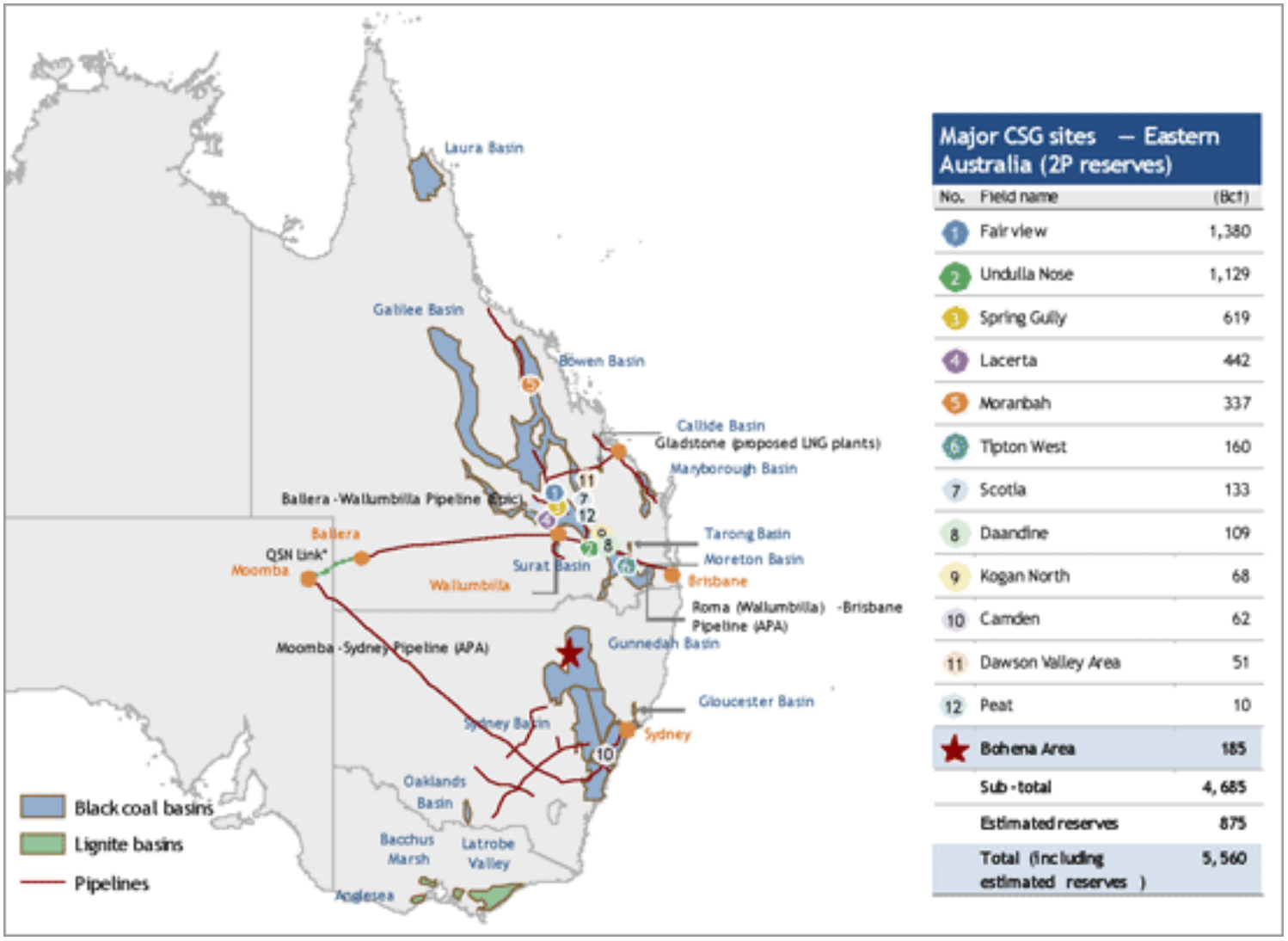
Southern Highlands Coal Action group

Coal Seam Gas

Overview and Issues

June 23, 2011

Potential Areas for Coal Seam Gas in Eastern Australia



Major CSG sites – Eastern Australia (2P reserves)

No.	Field name	(Bcf)
1	Fairview	1,380
2	Undulla Nose	1,129
3	Spring Gully	619
4	Lacerta	442
5	Moranbah	337
6	Tipton West	160
7	Scotia	133
8	Daandine	109
9	Kogan North	68
10	Camden	62
11	Dawson Valley Area	51
12	Peat	10
★	Bohena Area	185
	Sub-total	4,685
	Estimated reserves	875
	Total (including estimated reserves)	5,560

Eastern Star Gas

Companies involved in CSG in Australia

• Origin Energy/ConocoPhillips	QLD
• Arrow Energy (50/50 Shell/PetroChina)	QLD/NSW
• QGC a subsidiary of British Gas (BG)	QLD
• AGL	NSW
• Eastern Star Gas	NSW
• Santos	NSW
• Planet Gas/Leichardt Resources	NSW
• Apex Energy/Ormil Energy	NSW

Southern Highlands

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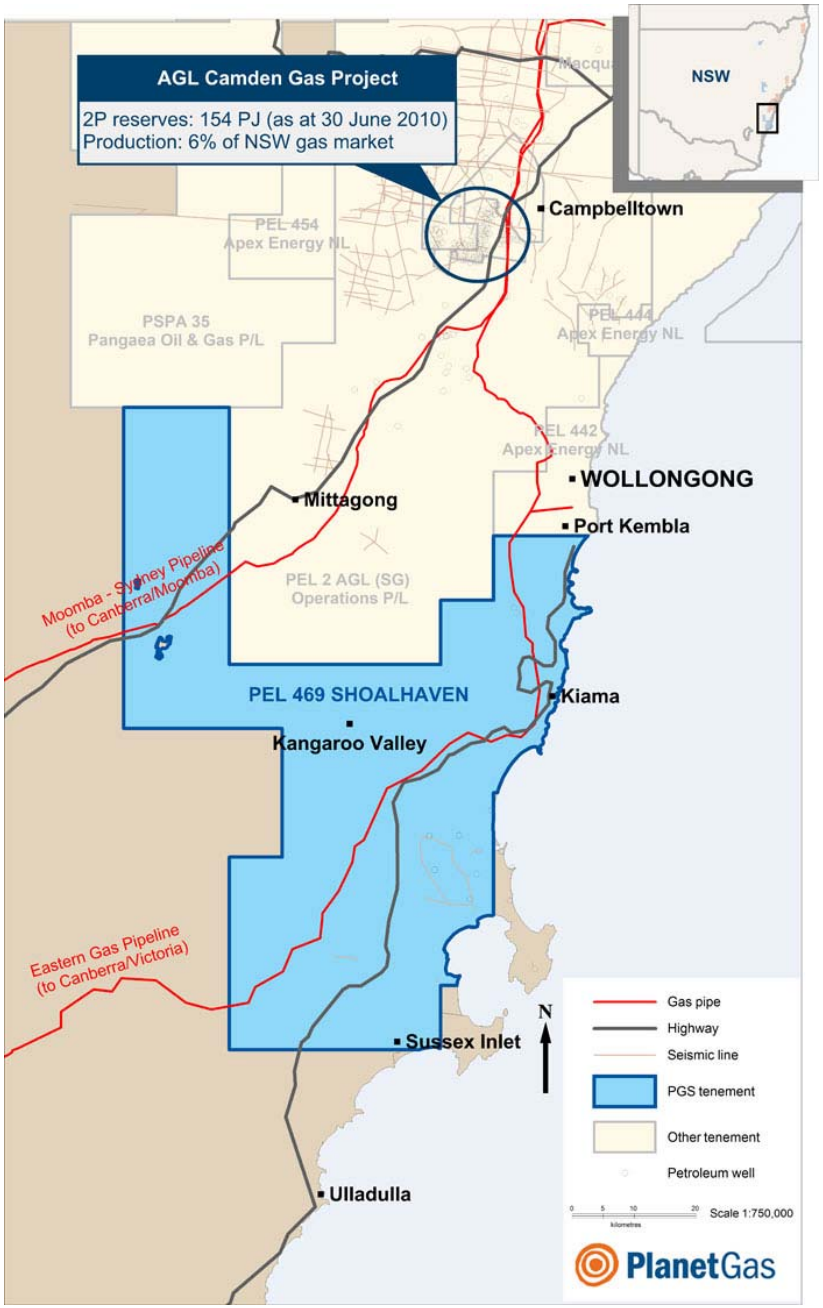
Planet Gas/Leichardt Resources



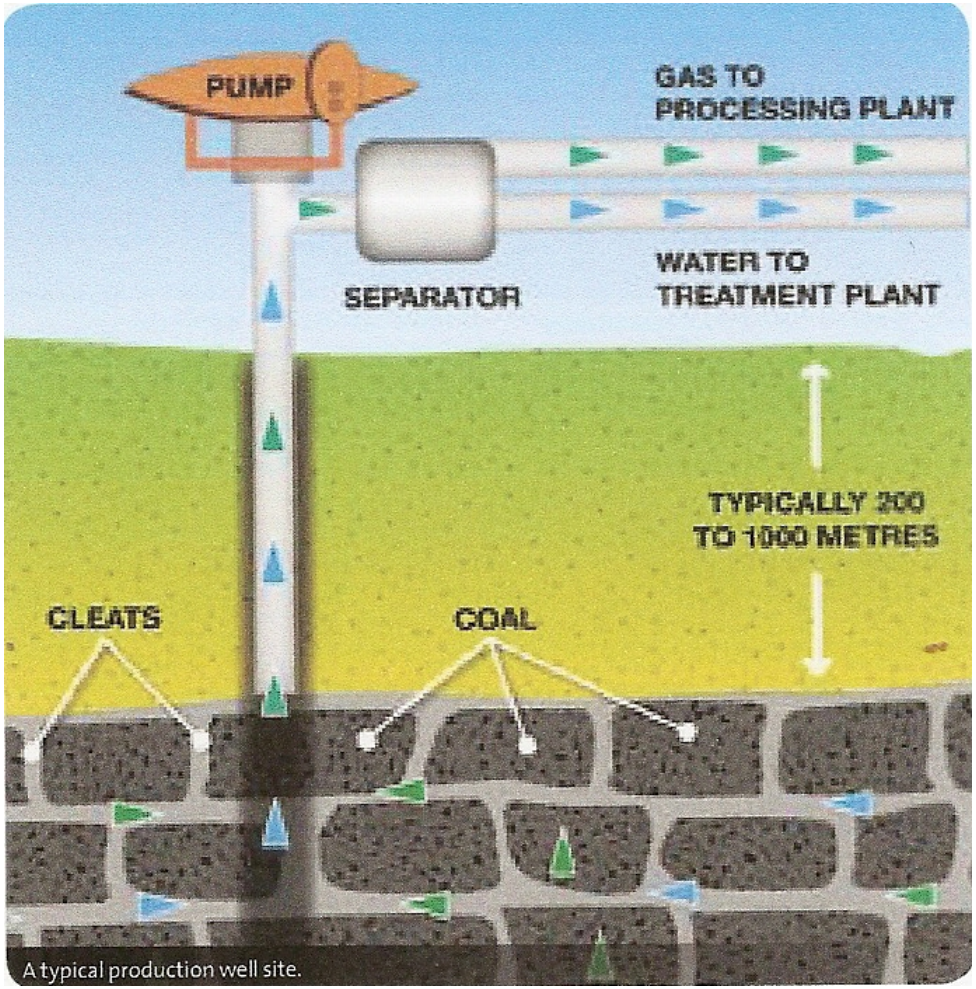
What is Coal Seam Gas?

- Coal Seam Gas occurs naturally in underground coal seams, and is usually most productive between 200 and 1,000 metres below the earth's surface.
- The gas is held in the fractures or 'cleats' of underground coal seams by water and ground pressure.
- It is released by drilling into the seam and pumping out the water. Wells are located 400-900 metres apart.

The distinguishing features of Coal Seam Gas

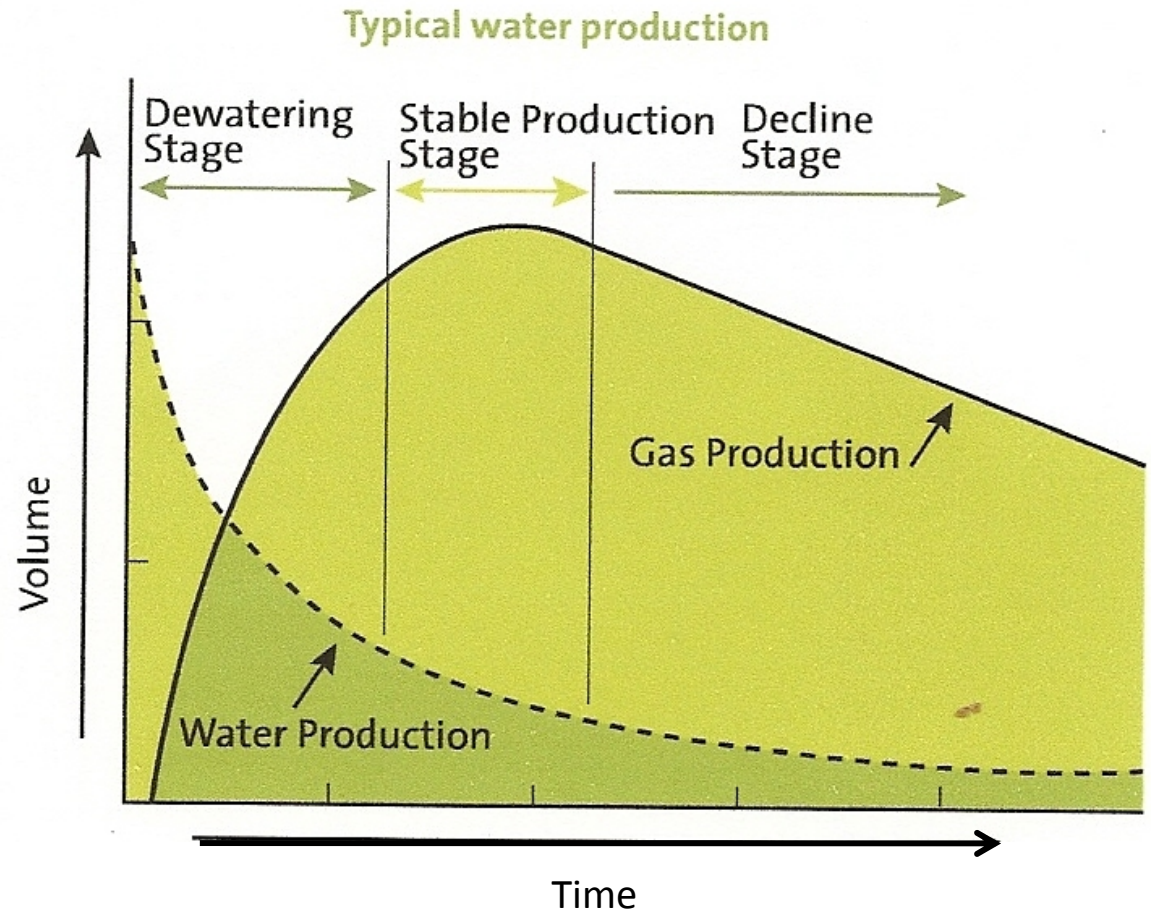
- CSG is a 'dilute' source of energy, in the sense that vast areas of land are required for its extraction.
- CSG companies generally own just enough land to secure their operations, the rest they 'borrow' from other landowners.
- The CSG extraction process has a large above ground footprint.
- Current legislation does not adequately protect landowner rights and conflict with the CSG companies has resulted.

Pictorial representation of a completed gas well



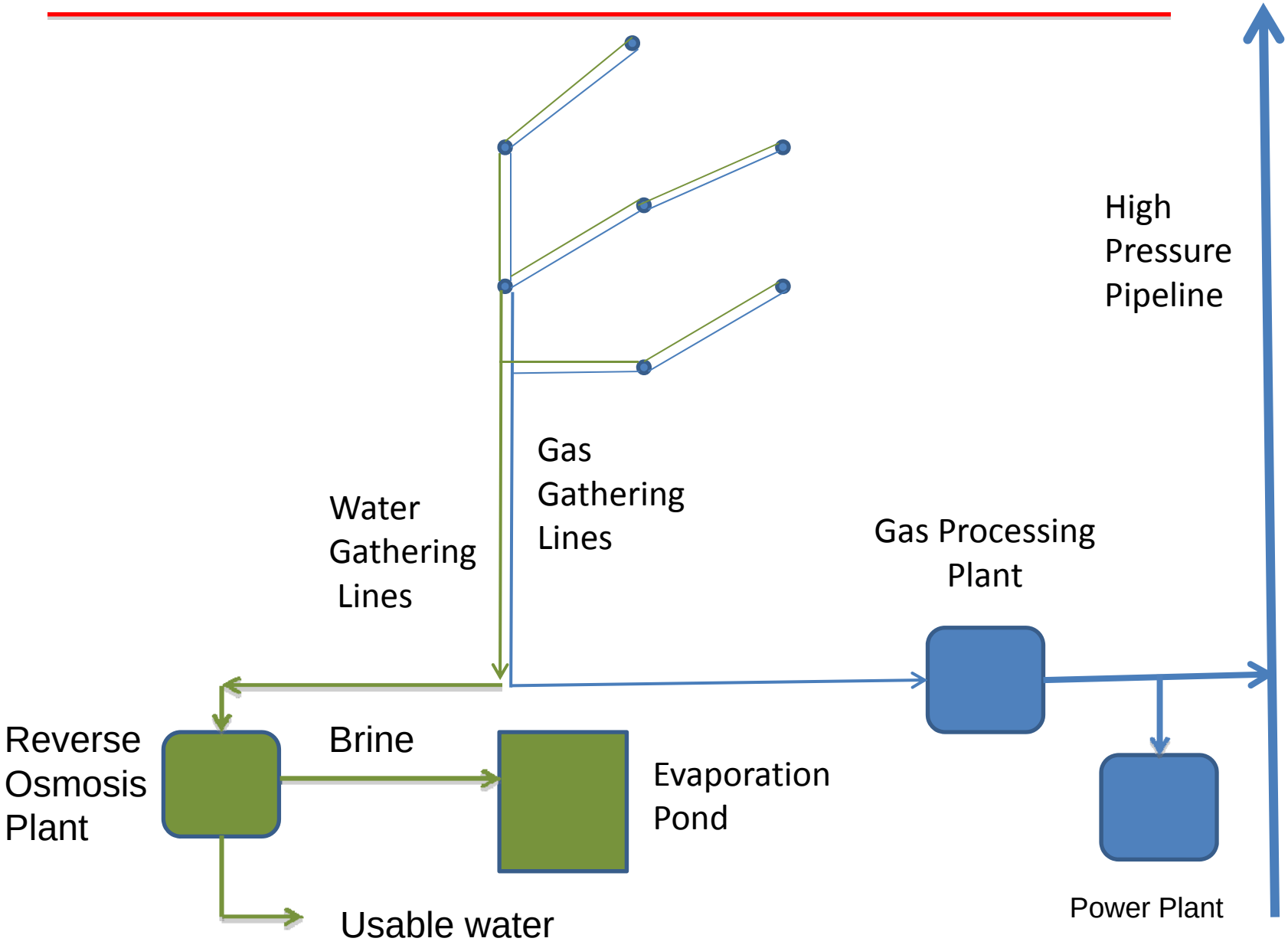
Origin Energy

Production of water and gas from a CSG well



Origin Energy

Arrow Energy space wells on a roughly hexagonal grid.
At 900 m spacing the hexagon covers roughly 160 acres.



The 5 stages of the development process

- as defined by Origin Energy

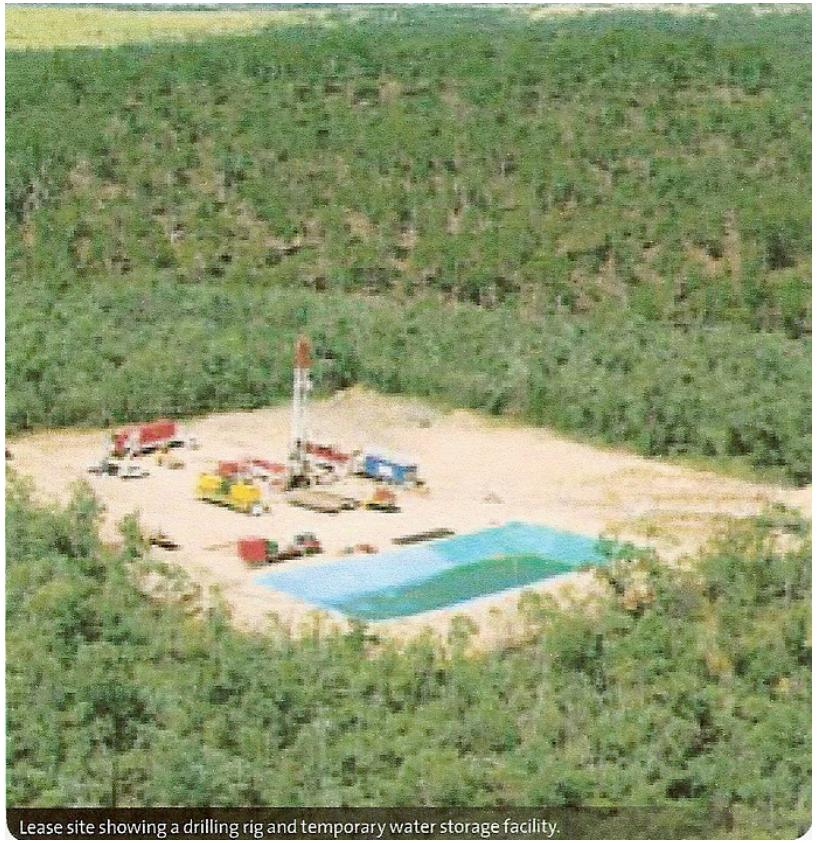
- Consultation
  - Reconciling landowner activities with gas production.
- Scouting
  - Survey the land to identify locations for gas infrastructure.
- Exploration and Pilot Programs
  - Vertical core holes are drilled (22 cm diam.) to obtain coal & rock samples.
  - Pilot testing – drilling up to 5 wells 500-700 metres apart, building water storage facilities, underground pipelines and a flare.
  - These wells may later be converted to production wells
- Production and construction of major facilities
- Ongoing maintenance and rehabilitation of disturbed areas

The infrastructure required in a gas field

- Gas field operations require a range of infrastructure Typically these may include –

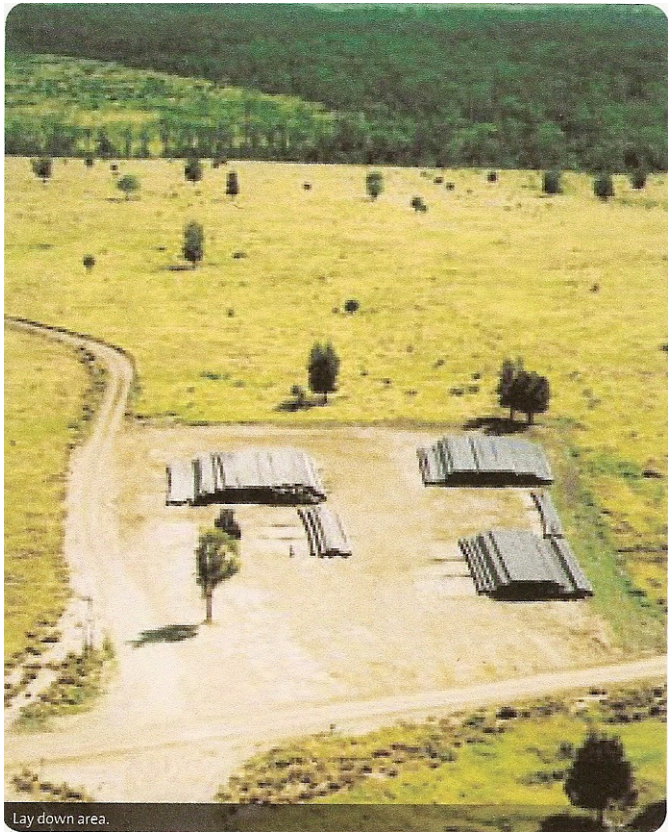
- In all cases, access roads, gas wells and underground pipelines.
- In selected locations, further infrastructure such as water storage and treatment facilities, site offices and gas processing facilities will also be required.
- Staff accommodation may also be needed depending on the logistics of the operation.
- Understand that CSG is not a cottage industry. It is full scale industrialisation.

Drilling rig and temporary water storage - 1.2 HA



Lease site showing a drilling rig and temporary water storage facility.

Storage Area

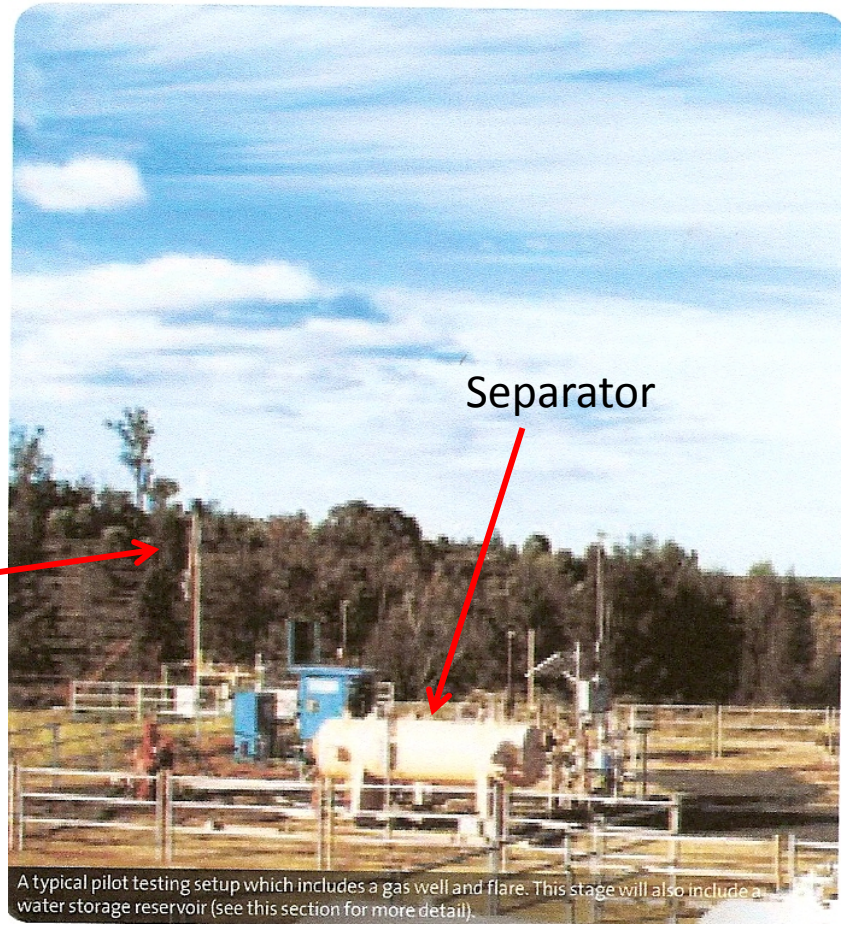


Lay down area.

Drilling rig with mobile above ground mud pits

Pilot testing facility
- may be connected to up to 5 wells

Flare - needed for 3 months

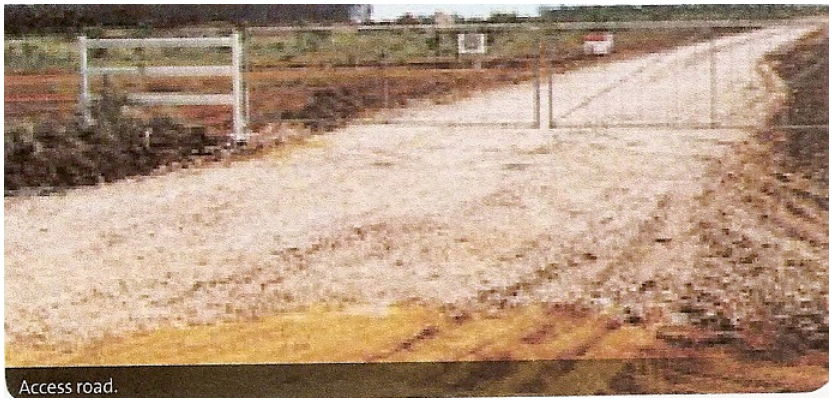


A typical pilot testing setup which includes a gas well and flare. This stage will also include a water storage reservoir (see this section for more detail).

Laying low pressure gas and water pipelines connecting wells

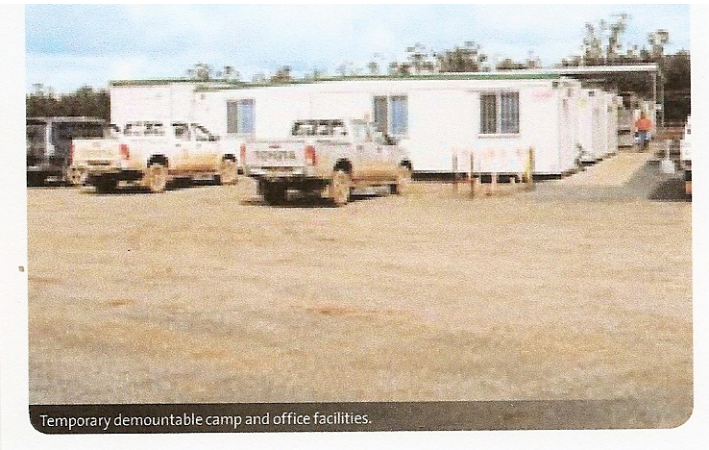
Gathering pipeline construction process.

An access road



Access road.

A site office



Temporary demountable camp and office facilities.

Completing a well

A drilling completion and workover rig.

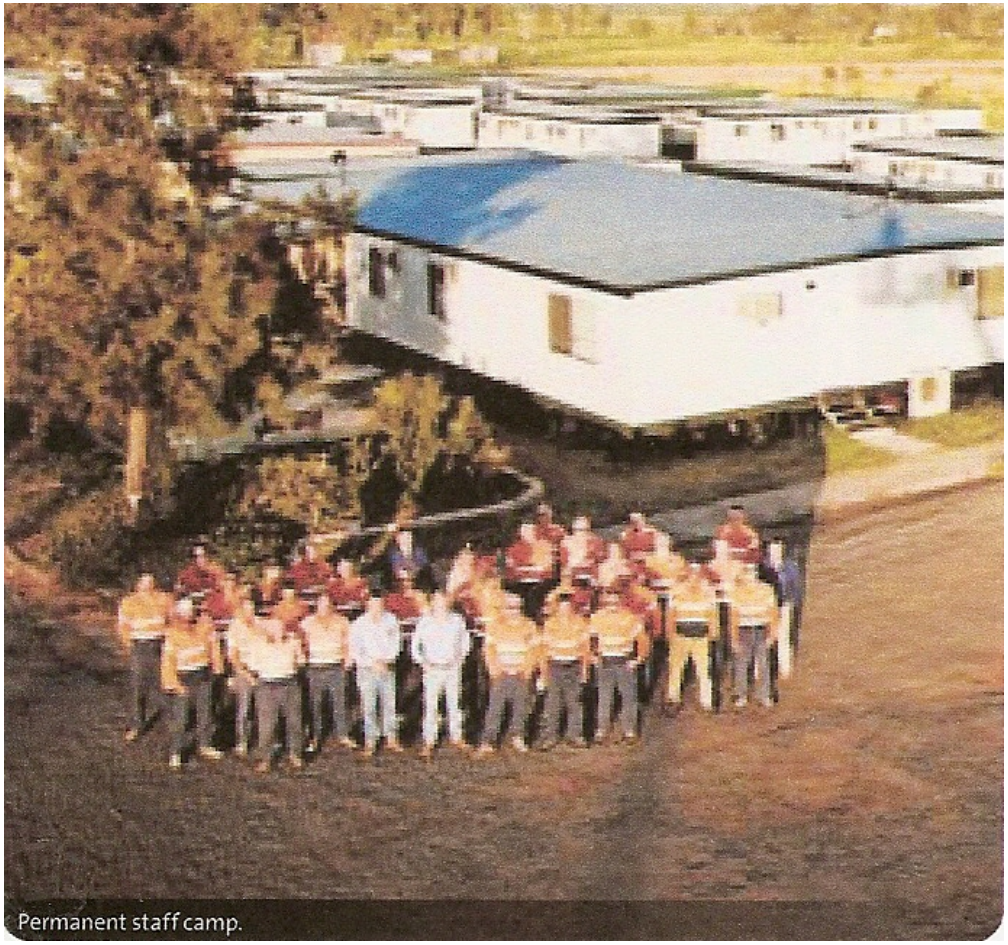
A completed well

Diagram of a gas well site.

A completed well – latest technology painted to help blend into the environment

Newly designed wells to help blend with the surrounds.

A staff camp with residential and recreational facilities



Permanent staff camp.

AGL's gas processing and compression plant at Rosalind Park

Remember what we are trying to avoid ……..

The gas fields near the Tara residential estate in Central Queensland

Photo: AAP Image
Sept. 2010

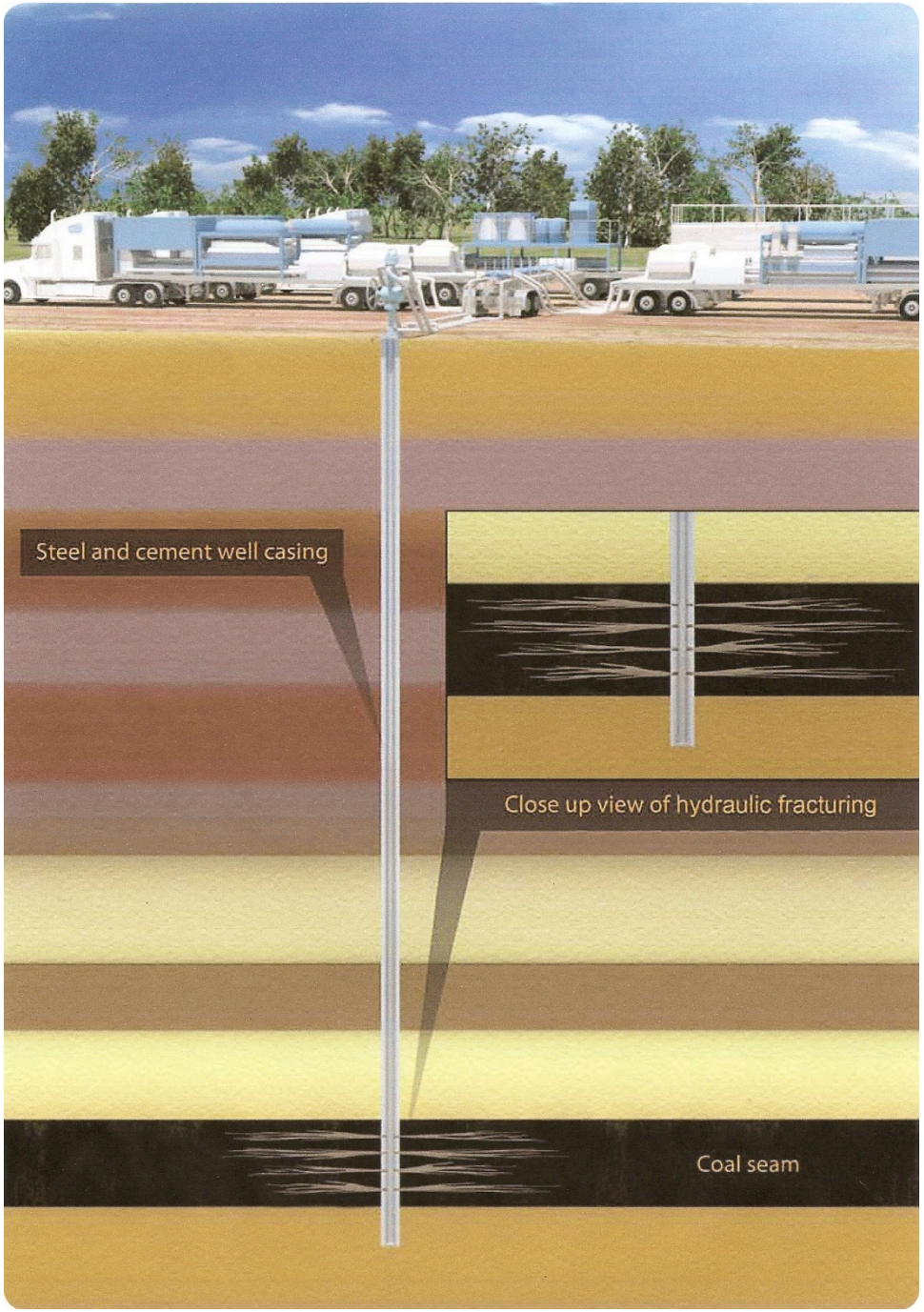
Major Coal Seam Gas Concerns

- Damage and contamination of aquifers.
  - The risks associated with hydraulic fracturing
  - The level of competence of the operators
- Handling and disposal of coal seam water.
- Impairment of high quality agricultural land.
- Visual and lifestyle impacts.
- The difficulty selling properties encumbered with a CSG extraction agreement.
- The high probability of reduced land values.

Hydraulic Fracturing (fraccing)

- Fraccing has been used in the oil and gas industry for more than 50 years. It facilitates the flow of oil and gas within sedimentary strata and aids collection.
- However for most of this time the technique has been used at great depths in thick strata, unlike the shallow depths and thinner strata involved in CSG.
- Use of fraccing with CSG is a legitimate environmental concern for the community.
- Apex and Planet Gas have said they will not use fraccing in their CSG areas, but the issue must be kept on the table.

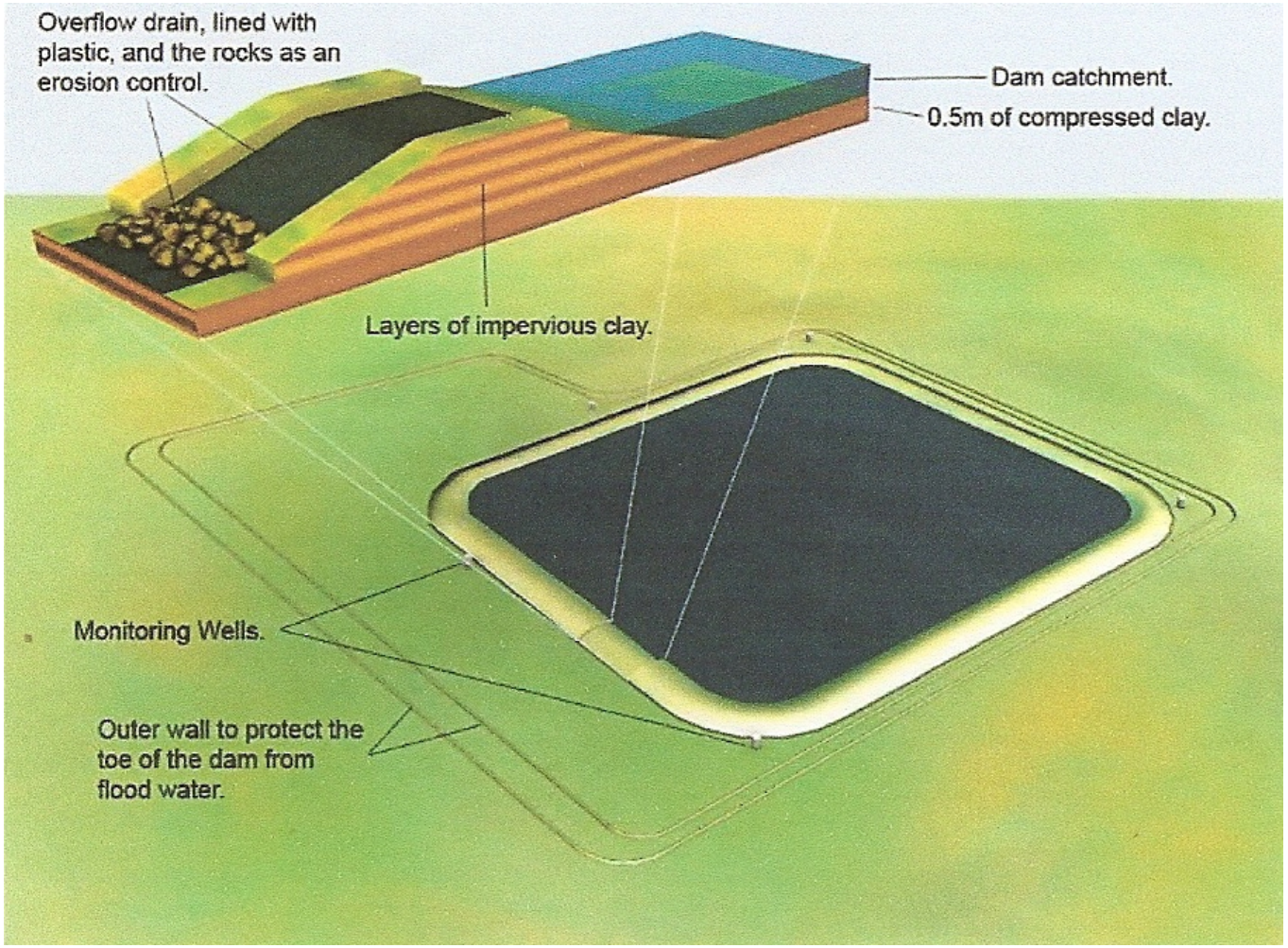
Fraccing operations as depicted by Arrow Energy



Coal seam water issues

- Large quantities of water flow from a coal seam before gas is produced, and during the gas production phase.
- This water is saline, is not suitable for agricultural activities and may contain contaminants such as carcinogenic aromatics (BTEX) and heavy metals.
- The current most common method of treatment of this water is in large evaporation ponds with residues encapsulated in clay – for eternity the companies say!
- Flooding of these ponds and the release of CSG water to the land is a concern.
- The Queensland Govt. has given the CSG industry 3 years to convert to treating and recycling the water.

An evaporation pond for coal seam water



Future CSG water disposal ideas

- Origin currently use evaporation ponds, but have completed some satisfactory desalination trials. They hope to use the treated water so produced in a variety of ways.
  - Irrigation of agricultural crops
  - Urban and industrial uses
    - In sewerage plants, for washing coal or as firefighting water
  - Discharge of interim or occasional surpluses of treated water into local river systems.
  - Reinjection into suitable underground aquifers.
- However a smaller quantity of concentrated saline material and impurities will still have to find a home.

Land issues – How you see CSG often depends on the size and use of your property

- For a large landowner of marginal grazing land – say 10,000 acres – involvement in a CSG project is very attractive if environment concerns can be resolved.
  - 100 wells on the property could generate around $150,000 pa in lease payments for 12 to 15 years.
  - The fencing and roads needed for the project may actually be useful.
  - Infrastructure activities can be kept well away from the homestead
  - Inconvenience is minimal and the footprint of the facilities is small in comparison to the size of the property.
  - The Origin Energy website carries a number of testimonials from farmers who see the benefit of cooperation in CSG projects.
- However farmers with high quality agricultural land generally do not share the enthusiasm of their grazier colleagues.

For smaller landowners

- Should small acreage owners (5-100 acres), have the misfortune to have a well or two located on their lot the impact is significant.
  - A well can be located as close as 200 m from a domestic dwelling and 50 m from a farm building.
  - The area needed for the construction activity represents a large part of the lot.
  - Noise, flares burning through the night and traffic will be a major nuisance at various stages of the project.
  - The gas company will have an impact on the value and the amenity of your property from the time they commence exploration to the completion of the land rehabilitation process – a period likely to be more than 20 years.
- For your trouble, you will receive a rental payment less than $4000 pa depending on the number of wells on your property.

CSG company policies are shifting in response to community concerns and actions

- Aquifer damage and contamination is now recognized as a potential problem
  - Qld has ‘make good’ provisions
- The impact on small landowners is being recognized.
  - QGC now say no wells on properties less than 15 HA.
  - Horizontal drilling techniques now touted as a solution in built up areas.
- Approach by some companies has become more conciliatory as a result of community resistance.
  - Less threats of legal action
  - Softening of rhetoric

CSG company policies are shifting in response to community concerns and actions….continued

- Some companies have improved their well design to give greater protection to aquifers'
  - The well has 2 separate liners – one to isolate the aquifers and a narrower one to penetrate the coal seam.

Summary

- Coal seam gas extraction is a major issue for residents in many areas of Queensland and NSW.
- CSG projects can be financially attractive to some landowners in marginal rural areas, but seriously impact the productivity, the environment and amenity in others cases.
- The Southern Highlands has an affinity with many areas of NSW and Qld where the fight against being overrun by CSG ventures goes on.
- This industry is being developed ‘on the run’, with new techniques not necessarily fully tested.
- Some of the operators lack the financial depth to compensate those affected by any errors they may make.
- We are asked to take the companies position on trust, but once we agree to these projects going ahead we are stuck with what they deliver.