9 Air Quality

This chapter addresses air quality as it relates to Humboldt County, which is located in the North Coast California Air Basin. Climate, air pollution standards, and air basin conditions are described, followed by a discussion of issues and policy options. Policy evaluation worksheets for air quality are in the Appendices.

9.1 CLIMATE

Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. In general, the climate of northern coastal California is characterized by cool summers with frequent fog and mild winters with lots of rain. In coastal areas, the ocean helps to moderate temperatures year-round. Further inland, the summers are hotter and drier and the winters colder and more snowy. At higher elevations in inland areas, it is cooler in the summers and snowier in the winter.

Winds control the rate and dispersion of local pollutant emissions. In the California North Coast Air Basin, dominant winds exhibit a seasonal pattern, especially in coastal areas. In the summer months, strong north to northwesterly winds are common; during the winter, storms from the south Pacific increase the percentage of days winds are from southerly quadrants. Wind direction often assumes a daily pattern in the river canyons that empty into the Pacific. In the morning hours, cool air from higher elevations flows down the valleys while later in the day as the lower elevation air heats up this pattern is reversed and the air flow heads up the canyon. These air flows are often quite strong. Offshore and onshore flows are also common along the coast and are associated with pressure systems in the area. Onshore flows frequently bring foggy cool weather to the coast, while offshore flows often blow fog away from the coast and bring sunny warm days.

In addition to wind direction, Humboldt County commonly experiences two types of inversions that affect the vertical depth of the atmosphere through which pollutants can be mixed. Vertical air movement is important in spreading pollutants through a thicker layer of air. Horizontal movement is important in spreading pollutants over a wider area. Upward dispersion of pollutants is hindered wherever the atmosphere is stable; that is, where warm air overlies cooler air below. This situation is known as a temperature inversion.

Radiation inversion occurs when the air layer near the surface of the ground cools and may extend upward several hundred feet. Radiation inversion in Humboldt County is found in the night and early mornings almost daily, but is more prominent from late fall to early spring when there is less sunlight and it is cooler. Radiation inversion tends to last longer into the morning during the winter months than in the summer.

Subsidence inversion is caused by downward moving air aloft, which is common in the area of high pressure along and off the coast. The air warms at a rate of 5.5 degrees Fahrenheit per

1,000 feet as it descends. Thus, it arrives at a lower height warmer than the air just below and limits the vertical mixing of air. Subsidence inversion often affects a large area and is more common during the summer months. This inversion, which usually occurs from late spring through the early fall[1], can be very strong and shallow given the cooling of the lower layers from the cool ocean water.

9.2 REGULATORY CONTEXT

The State of California and the Federal government have established ambient air quality standards for a number of pollutants, which are referred to as Criteria Pollutants. These standards are categorized as primary standards, designed to safeguard public health, or as secondary standards, intended to protect crops and to mitigate such effects as visibility reduction, soiling, nuisance and other forms of damage. Air quality is also regulated through emissions limits for individual sources of criteria air pollutants. The California Environmental Quality Act (CEQA) requires that developers and planners review applicable projects to determine their environmental impact. The North Coast Unified Air Quality Management District (NCUAQMD) is a local resource for air quality mitigation measures in Humboldt County.

CRITERIA AIR POLLUTANTS

The Federal Clean Air Act requires the U.S. Environmental Protection Agency (U.S. EPA) to identify National Ambient Air Quality Standards. Currently, U.S. EPA has established national standards for the following pollutants, which together form the criteria air pollutants:

- Ozone (O_3);
- Carbon monoxide (CO);
- Nitrogen dioxide (NO_2);
- Sulfur dioxide (SO_2);
- Suspended particulate matter (PM-10 and PM-2.5); and
- Lead (Pb).

Pursuant to the California Clean Air Act of 1988, California has adopted stricter ambient air quality standards (relative to federal standards) for the criteria air pollutants, particularly ozone and PM-10 (particulate matter, less than 10 microns in diameter). In addition, California has adopted ambient air quality standards for some pollutants for which there are no corresponding national standards.

[1] NCAQMD Particulate Matter Attainment Plan, 1995

Under the California Clean Air Act and amendments to the Federal Clean Air Act, U.S. EPA and the State Air Resources Board are required to classify Air Basins, or portions thereof, as either "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the national and state standards have been met. The North Coast Air Basin consists of the counties of Humboldt, Del Norte, and Trinity. Air Quality monitoring has been conducted in the North Coast Air Basin since 1982 when the North Coast Unified Air Quality Management District (NCUAQMD) was formed. The monitoring results have shown that the principal pollutant of the North Coast, including Humboldt County, is particulate matter.

TOXIC AIR CONTAMINANTS

Regulation of toxic air contaminants is achieved through federal and state controls on individual sources.[2] Toxic air contaminants are air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects, for which no ambient air quality standards have been established. The 1990 Federal Clean Air Act Amendments offer a comprehensive plan for achieving significant reductions in both mobile and stationary source emissions of certain designated toxic air contaminants.

The North Coast Unified Air Quality Management District conducts and updates risk assessment for all major point sources on the North Coast every four years. All sources within the District that have been reviewed for health risks are reported to fall below the ten in a million risk level. This means that less than ten individuals in a million are at risk of contracting cancer due to the emissions from the sources reviewed. Additionally, the NCUAQMD administers the Air Toxics Hot Spot program. This program identifies the types and kinds of chemicals that are released by certain facilities creating an emissions inventory. Next, the inventories are evaluated and ranked according to health risk potential. Those facilities with the highest risk potential must prepare formal risk assessments.

Regulation of toxic air contaminants from mobile sources has traditionally been implemented through emissions standards for on-road motor vehicles and through specifications for gasoline and diesel fuel sold in California, rather than through land use decisions, air quality permits or regulations addressing how the general public uses motor vehicles. In 1998, Diesel exhaust particulate matter from internal combustion engines was designated a toxic air contaminant (TAC) for cancer. Now land use decisions must include mitigation efforts for heavy duty diesel equipment operated during construction phases.

During 1991, the California Air Resource Board (CARB) used a mobile monitoring station to conduct risk assessment on ambient air measurements in Eureka and Arcata. Air samples were collected at various locations around Humboldt Bay by the mobile monitoring station and then analyzed for various toxic substances. The study included the risks from all air toxics and not just those emitted from industrial sources. This study showed that the average cancer

[2] Federal environmental laws refer to "hazardous air pollutants" and California environmental laws refer to "toxic air contaminants." The two terms generally encompass the same constituent toxic compounds.

risk from airborne toxics in the Humboldt Bay was 86 in a million. As shown in Table 9-1, this is substantially lower than the average risk in other California cities.

Table 9-1: Health Risk Associated with Air Quality in Humboldt and Other California Cities

City	*Location Risk (x1,000,000)*
Humboldt Bay	86
Azusa	459
San Francisco	524
Bakersfield	569
San Jose	780
Los Angeles	888
Burbank	1,231

Source: North Coast Air Quality Facts, NQUAQMD 1991

REGULATORY AGENCIES

The U.S. EPA sets national ambient air quality standards and oversees implementation of Federal requirements by State air quality agencies. California's air quality management agency, CARB, regulates most types of mobile emissions sources and oversees the activities of regional/County air districts. CARB is responsible for establishing emissions standards for on-road motor vehicles sold in California. Emissions standards for motor vehicles were developed primarily as a means to reduce emissions of carbon monoxide and ozone precursors (such as reactive organic gases, ROG), but by reducing such emissions, such standards also serve to reduce toxic air contaminants. CARB also produces the state's Air Pollution Control Plan, which implements the Federal Toxic Air Contaminant Program.

The North Coast Air Basin must submit to standards outlined in the NCUAQMD Air Quality Control Rules covering visible emissions, particulate matter, fugitive dust emissions, sulfur oxide and sulfides, and geothermal emissions.[3] All three counties in the NCUAQMD are currently classified as nonattainment for the California Ambient Air Quality Standards for PM-10. The NCUAQMD has identified major sources of PM-10 on the North Coast.

[3] North Coast Unified Air Quality Management District, *Regulation 1 Air Quality Control Rules*, readopted 25 September 1998, Chapter 4: Prohibitions.

9.3 EXISTING AIR QUALITY CONDITIONS AND TRENDS

In rural Humboldt County, air quality concerns are more related to industrial emission sources rather than urbanization levels and patterns. CARB operates a regional network of air pollution monitoring stations that provide information on ambient concentrations of criteria air pollutants and toxic air contaminants. NCUAQMD measures Particulate Matter (PM-10) at sites in Crescent City, Eureka, and Weaverville. Data for Humboldt County is collected at an air quality station, located in Eureka.[4] The Eureka air quality station also monitors for the federal Particulate Matter Standard (PM-2.5). Data from the monitoring station indicate that the air quality in Eureka City is improving, PM levels have been reduced to nearly below state standards.

CRITERIA AIR POLLUTANTS

Ozone[5]

Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NO_X). ROG and NO_X are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursor presence for approximately three hours in a stable atmosphere with strong sunlight. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production. On-road motor vehicles are a major source of ozone precursors.

Once formed, ozone acts as a strong irritant that attacks the body's respiratory system. Symptoms include shortness of breath, chest pain when inhaling deeply, wheezing and coughing. Additionally, ozone causes substantial damage to leaf tissues of crops and natural vegetation and damages many materials by acting as a chemical oxidizing agent. As shown in Table9-2, the State ambient air quality standard for ozone was violated on an average of two days per year in the North Coast Air Basin between 1995 and 2001. Neither state nor federal standards were violated in the past two years. The North Coast Air Basin, including Humboldt County, is listed as an attainment area for both federal and state standards for ozone.

[4] 6th and I Street, Eureka, measuring: PM2.5 and PM-10.

[5] Ozone at ground-level, where it is associated with adverse health and welfare effects, is distinguished from ozone in the upper atmosphere where it performs the essential function of absorbing ultraviolet radiation.

Table 9-2: North Coast Air Basin Ozone Data

	Standards & Number of Days Standard Exceeded			*1-hr Ozone Concentrations (ppm)*				*8-hr Ozone Concentrations ppm*			
Year	*State 1-hour (.09 ppm)*	*Federal 1-hour (.12ppm)*	*Federal 8-hour (.08 ppm)*	*1st High*	*2nd High*	*3rd High*	*4th High*	*1st High*	*2nd High*	*3rd High*	*4th High*
2001	0	0	0	0.090	0.080	0.080	0.070	0.073	0.066	0.065	0.063
2000	0	0	0	0.090	0.080	0.080	0.080	0.077	0.065	0.061	0.061
1999	4	0	2	0.100	0.100	0.100	0.100	0.087	0.086	0.082	0.081
1998	7	1	5	0.130	0.120	0.110	0.110	0.106	0.100	0.086	0.086
1997	2	0	1	0.100	0.100	0.090	0.090	0.091	0.083	0.081	0.081
1996	0	0	0	0.080	0.080	0.080	0.080	0.071	0.071	0.067	0.066
1995	1	0	1	0.100	0.090	0.080	0.080	0.090	0.078	0.075	0.071

Source: California Air Resources Board, 2001.

Carbon Monoxide

Carbon monoxide is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. Ambient concentrations normally correspond closely to the spatial and temporal distributions of vehicular traffic, but are also influenced by wind speed and atmospheric mixing. Under inversion conditions, concentrations may be distributed more uniformly over an area out to some distance from vehicular sources. Carbon monoxide's adverse health effects are related to its affinity for hemoglobin in the blood. High concentrations of carbon monoxide can impair the ability of the human body to absorb oxygen into the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches, and dizziness.

Since the introduction of oxygenated fuels in 1992, background carbon monoxide concentrations no longer exceed state standards even during stagnant wintertime conditions. However, concentrations in the vicinity of congested intersections and highway segments would be expected to be higher than the monitoring data in Table 9-3. Future carbon monoxide concentrations are expected to continue declining due to the natural replacement of older, more heavily polluting automobiles with newer, cleaner-running models.

Table 9-3: North Coast Air Basin 8-Hour Carbon Monoxide Averages

Year	8- hr Standard & Number of Days Standard Exceeded		Highest Daily Maximum 8-hour Carbon Monoxide Averages (parts per million)			
	State (9 ppm)	Federal (9ppm)	1st High	2nd High	3rd High	4th High
2001	0	0	1.07	0.96	0.95	0.94
2000	0	0	2.45	2.02	1.69	1.62
1999	0	0	3.66	3.60	3.53	3.32
1998	0	0	3.46	3.23	2.78	2.61
1997	0	0	3.21	3.04	2.82	2.80
1996	0	0	2.72	2.44	2.30	2.05
1995	0	0	3.22	3.17	3.14	2.84

Source: California Air Resources Board, 2001.

Suspended Particulate Matter

Suspended particulate matter (PM-10) consists of particulates 10 microns or less in diameter. These small particles can remain suspended in the air, are transported by winds, and can be inhaled and cause adverse health effects. Particulates in the atmosphere result from many kinds of dust- and fume-producing industrial and agricultural operations, construction, fugitive sources (such as roadway dust), and atmospheric photochemical reactions involving ROG and NO_X. Extended exposure to PM-10 can increase the risk of chronic respiratory disease. Humboldt County, as with most of the state of California, is in nonattainment for the state mandated PM-10 standards. Table 9-4 includes the five-year monitoring for PM-10 in Eureka.

Table 9-4: Eureka Health Department Monitoring Station Particulate Matter Data

Year	Standard & Number of Days Standard Exceeded		Daily PM 10 Measurements (micrograms per cubic meter)			
	State (50)	Federal (150)	1st High	2nd High	3rd High	4th High
2001	1	0	63.5	45.1	39.2	37.9
2000	1	0	50.9	46.3	45.4	43.9
1999	1	0	56.6	50.1	45.1	41.5
1998	0	0	43.0	40.0	34.2	32.0
1997	1	0	56.0	41.0	38.0	37.0
1996	2	0	87.0	56.0	45.0	39.0

Source: California Air Resources Board, 2001.

TOXIC AIR CONTAMINANTS

The ambient background of toxic air contaminants is the combined result of many diverse human activities, including emissions from gasoline stations, automobiles, dry cleaners, industrial operations, hospital sterilizers, and painting operations. The most obvious toxic air contaminant concern in Humboldt County is odorous emissions from local pulp mills. Benzene from gasoline is another, though less apparent, source of air toxics. Due to lower population, Humboldt County and the North Coast Air Basin have less potential for high ambient concentrations than the more populated areas of California. However, Humboldt has higher concentrations of toxic air contaminants than its neighboring counties (see Table 9-5).

Table 9-5: County Emissions (tons/year) for Ten Toxic Air Contaminants in the North Coast Air Basin

TAC	*Del Norte*	*Humboldt*	*Mendocino*	*Sonoma**	*Trinity*
Acetaldehyde	24	106	82	42	25
Benzene	42	187	183	177	71
1,3-Butadiene	18	38	31	29	20
Carbon Tetrachloride	<.01	<.01	<.01	0.00	<.01
Chromium (Hexavalent)	0.0003	0.0046	0.0284	0.0345	0.0010
Para-Dichlorobenzene	1	6	4	3	<1
Formaldehyde	46	221	181	119	56
Methylene Chloride	4	17	13	13	1
Perchloroethylene	19	77	53	10	9
Diesel PM	39	224	174	98	14

*This Air Basin includes only a portion of this county.

Source: ARB Almanac 2001.

In 1987, the California State legislature enacted through Assembly Bill 2588 the Air Toxics Hot Spots Information and Assessment Act which requires companies in California to provide information to the public about emissions of toxic air contaminants (TACs) and their possible impact on public health. Impact is measured as "maximum individual cancer risk" which is the likelihood that a person exposed to concentrations of TACs over a lifetime will develop cancer. There are several facilities in Humboldt County associated with an increased cancer risk. The Air Resources Board maintains an inventory of stationary sources of toxic air contaminants. In unincorporated Humboldt County there are four main sources of toxic air contaminants (Fairhaven Power Company (Fairhaven), Simpson Timber Company (Korbel), Louisiana Pacific Corp. (Somoa), and Pacific Lumber Company (Scotia) – see Table 9-6. Three of the four companies are associated with the timber industry.

Table 9-6: Main Toxic Air Contaminant Emission Sources in Unincorporated Humboldt County and Health Risk Assessment of Emissions

	Fairhaven Power Company, Fairhaven	*Simpson Timber Company, Korbel*	*Louisiana Pacific Corp., Somoa*	*Pacific Lumber Company, Scotia*
Priority Score Highest	1.4	0.42	28	28.3
HRA Cancer Risk			8.6	2.7
HRA Hazard Index			2.8	0.05
TOG	111.1	13.9	82.5	208.8
ROG	48.7	6.1	82.5	91.6
CO	1886	69.4	59.9	887.4
NOX	136.9	13.9	391.9	266.1
SOX	0.1		42.4	
PM	51.7	38.8	174.9	66.8
PM-10	51.5	24.4	144.6	50.5
Acetaldehyde	151.1	49.7	8004.9	288.3
Arsenic			0.4	
Benzene	1690.7	16.3	2257.5	3292.3
Beryllium			1.6	
Cadmium	6.7	0	12.8	4.8
Chloroform			3.9	
Copper	68.8	1.9	77	48.5
DiBenFurans	0	0	0	0
Dioxins-w/	0	0	0	0
Formaldehyde	961.7	136.8	7096.1	1874.4
Gasol vapors			1140	
H2S			10032.3	
HCl			1712.9	
Lead	34.8	5.1	77.6	24.5
Manganese	2112.9	20.3	69.7	1487.7
Mercury			8.9	
Methanol			231140	
Naphthalene	103.6	5.4	219.3	201.9
Nickel	59.6	0.1	89.2	42
PAHs-w/o	0	0		0.1
Selenium			3.8	
Sodium Hydroxide			103269.9	
Zinc	1014.8	4.9	237.5	714.5

Note: ROG, CO, NOX, SOX, PM, and PM-10 are in tons/year. All other TACs are in pounds/year.
Source: Air Resources Board, Emissions Inventory

The NCUAQMD assigned the facilities priority scores based upon the facilities emissions to determine if health risk assessment (HRA) was necessary. The latest HRAs were completed in 1998. These HRAs show that emissions from the Louisiana Pacific Corp. and the Pacific Lumber Company lead to elevated cancer risks of 8.6 cases per million and 2.7 cases per million respectively.

CARB regulates toxic air contaminants from stationary sources through their permit process. Mobile sources of toxic air contaminants are regulated indirectly through vehicle emissions standards (or ROG) and through fuel specifications. Cities play a role in reducing public exposure to TACs by enforcing zoning ordinances and ensuring proper buffer zones between stationary sources that emit toxic contaminants and sensitive receptors located down wind.

Sensitive Receptors

Some people are more sensitive than others to air pollutants. Heightened sensitivity may be caused by health problems, proximity to the emissions source, and duration of exposure to air pollutants. Sensitive receptors are facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollution. Hospitals, schools, convalescent facilities, and residential areas are examples of sensitive receptors. Residential areas are considered sensitive to poor air quality because people in residential areas are often at home for extended periods. Sensitive receptors and emissions generators could be considered incompatible land uses, and should not be located in close proximity to one another.

9.4 POLICY ISSUES

Humboldt County does not have specific air quality policies in the existing General Plan (Framework Plan). The existing General Plan acknowledges that the County UAQMD serves as the primary agency responsible for achieving air quality goals. There are opportunities for beneficially impacting air quality and public health through General Plan policies that would add to existing air quality attainment plans. The policy evaluation worksheets for air quality are in the Appendix. These worksheets are provided as a tool for members of the public to evaluate policy options and indicate preferences for accepting, modifying or rejecting these options.

ISSUES

- *What are reasonable standards to minimize land use conflicts?*
- *Which standards should apply to existing development?*

Recognizing that there is State and Federal pre-emption for mobile source controls and stationary source controls already are in place, these General Plan issues relate primarily to air quality impacts from automobile trips, and from cottage industries and commercial and industrial establishments near residential areas. The General Plan could include a more specific discussion of how local policies could relate to Federal and State air quality planning.

Policy option 9.1 could establish additional performance standard and make air quality a planning consideration in site design.

Option 9.1 Establish performance standards for cottage industries and for commercial and industrial uses and buffering standards where these uses abut residential neighborhoods to minimize environmental impacts including air quality. This policy would be implemented by amending the County's zoning regulations. Existing development would be required to meet these performance standards as a condition of approval of expansion or major alterations and additions. The zoning ordinance also could allow them to meet these standards over a reasonable time period in order to avoid imposing unnecessary costs on small businesses. And, appeal provisions would allow hardship to be considered.

ISSUE

- *What measures can be taken to reduce air pollution from vehicle emissions?*

Option 9.2 Promote residential development near employment centers to minimize commuting and air emissions from vehicles. Where possible, opportunities for residential development should be promoted near employment centers to minimize the length and extent of daily automobile trips. This policy option will be further explored as part of the Sketch Plan process. As a corollary, opportunities for alternative transportation such as public transit and bicycle commuting should be encouraged as part of the discussion on the upcoming Moving Goods and People report.

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