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FAVORABLE WITH AMENDMENTS

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Comments on the proposed Bill entitled "Retail Service Stations – New Construction – Setbacks and Electric Charging Stations" by Delegate Ruth

Disclaimer: The opinions expressed herein are my own and do not necessarily reflect the views of Columbia University.

My name is Markus Hilpert. I have a PhD in engineering, and I am an associate professor of environmental health sciences at Columbia University. My research addresses the transport of contaminants in the environment, and associated impacts on human health. I have published 74 scientific papers in the peer-reviewed literature, and I have been encouraged by Delegate Ruth to provide an overview of my research on gasoline releases from gas stations and to explain why setback distances from gas stations are needed.

At gas stations, unburned fuel can be released to various environmental compartments including soil, groundwater, surface water, and the atmosphere (see **Figure 1**) (Hilpert et al. 2015). So why should we be concerned about those gasoline releases? Gasoline contains several toxic compounds including benzene. There are numerous short-term health effects of inhalation exposure to benzene but perhaps more important for gas station regulations, long-term inhalation exposure to benzene can cause cancers including leukemia.

In my research, we examined gasoline spills at the nozzle. We found that the relatively small droplets of gasoline that are typically spilled during vehicle refueling can penetrate concrete pavement, which at times is considered to be impermeable. However, we found that the fraction of gasoline infiltrated can even exceed the fraction evaporated, promoting soil and groundwater contamination (see **Figure 2**) (Hilpert and Breysse 2014).

We also found that vent pipe emissions from gas stations can be more than 10 times higher than what one would expect based on estimates by the California Air Resources Board (CARB) (see **Figure 3**) (Hilpert et al. 2019).

In recent work, we developed a framework for estimating cancer risk as a function of distance from a gas station, sales volume of the station, and the number of gas stations in a gas station cluster (see **Figure 4**) (Hsieh et al. 2021).

Please let me close my remarks by stating that Delegate Ruth's initiative is very much needed and timely. I only filed my testimony as "Favorable With Amendments" (FWA), because I still need to examine whether the setback distance and sales volume threshold should potentially be adjusted.

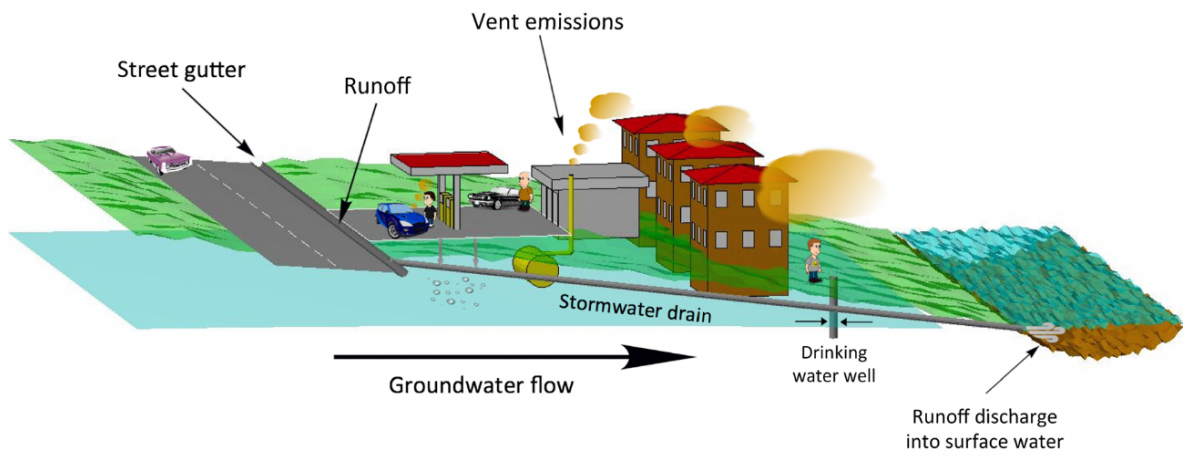


Figure 1: Gas stations are embedded into the natural environment and can consequently release pollutants to the atmosphere, the subsurface including soil and groundwater, and surface water. Source: Hilpert et al. (2015).



Figure 2: Concrete pads and pavement at gas stations. Source: Hilpert and Breyse (2014).



Figure 3: The three vent pipes (enclosed by the red ellipse) on the right side of the convenience store of a gas station are less than 10 m away from the residential building. Source: Hilpert et al. (2019).

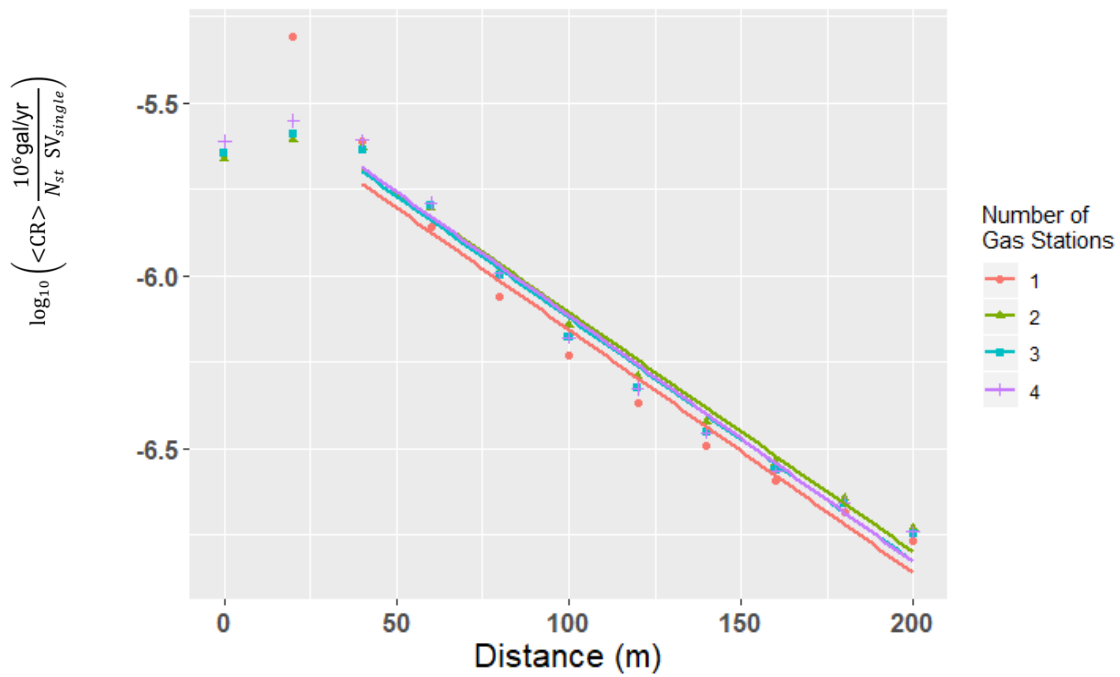
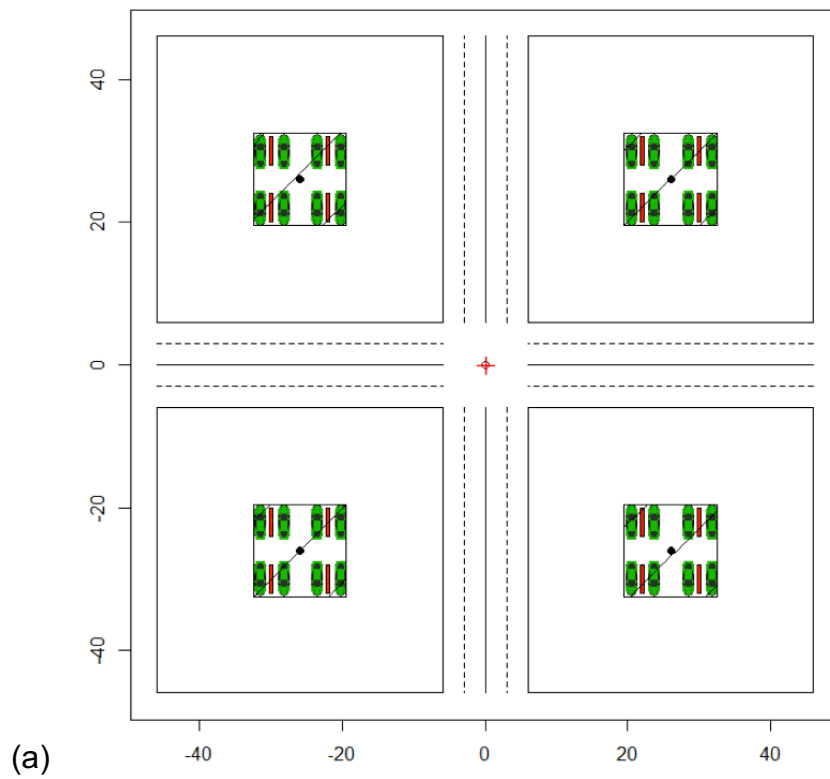


Figure 4: (a) Generic gas station cluster with one gas station on each corner of an intersection. (b) Lifetime cancer risk $\langle CR \rangle$ normalized by sales volume and then log-transformed for 1, 2, 3 and 4 gas stations in a gas station cluster. Source: Hsieh et al. (2021).

REFERENCES

Hilpert, M. and P. N. Breysse (2014). "Infiltration and evaporation of small hydrocarbon spills at gas stations." J Contam Hydrol **170**: 39-52.

Hilpert, M., B. A. Mora, J. Ni, A. M. Rule and K. E. Nachman (2015). "Hydrocarbon Release During Fuel Storage and Transfer at Gas Stations: Environmental and Health Effects." Curr Environ Health Rep **2**(4): 412-422.

Hilpert, M., A. M. Rule, B. Adria-Mora and T. Tiberi (2019). "Vent pipe emissions from storage tanks at gas stations: Implications for setback distances." Sci Total Environ **650**(Pt 2): 2239-2250.

Hsieh, P. Y., J. A. Shearston and M. Hilpert (2021). "Benzene emissions from gas station clusters: a new framework for estimating lifetime cancer risk." Journal of Environmental Health Science and Engineering.