

## **Reply to Brian Crosland – SC1**

We would like to thank Brian Crosland for his questions about the content of our study. We have addressed both of the comments below. No significant changes were made to the manuscript in response to this review.

*Comment 1: -Page 12 Line 20 refers to Omara et al and quotes a "natural gas facility emission volumes of 2.2 g/s". -Reading through the Omara paper it is not immediately clear where this value originates. As per the Omara abstract: "mean facility-level CH4 emission rate among UNG well pad sites in routine production (18.8 kg/h (95% confidence interval (CI) on the mean of 12.0-26.8 kg/h))" -Note that 18.8 kg / h works out to 5.2 g/s.*

*-Clouding the issue is a potentially inconsistent definition of "facility". Omara appears to only have measured well pad sites and often refers to them as facilities or "facility-level", eg p.2102 starting just before Figure 1 "Among the routinely producing well pad sites, absolute facility-level CH4 emission rates varied by more than 3 orders of magnitude..." while the current manuscript appears to differentiate between well pad sites and facilities, where the latter have the potential to emit plumes at heights significantly above the assumed 1m AGL. Can the authors please comment on the origin of the 2.2 g/s value in the Omara paper, as well as clarify the differentiation between "wells" and "facilities" in their manuscript versus the Omara paper.*

We will seek to verify the definition of “facility” with Omara and perhaps a corrigendum can be issued that clarifies. We have used the emission rates that we can best tell are accurate for a natural gas facility in our study area without further explanation. Furthermore, as the BC OGC have pointed out in their comment below, many well pads in the area we surveyed have multiple types of infrastructure (wells and processing facilities) on the same well pad. It is therefore reasonable to assume that Omara’s estimate of facility-level emissions is likely a realistic comparison to the locations classified as “facilities” in our study.

*Comment 2: Can the authors please comment on their use of a constant emission rate of 0.59 g/s for all well pad sites in light of the text in Omara et al (2016, quoted above) stating that "...absolute facility-level CH4 emission rates varied by more than 3 orders of magnitude, with UNG sites exhibiting generally higher CH4 emissions (range: 0.85 ± 0.40 (1σ) to 92.9 ± 47.5 (1σ) kg/h) ..." Thank you!*

Our CH4 volume calculation is an estimate of the *minimum* CH4 emissions in the area. As is outlined in our manuscript, we used emission frequencies of sources that we identified to be emitting persistently. To provide a conservative estimate of emissions, we applied our minimum detection limit to the fraction of persistent emission sources in the area. For this reason we have stated in our paper that our emissions inventory likely underestimates the real total CH4 emissions for this area.