these assumptions and using modeling results associated with projected median surface elevations for Lake Powell and Lake Mead, potential changes in shoreline exposure under baseline conditions and the interim surplus criteria alternatives were identified.

3.11.2.2 AFFECTED ENVIRONMENT

Ambient conditions in the Las Vegas (Lake Mead) area are characterized by low annual precipitation and generally light winds. Windrose data for the Las Vegas area for the period 1992 through 1996 indicate the predominant wind directions to be from the west, southwest, and south (i.e., away, rather than toward the Las Vegas metropolitan area) throughout the year. Wind speeds are less than five miles per hour (mph) for approximately 25 percent of the year and greater than 25 mph for less than one percent of the year. The average wind speed is approximately nine mph. Ambient conditions are similar for the Lake Powell area. Windrose data for Page, Arizona for the period 1992 through 1996 indicates there is no predominant wind direction. Rather, wind direction is somewhat evenly distributed, with the exception of winds from the southeast occurring less frequently. Wind speeds are less than five mph for more than 65 percent of the year and greater than 20 mph for less than one percent of the year. The average wind speed is less than five mph.

Lake Mead is located on the Nevada (Clark County)/Arizona (Mohave County) border. Air quality regulations, including implementation of the federal Clean Air Act, in the Lake Mead area are administered by the Clark County Air Pollution Control Division (Nevada) and the Arizona Department of Environmental Quality (ADEQ). Air quality regulations in the Lake Powell area, which is located on the Arizona/Utah border, are administered by the ADEQ and the Utah Department of Environmental Quality, Division of Air Quality.

Pursuant to the federal Clean Air Act, as amended in 1990, the EPA has established National Ambient Air Quality Standards (NAAQS) for a number of air pollutants, which are considered harmful to public health or the environment. There are two types of NAAQS, primary and secondary. Primary standards are designed to set limits for the protection of public health, including the health of sensitive populations (receptors) such as asthmatics, children and the elderly. Secondary standards are designed for the protection of the public welfare, including visibility as well as damage to animals, crops, vegetation and buildings. The EPA has established annual average and 24-hour average NAAQS for particulate matter of less than 10 microns in diameter (PM_{10}) and particulate matter of less than 2.5 microns in diameter ($PM_{2.5}$). Although the PM_{10} standards have been in effect for some time, the $PM_{2.5}$ standards are more recent (1997). Because development of baseline data for the latter is an ongoing effort and final implementation of the $PM_{2.5}$ standards may not occur for years, the discussion of fugitive dust emissions focuses on PM_{10}, which are more commonly understood and encompass $PM_{2.5}$ emissions in any event.

Fugitive dust emissions such as those from exposed reservoir shorelines can contribute to PM_{10} concentrations. To the extent that exposed shoreline is characterized by relatively fine or light soils, fugitive dust emissions can result. However, given the apparent nature of the reservoir shorelines (more gravel surface than soil) and the relatively low average winds in the reservoir areas, soil materials from exposed shoreline areas do not appear to result in significant fugitive dust emissions.

Another possible source of particulate emissions is from the deposition of dried plant material left along the shoreline as the water level recedes. Given the nature of the lakes' bottom compositions and the relatively slow rate of reservoir water level decreases, it is unlikely that this type of emissions source would be significant. The lakes do not appear to contain high levels of algae, and the water levels are projected to decline by a few feet per year (relative to baseline conditions). At this rate, algae or other forms of plant matter would be likely to recede with the water rather than be deposited along the shoreline.

Particulate emissions in the Lake Mead and Lake Powell areas do not appear to be a significant problem. While some urban areas (including Las Vegas, North Las Vegas and Henderson) within Clark County are not in attainment of the NAAQS for PM_{10}, the rest of the county, including Lake Mead, is in attainment of the standard. The portion of Mohave County adjacent to Lake Mead is also in attainment of the PM_{10} standard. The northern central Arizona and southern Utah area, including Lake Powell, is also in attainment of the PM_{10} standard. This attainment status corresponds with windrose information for both areas (i.e., relatively low average wind speeds implying low wind blown dust emissions on average) and the relatively low levels of dust generated from human activities.

Since both lake areas are used primarily for recreational purposes, there are limited sensitive receptor population concentrations such as asthmatics, children or elderly living in these areas.

3.11.2.3 ENVIRONMENTAL CONSEQUENCES

Based on modeled median surface elevations, baseline conditions will likely result in decreased reservoir water levels and increases in exposed shoreline for both Lake Mead and Lake Powell over the period of analysis. Median elevations under each of the alternatives indicate a similar potential for increased shoreline exposure over time. Tables 3.11-1 and 3.11-2 indicate Lake Mead and Lake Powell median surface elevations identified through modeling (described in Section 3.3), as well as reservoir surface area and exposed shoreline (based on shoreline slope estimates discussed in Section 3.11.2.1) associated with these elevations. The greatest difference in exposed shoreline between baseline conditions and each of the alternatives would generally occur in the first half of the modeled period, as indicated under years 2016 and 2026 in Tables 3.11 and 3.11-2. By year 2036, there are relatively minor variations in exposed

shoreline associated with the median elevations under the alternatives as compared with baseline projections.

Specifically, modeling results indicate an increased potential for fugitive dust emissions under the Basin States, Six States, California and Shortage Protection alternatives when compared with baseline projections throughout the initial, approximately 35 to 40 years of the projections, with the greatest differences in shoreline exposure potential occurring at or near the end of the interim period, in the year 2016. The Flood Control Alternative would have a slightly decreased potential for fugitive dust emission over the entire period of analysis when compared with baseline conditions.

Table 3.11-1
Median Lake Mead Surface Elevation, Surface Area and Exposed Shoreline Area Under Baseline Conditions and Alternative Projections

Scenario	Surface Elevation[1] (feet msl)				Reservoir Surface Area (acres x1000)				Exposed Shoreline Area[2] (acres x1000)			
	2016	2026	2036	2050	2016	2026	2036	2050	2016	2026	2036	2050
Baseline Conditions	1162	1126	1121	1111	120.2	99.8	97.6	93.6	42.3	65.9	68.4	73.0
Basin States Alternative	1143	1125	1120	1111	108.1	99.3	97.4	93.6	56.3	66.4	68.6	73.0
Flood Control Alternative	1162	1128	1119	1111	120.2	100.7	96.8	93.6	42.3	64.8	69.3	73.0
Six States Alternative	1145.5	1124.7	1120.4	1110.6	109.4	99.3	97.5	93.6	54.8	66.4	68.5	73.0
California Alternative	1131.2	1116.4	1117.6	1110.6	102.1	95.9	96.3	93.6	63.2	70.4	69.9	73.0
Shortage Protection Alternative	1130.2	1117.9	1117.6	1110.6	101.7	96.5	96.3	93.6	63.7	69.7	69.9	73.0

[1] Based on modeled median reservoir surface elevations.
[2] Area of exposed shoreline represents the area that would be exposed below the full pool elevation of Lake Mead for the various water surface elevations indicated, assuming an average shoreline slope of 30 degrees. Lake Mead's water surface area is 156,845 acres at water surface elevation of 1219.6 feet msl.

Table 3.11-2
Median Lake Powell Surface Elevation, Surface Area and Exposed Shoreline Area Under Baseline Conditions and Alternative Projections

Scenario	Surface Elevation[1] (feet msl)				Reservoir Surface Area (acres x1000)				Exposed Shoreline Area[2] (acres x1000)			
	2016	2026	2036	2050	2016	2026	2036	2050	2016	2026	2036	2050
Baseline Conditions	3665	3666	3670	3663	134.6	135.2	138.0	132.6	37.0	36.2	32.2	39.9
Basin States Alternative	3664	3666	3670	3663	134.1	135.2	138.0	132.6	37.7	36.2	32.2	39.9
Flood Control Alternative	3665	3666	3670	3665	134.6	135.2	138.0	134.2	37.0	36.2	32.2	37.6
Six States Alternative	3664	3666	3670	3663	134.1	135.2	138.0	132.6	37.7	36.2	32.2	39.9
California Alternative	3660	3661	3670	3663	130.8	131.6	138.0	133.0	42.4	41.3	32.2	39.3
Shortage Protection Alternative	3659	3661	3670	3663	130.2	131.6	138.0	132.6	43.2	41.3	32.2	39.9

[1] Based on modeled median surface elevations.
[2] Area of exposed shoreline represents the area that would be exposed below the full pool elevation of Lake Powell for the various water surface elevations indicated, assuming an average shoreline slope of 45 degrees. Lake Powell's water surface area is 160,782 acres at water surface elevation of 3700 feet msl.