GLOSSARY

Bay Area Air Quality Management District (Air District)
A regional air pollution control agency with jurisdiction over the nine counties that surround the Bay (excepting northeastern Solano and northern Sonoma counties); the Air District oversees policies and adopts regulations for the control of air pollution from stationary sources.

Best Practices to Reduce Emissions
Measures that reduce actual emissions, and therefore reduce health risks from air pollution. The Air District recommends that local governments adopt best practices as community-wide policies or ordinances. See pg. 9 for a complete list of best practices to reduce emissions.

Best Practices to Reduce Exposure
Measures that do not reduce actual emissions, but reduce people's exposure to pollutants and therefore reduce health risks. Examples include air filters, vegetation, and alternative truck routes. The Air District recommends implementing these types of measures in areas with elevated health risks (purple areas on Air District maps). See pg. 10 for the map, and for a complete list of best practices to reduce exposure.

California Air Resources Board (ARB)
A state agency, whose mission is to promote and protect public health, welfare and ecological resources through the reduction of air pollutants; the ARB oversees policies and adopts regulations for the control of air pollution from primarily mobile sources.

Cumulative Impact
The impact on the environment and the public which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time

Fine Particulate Matter (PM)
Includes tiny particles with a diameter less than or equal to 2.5 microns. This fraction of particulate matter penetrates more deeply into the lungs than larger particles.

Further Study
Conducting further study would entail air quality modeling of fine PM concentrations, and/or estimating increased health risks from air toxics to determine if there is an unacceptable level of health risk, and to identify if measures can be implemented to reduce health risks to acceptable levels.

Mobile Sources of Air Pollution
Sources of air pollution such as automobiles, motorcycles, trucks, off-road vehicles, boats and airplanes.

Sensitive Land uses

Places where sensitive populations are most likely to spend their time, such as schools, playgrounds, daycare centers, nursing homes, medical facilities, and residential communities.

Sensitive Populations

People, including infants, children, the elderly, and those with pre-existing conditions (such as asthma) that are at greater risk than the general population to the adverse health effects of air pollutants.

Stationary Sources of Air Pollution

Non-mobile sources such as power plants, refineries and manufacturing facilities which emit air pollutants.

Toxic Air Contaminants (TACs) or Air Toxics

TACs are air pollutants, identified by the ARB, which may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential health hazard. Health effects may occur at extremely low levels of TACs.

APPENDIX A: BEST PRACTICES TO REDUCE EMISSIONS OF LOCAL AIR POLLUTION

RETROFIT GENERATORS (TO LOW OR ZERO EMISSIONS)

Many buildings in developed areas include back-up diesel generators to provide emergency power in the event of power failure. Even if such engines are not used for emergency purposes, they are still operated periodically for maintenance and testing. Diesel backup generators, specifically older ones, can have significant diesel particulate matter emissions. As part of its diesel risk reduction program, ARB adopted an air toxic control measure for stationary engines, or generators. The measure requires that new generators, including back-up generators and generators used in construction, be certified to meet emission standards set by ARB and US EPA (ARB and US EPA have identical emission standards for generators). ARB/US EPA emission standards apply to generators larger than 50 horse power and are set forth as Tiers 1 through 4, with Tier 4 engines being the cleanest. Generator engines certified as Tier 4 reduce PM emissions 85 to 90 percent over a non-tiered engine, whereas Tier 1 only reduces PM emissions by 25 percent. By 2015, all new generator engines must have met Tier 4 emission standards. But since these regulations apply only to new engines, older existing generators can continue contributing to local air pollution. Local governments can require, via a local ordinance, development agreement, or other means, that existing older generators not subject to ARB limits be replaced with a new low or zero emitting generator or be retrofitted with control technologies such as diesel particulate filters, resulting in significant reductions in diesel PM emissions. New, zero emission back-up power technologies are also becoming available, including fuel cell back-up power (example: Bloom Energy)

ELECTRIFY LOADING DOCKS

Heavy duty diesel trucks are the predominant means to deliver goods to grocery stores, shopping malls, and other commercial and retail land uses. Diesel trucks normally need to idle their main diesel engine during loading and unloading operations to operate mechanical lift equipment or to run the air conditioner or heater in the cab of the truck. This idling of the main diesel engine produces a substantial amount of diesel particulate matter emissions and can impact the health of nearby people. The particulate matter emissions can be reduced or eliminated by requiring the electrification of all loading docks. Trucks that are equipped to utilize grid power can significantly reduce their emissions. Installing electrical outlets at all loading docks and promoting or requiring only trucks capable of plugging-in to deliver goods will lead to localized reductions in diesel emissions, thereby decreasing the potential for health risks to those that live and work in the area.

LIMIT IDLING TIMES

Prohibiting trucks from idling for more than two minutes can reduce emissions by limiting the amount of time that trucks run their engines. Idling limits could apply to all types and sizes of trucks, and/

or buses, that spend extended periods of time at idle when loading and unloading, staging or when not in active use. ARB regulations limit idling time to no more than five continuous minutes (for commercial motor vehicles with gross vehicular weight ratings of greater than 10,000 pounds). Local governments may, and often do, pass local ordinances that further limit allowable idling time to no more than two continuous minutes. In addition, local enforcement of ARB or local idling limits increases their effectiveness. Strict local limits on idling diesel engines, combined with local enforcement, can reduce local exposure to diesel exhaust.

ARB's idling regulation contains a number of exemptions that allow for longer idling periods when safety or power needs for equipment are required. Communities should consider if similar exemptions are appropriate when adopting a local ordinance on idling time limits.

ZERO EMISSION TECHNOLOGY & ALTERNATIVE FUELS

Zero emission (i.e. plug-in electric or hydrogen powered) vehicles have become more commonplace but will need the necessary infrastructure to continue to grow. Local governments can promote this infrastructure by requiring it at new or existing development (for example, required plug-in stations for electric vehicles). Diesel powered on-road and off-road equipment manufacturers are constantly developing new technologies and strategies to reduce diesel particulate matter emissions in order to comply with increasingly stringent ARB regulations. In addition, fuel providers are also developing lower emission and renewable fuels, such as biodiesel, to comply with ARB fuels regulations. Promoting the use of these new technologies and fuels within our communities, either through requirements or incentives, can reduce or eliminate the adverse health impacts from local sources of TACs and PM air pollution.

For example, truck manufacturers have begun offering diesel electric hybrids for all but the heaviest trucks. Gasoline hybrids are available for lighter weight trucks. The availability of propane and natural gas powered trucks is somewhat limited in terms of weight class and usage, although there are some well-established markets for natural and/or bio gas buses and garbage trucks. Trucks powered by battery or fuel cell hybrid electric are currently limited to demonstration projects, but when commercialized will present the lowest emission option.

PROMOTE OR REQUIRE THE USE OF TRANSPORTATION REFRIGERATION UNITS (TRU)

Trucks delivering goods often need to keep perishable items refrigerated or at a constant temperature. The use of Transportation Refrigeration Units (TRUs) in lieu of running the main engine on delivery trucks maintains refrigeration while minimizing diesel emissions. TRUs are refrigeration systems powered by diesel internal combustion engines designed to refrigerate perishable products that are transported in various containers, including semi-trailers, truck vans, shipping containers, and rail cars. Local policies or programs that promote the use of transportation refrigeration units, especially if they meet the federal Environmental Protection Agency's (US EPA) Tier 4 emission standards, can reduce emissions of diesel particulate matter and toxic air contaminants by 50 to 80 percent. It should be noted that while TRU engines are relatively small, ranging from 9 to 36

horsepower, significant numbers of these engines congregating at distribution centers, truck stops, and other facilities, could still result in the potential for adverse health risks to sensitive populations nearby.

TRANSPORTATION DEMAND MANAGEMENT (TDM) STRATEGIES

The Air District strongly supports local and regional efforts to reduce vehicle miles traveled and promote "focused growth", i.e. infill, transit-oriented, and mixed-use development throughout the region. Building such communities is critical to achieving reduced vehicle miles traveled, which will reduce air pollutant emissions from passenger vehicles and assist the Bay Area in attaining and maintaining health-based ambient air quality standards; in achieving continued reductions in TACs and fine PM from mobile sources; and in meeting GHG reduction goals. Focused growth strategies have the long-term benefit of improving overall air quality while also providing many other benefits to the Bay Area environment, including the preservation of natural land and open space, improved water quality, and protection of habitat and native wildlife species. Focused growth also provides important economic and equity benefits, including reduced traffic congestion and lower transportation costs, more housing options, and better access to jobs.

The Air District recommends requiring the implementation of as many TDM strategies as is feasible into projects and plans. Examples include, but are not limited to, parking pricing strategies; parking maximums; mandated parking spaces for car-sharing programs; the provision of transit passes in residential, commercial and office developments; charging stations for electric vehicles; bicycle lockers or racks; teleworking policies; bicycling improvements; and more. For a complete list of TDM strategies, consult the Air District's webpage: www.baaqmd.gov/planninghealthyplaces.

TRAFFIC MANAGEMENT STRATEGIES

Studies demonstrate that managing how traffic flows is a strategy to reduce the amount of air pollution emitted from vehicles.

Traffic Smoothing

Reducing acceleration and deceleration can reduce fuel consumption and emissions. Creating a more constant traffic speed (i.e. traffic smoothing) can reduce emissions fairly significantly (up to ~50%, according to several studies). Strategies to smooth traffic include installing roundabouts at stop-controlled intersections.

Speed Limits

Driving speed is one of the most important factors that determine vehicle emissions, according to ARB. A study by El-Shawarby et al (2005) found that fuel consumption and emission rates are optimum in the range of 38-55 mph. Outside of this range, both fuel consumption and emission rates increase considerably.

APPENDIX B: BEST PRACTICES TO REDUCE EXPOSURE TO LOCAL AIR POLLUTION

HEALTH PROTECTIVE DISTANCES

Planning sensitive land uses at a sufficient distance from localized air pollution sources is one of the most effective health protective measures that can be implemented to protect children and other vulnerable populations from the harmful effects of air pollution. In general, as the distance from a local source of air pollution increases, the level of air pollution and associated health risk decreases. The exact distance may vary, depending on the type and number of sources of emissions in a given geographic location.

A number of communities within the Bay Area are impacted from disproportionately high levels of air pollution. These areas with high pollution are usually characterized by heavily traveled roadways and freeways, railroads, industrial facilities, or more often a combination of these sources of emissions. The Air District conducted screening level air quality modeling to identify these local areas that may have higher concentrations of air pollution and therefore greater exposure of sensitive populations to fine PM and TACs. The results of the screening level air quality modeling are shown in purple, in maps on the Air District's website (www.baaqmd.gov/planninghealthyplaces; an example map is shown on pg. 10 of this guidebook. However, the air quality modeling can include uncertainty due to use of screening level input data or due to very localized variations in locations of air pollution sources and sensitive populations. The purple areas represent where the air pollutant levels are estimated to be elevated. The Air District recommends using caution before placing sensitive land uses in these purple areas, and recommends placing sensitive land uses as far from air pollutant sources as is feasible. The Air District encourages local governments to utilize zoning as a strategy for implementing health protective distances. Updating a zoning code to designate non-sensitive land uses in areas with elevated levels of air pollution (i.e. purple areas) is an excellent strategy for reducing health risks in a community.

The Air District recognizes that in dense urban communities, implementing a health protective distance barrier between sensitive land uses and sources of air pollution sometimes may not be feasible. If it is not possible to implement health protective distances, then the additional best practices to reduce exposure to local air pollution will help to reduce health risks, if fully implemented.

AIR FILTERS

Because many people spend a majority of their time indoors, reducing the entry of air pollutants into a home (or school, daycare, etc.) is a viable option to mitigate the adverse health impacts related

to air pollutant exposures. Heating, ventilating, and air conditioning (HVAC) systems control the air flow in buildings by circulating outside air through, and eventually out of a building. The use of high efficiency filtration in central HVAC systems and in portable air cleaners has been shown to be effective in most circumstances. Depending on the particle size, high efficiency filters can remove 50% - 98% of particles in the air, and portable air cleaners (designed for homes without a central HVAC) can remove 30% to 90% of particles.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) uses a Minimum Efficiency Reporting Value (MERV) measurement scale to rate the effectiveness of air filters on a scale of 1 to 16. For example, MERV-13 air filtration devices installed on an HVAC air intake system can remove 80-90% of indoor particulate matter (greater than 0.3 microns in diameter). High Efficiency Particle Filters, or HEPA filters, are effective at removing mold, pollen and ultrafine particles. HEPA filters have a particle size removal efficiency of > 99.999% for particles 0.3 - 1 micron in diameter which is roughly equivalent to a MERV 20 rating (US EPA, Residential Air Cleaners August 2009). However, only a few HEPA filters are designed for use in residential applications.

Studies conducted in California (Bhangar et al 2011, Less et al., 2015) have shown that particulate levels in homes with high efficiency filtration systems were 50% to 74% lower than those without filtration systems. Modeling simulations (Brown et al 2014) showed similar findings. The effectiveness of air filters in reducing health risks depends heavily on properly sealed ducting and maintenance. Higher MERV rated filters also require increased air pressure, which requires more energy use and can cause ducts to fail if not properly installed and sealed. An ongoing maintenance plan for a building's HVAC air filtration system should therefore be included in any air filtration best practice adopted by a local government. For additional information on air filters, see the U.S. EPA's document, "Residential Air Cleaners: A Summary of Available Information August 2009".

HVAC filtration is an effective and feasible air quality mitigation strategy. It is becoming increasingly common in Bay Area jurisdictions. For example, San Francisco requires MERV 13 air filters in new residential buildings located near freeways.

The Air District recommends requiring the installation and implementation of an air filtration system in sensitive land uses (minimum of MERV 13) along with a maintenance plan detailing how the filtration system will be maintained.

PROJECT PHASING

In 2008, the California Air Resources Board adopted the On-Road Heavy Duty Diesel Vehicle (in use) regulation to dramatically reduce diesel particulate matter emissions from trucks and buses. The regulation requires owners of diesel trucks to retrofit or replace their engines so that by 2016, nearly all trucks would have diesel particulate matter emissions equal to a 2010 or newer model year engine. The regulation went into effect in 2012, and will result in significant reductions in diesel particulate matter emissions from on-road diesel trucks and buses as truck and bus owners comply with the regulation. ARB estimates there should be up to an 80 percent reduction in diesel particulate matter by 2023 from on-road trucks and buses. Accordingly, it is expected that the geographic scope

of areas with unhealthy levels of diesel exhaust will decrease in future years as this truck and bus fleet becomes cleaner.

The ARB regulation makes project phasing an effective strategy for reducing people's exposure to PM and TAC emissions when the project or plan area is impacted from a source of emissions that includes on-road trucks and buses, such as a freeway or distribution center. When it is feasible to do so, such as on a relatively large project site, buildings that will be closest to the source of diesel particulate matter from on-road trucks or buses could be built last, so that air pollution from nearby highways or roadways will have declined due to the turnover of older diesel trucks and buses resulting from the ARB regulation. Phasing development near highways and major roadways can reduce exposure to fine PM concentrations and TACs.

BUILDING AND SITE DESIGN

Designing residential buildings and sites to locate people away from emission sources is an effective way to protect people's health.

Building Design

Building design can be an important factor in reducing exposure to PM and TACs by improving indoor air quality, especially when considering the location of the air intake for building ventilation. Generally, air pollution decreases with distance and with height, therefore air intake locations should be located as far as possible away from emission sources to provide the cleanest air to building occupants.

Other beneficial design features may further improve indoor air quality. Operable windows and balconies could be installed away from high volume roadways or other sources of air pollution. For example, if local sources of air pollution are located on the west of the building, operable windows and balconies could be installed on the east side of the building (if possible) where the concentrations of fine PM and TACs are likely to be lower.

Site Design

When designing a plan or project that includes sensitive land uses near local sources of fine PM and TACs, buildings within the development that do not house people, such as parking garages, commercial buildings or open space, should be located closest to the local source of emissions. Buildings that will house people should be located further away from local pollution sources.

If sensitive land uses are planned near a distribution center, locate the buildings of the sensitive land use away from the entry and exit points, the loading docks or where trucks concentrate and/or idle. Sensitive land uses should not be located in close proximity to a loading dock, either on a neighboring parcel or within a mixed use development. If loading docks are not used in the development but there will be areas where trucks concentrate to deliver goods, then a separation such as a setback should be provided between these uses.

Consider incorporating solid barriers, similar to sound walls, between buildings and sources of air pollution. Studies have demonstrated that barriers can reduce air pollutant levels, while also reducing noise (co-benefit). Also, implementing open space, such as parks, between buildings can improve

air flow and air pollution movement. This strategy can help to reduce build up of air pollution, or air pollution "hot spots".

VEGETATION

Planting certain trees can be an effective strategy for reducing exposure to air pollution. With certain trees, coarse and fine particulates become trapped and filtered by the leaves, stems, and twigs of the trees. Trapped pollution particles are eventually washed to the ground by rainfall. Trees also lower the air temperature by providing shade over streets and parking lots, thereby reducing evaporative emissions from vehicles and energy consumed on air conditioning during summer months.

The effectiveness of fine PM removal depends on the tree species planted. Large, evergreen trees (those with foliage year-round) with long-life spans are best. In addition, trees with branches and leaves that have a sticky surface are best at trapping fine PM. Trees with a fine, complex foliage structure that allows significant in-canopy airflow will also perform better at trapping particulate matter. Pines, Cypress, Hybrid Popular, and Redwoods are an example of trees that do well in trapping pollution.

In addition to the type of tree, the placement of the trees, relative to major roadways or other diesel emission sources, and how densely they are planted, are important considerations in using trees as a strategy to reduce air pollution exposure. Trees should be planted between land uses and the source of emissions, and as densely as possible, while still maintaining the health of the trees. Additionally, some trees emit volatile organic compounds (VOCs) which can lead to the formation of ozone. Care should be taken that trees planted with the intent to reduce fine PM do not also emit VOCs.

Research is continuing to determine and quantify the effectiveness of planting of trees near a source of particulate matter in reducing exposure.

LIMIT GROUND FLOOR USES

Avoiding residential development on the ground floor of buildings can be an effective strategy for reducing people's exposure to local pollutants from a nearby at-grade highway or busy roadway. This strategy is often applied to mixed use buildings on infill sites, where the ground floor is reserved for commercial space and the second and subsequent levels are used for residential. Limiting ground floor residential development is generally only effective when the adjacent roadway is not elevated. However, the Air District notes that in some instances (generally in more dense urban scenarios), air pollution may not decrease with height.

ALTERNATIVE TRUCK ROUTES

Truck routes can be planned or re-routed through non-residential neighborhoods, and to avoid other sensitive land uses such as daycare centers, schools, and elderly facilities. For example, the City of Oakland recently worked with community groups to re-route trucks away from residential streets around the Oakland Coliseum to address local concern about air pollution levels.

APPENDIX C
TECHNICAL NOTES

The maps created by the Air District include blue and purple areas.

The blue areas represent “large and/or complex” sources where further study is recommended. The Air District relied on ARB’s document entitled, “2005 Air Quality Land Use Handbook: A Community Health Perspective” (ARB Land Use Handbook) to define “large and/or complex” sources, and their associated further study areas. The further study areas are defined below:

- 0.5 miles around all major airports, including OAK, SFO, SJC;
- 0.5 miles around all oil refineries;
- 0.5 miles around the Port of Oakland; 1,000 feet around all other seaports;
- 1,000 feet around railyards (except Caltrain yards in San Jose & San Francisco - these are included in AQ modeling in purple areas)
- 150 feet around small gas stations; and
- 300 feet around large gas stations.

The purple areas on the maps are based primarily on a screening level, cumulative analysis of all mobile and stationary sources of air pollution. The Air District recommends implementing best practices to reduce exposure in these purple areas. To create the purple areas, the Air District identified areas that exceed 100 in a million for cancer risk, exceed fine PM concentrations of 0.8 micrograms per cubic meter, or are within 500 feet of a freeway, 175 feet of a major roadway (>30k AADT), or 500 feet of a ferry terminal. The Air District utilized US EPA’s recomendations on the range of acceptable excess cancer risk and concentrations of fine PM. According to the US EPA, anything outside of the range of 100 in a million for excess cancer risk and/or concentrations of fine PM exceeding 0.8 micrograms per cubic meter should be considered “high” risk. Implementation of best practices to reduce exposure will reduce the health risks; however, the health risks may not be reduced to acceptable levels.