FACT SHEET

CTSCO INTEGRATED SURAT BASIN CCS PROJECT 3D SEISMIC SURVEY PROGRAM

The 3D Seismic Survey is an essential assessment part of the Integrated Surat Basin Carbon Capture Storage Project. Acquired June 2015, the 3D Seismic Survey obtained geophysical data that allowed project scientists to map the properties of the different underground layers of rock over the 10 square kilometres at the Glenhaven Project site.

These geophysical rock properties provide useful information about:

- The distribution of storage rock properties, such as pore space
- The distribution of the overlying rocks that provide a seal to the storage reservoir to the near-surface
- Potential areas of weakness in rock strata, if present, which may impact on decisions in the next phases of the project.

This rock property data is then used to create a 3D model of the underground rock structure. This model helps the team calculate how much storage potential the site offers and how the injected CO_2 will behave and how far it might travel before stopping, when injection stops.

WHAT IS A SEISMIC SURVEY?

A seismic survey is similar to an ultrasound where sound waves are bounced off underground rock formations and the waves that reflect back to the surface captured by recording sensors for later analysis.

Analysing the time the waves take to return provides valuable information about rock types and possible gases or fluids in rock formations.

Onshore seismic operations normally use specialised trucks that carry a heavy plate that is pressed against the ground and then vibrated to generate a seismic signal. Seismic processing requires powerful computers, sophisticated software and specialised skills. Once the seismic has been processed, it must be interpreted by highly trained scientists.

ABOUT THE PROJECT

The Integrated Surat Basin Carbon Capture and Storage Project aims to demonstrate the safety and suitability of CCS in the region and is funded by industry and government. The outcomes of the project will benefit all emitters of CO_2.

The majority of current study activity is being conducted on Glencore-owned land in Queensland, 15km from Wandoan (approximately 400 km north-west of Brisbane). This area was chosen to host this project because:

- The 2009 National Carbon Storage Taskforce report and the Queensland Government Greenhouse Gas Storage Atlas identified the Surat Basin as a key geostorage area.
- Almost 3 billion tonnes of CO_2 theoretical storage potential is available in the Surat Basin. Precipice Sandstone (aquifer) accounts for 1.3 billion tonnes of theoretical storage potential.
- There are a significant number of coal-fired-power stations nearby in the Surat Basin, meaning the source of the CO_2 and the storage are co-located, reducing transportation costs.

The project is being delivered by Carbon Transport and Storage Corporation Pty Ltd (CTSCo) - a wholly owned, 'non-profit' subsidiary of Glencore, one of the world's largest diversified natural resource companies.

For more information about the project visit www.ctsco.com.au

Seismic survey recording vehicle.

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WHAT IS THE PROCESS USED TO PERFORM THE SEISMIC SURVEY?

The seismic survey was carried out using a range of equipment and support vehicles which brought the equipment to and from site. The equipment included:

- 30 vehicles to bring in equipment and run various functions of the operations. Most vehicles were 4x4 with some heavier vehicles comparable to a one tonne truck in size.
- 10,000 Fairfield Nodal ZLAND-1C geophones about the size of a small two litre paint bucket with sophisticated monitoring devices were installed.
- A Geokinetic's Vibroseis AHV-IV vibration truck which has a large plate under its chassis which is placed on the ground and vibrates the earth for eight seconds
- Radio equipment for the team to communicate using a temporary 10-20 metre radio tower.

WHAT IS THE PROCESS USED TO PERFORM THE SEISMIC SURVEY?

The seismic survey was carried out through a series of discrete steps of activity:

- A site map is created marking out a grid pattern of activities to be undertaken on the ground site.
- The site preparation team use the grid map to identify the lines and intersection of the grid on the ground and remove any debris or trim/slash any vegetation (retaining root stock) obstructing the grid pattern. A grid pattern is marked on the ground using spots of biodegradable paint to map out the gridlines in preparation for step three.
- The team partially bury individual geophones at regular intervals along each line of the grid, so only the top is visible. For this project, around 10,000 geophones were used over the Glenhaven site.
- The field operations controller instructs the vibration truck to vibrate the earth to bounce sound waves to generate images of the underground formations.
- The geophones record the signal returning to the surface.
- The vibration truck then moves to the next location and repeats the process approximately 10,000 times to complete the recording phase.
- Teams remove all equipment and demobilise from site.
- High power computers and software process the volumes of data gathered and produce a visual model of the underground formations, including area of geological variability and potential geological weakness.
- The model is then used to plan for the next stage of the Project.

ENVIRONMENTAL MANAGEMENT

Prior to entering the project site, all vehicles, plant and equipment were washed down for weed and seed. The geophones were retrieved after the seismic survey was completed. Disturbances to the land, flora and infrastructures were restored and rehabilitated after the survey was completed. The restoration and rehabilitation were inspected and approved by an independent environment and ecology consultant.

WHAT IS A GEOPHONE?

A geophone is a device that converts ground movement or vibration into small voltage charges, which may be recorded at a recording station. The deviation of this measured voltage from the baseline is called the seismic response and is analysed for information on the structure of the earth.

The geophone used for this survey, Fairfield Nodal ZLAND-1C, were buried to a depth of approximately 15 centimetres with five centimetres protruding above ground for receiving GPS and time reference signals wirelessly.

The geophones recorded 24-hours a day for the length of the recording, approximately 20 days.

WHAT IS A VIBRATION TRUCK?

A seismic vibrator mounted on the truck beneath its chassis transforms the energy provided by a diesel engine, via a sophisticated hydraulic system, into a vibration. It is performed by a shaker – a movable element that generates the vibration of a thick steel plate. The plate is applied to the ground for each vibration, then raised up so that the seismic vibrator can move to another vibrating point.

The model of vibration truck used for this seismic survey is a Geokinetics Vibroseis AHV-IV.

Fairfield Nodal ZLAND-1C geophone

Geokinetics Vibroseis AHV-IV

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