

## Surface and groundwater

Current research projects are looking at maximising the amount of treated coal seam gas water that can be re-injected into aquifers.

Overall progress









<u>GEOCHEMICAL RESPONSE TO RE-INJECTION –</u> understand how treated coal seam gas water interacts with groundwater

RE-INJECTION OF COAL SEAM GAS WATER—understand how to minimise clogging of re-injection wells.

HIGH PERFORMANCE GROUNDWATER MODELLING — determine the possibility of large scale re-injection programs.

<u>GROUNDWATER BASLINE MONITORING</u>—understand the origin and age of groundwater prior to and during initial stages of development.

CONSTRAINING WATER FLOWS IN THE SURAT BASIN - measuring and modelling specific chemicals called environmental tracers to gain a better understanding of the speed and direction of groundwater flow

HYRDOCARBONS IN GROUNDWATER, SURAT AND BOWN BASINS - assess the presence and source of hydrocarbons found in the Surat and Bowen basins

IMPACTS OF CSG DEPRESSURISATION ON THE GREAT ARTESIAN BASIN FLUX - improve the understanding of the GAB groundwater flow in the Pilliga region through integration of existing information from models, hydrochemical data and environmental tracers.

SPATIAL DESIGN OF GROUNDWATER MONITORING NETWORK IN THE NARRABRI GAS PROJECT AREA - analysis and design of groundwater bore networks for optimal groundwater monitoring and early detection of changes.

models for estimating the groundwater impacts from coal seam gas well fields GROUNDWATER CONTAMINATION RISK ASSESSMENT - analysing and designing optimal groundwater bore networks for groundwater monitoring will provide early

AIR, WATER AND SOIL IMPACTS OF HYDRAULIC FRACTURING PHASE 1 - design an intensive monitoring campaign that will measure the air, water and soil impacts of hydraulic fracturing of production wells in the Surat Basin.

AIR, WATER AND SOIL IMPACTS OF HYDRAULIC FRACTURING, PHASE 2— involves undertaking a comprehensive monitoring campaign to measure the air, surface water r and soil impacts of hydraulic fracturing of gas production wells in the Surat Basin, Queensland.

> WATER CONTAMINATION: CAUSES, PATHWAYS AND RISKS- investigates potential groundwater contamination causes, pathways and vulnerability to understand onshore gas water quality impacts for south east South Australia.

IMPROVING THE REPRESENTATION OF THE IMPACT OF CSG EXTRACTION IN GROUNDWATER FLOW MODELS FOR THE NAMOI REGION- develop more representative

GROUNDWATER BALANCE IN GAS DEVELOPMENT REGIONS OF SOUTH EAST SA- aims to improve groundwater balance models in the onshore gas development regions of

MICROBIAL DEGRADATION OF CHEMICAL COMPOUNDS USED IN ONSHORE GAS PRODUCTION IN THE SE OF SOUTH AUSTRALIA- aims to provide information about which chemical compounds are degraded by microbes living in the soils and subsurface aquifers, and the impact

> BASELINE ASSESSMENT OF GROUNDWATER CHARACTERISTICS IN THE BEETALOO SUB-BASIN, NT- will sample and analyse groundwater in the Beetaloo Sub-basin, and create a set of baseline data against which any potential impacts caused by the gas industry can be measured. It will provide information about the baseline geochemistry and groundwater flow characteristics in the Cambrian Limestone Aquifer.

# Agricultural land management

Current research projects are designed to maximise agricultural productivity during and beyond the life of gas extraction on farms.



PRESERVING AGRICULTURAL PRODUCTIVITY - land use planning to help protect agricultural productivity.

SHARED SPACE—understand how farmers perceive and value coal seam gas developments on their and others' farms.

GAS FARM DESIGN — understand how to design farms for a new mixed land use.

MAKING TRACKS, TREADING CAREFULLY - understand the impacts of tracks and traffic on weeds and erosion in agricultural landscapes.

WITHOUT A TRACE – identify the nature and extent of damage to agricultural soils, and methods for improving soils.

100% TELLING THE STORY - share understanding of changes on farms and in towns during CSG development in the Surat area.

CSG AND LIVESTOCK- INSIDE THE HERD — monitoring grazing land with coal seam gas (CSG) infrastructure to better understand the impacts of CSG infrastructure, traffic

GAS IMPACTS AND OPPORTUNITIE ON PRIMARY INDUSTRIES- analyse possible impacts and opportunities from gas development for rural areas in South Australia's south

Current research projects are identifying what communities want and need to help inform and support changes occurring in coal seam gas development regions

**Overall progress** 

Socio-economic



MONITORING REGIONAL TRANSITION – track and document the population and monetary changes occurring in coal seam gas development regions.

COMMUNITY FUNCTIONING AND WELL-BEING – understand what makes communities strong and how they respond to major developments.

UNDERSTANDING COMMUNITY ASPIRATIONS – understand how different sectors of the community see the future of their region.

ECONOMIC ASSESMENT AND FORECASTING — understand future impacts on regional economies and how local businesses can respond. COMMUNITY FUNCTIONING AND WELL-BEING 2 - conduct a community well-being survey to measure the changes since the end of the construction and start of the 100%

SOCIAL BASLINES ASSESSMENT OF THE NARRABRI REGION OF NSW IN RELATION TO CSG DEVELOPMENT — understand and measure attitudes, perceptions and expectations that exist within the community with respect to CSG development, and current levels of community wellbeing and community resilience.

ANALYSING ECONOMIC AND DEMOGRAPHIC TRAJECTORIES IN NSW REGIONS EXPERIENCING CSG DEVELOPMENT AND OPERATIONS - identify current levels and 100% trajectories of economic, social and demographic variables in CSG regions and analyse if the CSG industry could change the trajectories.

DECOMMISSIONING PATHWAYS FOR CSG PROJECTS - the project will review regulatory frameworks in relation to principles derived from international literature and consider social concerns with regard to decommissioning of wells and well pad infrastructure

TRENDS IN COMMUNITY WELLBEING AND ATTITUDES TO CSG DEVELOPMENT- SURVEY 3- involves monitoring and communicating the changes and trends in community wellbeing, resilience and attitudes to CSG development across different phases of industry operation.

COMMUNITY WELL-BEING AND ATTITUDES TO CONVENTIONAL GAS DEVELOPMENT IN THE SOUTH EAST OF SOUTH AUSTRALIA-measure levels of perceived risk, benefits, values, well-being and future expectations.

ASSESING THE VALUE OF LOCACLLY PRODUCED CONVENTIONAL GAS IN SA's SOUTH EAST-develop a profile of the gas industry and its role within the regional economy and develop scenarios for how the local gas industry may evolve

# **Health impact**

Current research projects are focusing on reviewing current information to look for potential health impacts of coal seam gas.











HUMAN HEALTH EFFECTS OF CSG - a review will be conducted of the current information to design a study on the health effects of CSG activities based on community stakeholder, governmental, expert consultation group, and industry input.

POTENTIAL HEALTH IMPACTS FROM CSG- identify and screen for potential human health effects of coal seam gas (CSG) activity, including establishing processes and governance to ensure research quality.





















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How much has been completed to date?

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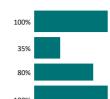


## Greenhouse gas footprint

Current research project is looking at characterising methane emissions from the Surat Basin.







METHANE SEEPAGE IN THE SURAT BASIN — measure methane seeping from underground in the Surat Basin, and identify sources of methane.

WHOLE OF LIFE CYCLE GREENHOUSE GAS ASSESSMENT- analysis of the whole of life cycle GHG emissions, including extraction, transportation and usage of CSG.

AMBIENT AIR QUALITY IN THE SURAT BASIN — comprehensive assessment of air quality in the Surat Basin region in Queensland using air quality measurement network and modelling.

REGIONAL METHANE EMISSIONS IN NSW CSG BASINS - identify and quantify methane emission sources such as CSG infrastructure, feedlots, coal mining, legacy bore

BASELINE MEASUREMENT AND MONITORING OF METHANE EMISSIONS IN THE BEETALOO SUB-BASIN- understanding of the natural methane levels, over the various seasons, a baseline for accurately quantifying any future on shore gas impacts.  $\label{eq:constraint}$ 

## **Terrestrial biodiversity**

Current research projects are identifying cost-effective actions that can be taken to reduce threats to plants and animals.







PRIORITY THREAT IDENTIFICATION AND MANAGEMENT - identify and understand the range of existing and new threats to biodiversity across a coal seam

FIRE ECOLOGY OF GRASSY WOODLANDS — determine how sensitive animals and plants are to burning events in coal seam gas development areas.

ENSURING BIODIVERSITY OFFSET SUCCESS: RUTIDOSIS LANTANA — identify genetic and demographic factors that may limit the success of establishing a rare daisy

HABITAT SELECTION BY TWO FOCAL SPECIES — understand the range of impacts from CSG development on Golden-tailed gecko and Glossy black-cockatoo habitats.

GUIDLINES FOR OFFSET POPULTATION SIZES – improve the understanding of how ecological and biological traits of rare species of plants, commonly encountered in restoration projects, and different environmental factors determine viable population sizes

## **Marine environment**

Current research projects are examining how sediments from dredging and discharge affect seagrass and turtle feeding grounds.







 $\underline{\textit{SUSTAINING TURTLES AND THEIr HOMES}-} understand how sediments from dredging and discharges affect seagrass and turtles.$ 





















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