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Estimating emissions reductions from traffic mitigation

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Vehicle emissions are the largest end use contributor to the creation of Greenhouse Gases (GHG). As part of the review process of a development project, many state agencies have been focusing on the generation of emissions including carbon dioxide (CO₂), a source of GHG pollution. The review process typically requires the estimation of CO₂ from both stationary and mobile sources as a result of a development project. For most developments, the stationary generation of CO₂ is primarily related to the proposed building's energy use. For projects that generate considerable volumes of traffic, the primary generation of CO₂ within the immediate area is typically related to vehicle emissions.

Engineers evaluating air quality have developed programs to estimate the emissions of vehicles based on area characteristics including climate conditions, vehicle registration, vehicle fleet mix, and vehicle miles traveled. However, none of these programs consider the effects of traffic congestion, which plays a significant role in localized GHG emissions. Similarly, traffic engineers have developed programs to evaluate traffic congestion on area roadways and intersections. While these programs can measure congestion in terms of capacity, delay, and level of service, they do not relate the impact of roadway and intersection operations to vehicle emissions.

Greenman-Pedersen, Inc. has developed a model that combines aspects of both methodologies and uses commonly available traffic engineering software to estimate GHG emissions on a localized area roadway network on the basis of traffic operations. As traffic volumes increase, so do GHG emissions. However, these emissions can be mitigated through implementation of roadway and intersection improvements, which serve to reduce congestion and thereby vehicle emissions. This is particularly important for those development projects that require state review of GHG emissions. Often times, such projects propose extensive roadway infrastructure improvements to mitigate the traffic impacts of the project. However, due to limitations of the current programs, the benefits that such roadway improvements have on reducing vehicle emissions cannot be documented. The Greenman-Pedersen, Inc. methodology allows development projects to document and take credit for reductions in GHG emissions resulting from proposed roadway improvements. In addition, this methodology can also be applied to state or federal roadway improvement projects to aid in attaining the goals of the Clean Air Act.

To improve traffic flow, measures such as the addition of exclusive turn lanes at intersections, optimization of traffic signal timings, and signal coordination along a roadway corridor are typically used. All of these measures have a beneficial impact on roadway operations resulting in lower vehicle emissions. The current air quality models can estimate the generation of CO₂ based on volume, vehicle fleet mix, climate conditions, etc., but not on the relative effects of these improvement measures. The Greenman-Pedersen, Inc. methodology can be used in conjunction with the approved models to estimate a proportional reduction in vehicle emissions resulting from

roadway and intersection improvements. Although this proportional reduction may or may not reduce the emissions related to a project below a "No-Build" condition (assumes the project is not built), it provides a way to measure the benefits of the improvements on vehicle emissions and a better estimation of a project's actual environmental impact.

As projects continue to be developed and public awareness continues to grow on the importance of environmental protection and sustainable design, the need to better predict the impacts of a project and the benefits of mitigation measures also continues to grow.

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