

Whose smoke is it anyway? Observing emissions crossing the urban-rural boundary in a polluted airshed

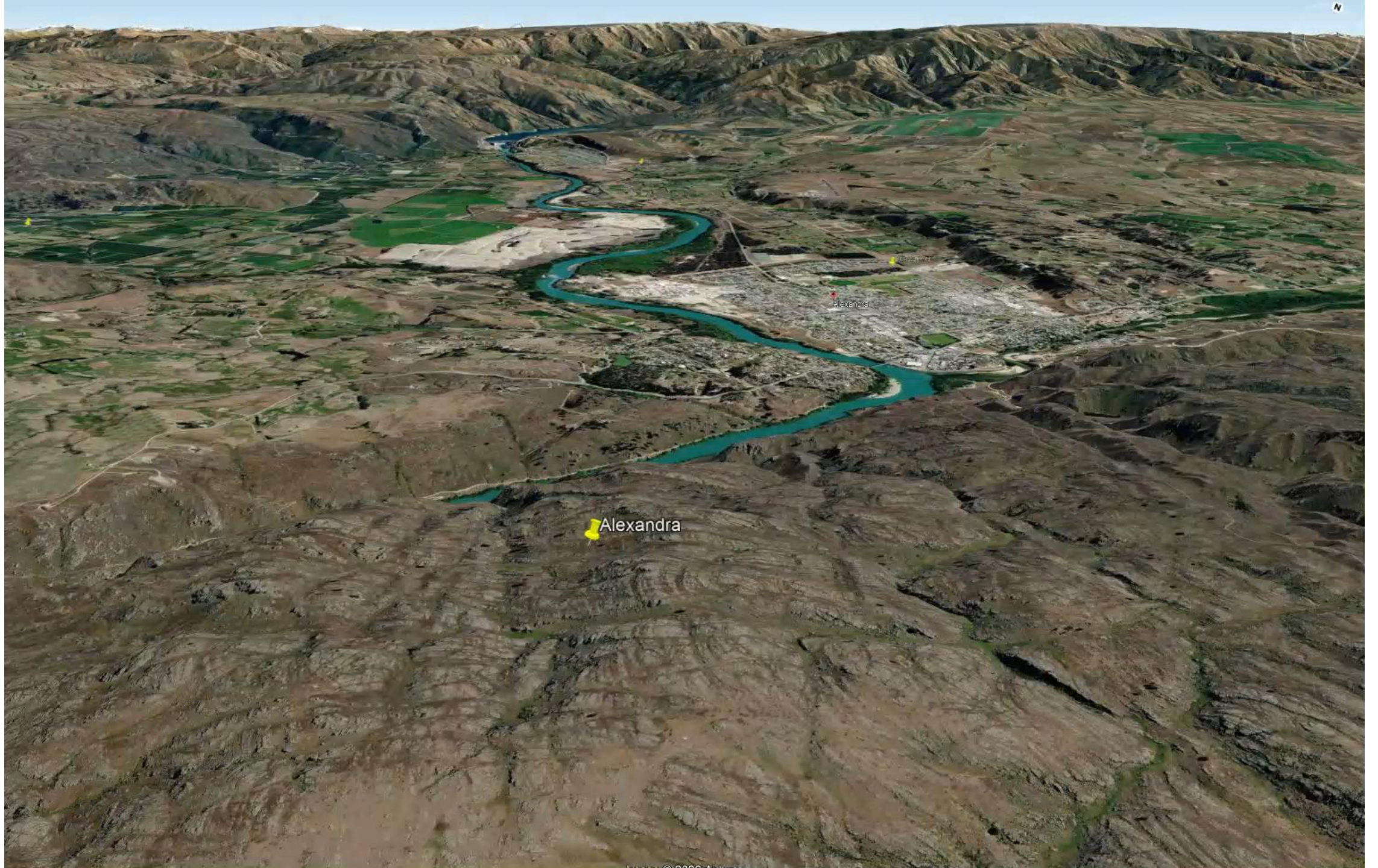
Dr Ian Longley, Gustavo Olivares
The Air Quality Collective



25/07/2025 01:57:08 pm FRI

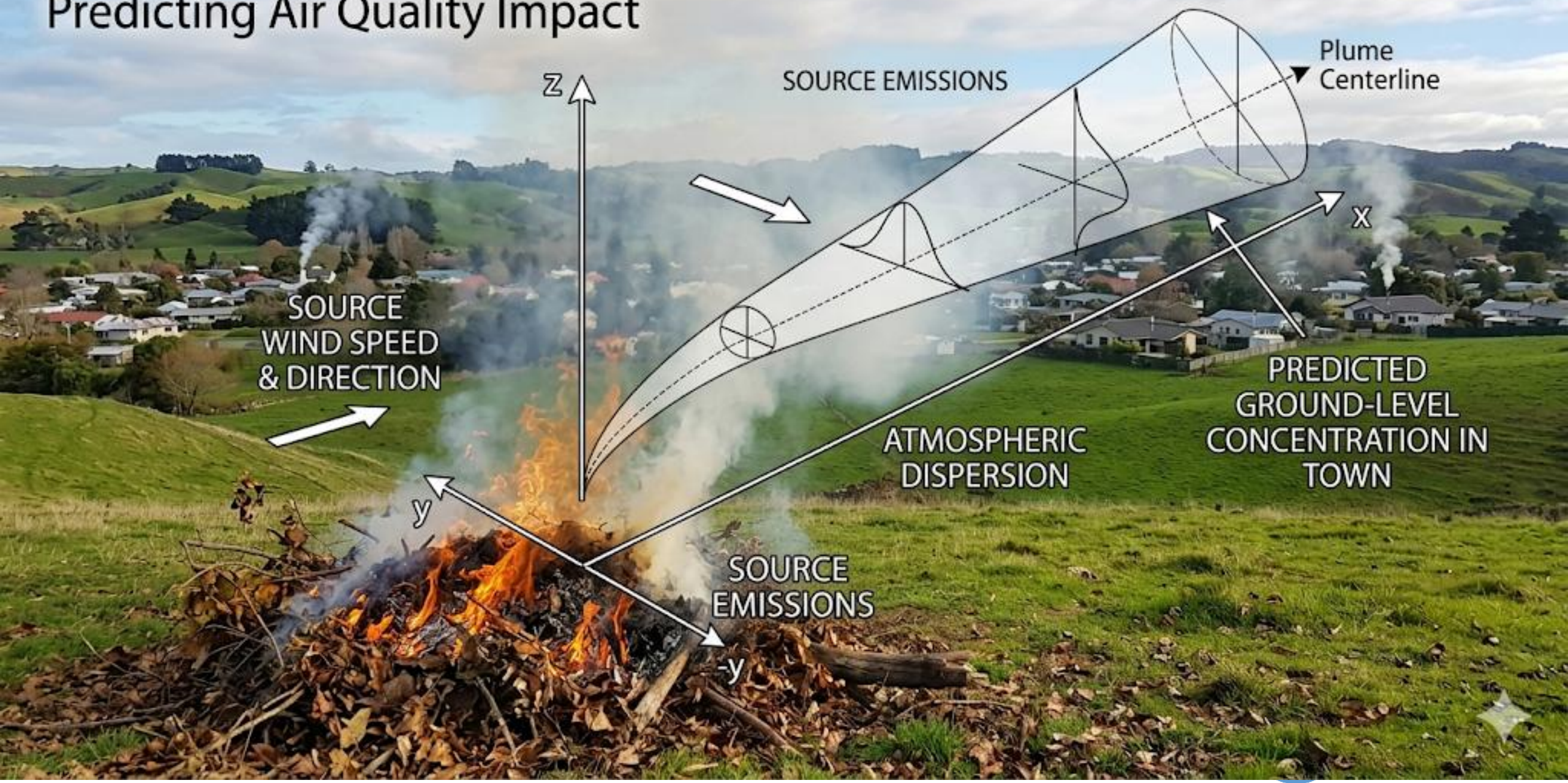


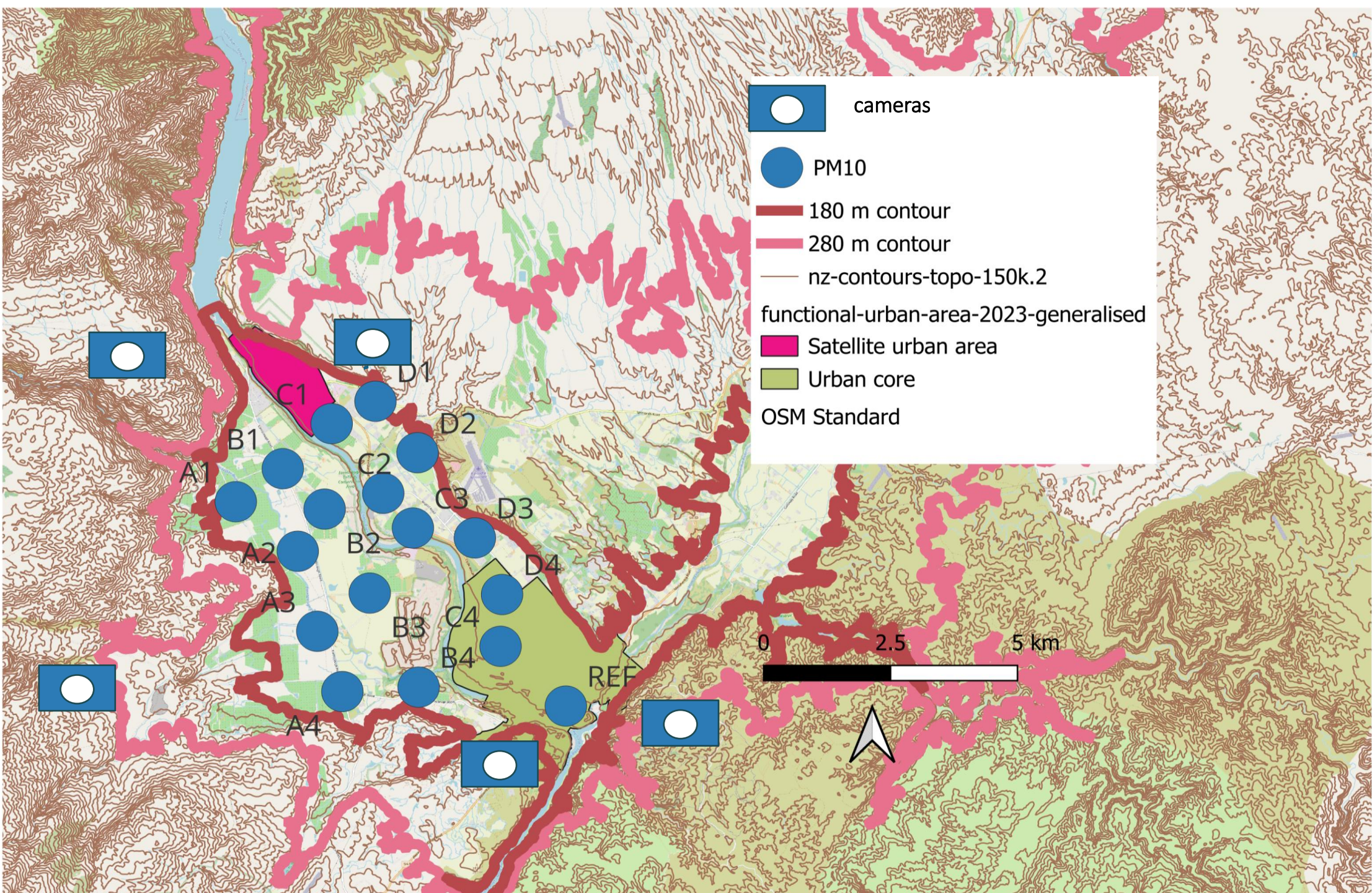


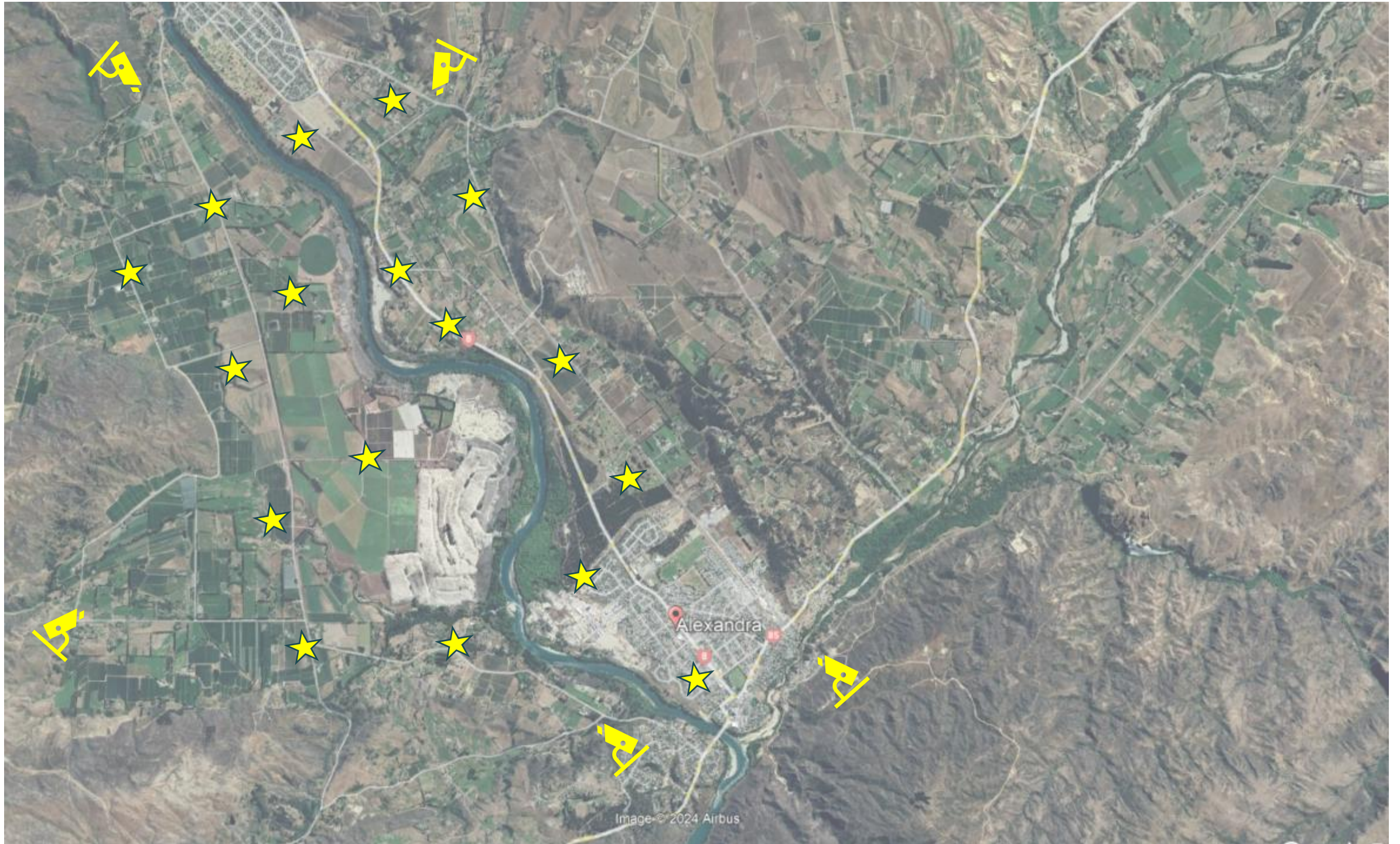


GAUSSIAN PLUME DISPERSION MODEL:

Predicting Air Quality Impact









cameras



Go PT Plus

85 Springvale Rd

Go PT Ultra

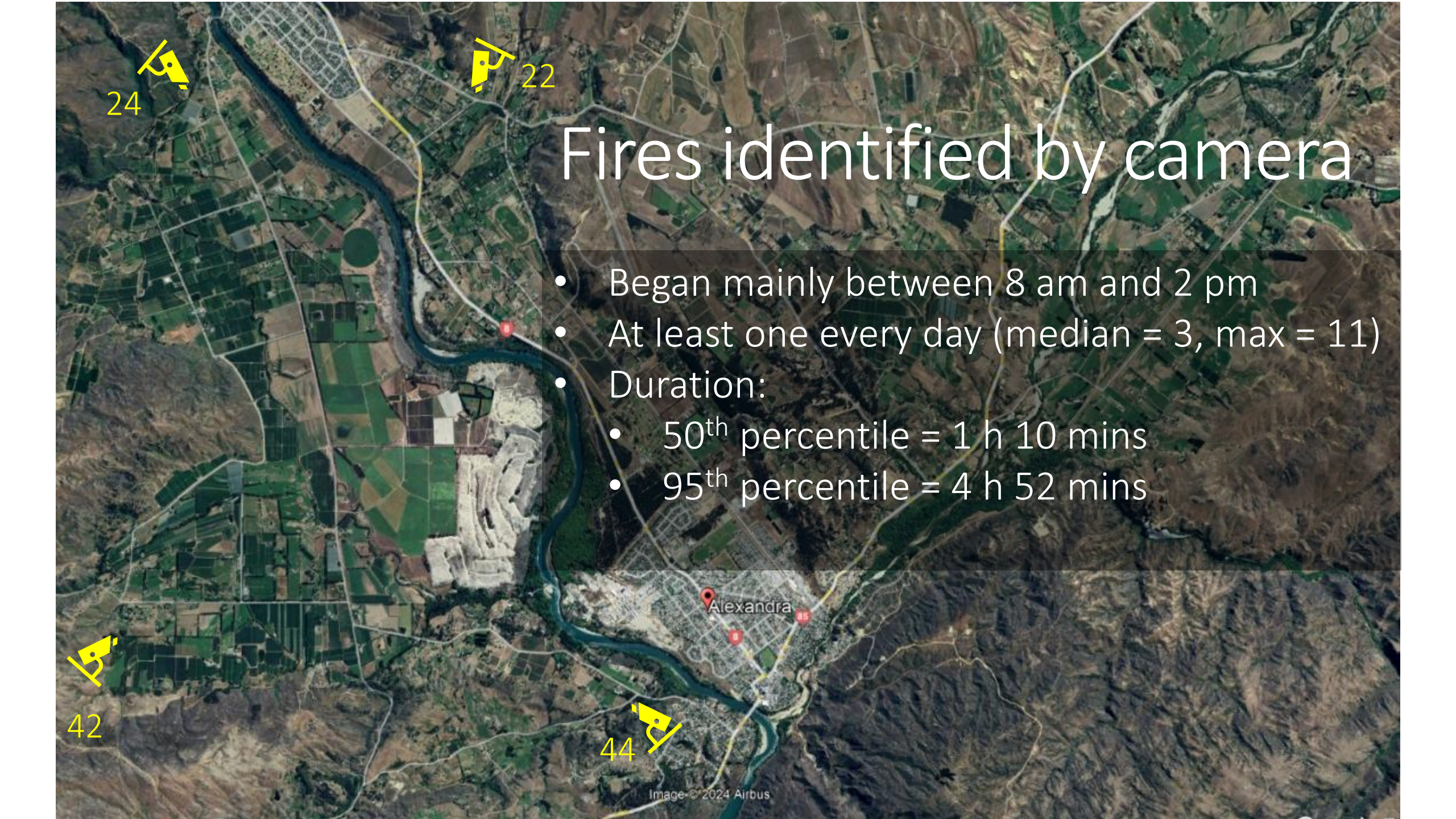
Alexandra



Estimated location of fires observed by cameras



Alexandra

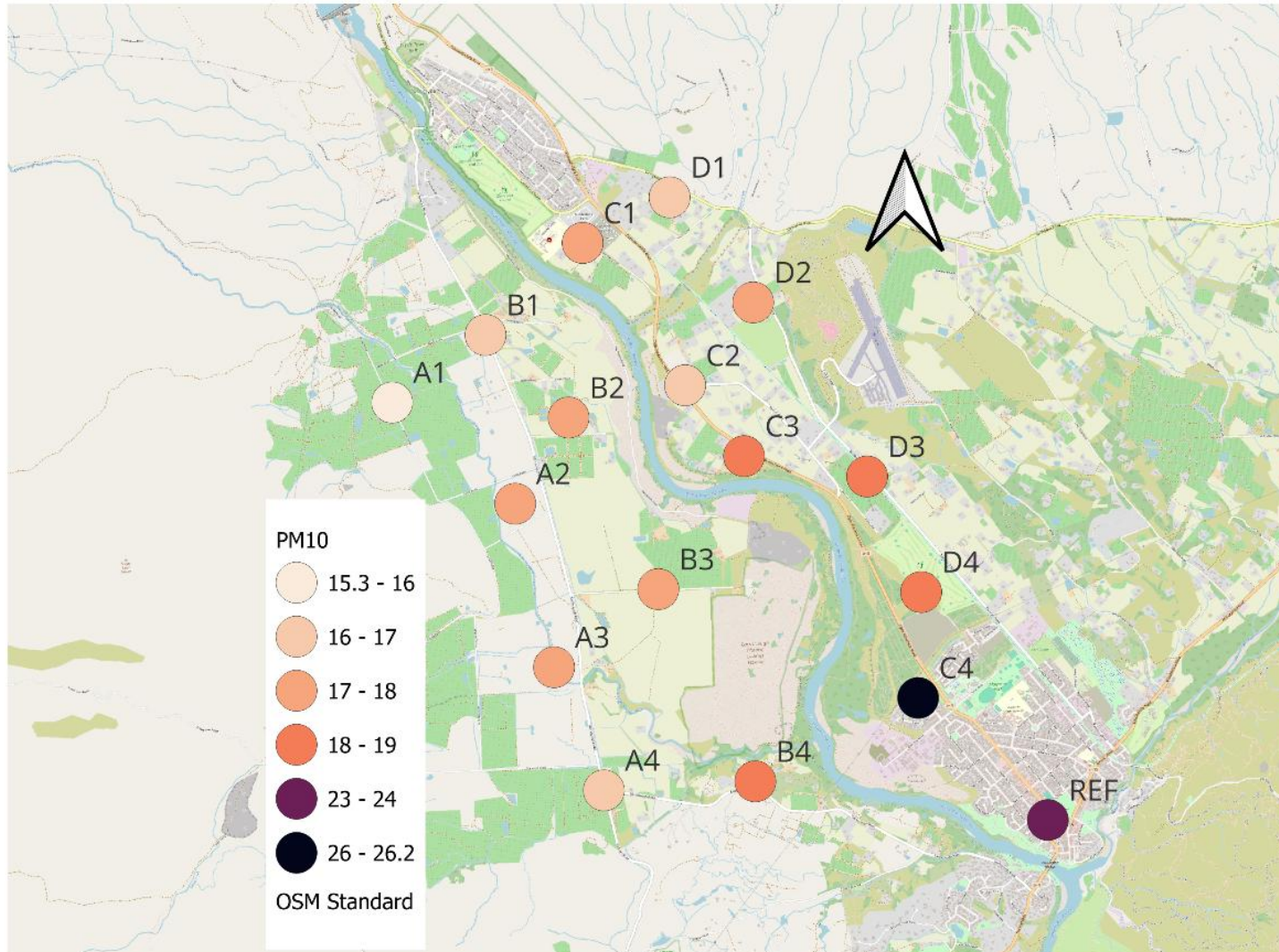


Fires identified by camera

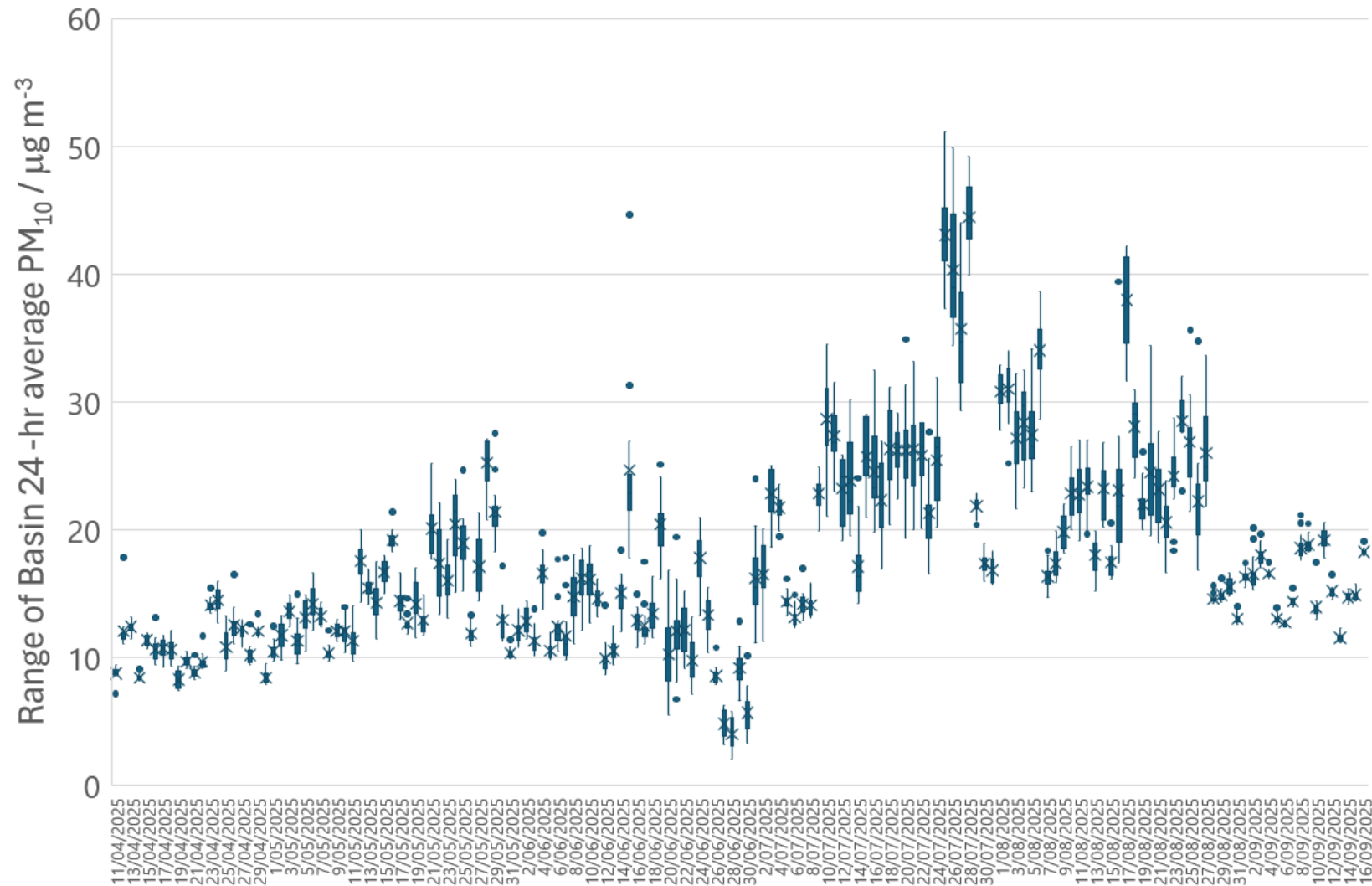
- Began mainly between 8 am and 2 pm
- At least one every day (median = 3, max = 11)
- Duration:
 - 50th percentile = 1 h 10 mins
 - 95th percentile = 4 h 52 mins

Alexandra

Mean 24 hr PM_{10} (adjusted to BAM-equivalence)



Distribution of 24-hr mean PM_{10} across the Basin sites



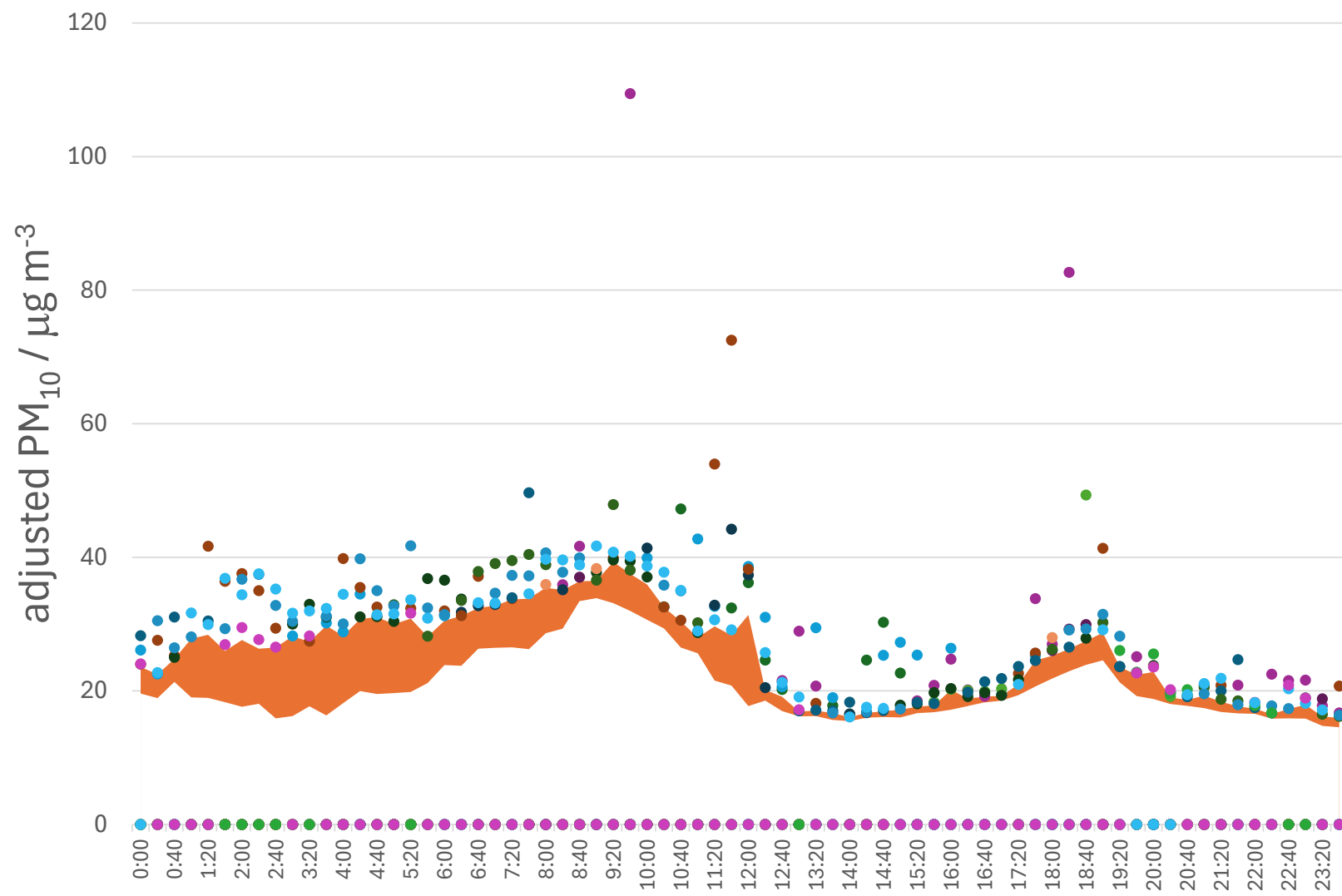
14/08/2025 05:51:08 am THU

reolink

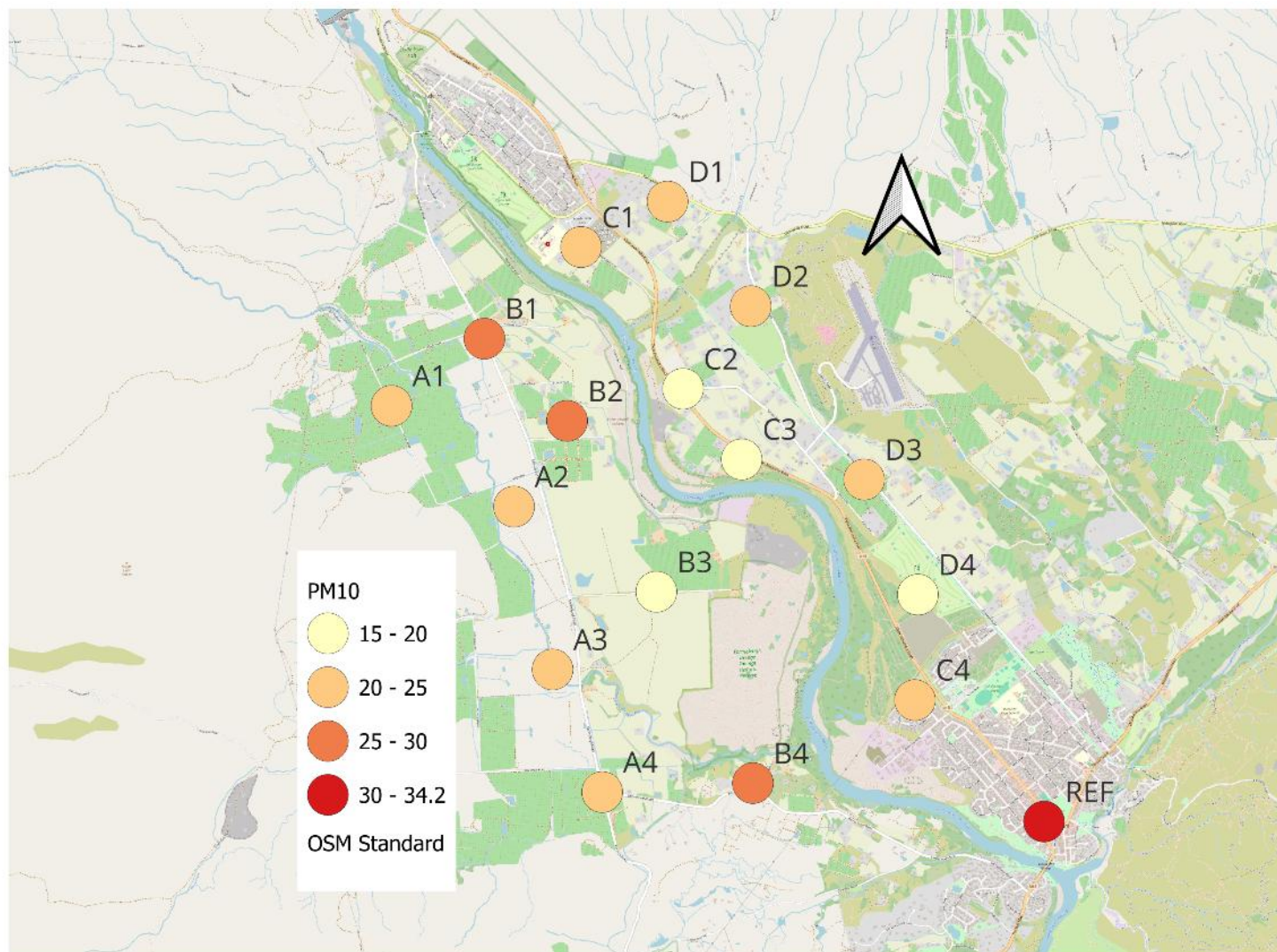


Reolink Go PT Ultra 001

Features of a typical day's data

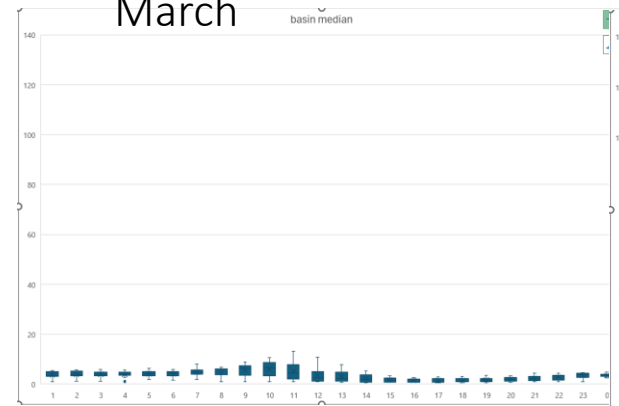


Mean PM₁₀ at 10am

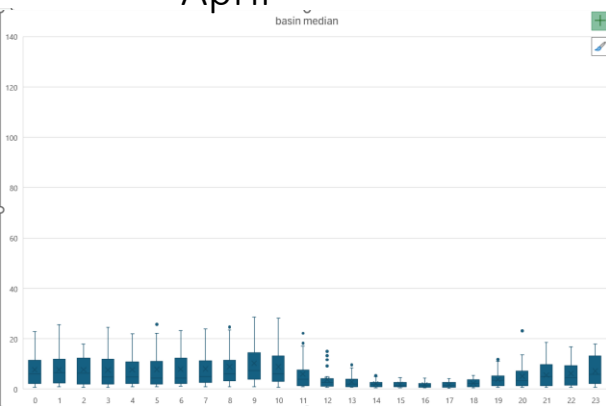


Basin-median concentration

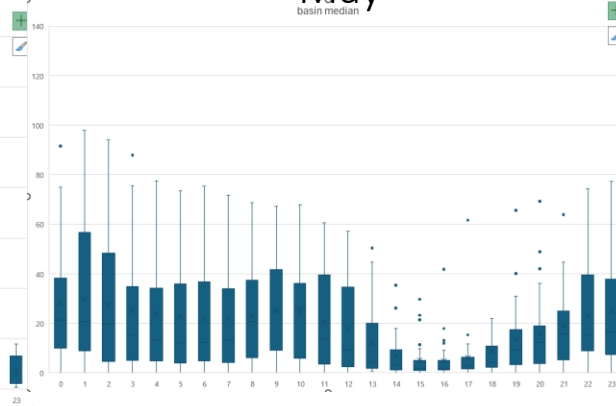
March



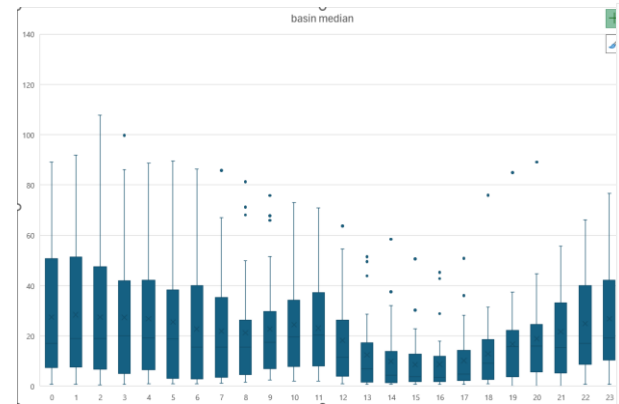
April



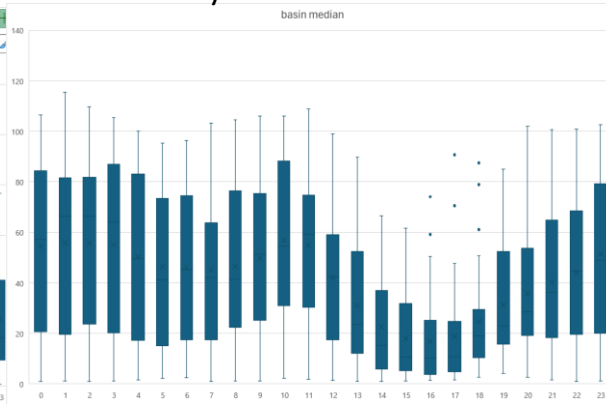
May



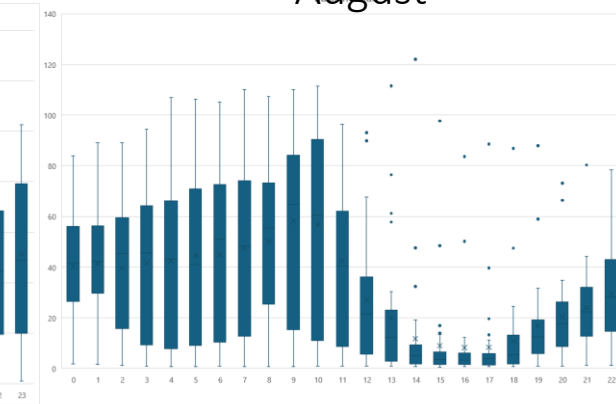
June



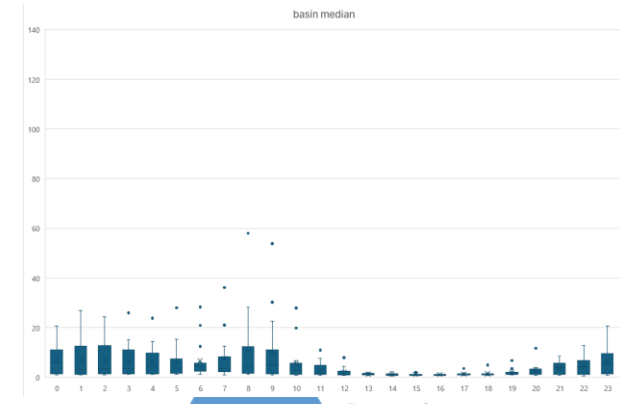
July



August



September





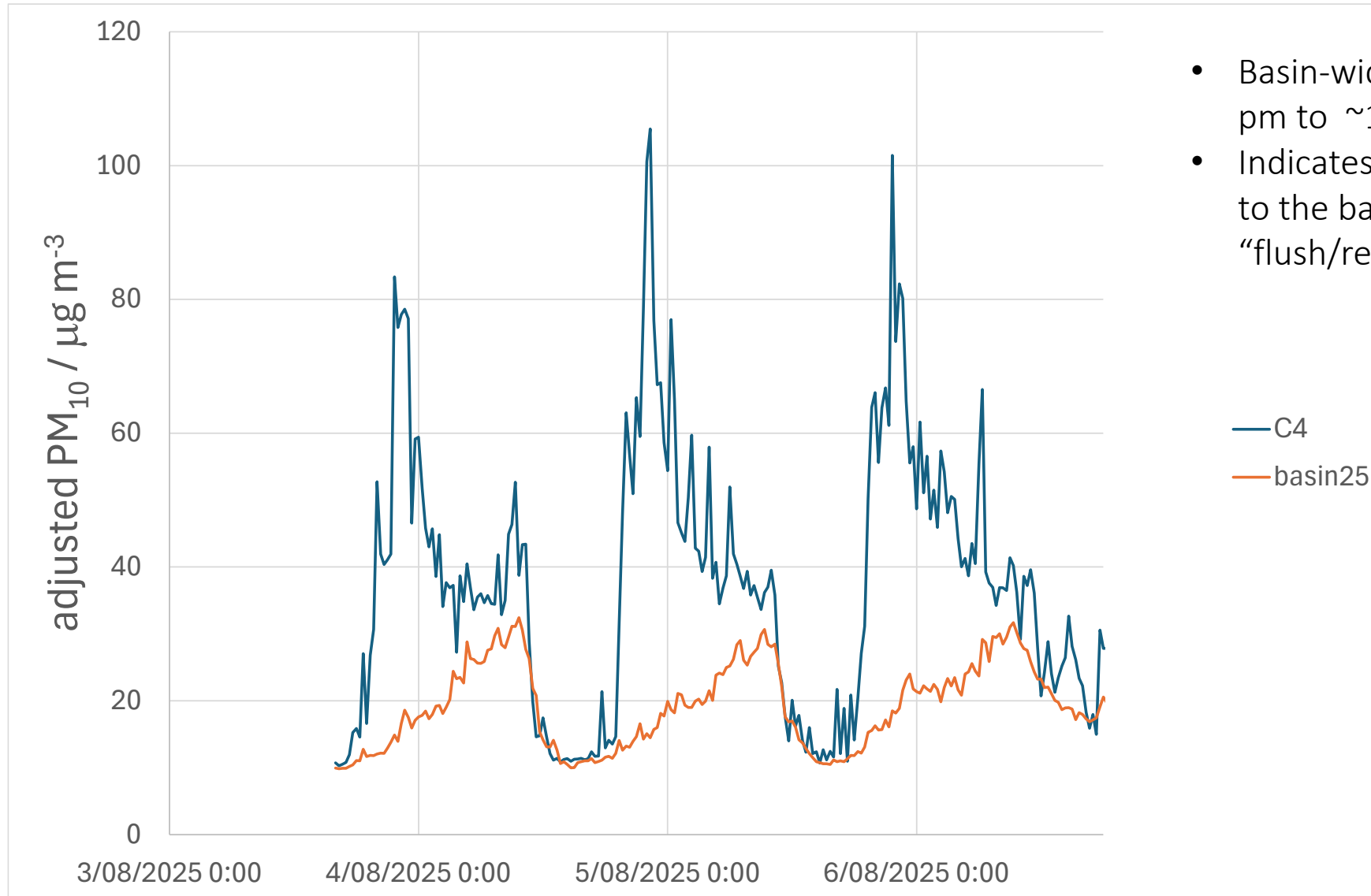
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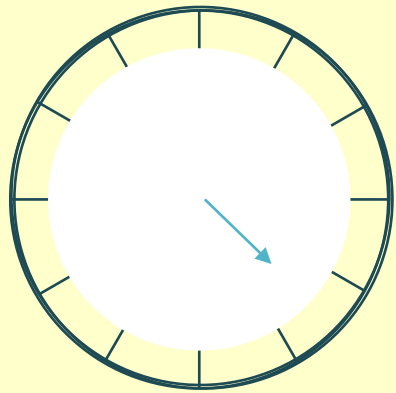




The “sawtooth”



- Basin-wide concentrations rise from 5 pm to ~10 am, then fall rapidly
- Indicates a continuous source of smoke to the basin all night, follows by a “flush/reset”



Key results and Conclusions – the airshed

6 official PM₁₀ exceedences (at Alexandra) during the study

We estimate one PM₁₀ exceedance at urban edge, none across the rest of the basin.

We estimate all sites across the basin would have exceeded PM_{2.5} standard of 25 µg m⁻³ 4 times

63 days out of 146 were inversion-controlled.

Inversions typically in place from 4 pm to 10 am, but sometimes persisted longer, and occasionally all day.

During inversion conditions smoke tended to mix across the basin

Inversions raised basin-wide PM₁₀ by 10 – 30 µg m⁻³.

Key results and Conclusions – Outdoor Burning

Most fires occurred outside of inversion conditions.

441 events were detected where the 15-min average impact on at least one monitor was $> 10 \mu\text{g m}^{-3}$ and 23 events where the impact was over $50 \mu\text{g m}^{-3}$.

However, these events were short-lived and as a 24-hr average their impact was no more than $1.5 \mu\text{g m}^{-3}$.

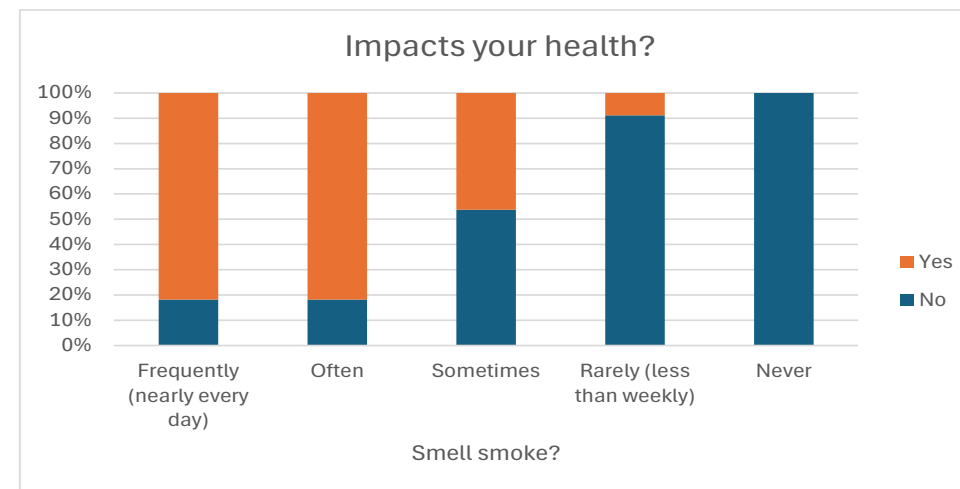
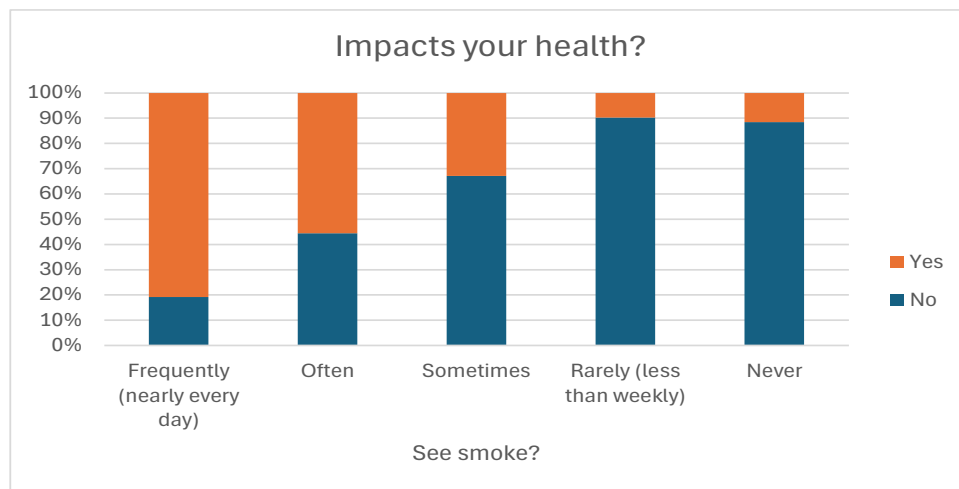
On relatively few occasions when fires occurred under an inversion smoke was readily spread across the basin and probably remained in the basin until the inversion lifted.

This lateral transport and mixing makes it especially difficult to disaggregate the impacts of home heating and outdoor burning emissions.

25/07/2025 01:57:08 pm FRI

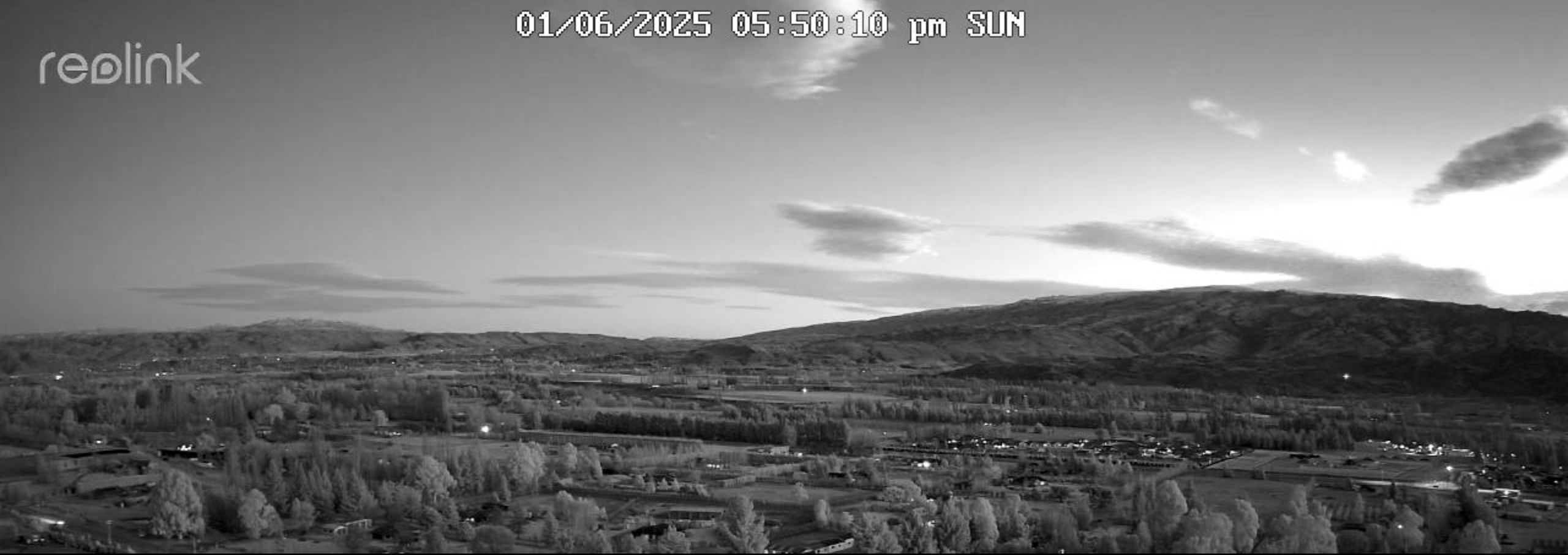


Survey: seeing or smelling smoke associated with belief it impacts health



01/06/2025 05:50:10 pm SUN

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Acknowledgements

The work featured in this presentation was funded by Otago Regional Council
With many thanks to Tim Hay for help with fieldwork.