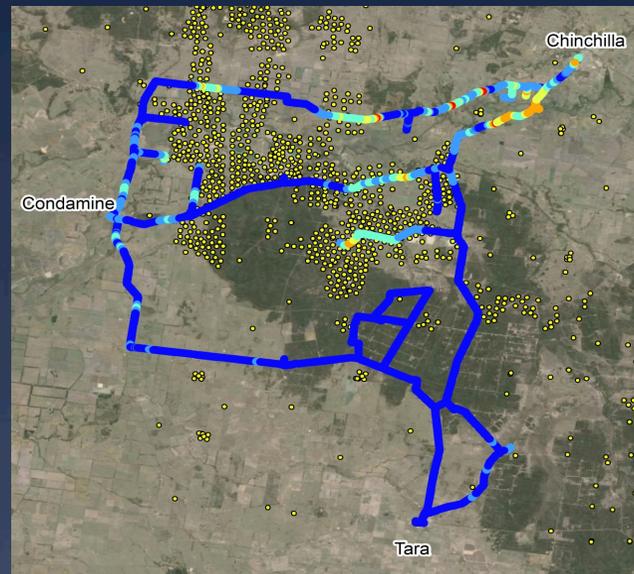


Baseline Fugitive Emission Measurements in CSG Fields



Sprigg Geobiology Centre
University of Adelaide

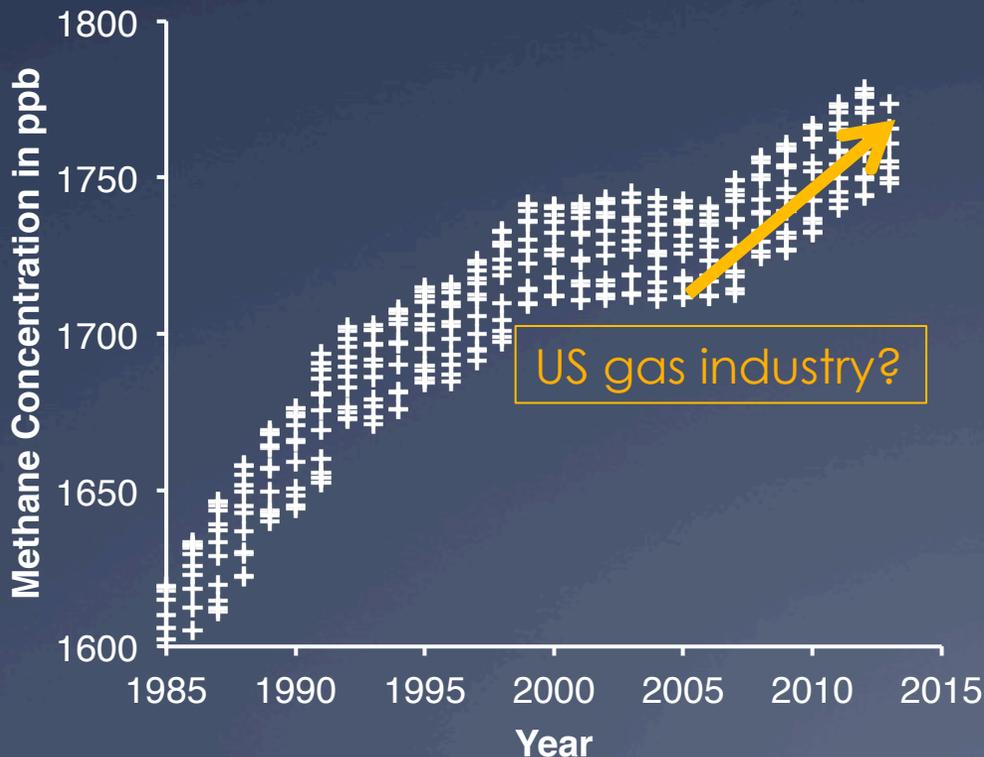
Martin Kennedy, unconventional energy
Michael Hatch, geophysical monitoring systems
Robert Vincent, atmospheric physics
Murray Hamilton, optics & photonics



International Focus on Methane rise and natural gas industry

Growth of unconventional natural gas industry in US perceived as a major contributor to this rise

**Methane Concentration from 1980
Cape Grim**



CH₄ second most important GHG

- CO₂ ~ 1.66 W/m²
- CH₄ is ~ 0.48 W/m²

CH₄ rising rapidly since 1990

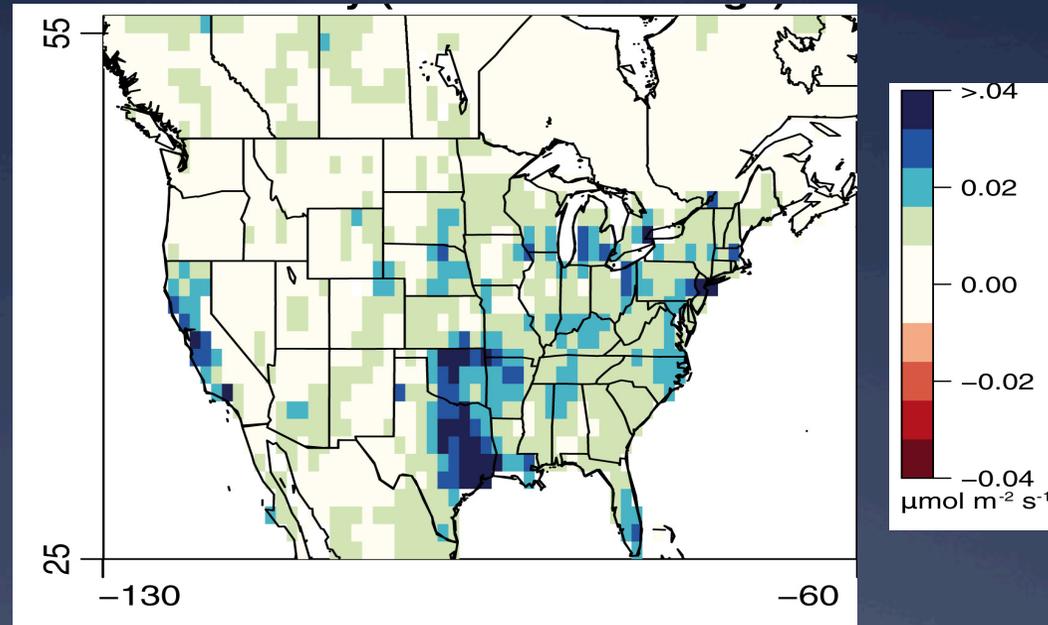
- 680 ppb preindustrial
- 1800 ppb present

Anthropogenic emissions 50-65%

- 526-570 TgC/y

International Focus on Methane rise and natural gas industry

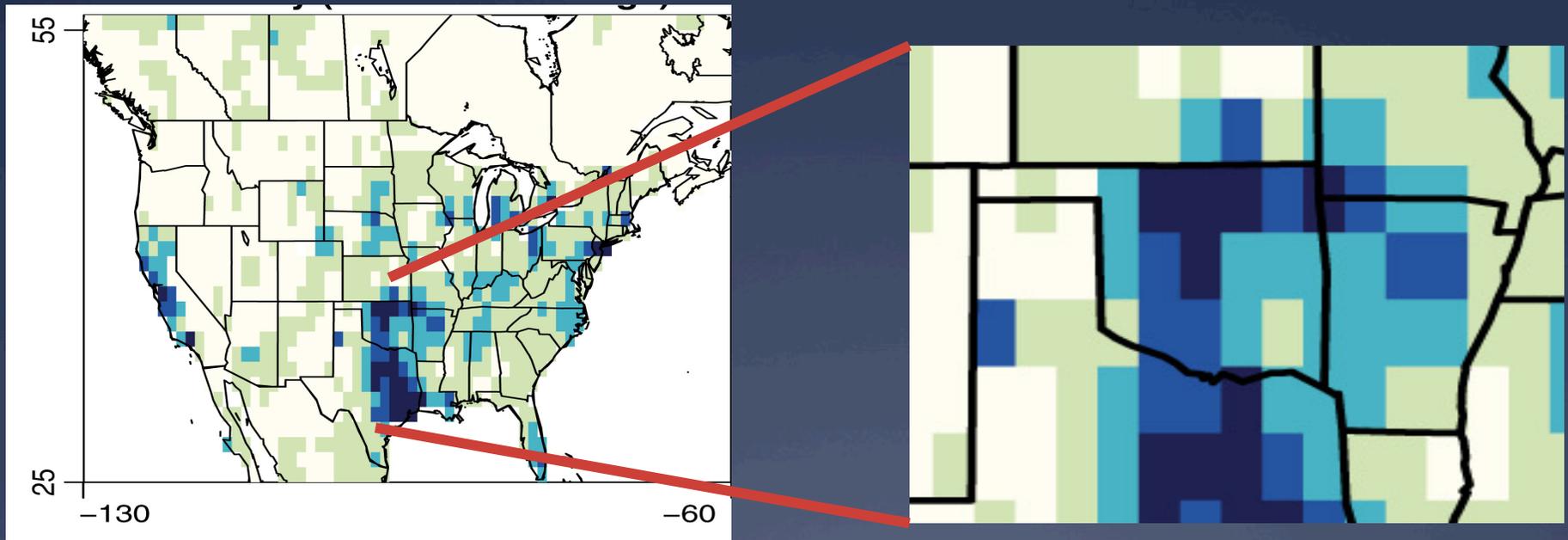
Growth of unconventional natural gas industry in US perceived as a major contributor to this rise



Regional methane anomalies are attributed to the gas industry

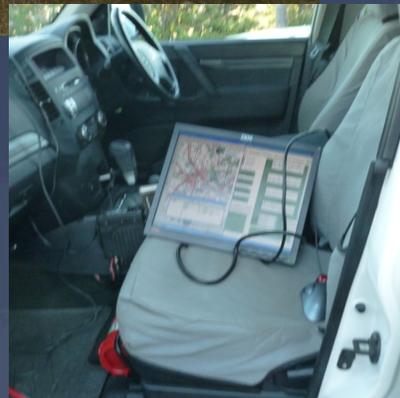
Central Question:

- * What are the sources of methane making up each pixel?
- * Regional measurements only provide part of the picture



Sources of Methane Poorly Known: Highly Controversial

Attribution of methane to specific activities is limited by ability to measure ppb variation: *until now*



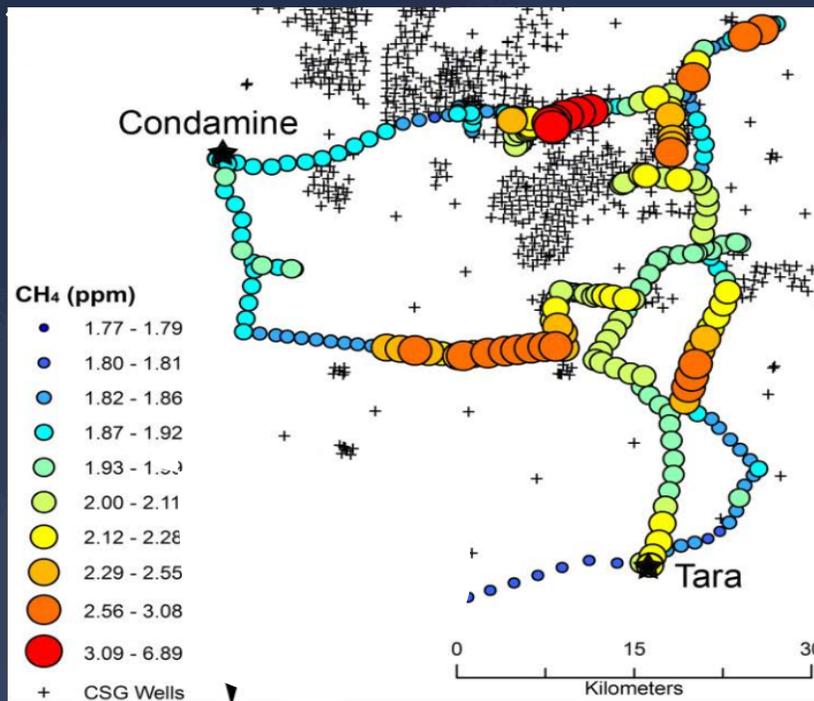
Cavity Ring Down Spectrometer

- ppb sensitivity
- Mobile
- Isotope capable
- Continuous monitoring
- Sniffer capability

Methane surveys- we know so little about natural and anthropogenic variation

Southern Cross University Study

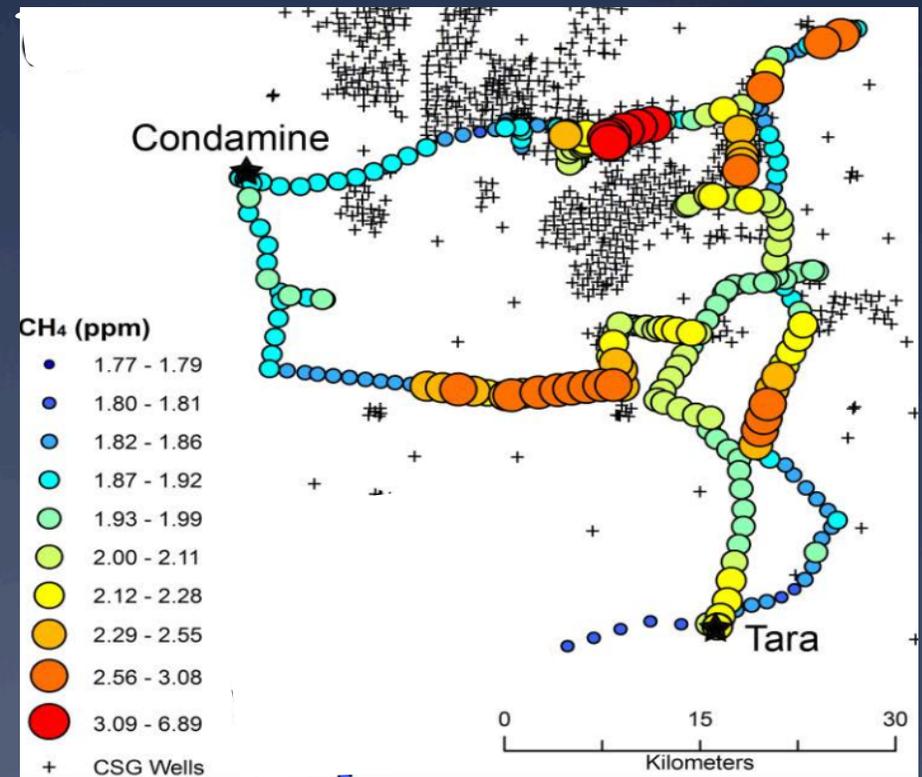
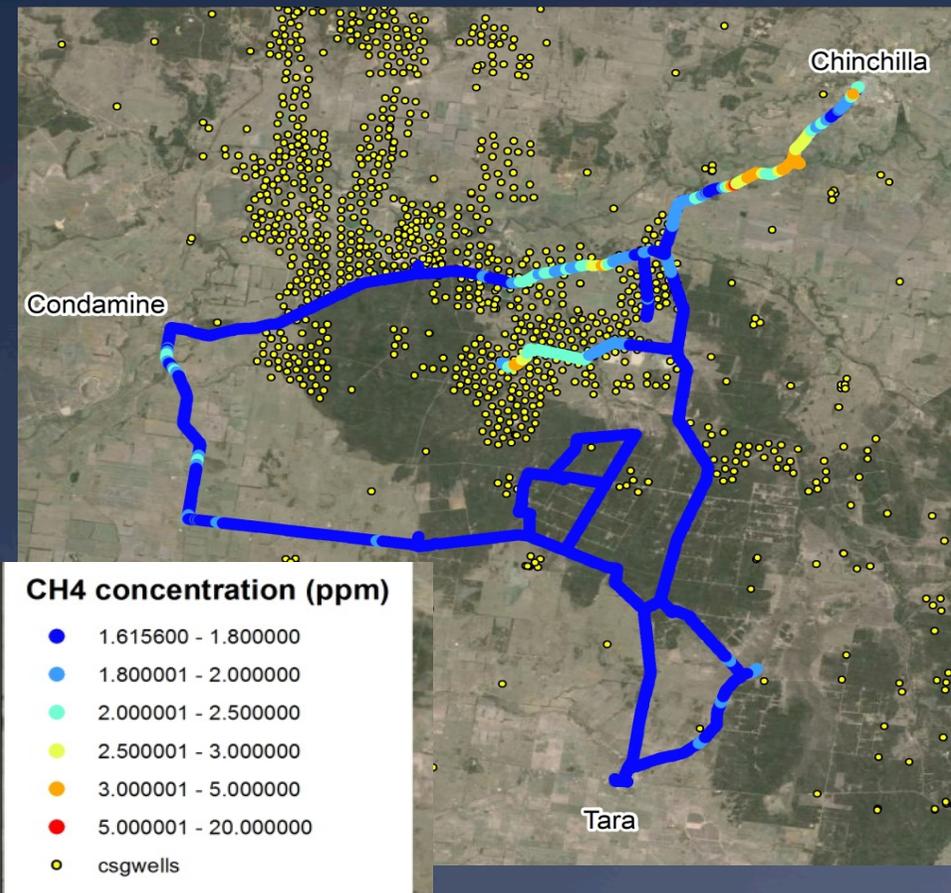
- Used CRDS technology to show anomalies surrounding CSG fields
- Suggested CSG industry was responsible for significant fugitive methane emissions
- Significant public and governmental reactions



What is the flux from different sources?

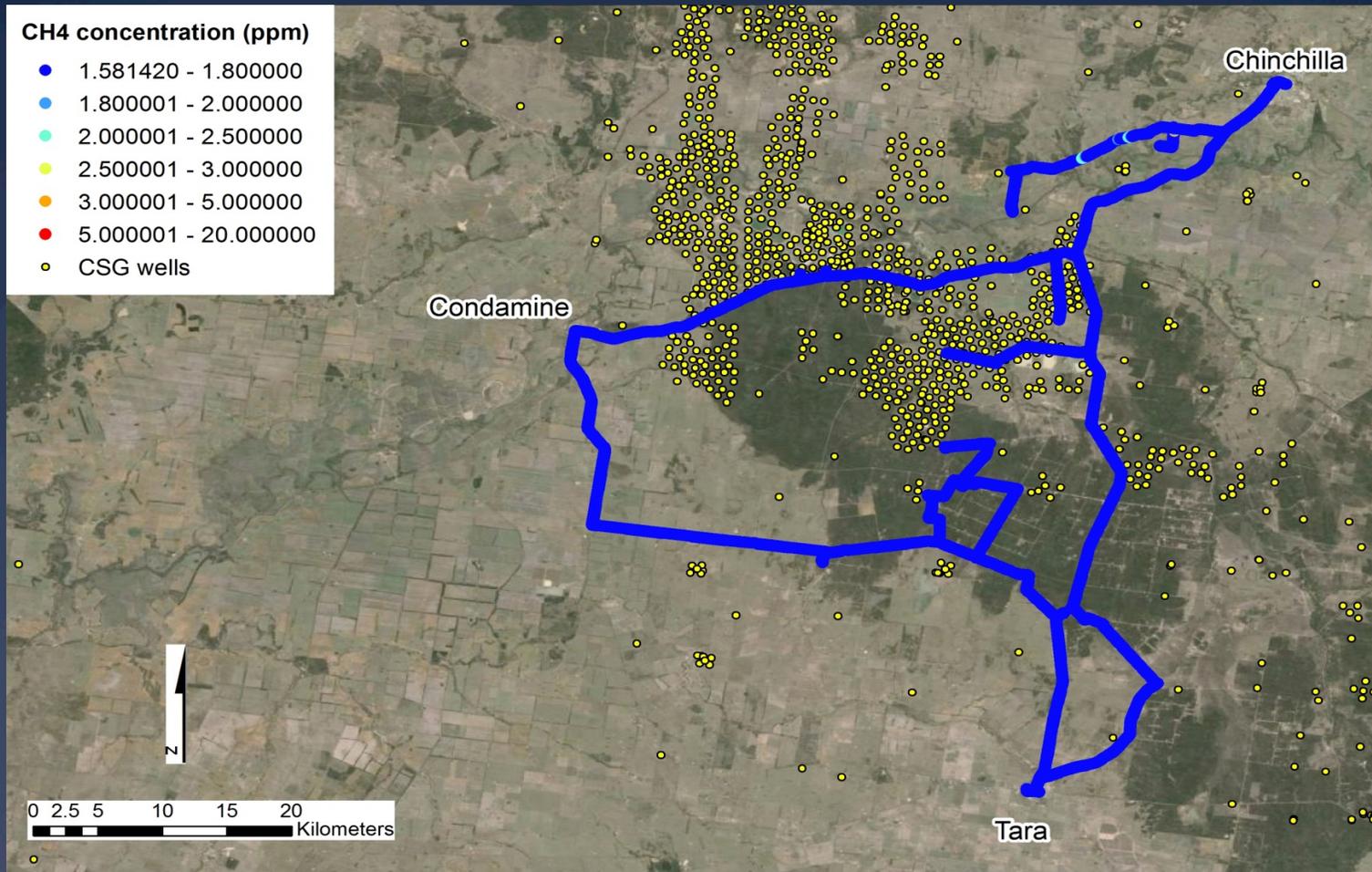
What did the SCU study measure?

- Concentration not flux- highly variable with wind conditions
- No background accounting for natural or anthropogenic sources



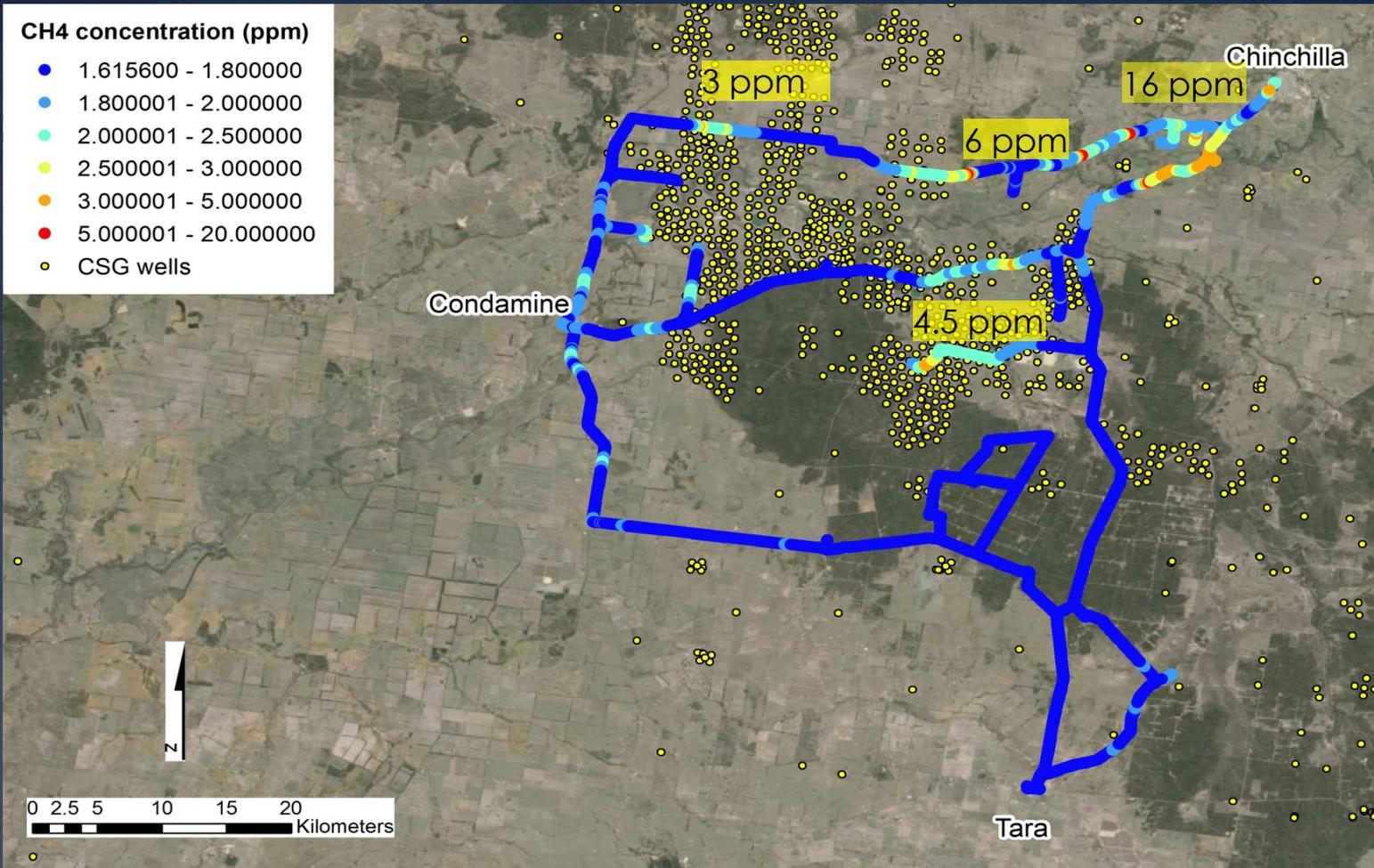
Tara / Chinchilla 2013: Day time Flux is not equal to concentration

- Day time air exchange is greater- similar flux, but lower concentration



Tara / Chinchilla 2013: Night time

- Still air allows methane to build up near the ground
- high concentration but low flux
- **Natural seeps evident and presented highest readings**

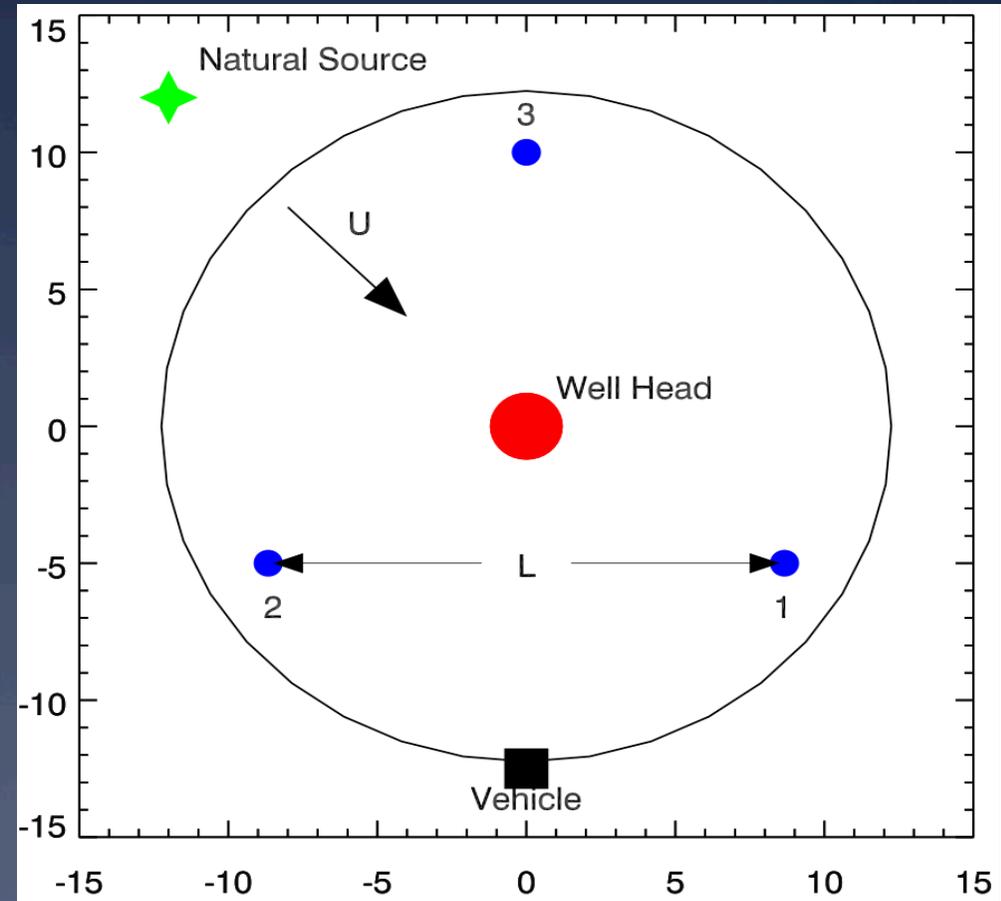


Network-based Flux Determination and background measurement

Standardized protocol and inexpensive instrumentation for routine deployment with drilling rigs in development

Conceptual Design

- **methane** concentrations and wind conditions (u) continually monitored
- Concentrations plus the 3-D wind field allow a determination of the methane flux.
- Picarro identifies point sources to optimize fixed position instrument locations (1,2,3) and spacing, L .
- installed before drilling operations commence with continuous monitoring through operations



How significant is CSG infrastructure?

- Is CSG a significant emitter compared to other anthropogenic sources?
- What is the best way to target fugitive emissions for maximum effect?
- Stockyard near Narrabri showed the highest concentration of study, ~ 3 times that of the highest value in the SCU study

This project will identify the sources and fluxes comprising regional anomalies

