Australia's National
Science Agency

GISERA | Gas Industry Social and Environmental Research Alliance

Progress report

Methane emissions quantification of well drilling to completion processes in Beetaloo sub-basin

Progress against project milestones

Progress against milestones/tasks are approved by the GISERA Director, acting with authority in accordance with the GISERA Alliance Agreement.

Progress against project milestones/tasks is indicated by two methods: Traffic light reports and descriptive Project schedule reports.

1. Traffic light reports in the Project Schedule Table below show progress using a simple colour code:

- **Green**:
  - Milestone fully met according to schedule.
  - Project is expected to continue to deliver according to plan.
  - Milestone payment is approved.
- **Amber**:
  - Milestone largely met according to schedule.
  - Project has experienced delays or difficulties that will be overcome by next milestone, enabling project to return to delivery according to plan by next milestone.
  - Milestone payment is withheld.
  - Milestone payment withheld for second of two successive amber lights; project review initiated and undertaken by GISERA Director.
- **Red**:
  - Milestone not met according to schedule.
  - Problems in meeting milestone are likely to impact subsequent project delivery, such that revisions to project timing, scope or budget must be considered.
  - Milestone payment is withheld.
  - Project review initiated by GISERA Director.

2. Progress Schedule Reports outline task objectives and outputs and describe, in the 'progress report' section, the means and extent to which progress towards tasks has been made.

Project schedule table

TASK NUMBER	TASK DESCRIPTION	SCHEDULED START	SCHEDULED FINISH	COMMENT
1	Baseline flux chamber measurements, initial manual tracer & calibration and validation data	Apr-21	Sept-22	Completed
2	Monitoring station deployment, extension and maintenance	Apr-21	Mar-24	Delays associated with the final well to be measured have impacted completion of this milestone. This task will be completed in July 2025.
3	Comparisons between flux measurements from tracer method and atmospheric modelling and inversion	Jul-22	Apr-24	Delays in task 2 have impacted delivery of this task. This task will be completed November 2025.
4	Determining the numbers and locations of AEMS and cost	Jul-21	Jan-23	Completed
5	Project Reporting	Apr-21	Jun-24	Delays in tasks 2 and 3 have impacted delivery of this task. This task will be completed February 2026.
6	Communicate findings to stakeholders	Apr-23	Jul-24	Delays in tasks 2 and 3 have impacted delivery of this task. This task will be completed February 2026.

Project schedule report

TASK 1: Baseline flux chamber measurements, initial manual tracer & calibration and validation data

BACKGROUND

It is important to capture the baseline flux before operations commence to define the reference levels from which the impacts can be estimated. This pre-operational baseline will be captured using flux chamber measurements of the wellpad after clearing or before the commencement of operations if it is an existing well. In addition, to ensure high-quality measurements, flux measurements of key operations will be collected manually using the tracer method.

TASK OBJECTIVES

1) To collect comprehensive soil flux data pre-commencement of the hydraulic fracturing operations.
2) Manually collect comprehensive flux measurements using the tracer method at key points during the hydraulic fracturing processing to expedite the data collection at the initial stages and for calibration and validation of the results from the AEMS.

TASK OUTPUTS AND SPECIFIC DELIVERABLES:

1) The initial results will be documented in a section of an overall report in Task 5 6 months from commencement of the hydraulic fracturing process documenting the baseline soil flux levels and initial results from the hydraulic fracturing process; 2) The results overall report from the hydraulic fracturing process from the first two wells where manual tracer measurements were made will be reported in a section of an overall report in Task 5 12 months from the commencement of the work.

PROGRESS REPORT

This task was completed in April 2023.

1) The first objective of collecting comprehensive soil flux data pre-commencement of hydraulic fracturing has been met. Baseline flux chamber measurements were completed in the week of 12 September at the Amungee NW1 well pads where 2 wells will be developed. 18 measurements were collected in radial grid pattern from the new well location. Processing of the data is currently underway.
2) The second objective, manual tracer measurement was undertaken between 16-25 March 2023 at the Amungee NW1 well pad. Comprehensive data covering the different stages of the well completion process were collected.

TASK 2: Monitoring station deployment, extension, and maintenance

BACKGROUND

It is important to collect temporal data throughout the hydraulic fracturing process to ensure that emissions impacts can be captured accurately. The extended length of time (months) for the whole operation from commencement to well completion requires automated techniques to be

deployed. CSIRO has developed 2 AEMS which are deployable immediately for the continuous measurement of methane and ethane. However, flux measurements are also essential. The most reliable method of obtaining flux is via the tracer method. Extension of the AEMS with additional instrumentations is required to enable this capability.

TASK OBJECTIVES

1) At the start of the project, to deploy 2 current AEMS (AEMS-C) at 2 new well sites to initially capture methane and ethane concentrations only;

2) To develop an extended AEMS (AEMS-CF) with tracer capabilities and to extend one of the AEMS-C in readiness for the subsequent new wells; 3) Deploy the 2 AEMS-CF as soon as the systems are completed and tested and subsequently to 2 new wells each time with the aim of collecting methane concentration and flux for a total of 6-8 new wells during the project

TASK OUTPUTS AND SPECIFIC DELIVERABLES

6 monthly interim reporting in a section of overall report (Task 5) documenting the results from the AEMS deployments, that is, the concentration and flux measurements recorded, highlighting significant events.

PROGRESS REPORT

An AEMS has been deployed at Shenandoah South 2H since 21st February 2025. Independent validation data collected from a sensor mounted in a vehicle was collected for two days from 2nd March 2025 from the start of the flowback of the first well. The AEMS continues to collect data autonomously until after well completion. The final well is scheduled to start in late June/early July 2025.

TASK 3: Comparisons between flux measurements from tracer method and atmospheric modelling and inversion

BACKGROUND

Simplified AEMS with fewer components, lower power consumption and lower maintenance and overall cost is potentially feasible if atmospheric modelling methods are used with the methane concentration and meteorological measurements. However, the compromise is a potentially higher level of uncertainties. The data from the extended AEMS could be used to simulate a simplified system and atmospheric modelling and inversion methods tested for estimating flux related to the industry's operations.

TASK OBJECTIVES

To 1) To test simplified atmospheric modelling methods such as Windtrax for the estimation of flux of the local area, and potentially optimised the methods for the use case; and 2) to compare the results from the atmospheric modelling methods with the results from the tracer method

TASK OUTPUTS AND SPECIFIC DELIVERABLES:

6 monthly report documenting the progress of the atmospheric modelling work and final report documenting the final results and comparisons in a section of overall report as outlined in Task 5.

PROGRESS REPORT

This task will be delivered in November 2025.

Processing of early data collected at Amungee commenced for this work. The processing of the data will continue for the first well in Shenandoah South 2H.

TASK 4: Determining the numbers and locations of AEMS and cost

BACKGROUND

The number of AEMS that are required and their location to be representative of regions such as the entire Beetaloo sub-basin and, the different sources of emissions within it is unknown. To operationally deploy AEMS in the remote locations such as the Beetaloo sub-basin, a solution balancing the cost and the quality of the data needs to be found.

TASK OBJECTIVES

To 1) determine the optimum number and location of AEMS required to be representative of regions such as the entire Beetaloo sub-basin and, the different sources of emissions within it; 2) undertake a review of the most relevant technologies' cost structure to understand the optimal cost-effective solutions and cost savings; comparison of the value of fixed versus mobile monitoring solutions; 4) estimation of operational maintenance and running costs;

TASK OUTPUTS AND SPECIFIC DELIVERABLES:

Report documenting analysis performed to determine the optimal numbers and locations of AEMS and review of current state-of-the-art instrumentation and related cost analysis for AEMS, comparisons of mobile versus fixed AEMS solutions and estimation of operating maintenance and running cost to be included in a section of the overall reporting as outlined in Task 5 in order to understand the practicality of an operational system.

PROGRESS REPORT

The analysis work is now complete. The report has been finalised and delivered to GISERA, this report will form several chapters of the final report which will be delivered at project end.

Task 5: Project Reporting

BACKGROUND

Information from this project is to be made publicly available after completion of standard CSIRO publication and review processes.

TASK OBJECTIVES

To ensure that the information generated by this project is documented and published after thorough CSIRO Internal review.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

1) Preparation of a final report outlining the scope, methodology, scenarios, assumptions, findings and any recommendations for future research;
2) Following CSIRO Internal review, the report will be submitted to the GISERA Director for final approval; and
3) Provide 6 monthly progress updates on Tasks 1, 2, 3 & 4 to GISERA office.

PROGRESS REPORT

This task will be completed in February 2026.

Task 6: Communicate findings to stakeholders

BACKGROUND

Communications of GISERA research are an important component of outreach and dissemination of findings to diverse audiences.

TASK OBJECTIVES

Communicate findings to stakeholders through meetings, knowledge transfer session, factsheet and journal article, in collaboration with GISERA Communications officers.

TASK OUTPUTS AND SPECIFIC DELIVERABLES

Communicate results to GISERA stakeholders according to standard GISERA project procedures which will include:

1) Knowledge Transfer session with Government/Gas Industry
2) Presentation of findings to Community members/groups
3) Preparation of article for GISERA newsletter
4) Revision of project factsheet to include final results (a factsheet is developed at project commencement and another will be done at completion)
5) Peer reviewed scientific manuscript ready for submission to relevant journal (optional)

PROGRESS REPORT

This task will be completed in February 2026.

Variations to Project Order

Changes to research Project Orders are approved by the GISERA Director, acting with authority, in accordance with the GISERA Alliance Agreement. Any variations above the GISERA Director's delegation require the approval of the relevant GISERA Research Advisory Committee.

The table below details variations to research Project Order.

Register of changes to Research Project Order

DATE	ISSUE	ACTION	AUTHORISATION
22/04/2022	Delays due to covid border restrictions & the additional requirement of the development of a new well have had an ongoing affect and caused delays for all tasks.	Task 1 delivery date extended 6 months, from Mar 2022 to Sept 2022.	

DATE	ISSUE	ACTION	AUTHORISATION
22/04/2022	Delays due to covid border restrictions & the additional requirement of the development of a new well have had an ongoing affect and caused delays for all tasks.	Task 2 delivery date extended 6 months, from Mar 2023 to Aug 2023.	
22/04/2022	Delays due to covid border restrictions & the additional requirement of the development of a new well have had an ongoing affect and caused delays for all tasks.	Task 3 delivery date extended 6 months, from Mar 2023 to June 2023.	
22/04/2022	This work has been delayed due to key personnel being on maternity leave.	Task 4 delivery date extended 6 months, from Jul 2022 to Jan 2023.	
22/04/2022	Delivery date has been revised to reflect changes for the tasks above.	Task 5 delivery date extended 6 months, from Mar 2023 to Sept 2023.	
22/04/2022	Delivery date has been revised to reflect changes for the tasks above.	Task 6 delivery date extended 6 months, from June 2023 to Dec 2023.	
22/06/23	The project team wish to carry out an additional field campaign to conduct manual emission rate quantification using the tracer measurements on additional well	Milestone 2 delivery date extended from August 2023 to December 2023. An additional $34,743 ($27,794 GISERA funding and $6,949 CSIRO funding) is allocated to conduct the manual tracer measurements.	
28/07/23	The project team wish to conduct AEMS-CF measurements and additional manual tracer measurements on additional well (resulting in total wells monitored to 4).	Milestone 2 delivery date extended from Dec 23 to Mar 24 Milestone 3 delivery date extended from Jun 23 to Apr 24	

DATE	ISSUE	ACTION	AUTHORISATION
		Milestone 5 delivery date extended from Sep 23 to Jun 24 Milestone 6 delivery date extended from Dec 23 to Jul 24 An additional $67,845 ($54,276 GISERA funding and $13,569 CSIRO funding) is allocated to complete this project taking the overall budget to $758,434	

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Contact us

1300 363 400
+61 3 9545 2176
csiro.au/contact
csiro.au

For further information

1300 363 400
gisera.csiro.au

GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.