

# Policy 1 – FREEWAY AIR POLLUTION EXPOSURE ZONES (APEZ)

**Recommended policy:** Apply a 500 ft. to 1,000 ft. overlay zone that is measured from the edge of a freeway Right-of-Way (ROW) or high-trafficked corridor with significant diesel truck, goods movement and/or vehicular traffic. This buffer should be extended to the full 1,000 ft. for corridors with adjacent residential areas abutting the downwind side of freeways or urban roads with 100,000 vehicles/day to account for the impact of nocturnal pollution drift.

## Background: Addressing Freeway Air Pollution

Typically, the freeway “near roadway” emissions that are of concern for an air pollution policy include ultrafine particulates (UFP) such as black carbon (BC) - especially noted with diesel; nitrogen oxides (NOx); carbon monoxide (CO); PM 2.5; and reactive or volatile organic compounds (VOCs). These pollutants tend to decrease exponentially with distance from the freeway sources with spikes of BC, UFP, CO found within 100m/328 ft. from freeway. Research has shown that during the pre-sunrise and nighttime hours, pollution from freeways can drift downwind much more extensively than during the day hours even extending as far as 4,920 feet (see Paulson, Suzanne et al, 2012 cited by UCLA/CARB).

## Methods of Mapping Buffer Sizes

In policy implementation practice, the suggested physical extent of recommended freeway buffer zones can vary. Generally, particulate matter pollution levels decrease by about 70 percent at 500 feet from freeways and high-traffic roadways (defined as urban roads with 100,000 vehicles/day per California Air Resources Board, 2005). Therefore, we recommend that establishing a 500 ft. buffer is the minimum size for such protective zones but in certain cases, especially on the downwind side of freeways that intersect with residential areas, this may be extended out to 1,000 ft. Other strategies are to map buffers according to specific modeled or measured emission dispersion levels. Examples of buffer recommendations surveyed here include a 500 ft. target area with San Francisco’s Air Pollution Exposure Zone example (see case study below), a 700 ft. buffer for residential areas (Tufts University/CAFEH Study, 2016) and a 1,000 ft buffer from freeways and roads with 10,000+ vehicles/day for sensitive uses in the City of Oakland.

In developing appropriate buffer policies, the local features of freeway design should also be taken into considerations and may require a higher degree of pollution mitigation responses. For instance, increased freeway grades create an increased load on vehicles ascending resulting in more exhaust and tire-wear, meanwhile descending produces increased break wear dust. Interchanges and complex lane-merger areas can also create congestion and increase the pollution levels. Elevated freeways will cause a greater dispersion area of the pollution emissions but lower the concentrations closer to the freeway as a shadow effect. Existing noise barriers/sound walls (even on upwind sides of freeways) can help with air

pollution however they are not sufficient to reduce air pollution in themselves (see more specific freeway related pollution mitigation strategies in Policy Strategy E).

## CASE STUDY – San Francisco, Air Pollution Exposure Zone (APEZ)

In 2008, the City of San Francisco, through a collaborative effort with the Air District, developed an innovative APEZ health policy under Article 38 of the San Francisco Health Code. This policy maps an air pollution exposure overlay zone around the city's main freeways and requires new construction in these and other targeted areas of poor air quality to install enhanced ventilation systems and other proactive strategies to protect residents from respiratory, heart, and other health effects associated with breathing polluted air. The City maintains an interactive property information map so the public can determine if a property is in the Air Pollution Exposure Zone ([SF Planning's Property Information Map](#)).

### Key aspects of policy:

- San Francisco started the mapping of "Air Pollution Exposure Zones" APEZ areas as part of their Air District-funded Community Risk Reduction Planning.
- The zoning policy was adopted in 2008 (updated 2014) in Article 38 of the County's Health Code to protect public health in sites with high level of background concentrations of air pollution.
- Targeted zones include areas 500 feet from a freeway (as well as zip codes with high hospitalization rates and emergency room visits for air pollution illnesses).
- Applied specially tailored development conditions within the overlay.
- The APEZ maps are to be updated every five years to identify new sources, receptors, updated pollutant standards, transportation data.

For more information see SF Department of Public Health: <https://www.sfdph.org/dph/EH/Air/Article38.asp>.

### Sources:

BAAQMD, April 2014: Improving Air Quality and Health in Bay Area Communities. Community Air Risk Evaluation Program Retrospective and Path Forward (2004 to 2013).

Bowker, Baldauf, Isakov, 2017: "The effects of roadside structures on the transport and dispersion of UFP from highways in Atmospheric Environment." 41(37), 8128-39.

California Air Resources Board, 2005: "Air Quality and Land Use Handbook: A Community Health Perspective."

C.N. Hewitt, 2013: Dept of Atmospheric and Oceanic Sciences.

Kresge Foundation, 2016: Community Assessment of Freeway Exposure and Health (CAFEH), Improving Health in Communities Near Highways. Tufts University, Tisch College of Community Research.

Paulson, Suzanne et al, 2012: Prevalence of Wide Area Impacts Downwind of Freeways Under Pre-Sunrise Stable Atmospheric Conditions in *Atmospheric Environment*, (December).

Metropolitan Transportation Commission, 2016: San Francisco Bay Area Goods Movement Plan, February.

South Coast Air Quality Management District, 2012: Near Roadway Exposure and Ultrafine Particles, (Chapter 9).