



People For The Plains

The following is a submission against the Santos Environmental Impact Statement for the Narrabri Gas Project, Application Number SSD 6456.

PEOPLE FOR THE PLAINS STRENUOUSLY OBJECTS TO THE SANTOS ENVIRONMENTAL IMPACT STATEMENT FOR THE NARRABRI GAS PROJECT AND ADVISES THE RELEVANT AUTHORITY THAT THIS INDUSTRY IS NEITHER WANTED NOR WELCOME IN OUR COMMUNITY.

People for the Plains members comprise a broad representation of the local township and surrounds. We came together to share knowledge and research the true impacts of the coal and coal seam gas industries.

Since then we have received widespread support from local business owners, farmers and graziers, cotton growers and many others.

We formed this group because Narrabri Shire is the place we love and we believe it has a strong future if there is careful planning and innovation. There is no need to rush into extractive industries, where most of the benefits are transferred out of the Shire. However, Santos proposes to move from 16 exploration wells in the northern Pilliga Forest to having a full proposal for almost 900 production wells submitted for approval in mid-2014.

The Narrabri Gas Project Area will come within six kilometres of Narrabri West Post Office. Whitehaven has already started expansion of its Maules Creek coal mine, which will bring open cut mining within 40 kilometres of Narrabri, with the potential to move closer. The town of Narrabri shall therefore be wedged between coal seam gas on one side and coal mining on the other. Coal seam gas has meant huge changes to a number of rural towns in Queensland and not for the better. Coal mining in the Hunter Valley has had a devastating impact on the local landscape and on human health. We need independent social assessments of the impacts these industries will have on the residents of Narrabri Shire as well as vital water supplies such as the Great Artesian Basin and the Namoi River. We need to be evaluating the costs of these industries on rural identity, water supplies, local industry, health, agriculture, housing and tourism.

In the meantime, People for the Plains calls on the residents of Narrabri Shire to make their political representatives aware that there is considerable opposition to this development, for entirely valid reasons. Our objective is to stop further coal mining and coal seam gas development in the Shire until the abovementioned studies have been carried out.

ABOUT OUR CONTRIBUTING AUTHORS

Please note that this list below is not a complete list of all contributors. For personal reasons some contributing members have asked to remain anonymous.

DR HUGH BARRETT is a retired consulting engineer, with a professional career devoted mainly to water resources and irrigation development. For most of his career he was based in Narrabri, but also studied and worked in the United States and undertook consulting assignments around the world for such organisations as the Australian Agency for International Development, the World Bank, the United Nations Food and Agriculture Organisation, and larger consulting organisations. He has a degree in Civil Engineering (Honours) from the University of New South Wales and a Masters and PhD from Colorado State University.

During his career, he has prepared numerous Reviews of Environmental Factors and several Environmental Impact Statements, one of which was described by a reviewing senior government officer as “the best EIS that I have seen”. Unfortunately, based on the parts that I have read, the EIS prepared for the NGP is the worst EIS that he has seen.

STUART MURRAY is a retired agronomist having worked with dry land and irrigated farmers in the North West of NSW since 1965. He has a Diploma in Agriculture from Wagga Agricultural College. He gained accreditation in the sampling and interpretation of soil, plant tissue and water analysis results from Analysis Systems. Although he lives in Narrabri he owns and operates a beef cattle operation not far from town. He has a deep appreciation of the natural world.

SALLY HUNTER is based on a farm outside Narrabri with her family. She has a Bachelor of Business from the University of Queensland and a Certificate in Rural Community Development. She has worked for local governments throughout Queensland and NSW both as an employee and consultant for more than twenty years in Community Economic Development.

SARAH and MATTHEW CIESIOLKA, together with their three young children, live and farm less than 6km to the north, and downstream, from Santos’ proposed Narrabri Gas Project. Each year, year in, year out, their farm produces over 50 million potatoes, 1 million kilograms of peanuts and enough wheat for 3.3 million loaves of bread. They also employ up to 20 permanent and seasonal staff. They rely entirely on underground water to irrigate their crops, and for drinking and everyday household use. They have no other reliable source of water.

In addition, Sarah has a Bachelor of Commerce degree from the University of New England. She has worked in private enterprise as an Accountant and Human Resources Manager for over twenty years.

TIM WILSON and his family have lived in Narrabri for 10 years. He holds a Bachelor of Mechanical Engineering from UNSW, Certificate IV in Transport and Distribution and has worked as a professional Engineer in Australia and abroad for over 20 years for Defence, Government and in the Private Sector.

INTRODUCTION

In Santos' Environmental Impact Statement – Introduction, Santos states that

“The total project area is around 95,000 hectares; however, the disturbance footprint from the project infrastructure would take up no more than 1,000 hectares, or around one percent of the project area.” Chapter 1 – Introduction

The following questions require clarification:

1. Is the 1,000 hectares' project wide or just in the Pilliga State Forest?
2. Is the disturbance footprint measured before or after partial rehabilitation of the initial disturbance and clearing?

Santos also states;

“The project area is largely located on land that the NSW government has specifically designated for commercial extraction activities.” Chapter 1 – Introduction

The following questions require clarification:

1. If the project is “specifically designated” for commercial extraction activities, will Santos be going onto those areas not so designated and if so, why?
2. Where are the areas which are not designated for extractive activities in relation to those that are?
3. Will Santos in any way be accessing the coal seams below the areas not designated for extractive activities?

It is interesting to note that Santos also states that

“Other parts of the Pilliga were dedicated as State Forest, and set aside for the purposes of ‘forestry, recreation and mineral extraction’...” Chapter 1 – Introduction

In the past, the community living in and around the Pilliga State Forest has seen sections of the Forest made unavailable to the general public, due to Santos' Coal Seam Gas Mining activities.

1. How can the community utilise the Forest for recreation if they can't access it due to the public being denied access in favour of Santos conducting its operations?
2. Will mineral extraction always take priority over community access?
3. During the peak bushfire season, will flaring cease in the Forest to be able to guarantee the safety of the public while accessing the recreational areas in the Forest?

Santos continues with the following statement;

“The gas would be made available to the NSW market via a high-pressure gas transmission pipeline which would connect to the existing Moomba to Sydney gas pipeline.” Chapter 1 – Introduction

Santos fail to tell the whole truth here. Santos representatives, via various radio and television interviews have always said that every molecule of gas from the Narrabri Gas Project will go to the NSW Market, however, further on in this Environmental Impact Statement (EIS) Santos states that the gas from the Narrabri Gas Project will be made available to the NSW market, however, if there is a

surplus to the market, then that surplus would most likely be exported overseas to fulfil Santos' international contracts.

There has been a lot of scare mongering in the media regarding the so-called "gas shortage" which is going to particularly effect NSW. However, it has recently been divulged to the Australian public that this "gas shortage" has been created by the Coal Seam Gas Mining Companies, including Santos, themselves. Santos has overcommitted to overseas contracts, leaving the NSW public short of a resource that belongs to them in the first place. If the Australian Federal Government and the NSW State Government could see past the almighty dollar and enforce a policy to ensure supply to NSW, such as that put in place by the West Australian State Government, then the Narrabri Gas Project would not be required and the lives of those living in and around the project could go back to being peaceful, tranquil and one with nature as per our intentions when first moving to the Narrabri Shire prior to Santos and its predecessor, Eastern Star Gas, forcing their way into our community.

On Page 1-3 of Chapter 1 – Introduction, Santo states;

"The rehabilitation of areas disturbed during natural gas extraction is generally easier than for open cut mining. This is largely due to the smaller surface disturbance at each location, along with plant root zones remaining intact, and therefore, ecologically functional. This minimises the impacts of fragmentation and allows vegetation and ecosystems to rehabilitate effectively due to the proximity of surrounding undisturbed landscape."

This statement is not quite correct as older well sites, mostly those of the Eastern Star Gas era, are taking longer to establish good brush cover. Grasses are also a problem with both old and new sites.

On Page 1-4 of Chapter 1 – Introduction, Santo states;

"The placement of field infrastructure is dependent on the ongoing assessment of gas reserves that occurs during the exploration and appraisal phase. Therefore, the exact placement of field infrastructure cannot be precisely determined in early planning stages, and is instead, typically marked for development within a broader area for planning purposes. The precise placement of infrastructure is also dependent on environmental and social factors identified and assessed through planning processes such as environmental impact assessment and resultant management plans protocol."

The precise location of the gas wells should have been available at the time this EIS was submitted. If the exact location of the first production wells is not known at this point in time then Santos is not the company to be given approval for the area known as the Narrabri Gas Project.

Again, on Page 1-4 of Chapter 1 – Introduction, Santo states;

"Once an exploration and appraisal program has confirmed the availability and quality of gas, production wells and associated infrastructure may be constructed. The required infrastructure includes production wells and associated well head equipment, underground gas and water gathering lines, water management facilities and gas processing facilities. Sometimes, in-field gas compression is also required."

Is this forewarning that there will be more than just two (2) gas compressing units scattered across the gas field in years to come as the gas pressure from the wells drops off?

On Page 1-6 of Chapter 1 – Introduction, Santos states;

“Once the treated water is of suitable quality it can be beneficially reused in accordance with relevant water quality standards. The treated water is commonly beneficially reused for irrigation, stock watering, construction and dust suppression activities. The sale managed in accordance with relevant regulations which may include disposal to suitably licensed landfill.”

These may be beneficial reuses of the treated water but that treated water has a salts content of almost three (3) times the local natural level, and a sodium level three (3) times the existing natural level, and this calculation is based on the produced water being treated at 25°C and new membranes in the reverse osmosis plant. At 30°C, the treatment temperature, with new membranes in the reverse osmosis plant, the salt content rises to almost sixty-five times the natural level and the sodium content rises to almost five (5) times the natural levels. (These figures are based on the best stock and domestic bore results from within the Pilliga State Forest.)

Again, on Page 1-6 of Chapter 1 – Introduction, Santo states;

“The gas is also transferred, typically via buried gas gathering lines, to processing facilities for the removal of impurities and subsequent compression. In-field compression of the gas is often required to help boost gas pressure to enable it to be transferred to the processing facilities. The treated and compressed gas can then be sent to market.”

It is interesting to note here that the smaller compression plants would be noisier than the larger stationary plants as the noise shielding would be less. Santos needs to ensure that the noise levels around these compression units are kept to a minimum to ensure the least amount to the disruption to the fauna in the local environment as well as to that of the nearby residents.

And again, on Page 1-6 of Chapter 1 – Introduction, Santo states,

“Decommissioning and rehabilitation is undertaken in line with industry standard practices, statutory requirements and conditions of approval, usually collated and implemented through project-specific decommissioning and rehabilitation plans. Decommissioning and rehabilitation places typically include a range of measures, including requirements to return disturbed areas to a stable condition similar to the surrounding area.”

The rehabilitation should ensure that all species of trees adjacent to the cleared sites should be represented on the rehabilitated areas.

On Page 1-7 of Chapter 1 – Introduction Santos has included a photograph of a decommissioned well pad and notes that it is in the process of being fully rehabilitated. Please notice the absence of grasses and any actual ground cover, also there are no trees growing on the site. This suggests that Santos has a long way to go, with this site particularly, when it comes to rehabilitation. It makes you wonder what other rehabilitation sites look like.

Towards the end of Page 1-7 of Chapter 1 – Introduction Santos quotes a segment of the NSW Chief Scientist and Engineers review into coal seam gas activities in NSW conducted in 2014. Namoi Water also conducted a study and has some interesting Hydro-geological and Hydraulic Conductivity information on the strata that Santos is likely to encounter. We suggest that the Department of Planning read the four phases of this study prior to approving Santos' EIS.

On Page 1-8 of Chapter 1 – Introduction Santos states;

“The NSW Chief Scientist and Engineer concluded that “the technical challenges and risks posed by the industry can in general be managed through:

- *Application of new technological developments as they become available’.”*

The last point noted above will require a complete rethink on how things are done, Santos or any future lead operator may not wish to comply with changing industry requirements unless this is made a major and non-negotiable requirement in any conditions of consent should the project be approved.

Again, on Page 1-8 of Chapter 1 – Introduction Santos states;

“The NSW Chief Scientist and Engineer made recommendations to establish a world-class regime for extraction of gas, including (amongst other things) a clear public statement that covers the rationale or need for gas extraction. The NSW Government subsequently released the NSW Gas Plan (NSW Government 2014) to address the recommendations made by the NSW Chief Scientist and Engineer.”

Santos has not fully complied with this recommendation as it has never stated what it will do with any excess gas. Initially, in early 2014, Santos stated that every molecule of gas would go south to the NSW market, even Mr A Roberts MP was recorded as saying so. Now things have changed and the final destination for the gas from the Pilliga has not yet been established. Santos says that it is up to the wholesale purchaser of the gas to say where it goes, however, Santos obtained a degree of social licence by saying that the gas from the Pilliga Project would go the NSW market.

On Page 1-9 of Chapter 1 – Introduction Santos states;

“A Field Development Protocol will be implemented during field development of wells and some associated infrastructure to minimise environment impacts. The Field Development Protocol is described in Chapter 10 and included as Appendix C of this EIS.”

The notion of having a Field Development Protocol is a good one, however, it is not contained or referenced anywhere else within this EIS as the above paragraph states. This just adds to all the other incomplete or non-existent information Santos has referred to throughout the course of the NGP.

On Page 1-11 of Chapter 1 – Introduction Santos states what the benefits of the Narrabri Gas Projects would be. Section 2 of Point 4 states;

- *“161 full-time equivalent jobs in the wider region, being the Council areas of Gunnedah, Tamworth, Uralla, Armidale Dumaresq, Glenn Innes Severn, Gwydir, Moree Plains, Walgett, Coonamble, Gilgandra, Dubbo, Warrumbungle and Liverpool Plains.”*

These are full-time equivalent job figures, but what are the ACTUAL JOB POSITIONS CREATED. We need Santos to give a breakdown of actual numbers and length of time these positions will be available for.

Section 3 of Point 4 states;

- *“224 full-time equivalent jobs in the rest of NSW, in addition to the combined 288 full-time equivalent jobs described above.”*

All these numbers differ from those stated in later chapters in this EIS. The fifth point states;

- *“Establishment of a Gas Community Benefit Fund which would receive and estimated \$120 million through the life of the project. The NSW Government has committed that for every two dollars paid by the gas producer that holds a petroleum title into an authorised Gas Community Benefit Fund, the company will receive a one-dollar rebate on its gas royalties, up to a maximum of 10 percent of the royalty due in each year.”*

Santos has failed to mention here that the “royalty discount” could be as high as \$500,000 per year. The sixth and final point states;

- *“Economic modelling undertaken during this environmental impact assessment shows that real income will increase by around \$526 million in the Narrabri Local Government Area, with the project economic benefits shown to outweigh costs at a benefit-cost ratio of about 1.4.”*

This money is not actually paid to local businesses, but rather through local businesses to the main supply company, exactly how much a local business gets should be shown here. For example, bulk fuel is ordered direct from the manufacturer, however, due to franchise agreements the local supplier has to invoice Santos and this invoice is paid directly to the manufacturer. The local agent may receive a small commission but that is subject to contractual arrangements with the parent manufacturer.

Something that needs to be mentioned here regarding local business is a statement that Santos has bandied around that promises to “drought proof our community.” This statement has been totally misleading. Narrabri has recently suffered through one of its worst droughts on record. We have seen a number of small businesses close and an even greater number of families move from our Shire. Santos’ Narrabri Gas Project has not made one iota of difference for those farmers, individuals or businesses affected by the drought.

On Page 1-12 of Chapter 1 – Introduction Santos states;

“The EIS supports the State significant development application by for project approval. The EIS provides:

- *The proponent’s commitments in terms of measures to avoid, manage, mitigate or offset potential environmental impacts.”*

Commitments for management plans, protocols and any other guiding instrument to do with this project, all should be in this EIS, however, they are not, along with other information on such items as

1. The proposed new ponds at Leewood
2. The actual site of the Irrigated country
3. Soils and drainage information
4. Information on the final gas compression unit
5. Information on the entire produced water treatment plant
6. Information on the brine crystallizer and supporting infrastructure
7. Where the re-classified salts waste will go

8. The Bohena Creek outlet design

and so much more.

The approval of the Narrabri Gas Project could have disastrous outcomes for the people living within and around the Project Area. These disastrous outcomes, could not only be environmental, but also social and have the potential to decimate the Shire of Narrabri, similarly to that of Tara. The impacts to health, the financial stability of the region, including businesses and general households, the environment, the future of our community and families are just but a few of the reasons that Santos' Narrabri Gas Project should not go ahead.

This is our home and we don't want a Coal Seam Gas Well in our backyard, would you?

WATER

Looking over the chapters on water in this Environmental Impact Statement (EIS), whether it is Produced Water Management, Ground Water or Surface Water, it is all the same when it comes to information that should be included in this EIS. There is very little and what is present is unusable because the information needed to interpret the provided data is missing. As an example, the gas well water levels as stated in the Appendix, are given as Australian Height Datum (AHD), but the surface AHD is not given, so what use is the provided information? Santos' Water Portal only gives the Standing Water Levels (SWL), which makes it difficult to work with the information as the levels are given in two different formats, so there is no way to check the accuracy of the figures.

At least Santos is now admitting that the Narrabri Gas Project (NGP) will affect the regions of the Great Artesian Basin (GAB) and Namoi Alluvium, due to the extraction of the waters from the coal seams, but then the EIS goes on to state that the Namoi Alluvium and the GAB are not connected so how can they both be affected to almost the same degree if they are not connected?

The EIS goes on to discuss the treatment of the produced water and what the plans are for this water. Santos intends to use part of this treated water for irrigation, after adding gypsum. The remaining treated water will be used for dust suppression, drilling fluid augmentation and discharged into Bohena Creek, when the Creek flows at a certain rate. At this stage, the site of the discharge of the excess accumulation of the treated water in to Bohena Creek has not yet been determined.

The discharge of treated water into Bohena creek will only occur when a flow of 100 megalitres per day is recorded at a site that is five (5) creek kilometres downstream of a section of Bohena Creek, the location of which is unknown, but could be somewhere in an area indicated in a figure, the sole purpose of which was to indicate where Bohena Creek had been checked for effects that may be caused by this discharge, including water quality and creek bank condition.

This EIS gives only two (2) conditions under which the produced water is treated, these being 25°C and 30°C respectively, with the resultant analytical reports on the indicative treated water conditions being obtained only when the membranes of the reverse osmosis plant are new. The resultant sodium level, even at the treating temperature of 25°C, is over three (3) times that found in Bohena Creek, while at the treating temperature of 30°C the sodium level is seven (7) times greater. Arsenic, selenium, molybdenum, cadmium, mercury and lead are not found naturally occurring in Bohena Creek, so they are being introduced. Aside from this, the list of chemicals stated above differs throughout the EIS, depending on which chapter or appendix you are referencing at the time. As mentioned earlier, the flow rate of Bohena Creek is measured five (5) creek kilometres downstream of the surveyed portion of Bohena Creek and could be influenced by two other creeks, with different catchments, that enter Bohena Creek downstream of the surveyed area, with a possible result of less than 100 megalitres per day flowing in the area of the proposed discharge point.

This EIS says that a 10:1 flow rate versus the discharge rate is required to attain good dilution of the introduced waters. This may mean that the creek flow rate past the discharge point is not obtainable.

If a ratio of 10:1 is applied to the 25°C treated water discharged, then the Bohena Creek flow rate past the discharge point for water treated at 30°C, in order to achieve the same dilution, would be in the order of 200 megalitres per day. All these figures are based on the **assumption** that the temperature

for the treatment of the produced water will be either exactly 25°C or exactly 30°C and that the reverse osmosis plant will have new membranes.

To ensure that the stated required water flow conditions for complete dilution of the discharged treated water are met, the flow of 100 megalitres per day in Bohena Creek **MUST be measured at or just upstream of any discharge point.**

ALGAE

This is the elephant in the room as far as discharging treated water into Bohena Creek. Even EcoLogical, one of Santos' own contractors, warns of possible problems with Algal growth. Turbidity is another, and both go hand in hand, because the bacteria which create Algae, amongst causing other problems, can burrow into the particles that cause turbidity and be immune from any form of chlorinated bacterial control.

All the chapters and appendices regarding water in this EIS only give the barest details and keep referring back to proposed Management Plans, Policies and the like, most of which are not contained within the documentation making up this EIS, but may be done in the future should this EIS be approved in its current format.

There are **no** details regarding the reverse osmosis plant.

1. How will the temperature of the produced water be maintained at the quoted temperatures for treatment?
2. How will the sterilisation process for the adequate control of bacteria be performed?
3. How will any residual 'algal flock' or chemical be removed and what will its method of disposal be?
4. What is the route from the holding facilities to the discharge point in Bohena Creek and why is there **no** description on what form this proposed discharge point will take?
5. Why is there no mention, except for an indication on one figure, that there will be two (2) extra produced water ponds constructed at Leewood?

SALTS

The use of amended treated water for irrigation by admission in the EIS, would lead to an annual accumulation of salts in the soil well above that which naturally occurs as a result of rainfall. An attempt is made to reduce this accumulation by the use of a crop that could absorb some of the salts along with the use of extra gypsum by the farmer in the field. The fact still remains that despite all the precautions mentioned, there will still be an annual accumulation of salts that needs to be "flushed" away from the growing zone of any irrigated crop. This flushing could either be horizontal or vertically downwards, some of which will come to the surface as the water table rises for various reasons. The important question is, where will these salts end up? If horizontal flushing is practiced then a creek or watercourse is most likely, if vertical flushing occurs then the salts could end up in the local aquifer systems or "trapped" in the clay barrier, which will leach back out over time, which is currently

occurring at the kill sites of Bohena, and to a lesser degree Bibblewindi. The reason it is to a lesser degree at Bibblewindi is only because this leaching was found in time and rehabilitation started reasonably quickly, thus reducing the dwell time for the salts to enter the clay properly.

A major problem with this EIS in regard to the possible effects that the augmented treated water could have on any ground or surface water, is that the whole **irrigated land area is hypothetical; no actual access or landholder agreements have yet been signed**. This EIS is asking for approval based on nothing factual with regards to the effects from the augmented treated water on the ground and surface waters, **just more assumptions**.

There is one other point to consider, and that is that the augmented water may not end up being used in the project area. That is a whole new ball game. To this end the location and a full soil/water study needs to be performed and bought back for public comment before this EIS progresses any further.

Dust suppression, using treated water, needs to be very carefully monitored to ensure that the salt composition is of the level that will not create an accumulation problem in the soils or surrounding run-off channels, either during rain events or from improper use.



The picture above was taken in Queensland gas fields and shows what could occur in the Narrabri Gas Project area if proper supervision is not carried out when using treated water to suppress road dust. **We draw your attention to the salt sitting atop the road surface.**

As the Project is dealing with a product that contains large quantities of salts, the accumulative effect must always be in the forefront of any thinking, and as such, the **“precautionary principle”** must always be applied. We are sure that Santos agrees whole heartily with that principle.

DRILLING

The section on drilling and the extent to which the drill fluid can travel in some aquifers, due to the “positive” pressure of the drill fluid as to obtain the best drilling conditions, is of great concern, especially the noted distance of 70 metres from the hole. That then begs the questions of

1. How much drill fluid is lost?
2. What effect it will have on the aquifer, either short or long term, especially on the gifted food source for the naturally occurring, or introduced, sulphate reducing bacteria, and/or other bacteria, that can reduce the life of any protection around a well, which could lead to either cross aquifer contamination, or, if the inner casing plug is faulty, to cross contamination with the coal seam?

The above material is just a small sample of the concerns around water, salts, algae, bacteria and drilling that need to be addressed.

Should this project go ahead, thorough monitoring of all aspects of the Narrabri Gas Project is required and should be conducted at the cost of the proponent not through royalties paid to the relevant government agency nor at the expense of the Community Benefit Fund. This monitoring should be done daily, weekly, monthly and annually, sometimes in combination, but all done independently of the lead operator of the project and the NSW State and Federal Governments. All results must be published in real time and in terms that the community can understand and easily equate to. Consistency of measurement scales is vital; they are to be functional and easy to read. Public accessibility to the monitoring data is paramount for the sake of transparency and to foster a sense of honesty between the proponent, Local, State and Federal Government agencies and the public.

CONCEPT IRRIGATION DESIGN

Chapter 14 – Soils and land contamination and Appendix G2 – Concept irrigation design, of the EIS deals with the disposal of waste water after it has been treated in the reverse osmosis water treatment plant at the Santos owned property Leewood.

Santos proposes that the majority of this treated water be used for irrigation with a limited release of water into Bohena Creek, if the irrigation scheme cannot cope with the supply of treated water from the treatment plant. This is likely to happen during periods of prolonged wet weather when there is no need to be irrigating. For this to happen the creek would need to be flowing at a rate greater than 100 megalitres per day.

This managed release has not been approved and neither should this EIS until the managed release of water into Bohena Creek is properly researched and presented by Santos, had adequate community input and thoroughly investigated by the governing body.

Santos assume that neighbouring landholders, referred to as third parties throughout the EIS, in close proximity to their Leewood Water Treatment Plant, will develop centre pivot irrigation infrastructure and prepare their land to use Santos' treated water to irrigate their lucerne crops. These arrangements have not commenced nor have agreements been put in place, again which should be done so before the Narrabri Gas Project (NGP) is approved.

Santos's preferred crop is lucerne as it is a perennial, capable of using a large quantity of water and will provide a more predictable demand across the year compared with annual crops. The annual cropping options are all inferior to the perennial lucerne¹, as their water use fluctuated during the year in contrast to the more regular supply from the water treatment plant. This was an important criterion in order to minimise the need to build more flexibility into the supply system to cope with the seasonal demand for the treated water.

The Santos proposal for dealing with the treated waste water to irrigate lucerne will fall short of their expectations. There are agronomic and economic reasons why lucerne is a poor choice and these should be addressed before the NGP is approved.

The Reasons Why Lucerne is a Poor Choice.

1. Traditionally the better lucerne growing areas have alluvial, well drained soils often associated with river flats and a milder climate, for example the Hunter Valley and Tamworth.
2. Lucerne does best on well-drained soils of medium to light texture. Rich alluvial soils are ideal².
3. Waterlogging often kills or weakens lucerne plants, particularly when temperatures are high³.
4. Lucerne is very susceptible to waterlogging. Prolonged waterlogging due to poor drainage kills lucerne⁴.

¹ Appendix G2 Executive Summary, Paragraph 9

² NSW Agriculture, Agfacts. p2.2.25, 3rd Edition 2003. Lucerne For Pasture & Fodder. Soil Requirements, Page 8

³ NSW Agriculture, Agfacts. p2.2.25, 3rd Edition 2003. Poorly Drained Soils, Page 9

⁴ NSW Agriculture, Agfacts. p2.2.25, 3rd Edition 2003. Waterlogging, Page 33

5. Waterlogging is a serious environmental stress on lucerne. Even after short periods of waterlogging, lucerne plants are severely damaged⁵.

Points 2, 3, 4 and 5 above show clearly that waterlogging is a serious limiting factor for lucerne, yet some of the information in Appendix G2 – Concept irrigation design, is at variance to this fact.

Appendix G2 – Concept irrigation design, Section 6.1.4 – Lucerne, Page 21, states that

“the longevity of a lucerne stand is dependent on a variety of factors”

however, it fails to mention that waterlogging is a major limiting factor.

Appendix G2 – Concept irrigation design, Section 4.5 – Soil Units Description, Page 15, states that these soils

“...are unlikely to remain saturated for more than a few weeks...”

This has been portrayed as a positive statement and is therefore misleading. It has been established that lucerne does not tolerate waterlogging and an event lasting a few weeks would result in crop failure.

Santos acknowledges the soils chosen for irrigated lucerne are not well drained and are prone to waterlogging.

A Summary of The Soils Physical Limitations.

The key limitations of the site relate to the permeability of the majority of the soils. Due to slower infiltration into the subsoil, saturation of the surface soil following heavy rainfall is likely to extend for several days after rain/overland flow stops. Santos states in Appendix G2 – Concept irrigation design, Section 5.2.10 – Soil Physical Limitations, Page 19,

“These drainage/waterlogging related issues will demand careful water scheduling options.”

Sodic soils tend to disperse when wet causing the soil structure to collapse which reduces drainage making them prone to waterlogging.

The majority of the soils in the proposed irrigation area are described as vertosol units and sodosol units. As per Appendix G2 – Concept irrigation design, Section 4.2 – Landscape and Soil Selection Criteria, Page 12,

[soil sodicity is a] “common attribute of both the Sodosol and Vertosol soils within the survey area.”

Further detail, Appendix G2 – Concept irrigation design, Section 4.5 – Soil Units Description, Paragraph 5, Page 14, describes these soils as

⁵ CSIRO Publishing, www.publishing.csiro.au/journals/fpb Functional Plant Biology, 2003, 30, 335-343. Page 1, Abstract & Introduction

“being clayey and slightly to moderately sodic below around 15 cm and become progressively more sodic with depth.”

The cracking nature of the vertosol soils indicates that they will initially exhibit rapid infiltration when first irrigated from a dry condition, but due to swelling of the clays closing the cracks, the infiltration rate of these soils will subsequently decline from low to moderate. The coarsely lenticular subsoil presents imperfect internal drainage.

The surface of the sodosol unit, as per Appendix G2 – Concept irrigation design, Section 4.5 – Soil Units Description, Paragraphs 2 and 4, Page 14,

“was prone to waterlogging and compaction. The subsoils were similar to the vertosol units described above. “

The consequence of sodic soils is poor soil structure leading to reduced drainage and therefore waterlogging.

As these soils are not well drained the accumulation of salts by using the treated water for irrigation is likely to have adverse impacts on their long term agricultural capacity.

“There is potential for EC_e [salinity] to rise to an inhibitory level unless sufficient leaching occurs and this will be managed by targeting the leaching fraction seasonally, towards periods when evapotranspiration (ET) is low. This is best monitored through annual soil sampling (DEC 2004).” Appendix G2 – Concept irrigation design, Section 5.2 – Soil Limitations Subsection 5.2.2 Electrical Conductivity, Page 17.

When describing the salt impacts from treated water and the need to maintain rootzone salinity EC_e of 4.0 the method described as per Appendix G2 – Concept irrigation design, Section 8.1 – Salt Inputs from Treated Water and Soil Impacts, Paragraph 3, Page 28, was that,

“during periods of low evapotranspiration, an excess amount of water could be applied as irrigation and rainfall, resulting in dilution and achieving adequate leaching of rootzone salts.”

As these soils are not well drained attempts to leach these salts will be unsuccessful and lead to waterlogging which will be detrimental to the lucerne crop.

The total annual input of sodium, chloride and bicarbonate salts from irrigation is expected to be between 1734 and 3124 kg/ha-yr. Appendix G2 – Concept irrigation design, Section 8.1 – Salt Inputs from Treated Water and Soil Impacts, Paragraph 2, Page 28.

This is a total of approximately nine (9) to fifteen (15) tonnes per hectare of these salts over the first 5 years, with the rate of salt accumulation declining gradually over the next twenty (20) years as the treated water supply diminishes. Over the life of the project a total of approximately 11,400 tonnes of these three salts, sodium, chloride and bicarbonate, will have been deposited on the irrigated lands affected by the proposed irrigation scheme.

Appendix G2 – Concept irrigation design, Section 8.2 – Deep Drainage and Groundwater Impacts, Paragraph 4, Page 28, states that,

“deep drainage of 4mm/yr under lucerne would take approximately 500 years for applied irrigation water to reach the water table at 20m.”

It would be difficult to know exactly where these salts will accumulate, however, given these poorly drained soils are going to be irrigated with a dwindling supply of treated water for only 20-25 years, it would be reasonable to assume that these salts will accumulate close to the surface where they are likely to cause long term damage to these soils.

These salts, heavy metals and other components in the produced water are all essentially new pollutants to our environment having been locked away in the coal seams until being pumped out as a result of the coal seam gas mining process. These new pollutants will have an adverse cumulative impact on the environment and therefore should remain in the coal seams.

The EIS describes the need to and method proposed to address surface and subsoil sodicity in order to maintain and improve infiltration rates of these soils.

For example, Appendix G2 – Concept irrigation design, Section 7.3.2 – Gypsum, Page 26 states,

“it is common practice in farming, to apply gypsum into sodic layers through deep tillage to achieve this outcome”

as per Appendix G2 – Concept irrigation design, Section 5.3 – Soil Management, Page 19,

“Ongoing gypsum additions will assist in addressing the existing surface and subsoil sodicity.”

The use of gypsum should improve infiltration rates at the surface of these soils, however during periods of high rainfall the likelihood of waterlogging will increase. As runoff is reduced more water will enter the soil and with little subsoil drainage the soil above will fill to capacity. This can be an advantage for crops that tolerate saturated rootzones, but **will be detrimental to lucerne**.

Deep tillage of gypsum is **not a common practice** as claimed in Appendix G2 – Concept irrigation design, Section 5.3 – Soil Management, Page 19. Many soils in NSW have sodic clay subsoils of low permeability. These soils waterlog readily after heavy rain or irrigation. The fact that reports of successful subsoil treatment with gypsum are much fewer than those relating to top soils is probably mainly due to the difficulties of treating subsoils with gypsum⁶.

It is difficult to get gypsum deep enough to improve a sodic subsoil⁷.

A subsoil that is not exposed is difficult to treat with gypsum. The problem is getting the gypsum to the subsoil and it is not very economical⁸.

Where irrigation water of suitable quality is available, soluble salts can be leached beyond the root zones of plants. However, the conditions have to be just right with deep, light textured soils⁹.

⁶ NSW Agriculture, Agfacts. A. C. Improving Soil Structure with Gypsum, Subsoils, Page 5

⁷ SOILpac. Chapter D1, Improving Soil Structure, Page 23

⁸ Soil Notes. Soils Information for Northern Wheat-Belt Farmers. Sue Gunter, Soils Advisory Officer – NSW Agriculture.

⁹ AFL Greenleaf Information Bulletin. Soil Salinity. Methods of Overcoming a Soil Salinity Problem. No. 4 – Leaching Soluble Salts

If poor quality water is used, salts are likely to accumulate in the root zone, unless they are leached by heavy irrigations. Such leaching irrigations are usually most successful on sandy (or light textured) soils¹⁰.

Unless the soil is light-textured, sodium is difficult to remove from the soil profile by leaching irrigations¹¹.

References 9 and 10 above refer to the need for suitable quality water for leaching irrigations, and if poor quality water is used, then salts are likely to accumulate in the root zone, unless the soils are sandy or light textured. These soils are not sandy or light textured, they are clays and poorly drained.

The description of the amended treated water quality according to Table 2 in Appendix G2 – Concept irrigation design, Section 3.2 – Treated Water Quality, Page 10, combined with the comments on irrigation water suitability, Appendix G2 – Concept irrigation design, Section 3.3 – Irrigation Suitability, Page 10, states

“the water would be classified as ‘low to medium strength effluent’”

depending on the water temperature.

“The 30°C treated water total dissolved solid (TDS) concentration was ranked as ‘medium strength’.”

Using the average electrical conductivity (EC) of 775µS/cm from Table 2 in Appendix G2 – Concept irrigation design, Section 3.2 – Treated Water Quality, Page 10, the amended treated water quality description is moderate salinity, with the comment,

“ensure leaching by avoiding frequent light watering.”¹²

As these soils are not well drained and unlikely to be remediated, particularly to a suitable standard at depth, it is reasonable to conclude that these additional salts will accumulate in the root zone using the treated water described above.

Santos’s assumption that third parties, preferably neighbouring land holders will use this treated water for irrigation of lucerne is optimistic.

No third party has been formally approached to take the treated water and none are likely to agree to this proposal as it stands.

Few, if anybody, would want to grow irrigated lucerne as these soils are not suitable. Other more profitable and easier to market crops will be preferred.

Nobody in their right mind would commit to the capital expenditure of land preparation as suggested, centre pivot irrigation infrastructure, hay storage shed/s and lucerne harvesting and handling

¹⁰ AFL Greenleaf Information Bulletin. Soil Salinity. Causes and Occurrence of Salt Problems. No. 3, Paragraph 6.

¹¹ Incitec Soil Analysis Interpretation Manual. Assessing Sodium Status & Changing Sodium Levels, 2.1.10.e

¹² Incitec Water Analysis Interpretation Manual. Table 3: Salinity Classification of Irrigation Waters, Page 18.

equipment, knowing their irrigation water supply after the first four years will diminish rapidly then peter-out to almost nothing in 20-25 years.

Another concern is the possibility that Santos could abandon the project, so this possibility would need to be addressed in any agreement with a third-party irrigator.

Another significant issue that will need to be considered is the transfer of responsibility for any adverse impact at a site or the surrounding environment from third party use. Fodder production from these sites would also require testing to ensure it is not contaminated, so there is no risk of residue in the animals that consume it or contamination of those that consume the animals.

While water monitoring for salt levels and any potential toxic elements will be carried out by Santos, the proposed soil monitoring and management standards will be the responsibility of the third party. These will be onerous and expensive and therefore another deterrent to enter into an agreement to accept treated water for irrigation from Santos.

Based on the information provided it is our conclusion that the Santos plan for the disposal of treated waste water by irrigating lucerne is unworkable in its current form.

Santos's current proposal is weak and subject to change with the creep approval process, then being used to modify and water down standards suggested in Appendix G2 – Concept irrigation design to dispose of the treated waste water. To go down this path will result in significant adverse impacts and potential loss of the agricultural capacity of the targeted lands affected by the proposal.

The suggestion that third parties will accept the treated irrigation water to grow lucerne is deeply flawed. There is no detail at all about the possible commercial arrangements between Santos and the third parties. A workable solution needs to be presented for appraisal. This may mean Santos will have to purchase properties and implement the proposal themselves. Another possibility is they could negotiate arrangements where the third parties are paid to manage land on behalf of Santos. Crops other than lucerne may need to be permitted even though their water use patterns will not match the more regular supply of produced water. It is inevitable that a workable Concept Irrigation Design Plan, compared with the current optimistic best case scenario, will cost Santos more money which may influence their decision on whether or not to proceed with the NGP. This is a possibility as the NGP is now a non-core project that Santos has been trying to sell.

The information on the need to monitor the treated water quality, soil, ground water, runoff etc is vague. Words and phrases such as, **would need** to be undertaken, **should be** undertaken, **would be** developed, **would be** considered, **may be**, **should in most instances**, just to name a few, **MUST BE REPLACED BY THE WORDS WILL BE**.

Of particular concern, is the monitoring of the treated water quality as the effectiveness of the reverse osmosis membranes as they diminish with age. This should be done by an independent organisation several times during the life of a reverse osmosis membrane to ensure the treatment process is functioning correctly. These tests must include the salts to determine salinity but also heavy metals, metalloids and potential toxic elements left in the treated water. Maximum values which must not be exceeded must be set for these tests results.

It is noted that Santos will apply for surface discharge authority as stated in Appendix G2 – Concept irrigation design, Section 1.3 Assumptions and Limitations Point 10, Page 3.

The approval for limited releases of treated water into Bohena Creek if the irrigation scheme cannot cope with the supply of treated water during periods of prolonged wet weather or any other reason should be part of the approval process for the NGP.

The use of Bohena Creek to dispose of treated water is a concern to downstream water users and there is also potential for the treated water to impact the aquatic environment.

The Santos proposal is to release a maximum of 12 megalitres per day of treated water into Bohena Creek when the natural flow is greater than 100 megalitres per day. These releases are likely to occur during periods of prolonged wet weather when there is no need to be irrigating and the treated water storage and upstream produced water storages are filled, as a result of a continued supply of treated water from the reverse osmosis plant.

The statement made in Chapter 7 – Produced Water Management Section 7.7.1 Treated water beneficial reuse options, Page 19 of the EIS, that

“The treated water would also be available for managed release to Bohena Creek during flow conditions equal to, or greater than, 100 mega litres per day as measured at the Newell Highway gauging station.”

This gauging station is approximately 4km downstream of the proposed discharge location. It is possible this location will not always give an accurate reading for the flow rate of Bohena Creek at the proposed discharge location, because of the inflow from the catchment between the two sites. The readings from the Newell Highway gauging station will almost always underestimate the flow rate for the discharge location which is approximately 4km upstream as already mentioned.

If the NGP is given approval to proceed we recommend that the gauging station be situated at the discharge location, that the Bohena Creek flow rate be at or above the 100 megalitres per day and the maximum treated water discharge rate be no more than 12 megalitres per day, **and** be made a condition of the NGP approval.

As set out in the EIS the risks of releasing this water into Bohena Creek are considered manageable and can be reduced by incorporating mitigation measures. These measures are set out in the Managed Release Study-Bohena Creek.¹³

We would seek the inclusion of the above treated water release criteria be made a condition of a NGP if approved. The correct disposal of this treated water is too important an issue to be deferred for later approval or possibly requests to have it modified.

As per Appendix G2 – Concept irrigation design, Section 1 Introduction, Page 1, Paragraph 3 Santos states that

¹³ EcoLogical Australia Pty Ltd. 9.3 Managed Release Study – Bohena Creek Mitigation Measures, 9.3.1 Design, 9.3.2 Monitoring and 9.3.3 Management

“Other proposed uses for the treated water include dust suppression and stock watering.”

We do not support the use of treated water for dust suppression nor stock watering, without a plan to manage the risks of contamination. This should include testing of water being delivered to the stock owner and soil monitoring, particularly where treated water is used for dust suppression on roads. Accumulation of salts is likely along the sides of roads where treated water has been disposed. This roadside soil monitoring would probably reduce the temptation for unnecessary dust suppression which could be considered by Santos if water storages are full.

These plans must also be included in the EIS for approval rather than being deferred to a piecemeal process of approval at a later date.

We recommend the Department of Planning reject the application for approval of the Narrabri Gas Project until the issues raised in the People for The Plains submission are addressed, due to the potential adverse impacts. The decisions made regarding the reuse of treated water in the Narrabri Gas Project EIS is vital to the sustainability of our community and should be properly researched and investigated, not become just another incremental step in the development of the Narrabri Gas Project as other components of this project have become in the past.

TRAFFIC AND TRANSPORT

Secretary's Environmental Assessment Requirements

- **General Requirements:** An assessment of the likely impacts of the development on the environment, focussing on the specific issues identified below, including – a description of the existing environment likely to be affected by the development, using sufficient baseline data.
- **Key Issue – Transport:** An assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the local and State road network, having regard to Roads and Maritime Services' requirements (see attachments 3A and 3B).

Given the time and resources available, the proponents EIS in relation to Transport is disappointing in that it lacks critical accurate and detailed information and clearly does not fully address the requirements as requested.

The most significant area of concern is that mitigation of risk associated with the proposed development relying on a 'Traffic Management Plan' (TMP) which is not included in the EIS. The stated measures to be included in the TMP are not clearly defined and no commitment is provided as to which would be undertaken. Furthermore, it not clear what outcome could expected from measures that involve 'consultation' 'review' or 'manage'.

The proponent is requested to provide a detailed Traffic Management Plan that it intends to implement.

The EIS does not adequately address the following as requested by the SEAR's:

- Mitigation on roads due to wet or inclement weather (Risk Analysis does not consider wet weather).
- No baseline data (or proposal) for road conditions prior to project starting.
- No prescribed method or use of appropriately trained personnel to monitor road deterioration.
- No assessment on cumulative impact on roads on drillers camp accommodation or forestry roads (as requested by Roads and Maritime Services).
- No Concept plans for proposed intersection upgrades provided.
- Incorrect speed allocated to Yarrie Lake Road for analysis at Intersection with Kiandool Lane (80km).
- No consideration to School Bus turning points on Yarrie Lake Road.
- No proposed contribution to maintaining Forestry Roads.
- No commitment to funding repairs to road damage caused by Project traffic.

SIDING SPRING OBSERVATORY

The EIS assures that “light generated during the construction and operation of the project would be designed considering ... the good lighting design principles documented in *Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring* (NSW Department of Planning and Environment 2016)”. Also, “the pilot well flares and safety flares are unlikely to cause an impact on the long-term operation of Siding Spring observatory, near Coonabarabran”.



4m AAT Telescope

These statements are at odds with the views of astronomers and other personnel at Siding Spring, who point out that the current Dark Sky guidelines only affect buildings etc, and flares are not discussed.

The NGP exploration flares can be seen in direct line of sight from the Siding Spring telescopes. The single, unmanned Bibblewindi flare, which is 90 kilometres away, creates more light pollution than the entire neighbouring town of Coonabarabran, with a population of 3500. Furthermore, the red coloured light caused by flaring is worse than white

light in astronomical research, as a lot of the science, including astronomy and astrophysics, is undertaken with red spectrum light, and flaring will blind this out.

Santos proposes to triple the amount of pilot flares and double the amount of large flares. Large flare stacks would be built 50m high with flame heights up to 30m above the stacks.

Every little bit of unshielded light makes it harder to conduct cutting edge research. Even light pollution from Sydney, over 400 kilometres away, can have an impact. The Federal Government has highlighted the protection of the observatory as one of the key areas it will be looking at in the EIS, because of its importance to the regional economy and the national astronomy sector.

Siding Spring Observatory is a unique scientific research facility which has been working for over 50 years, and houses currently 49 of Australia’s largest optical telescopes which conduct both national and international research in astronomy and astrophysics. Future plans include another 50 telescopes to be built on site within the next decade. This is Australia’s premier research facility of this type and was located in the Warrumbungles expressly to take advantage of the requisite dark skies. It is also one of the three observatories in the southern hemisphere which together provide the required 24-hour night sky coverage.

The Australian National University co-ordinates work at the facility, alongside other universities, government industries and private enterprise from around the world. More than \$100 million worth of research equipment is located at the observatory, with extra funds allocated annually to maintain and upgrade facilities to keep abreast of innovations in science and research.

Siding Spring Mountain



This research hub is Coonabarabran’s largest employer, with 50 people employed onsite and a further 150 supported in Canberra and Sydney. The facility is credited with discovering the oldest known star and is currently undertaking the largest survey of dark matter every attempted, maintaining Australia’s reputation as a leading astrophysics player.

The observatory also gives Coonabarabran its identity and provides core tourism opportunities, with 30,000 visitors annually.

Santos' future gasfield expansions include Coonabarabran itself, Tooraweenah, Gilgandra, Gunnedah, Mullaley, Dubbo and more. Some of these gasfields would be much closer to Siding Spring and there would be increased flaring, causing an even greater impact on the observatory than the NGP. There is nothing in the EIS to suggest that the flares would be enclosed, despite this being a recommendation of the EPA. If flares are not enclosed to minimise light pollution, the most likely outcome would be the shutdown of Siding Spring permanently.

The loss of Siding Spring would result in the removal of Australia from the global astrophysics landscape. This site would not be rebuilt elsewhere again. No further developments or discoveries would be made in Australia and Coonabarabran would be stripped of its key employer, its major tourist attraction, and its identity.

Santos could shield some lights on new building facilities but the light pollution from 900 gas wells (with flaring to greater heights than currently), and the compressor stations and the water treatment plant will cause an insurmountable problem for the observatory. Santos needs to provide further detailed explanation of how these problems could possibly be overcome. One of the solutions needs to be that all current and future flares be enclosed as per the EPA recommendation.

GREENHOUSE GASES

This section of the submission has been written by reviewing Chapter 24 – Greenhouse gas, and Appendix R – Greenhouse gas assessment, page by page, noting the deficiencies, inaccuracies and misleading statements as they occur. An assessment is then made at the end of this section, outlining what needs to occur before the project is considered further.

Chapter 24 - Greenhouse Gas, is strong on ambit claims but woefully deficient on substantiation. The chapter is rife with deficiencies and inaccuracies, together with motherhood statements that could only be described as propaganda. These errors, omissions and distortions are discussed in turn below as they arise.

Page 24-1:

“Given the environmental benefits of low-carbon energy sources, the project is consistent with the principles of ecologically sustainable development”.

This statement is patently false:

1. *“low-carbon energy sources”*: when did methane (CH₄) become low-carbon? Methane, a patently carbon compound, is 86 times more potent a greenhouse gas than carbon dioxide over a 20-year period and 34 times more potent over a 100-year period (IPCC).
2. *“ecologically sustainable development”*: Australia’s *National Strategy for Ecologically Sustainable Development (1992)* defines ecologically sustainable development as: ‘*using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*’. The project therefore violates these principles on numerous fronts, including that:
 - the resource would not be conserved, being exhausted over 25 years
 - the project is, by definition, not sustainable, as the gas, once exhausted, would not be replaced
 - ecological processes would be disrupted by the fragmentation of the Pilliga forest, with numerous dissecting roads, well pads and other infrastructure and the associated noise and dust
 - quality of life would be severely compromised by global warming, with fossil fuels, and particularly methane, being a major contributor.

“The most material emissions from the project are associated with carbon dioxide venting and combustion of fuel during gas processing or for electricity generation for the project”.

This statement will subsequently be shown to be false. While carbon dioxide would be a material emission from the project, the more material emission would most likely be the discharge of methane to the atmosphere, due to its relative potency as a greenhouse gas. The emissions associated with the combustion of fuel during gas processing or for electricity generation for the project would be dwarfed by the emissions resulting from use of the end product elsewhere, such as for power generation or by industry.

Page 24-2:

Two electricity options were considered for the project. It is totally unclear why, after several years of preparation and planning, that these options have not been resolved. Reviewers of the project should not have to consider all possible options. It is up to the proponent to have determined the most

appropriate option before submitting their application. The EIS should not be accepted until the preferred option is nominated.

Tables 24-2 and 24-3:

These tables show the direct greenhouse gas emissions over the 25-year life of the project and for a typical operating year. The figures are totally unsubstantiated, without even reference to the accompanying appendix. While the figures can be sourced from Appendix R – Greenhouse gas assessment, they are highly contentious and will be discussed later within the review of that appendix.

Section 24.3.3:

The same comment applies – unsubstantiated figures, sourced from Appendix R – Greenhouse gas assessment.

Section 24.3.4:

“Product use emissions by consumers of natural gas will generate additional greenhouse gas emissions that are beyond the control of the proponent”.

This statement is a base attempt to deflect attention away from the real greenhouse gas issue of the project – suggesting *“it’s not our problem”*. It is the classic Neuremburg defense – *“I was only following orders”* (meeting market demand) and, *“if I didn’t do it, someone else would”* (as expressed in the last sentence: *“Such downstream emissions are the result of the consumer demand for energy”*) – again *“it’s not our fault”*.

Nowhere in the EIS does Santos own up to the fact that it chooses to produce a product that is entirely detrimental to the health of the planet. In the following Section 24.3.5 – Impacts of greenhouse gas emissions, it claims that *“the annual direct emissions from the project are equivalent to less than 0.2 per cent of Australia’s current annual emissions”*. While this might provide some comfort to Santos, it must be considered against the backdrop that Australia, and the rest of the world, is trying to reduce emissions. Further, it refers only to direct emissions and none of those relating to the burning of its product elsewhere.

This therefore makes a mockery of its statement on page 24-5:

*“The relatively small incremental increase (less than 0.2 per cent) in Australia’s annual greenhouse gas emissions associated with the project, and its contribution to global emissions, should be considered in terms if the **net environmental benefit** (emphasis added) of the natural gas generated by the project”.*

This statement can only be considered as propaganda and attempted “greenwash”. The real greenhouse gas impacts of the project will be discussed later.

The delusion of being greenhouse gas friendly is continued in Section 24.4.1 – Governance approach. The company completely skirts the major issue in this approach i.e. that its sole raison d’être is to produce one of the most potent of all greenhouse gases, ultimately for direct release into the atmosphere as fugitive emissions, or for burning to produce carbon dioxide. Other gas companies, such as AGL and Origin, have recognized this moral dilemma and are moving rapidly to position themselves amongst the leaders of renewable energy deployment. Santos **chooses** to remain a fossil fuel producer and simply ignores the role of its highly potent product in global warming.

Not that this was always the case. In 2015, under the heading “CEO’s Statement on Climate Change”, its website avowed that

“Climate change is affecting our businesses and the communities in which we operate ... The longer we wait, the harder it will be and the more it will cost us ... We are also vulnerable to climate impacts and we have a strategic interest in managing climate change”.

This statement no longer appears on the Santos website. Santos would appear to have abandoned any interest in addressing climate change at the same time as it abandoned the CEO over whose name the above appeared.

Instead, Santos sets out in broad terms how it will attempt to maximize energy efficiencies in its own operations, completely ignoring the dangers of its product. The measures to achieve energy efficiencies are outlined in Table 24-5 and relate principally to plant, vehicle and equipment operations. The only reference to the deadly consequences of methane is in the last line:

“A leak detection and repair program approved by the NSW Environment Protection Authority will be implemented to identify and minimize fugitive emissions”.

Where is this program? It is referred to again in Table 6.1 of Appendix R – Greenhouse gas assessment, but the EIS does not contain a description. As will be discussed later, leaks and venting are major sources of greenhouse gas emissions, second only to when the gas is burnt.

Second 24-5 Conclusion:

The conclusions at the end of the chapter can only be described as propaganda and bring into question the independence of the consultant:

“Natural gas can underpin the transition to a low carbon economy”.

“Low-carbon energy sources such as natural gas can help to meet growing global energy demand while reducing relative global greenhouse gas emissions”.

“Given the environmental benefits of low-carbon energy sources, the project is consistent with the principles of ecologically sustainable development”.

“As such, the residual environmental risk presented by the project with regard to greenhouse gas emissions is low”.

All of these statements are false, as described above and some in more detail later. On this basis, the EIS should be rejected and sent back to Santos for correction and completion.

APPENDIX R – GREENHOUSE GAS ASSESSMENT

Appendix R – Greenhouse gas assessment opens with the same sorts of ambit claims and propaganda that characterized the chapter to which it is appended. Working through these page by page:

Executive summary:

“The primary objective is ... to support the energy security needs of NSW”.

It is surprising that this statement has been retained in the EIS, as it has been consistently shown by energy industry analysts to be false and finally picked up by the media over the last few months. The current gas needs of NSW can be met by supply from Bass Strait, which has more than 200 years of supply for the east coast of Australia, according to BHP/Exxon.

The primary objective of the Narrabri Gas Project is, in fact, to replace gas diverted from Moomba to Gladstone, to meet Santos' over-commitment of export orders. This over-commitment has placed east coast gas supplies in jeopardy. The Narrabri community in particular and the global community in general is being asked to pay the price of Santos' over-exuberance, as it seeks to bring more gas to market, with the commensurate greenhouse gas impacts.

The Executive Summary refers to "Santos' Climate Change Policy" with commitments which "*underpin Santos' approach to greenhouse gas emissions management*". The first means of achieving these commitments, according to the Santos website, will be to "*continue to reduce the carbon intensity of Santos' products ...*". Given that Santos' main product is methane, how is the development of the NGP consistent with the company's policy? In other words, the policy is a complete farce and any reference to it should be ignored.

When asked at Santos' 2017 AGM to disclose its climate risk assessment and scenario analyses, Chairman Peter Coates replied that the company had adopted a 4°C (rise in global temperatures) pathway. Given that the rest of the world has committed to a less than 2°C rise in global temperatures, the company obviously has no commitment to reducing greenhouse gases, which are its stock-in-trade.

The EIS is further devalued by the inclusion of two additional sentences, one from the Conclusion of Chapter 24:

"Lower-carbon energy sources such as natural gas can help to meet growing global energy demand while reducing relative global greenhouse gas emissions",

and

"Greenhouse gas emissions generated by the project are considered to be reasonable given the nature of the project".

These sentences are propaganda, not an environmental assessment.

Section 1.1:

This (and the following couple of) section(s) reiterate project background unrelated to greenhouse gases. Nonetheless, a number of statements are open to challenge.

The project will result in the "*Generation of approximately 1,300 jobs during construction and 200 jobs during the operational phase*".

Nowhere in the EIS is this statement substantiated, with a breakdown of the positions and locations of employees. Jobs figures provided by some other resource developers (e.g. for the Galilee Basin in Queensland and at Bulga in NSW) have proven to be vastly overstated. Yet the public is expected to take Santos' figures on trust. Given the high value that governments place on jobs, and the community on jobs provided locally, the EIS should not be accepted until the job breakdown figures are furnished by Santos.

Table 1-1:

"conversion or upgrade of existing exploration and appraisal wells to production in addition to the 850 new wells".

This figure is a complete surprise and inconsistent with the information made public to date, where Santos has frequently confirmed the figures in its NGP brochure, that the *“Infrastructure will include up to 850 individual production wells... or up to 425 well sets”*. As more than 50 wells have been constructed or approved already (see Chapter 2), it now appears that the project will consist of more than 900 wells in total. This figure has never been disclosed previously. While the Executive Summary refers to “850 new gas wells” it was always considered that this included the exploration wells. Indeed, Table 2-3 states simply that *“the project will involve construction of 850 wells”*.

This anomaly needs to be resolved before further consideration is given to the project.

Section 1.3:

“The proposed project is located ... approximately 20 kilometres south-west of Narrabri ...”.

In fact, the project area, as shown on Figure1-1, comes within five kilometres of the Narrabri urban area and six kilometres from the Narrabri West post office. Where is a map showing the location of works? How can a project be approved when no-one outside the company knows where their works are to be located? How close will significant infrastructure, with noise, lights and smell, be located to Narrabri? The EIS should not be considered further until a map is provided showing the location and layout of all of the works.

Section 1.5:

*“Fugitive emissions (excluding venting and flaring) are minor losses of gas that are **assumed to occur** (emphasis added) from equipment and infrastructure. They are **measured by applying legislative emission factors**” (emphasis added).*

Fugitive emissions are NOT “assumed to occur” – they are known to occur. They are NOT a “minor loss”, but a significant portion (to be discussed later) of the produced gas and a major contributor to greenhouse gases. They are such a problem that they need to be quantified by measurement, not “measured” (?) “by applying legislative emission factors”. Santos has been operating exploratory wells in the Pilliga for a sufficient time to have undertaken these measurements and the project should not be considered further until they do so. Losses also occur in transmission and, again, can be readily quantified by measuring inflows and outflows of selected pipelines.

Tables 2-2 and 2.3:

Each table consists of two columns, with the conflicting headings “Parameter measured” and “Assumptions”. In other words, **not one parameter was measured – every “measurement” is in fact an assumption**. This would suggest that Santos was totally derelict in its duty in carrying out the multi-year exploration program, as the tables suggest that nothing was measured in relation to losses of methane from the system and the production of other greenhouse gases such as CO₂.

For example, under the “Parameter measured: Emissions during gas processing – CO₂

“The assumed carbon dioxide content of gas was based on industry experience”

and

“The estimates were based on the extracted gas containing 10 mol% carbon dioxide”,

which is equivalent to the volume percentage (Santos, personal communication). That is, the extracted gas is **assumed** to contain 10 per cent carbon dioxide by volume.

There is absolutely no reason to assume the carbon dioxide content of the Pilliga gas, as it has been measured during the exploration phase. Why have an exploration phase if the data collected is not used? The data (GeoGas Pty Ltd) shows the ranges of CO₂ contents as follows, for the various Pilliga coal seams:

Upper Black Jack	38 – 67% (average 55%)
Hoskissons	59 – 78% (average 63%)
Upper Maules Creek	17 – 18% (average 18%)
Bohena	22 – 30% (average 28%)

These figures have not been found in the EIS and they certainly have not been used in calculating greenhouse gas emissions. Table 2-2 states that *“It was assumed that all carbon dioxide extracted from gas being processed is emitted”*. This suggests that somewhere between 18 and 63 percent of the gas extracted will be emitted to the atmosphere, not the 10 per cent claimed by Santos.

The project should not be considered further until these figures are clarified, as there is every possibility that the amount of CO₂ being vented to the atmosphere during gas processing is vastly underestimated.

“Fugitive emissions from gathering pipe maintenance were ... calculated ...”.

As mentioned above, there is no reason for these emissions to be calculated when they can be determined from the existing pipe network by measuring gas inflows and outflows and subtracting the difference.

Nowhere in Tables 2-2 or 2-3 is there any reference to emissions from high point vents (HPVs). HPVs are located at high points of any water pipeline as it traverses the landscape, to allow the release of accumulated air (see attached photo). Otherwise, air comes out of solution, with pockets of air collecting at the high points and the water ceases to flow. In the case of a produced water pipeline associated with a gas field, gas accumulates at the HPV and must be released to allow produced water to flow.



High point vent in Narrabri Gas Project flow line

Gas losses from HPVs in the Pilliga have been observed and photographed by community members. Their attention was attracted by the noise and water emanating from an HPV after the release valve was opened by a Santos employee. **Given that the gas must be released at regular intervals as it accumulates at the HPVs, and given that the gas comprises mostly methane and carbon dioxide, this could represent a major emissions source – AND IT IS COMPLETELY IGNORED IN THE EIS.**

If not done already, the vent pipes of the HPVs could be fitted with flow meters to measure the amount of gas vented. The project should not be considered further until this is done and the amount of gas lost to venting through HPVs is quantified.

The amount of greenhouse gas emissions that have been calculated and omitted, rather than measured, could well disprove the last paragraph of Section 2.5:

“All greenhouse gas emissions excluded from this assessment satisfy the de minimis principle, that is, any exclusion would be less than 1% of the total greenhouse gas emissions from the project and the sum of all exclusions would be less than 5% of the total greenhouse gas emissions from the project”.

Santos needs to revise these estimates on the basis of measurement, not assumptions, and no further consideration be given to the project until it has done so.

Section 4:

Santos makes the sweeping statement that

“Baseline fugitive methane emissions are reasonably expected to be comparable with the existing activities in the area, including agriculture, waste management, and naturally occurring anaerobic processes and seeps”

– without offering a shred of evidence. With venting of coal seam gas from high point vents and other losses in transport, as discussed above, it is highly likely that baseline fugitive emissions will release far more methane into the atmosphere than existing activities in the area. In addition, the high concentrations of CO₂ separated from methane during processing will be vented directly to the atmosphere.

Section 5.1:

Table 5.1 and Table 5.2 give the total greenhouse gas emissions over a 25-year period for Options 1 and 2 respectively (alternative power supplies). Table 5-3 gives the emissions in a typical operating year. All of these calculations are based on the **assumptions** of Tables 2-2 and 2-3, discussed earlier. The project should not be considered further until these calculations are based on measurements made during the exploration phase of the NGP. The impact would then need to be reassessed.

Section 5.3:

“Downstream emissions are a result of consumer demand for energy”.

This outlying sentence has been tacked onto the end of the section in what would appear another attempt to deflect attention from the real greenhouse gas culprit – the methane produced as a result of the project. Propaganda statements such as this compound and highlight the deficiencies of the EIS.

A similar propaganda statement is attached to the end of Section 5.4:

“In the context of these net environmental benefits, the project is consistent with the principles of ecologically sustainable development”.

As pointed out earlier, the project is not consistent with these principles and is not sustainable.

The same section repeats the propaganda phrases

“ the net environmental benefit of the natural gas generated by the project”

and

“lower-carbon alternative”, both of which have been dealt with earlier.

Sections 6 and 7:

These sections repeat, almost verbatim, the words of Sections 24.4 and 24.5 of Chapter 24, hence the comments that were made in respect to those sections apply here.

ASSESSMENT

The whole Narrabri Gas Project is based on the premise that NSW needs the gas. Santos’ brochure on the NGP claims that *“New South Wales receives the majority of its gas from interstate and produces less than 5 percent of its domestic gas needs”*. Santos has frequently confirmed the statement, including in its NGP brochure, that the project would supply *“half of NSW’s natural gas needs”*. The gas industry’s lobby groups frequently and noisily warned of an impending *“gas supply cliff”*. These statements are re-affirmed in the Executive Summary of the EIS.

This has been Santos’ rationale for the project. In fact, however, it has now become increasingly obvious that the project is needed (by Santos only) to compensate for its shortfall in gas deliveries for export through Gladstone. Santos’ strategy has been to take a reliable supply of a public good (methane) and sell it overseas, creating a shortage which would allow it to ramp up the domestic price. The higher price is required to economically justify the high-cost NGP.

The Australian public has now become aware of this nefarious strategy and has reacted. Prime Minister Malcolm Turnbull now wishes to take control of the issue, stating *“It is not acceptable for Australia to be shortly the world’s largest exporter of LNG and yet, to have a gas shortage on the east coast in its domestic market. That is clearly unacceptable”*.

There is clearly no need for more gas fields and Narrabri should not be the sacrificial lamb for Santos’ selfish strategy which has now come undone.

Santos’ repeated claims in the EIS that methane is a

“low carbon energy source”

that

“can underpin the transition to a low carbon economy”

is simply wishful thinking which is consistent with Santos’ flawed strategy. Methane is a far more potent greenhouse gas than carbon dioxide. Santos optimistically states that

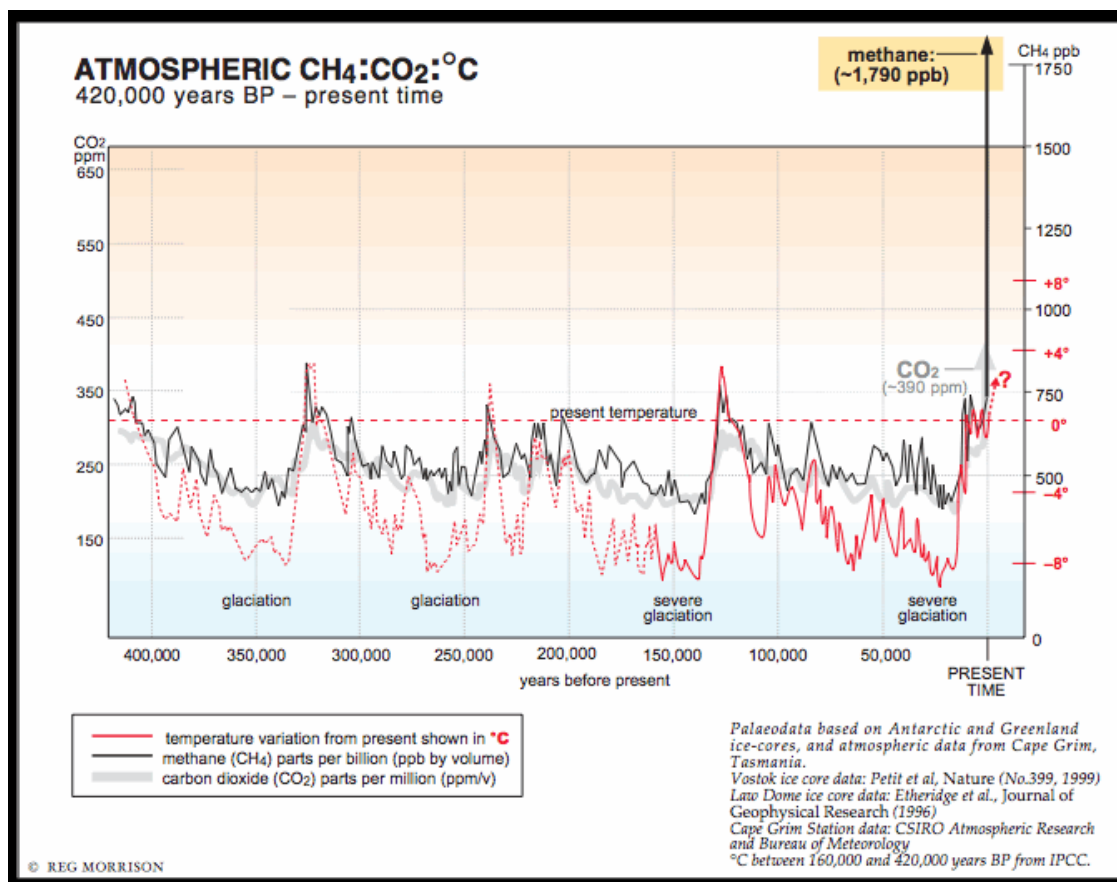
“lifecycle emissions for energy produced from the combustion of the natural gas delivered by the project will be nearly 50% less than for electricity that is currently supplied to the NSW grid”.

This is stated without any provisos about fugitive emissions.

While it is true that natural gas emits 50 to 60 per cent less CO₂ than an equivalent amount of coal when combusted in new, efficient natural gas power plants, this conveniently overlooks the impact of fugitive emissions. As discussed earlier, methane is 34 to 86 times more potent a greenhouse gas than CO₂ in the long and short term respectively. Consequently, a loss of only a few per cent of methane from the system easily overcomes the advantage of methane over coal (e.g. 2% x say 35 times the potency = 70% + 50% from combustion = 120% compared to coal).

The Paris summit affirmed that, to avert catastrophic global warming, nearly all of the world’s known reserves of fossil fuels need to be kept in the ground. Yet Santos chooses to ignore the obvious and the avalanche of renewable energy developments coming its way. It chooses a highly potent greenhouse gas as stock-in-trade for its profitability, leaving the rest of the world to put up with the consequences.

While there is over 200 times more CO₂ in the atmosphere than methane, the higher potency of methane means that its contribution to global warming is a far from insignificant 28 per cent of that contributed by CO₂. Of greater concern, the amount of methane in the atmosphere has now begun to skyrocket, as shown in the attached figure. Methane from the NGP should stay in the ground.



The Narrabri Gas Project would be a high cost producer

The EIS blithely uses industry estimates for all of its figures on gas losses from the production, transport and processing system. However, there have been no studies of whole-of-system emissions undertaken in Australia. Currently, the National Greenhouse Gas Inventory reports methane emissions based on default emission factors, none of which relate specifically to the production of coal seam gas in Australia. The National Inventory Report (NIR) states that emissions from 'production' are estimated using a single emission factor of 0.058 tonnes of methane per kilotonne of methane produced, i.e. 0.0058%. The NIR states that this value is validated by measurements made by CSIRO. However, the CSIRO study was confined to methane leakage at well pads. CSIRO noted that large methane emissions emanating from neighbouring water-gathering lines, water-pump shaft seals, and gas compression plants were not measured because they were outside the prescribed scope of their study. Such observations suggest that the factor of 0.058 tonnes of methane per kilotonne of methane produced may substantially underestimate 'production' emissions for the associated network of gathering lines, compressors and pumps along with wellheads. Where measured, emissions from unconventional gas developments in the United States range from 2 to 17% of production (Melbourne Energy Institute 2016).

The United States Environment Protection Authority recently (2016) increased its estimates of emissions emanating from gas field production and gathering systems by 134 per cent, based on the more recent measurements. These estimates have not been increased in Australia. The largest coal seam gas (as opposed to shale gas) producing area in the United States is the San Juan Basin, in Colorado and New Mexico. Satellite data shows that this area now sits under a methane emissions "hot-spot", with emissions 1.8 times greater than reported emissions for the region. Residents of the farms, towns and villages in and around the Pilliga Forest would prefer not to sit under a methane "hot-spot".

As pointed out earlier, Santos obviously has some data (e.g. gas composition) from the NGP exploration phase but chooses not to use it. The only reason could be that the figures obtained from the data are not as favourable as the estimates. The company would have been negligent not to have collected further data on emissions during the exploration phase, as these losses affect profitability as well as causing major environmental impacts.

The EIS assumes "that 100% of the gas delivered to end-users from the project would be combusted for energy generation". There is **absolutely no mention** of gas loss from the major distribution pipelines, with their pumping stations, valves, etc. These losses are known to occur, having been observed through infra-red photography. Drivers along the Newell Highway report a strong smell of gas as they pass the Marsden Pumping Station. The volumes and percentages could be determined by inflow/outflow measurement.

There is also no mention of gas lost through high point vents. As pointed out earlier, these losses could readily be measured. This is a damning indictment of the EIS, as the HPVs are a known and necessary point of gas loss from the water collection system.

In summary, therefore, this chapter of the EIS:

1. Has overstated the need for the project in terms of NSW gas supplies.
2. Dismisses the use of the product Santos brings into the atmosphere as "someone else's problem" and accounts for none of this use (apart from its own) in the assessment of greenhouse gas impacts.
3. Uses industry estimates for greenhouse gas emissions rather than data that has (or should have been) collected from the exploratory program, and, as a consequence.
4. Vastly under-estimates fugitive emissions.

5. Takes no account of emissions from high point vents.
6. Vastly under-estimates the amount of carbon dioxide vented directly to the atmosphere, through using “industry experience” in place of data collected on the CO₂ content of the gas in the various coal seams of the Pilliga and, as a result,
7. Vastly under-estimates the greenhouse gases produced by the project and its impact on climate change.

The project should therefore proceed no further until all of the points regarding Greenhouse Gases have been comprehensively addressed.

HAZARD AND RISK ASSESSMENT

Santos has not properly assessed the major hazards and risks of the project, in that it has incorrectly applied the techniques of EPP33 and HIPAP 4, when the correct legislation it needs to comply with is Chapter 10 of the *Work Health and Safety Regulation 2011 – Major Hazard Facilities*.

EPP33 and HIPA4 are no longer the relevant legislative standards applicable to major gas/LNG processing plants in NSW. The correct legislation is the *Work Health and Safety Act*.

Leewood gas processing plant needs to be regulated as a licensed major hazard facility and undertake safety case assessment as required by the Work Health and Safety regulation 2011. Santos will be handling over 10% of a 'Schedule 15' chemical i.e. methane. In addition, the gas processing equipment, wells, compressor stations will generate air toxics when need to be adequately safety-cased.

This legislation requires notification to WorkSafe NSW, licensing and production of a detailed safety case to ensure onsite and offsite risks to the public, workers, property and the environment are MINIMISED (as low as reasonably practicable).

The tests applied by the guidelines EPP33 and HIPAP4 are INADEQUATE to ensure safety and risk minimisation to the nearby suburbs of Narrabri. It is noted that a primary school, Narrabri West, is within a few kilometres of the active gas field and approximately 10 kilometres from the Leewood gas processing facility.

Santos has not adequately assessed, and as a consequence, not adequately mitigated the risks to the public, workers, plant and the environment of methane explosion, catastrophic toxic untreated produced water loss of containment, catastrophic air toxics cloud production and plant failure such as well blow outs, pipeline rupture, gas processing plant failure, compressor failure etc.

The Project should be rejected out of hand as inadequately assessed.

I note that even using the incorrect and out-dated legislative techniques, Santos has identified at least one 'sensitive receptor' 350 metres from the boundary of Leewood at risk from 'uncontrolled containment of gases'.

Further, Santos has identified a 'moderate' level of bushfire risk with a potential to cause large bushfires. Again, this risk has been subjectively assessed and claimed mitigation measures are untested. Santos's own 'risk assessment' may not be acceptable to the surrounding community and protected bushland areas.

There is no analysis whatsoever of lack of containment of air toxics from either catastrophic or normal operation of the gas processing plant at Leewood.

Santos has failed to adequately assess the safety of the untreated toxic coal seam gas produced water dams which are proposed to be re-built at Bibblewindi, nor of the risk of flood or loss of containment at the vast Leewood brine storage dams. Both of these areas risk contamination of the Namoi catchment area and the Narrabri town water source.

Unless an adequate safety case is approved by WorkSafe NSW in accordance with licensing requirements of the Major Hazard facility regulations, this project must be rejected out of hand and NOT approved.

SOCIAL AND HEALTH

Introduction

The Social and Health chapter of the EIS is a highly simplistic view of the potential impacts to our community. It appears as if the proponent has no interest in truly identifying the potential negative impacts and even less interest in proactively managing the likely impacts. The lack of detail and deliberate evasion of important elements leave all stakeholders without the ability to appropriately manage the impacts into the future.

The EIS makes no consideration for the broader, secondary and cumulative social impacts of the CSG industry. The boom/bust cycle that the industry inevitably creates must be taken into account. The approach the EIS takes is that employment outcomes are the only impacts and these flow onto housing and service impact. This segmenting approach is a conventional approach to analysis of the social impacts by the CSG industry, however in this day and age in NSW this is no longer a suitable approach. Since bringing in new Social Impact Guidelines (draft concluded in March 2017), it is clear that our NSW Planning Department now requires serious and detailed assessment of the entire social and health impacts created by the whole life cycle of the project.

“In July 2013, a media statement by the Liberal National Party in Queensland indicated a political agenda to “cut red-tape for major resource projects to proceed in the state” (Seeney, 2013a). It announced modifications to the Queensland SIA policy, which reduce the prescriptive character of the previous guidelines.”¹⁴ It is our belief that this Chapter of the EIS follows these Queensland guidelines, rather than the more acceptable new Guidelines introduced by NSW this year.

As made plainly clear by Dr Tim Forcey when he was interviewed by Allan Jones on 8th April “The Narrabri EIS is a cut and paste from the Surat Basin” ¹⁵.

Narrabri Has a Resilient and Balanced Economy

Currently Narrabri has a resilient and balanced economy, that suffers through gradual booms and busts with steady progress. The rapid and extreme jolts to a community from the CSG industry not only create the immediate impacts but often result in a complete hollowing out, leaving the community worse off than before. This is often heightened by the hype created by project proponents and government entities seeking to embellish the truth for their own personal gain which often leads to poor investment decisions and ultimately very sore losers.

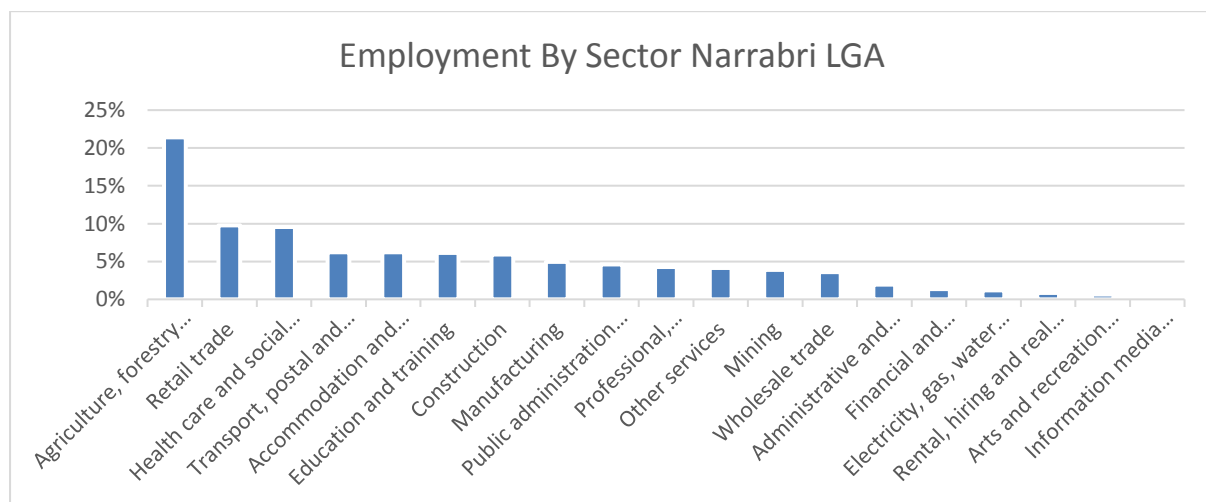
As outlined in the EIS, the number of house sales since 1999 has been roughly constant and median house prices have gradually increased since 1999. These indicators are consistent with a resilient, diversified and well balanced economy. Furthermore, the unemployment rate is lower than the state average and housing rental demand is historically low at between 0% and 2%. This is a community that is bubbling along nicely, without a need for intense shocks to its social fabric.

¹⁴ <http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1250&context=jesp>

¹⁵ Tim Forcey interviewed by Alan Jones <http://www.2gb.com/podcast/tim-forcey/>

In 2014/15 Narrabri Shire generated over B\$1 in Gross Regional Product (79th most productive LGA in NSW), a 0.2% increase on 2010/2011. ABARE has stated that 2016 agriculture production is up even further so we can assume this figure is conservative. Interestingly the Worker Productivity of the Shire is \$142,500 GRP per worker which puts us 21st in the state¹⁶.

Narrabri Shire currently has a sustainable and resilient economy with 21% of employment in agriculture, 10% in both retail and healthcare and several sectors providing between 2% and 9% of employment including transport, accommodation and food, education and training, construction manufacturing, public administration, processional, scientific and technical services, other, mining, wholesale trade and administrative and support services.



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Social Impacts Will be Created Over the Whole Life Cycle of the Project

Whilst the EIS prefers an approach of simply identifying the construction phase and operational phase, much work has been done to identify the full range of stages in the life cycle of such a project.

Gas Industry Social and Environmental Research Alliance (GISERA)'s work states "headline indicators such as employment and income are important, but should not overshadow indirect effects which may in the long run play a greater influence in determining how rural transition is experienced by the region."¹⁸

A socially responsible EIS would consider how this project impacts the community as whole, both secondary and cumulative impacts, over the full life cycle of the project. A body of work has been

¹⁶ <http://economic-indicators.id.com.au/>

¹⁷ AUSTRALIAN BUREAU OF STATISTICS 2011 Census of Population and Housing, Narrabri Shire Council, accessed 4th April, 2017

¹⁸ *Research paper (PDF): Lessons from development of resource extraction industries in rural areas: a literature review report to the Gas Industry Social and Environmental Research Alliance*. Available from: https://www.researchgate.net/publication/239524839_Lessons_from_development_of_resource_extraction_in_rural_areas_a_literature_review_report_to_the_Gas_Industry_Social_and_Environmental_Research_Alliance [accessed Apr 5, 2017].

developed around the Resource Community Cycle by Taylor and used to analyse the impacts of a coal development in Queensland and recommends consideration of the whole life cycle¹⁹.

USA has undertaken comprehensive research over a longer period given the length of history of extractive industries in that country. They have found the following patterns in the stages of the lifecycle of the project; “Energy booms may not be the economic windfall that boosters make them out to be. After the initial surge in income and jobs that comes with drilling, problems inevitably follow: higher crime rate, decreased educational attainment and over the long run, significant declines in income. The more heavily a community ties itself to the drilling economy, the greater the decline. “The magnitude of this relationship is substantial,” the study authors are quoted saying in the *Washington Post*, “decreasing per capita income by as much as \$7,000 for a county with high participation in the boom.”²⁰

The way the CSG industry works is not one of diversifying a communities’ economy. It totally captures the economy for a short period of time, wreaking havoc in the rapid expansion of the industry and the equally rapid disbandment of the industry, leaving gaping wounds in places where the community had become completely dependent on it.

CSG cannot co-exist with community, just as it cannot co-exist with agriculture, it must dominate, then depart, purely by the nature of the industry. It is completely contrary to sustainability and resilience.

Page 93 appendix T1 mitigation strategy states Santos will engage service providers on an ongoing basis through various forums initiated by Santos to monitor change in demand on services from the project. We suggest this process should be resourced by Santos but be the initiation and management of an independent body.

Impacts on social infrastructure caused by the project should be funded directly by Santos, not by the Gas Community Benefit Fund. The NSW Government has committed that for every two dollars paid by a gas producer into an authorised Gas Community Benefit Fund, the company is entitled to claim a one dollar rebate on its gas royalties, up to a maximum of 10 per cent of the royalty due in each year. Given this fund is actually partially funded by the tax payer (through the forfeit of royalties) it should not be used to fix up the problems caused by the proponent. We propose that the criteria around this fund must be tight and independently managed, with regular audits of the independence undertaken.

End of Project Life Impacts

The EIS has not adequately considered nor planned for the end of the limited life span of the project. This omission could have major impacts on our community and it is negligent to simply leave it out.

Job Creation Benefits Are Over Stated

The way the EIS outlines the benefits created through new jobs is confusing and ultimately overstates the true job creation outputs.

¹⁹ Lockie et al “Coal mining and the resource community cycle: A longitudinal assessment of the social impacts of the Coppabella coal mine” September 2009,

<http://www.sciencedirect.com/science/article/pii/S0195925509000262>

²⁰ <http://www.resource-media.org/drilling-vs-the-american-dream-fracking-impacts-on-property-rights-and-home-values/>

Locals will only be likely to secure 8% (105 jobs) (in purple in the table below) in the 3-4 year construction phase due to the specialised nature of the skills required and an abundance of these skills in other regions such as the Hunter and Queensland. Therefore 92% of construction phase workers will come from outside Narrabri.

The operational phase is where the local community will benefit from any sustainable job outcomes. Santos estimates that only 13% of the new operational phase jobs will be suitable for Narrabri people (44.5 new jobs; in yellow, on top of the 25 current Narrabri jobs).

The EIS attempts to deliberately confuse the reader with unnecessary detail in the tables. We have helped the community and media's understanding of the numbers by recreating a more useful table. Yellow indicates the new jobs for locals and blue indicates the number of people expected to relocate to Narrabri for jobs:

Timeframe	Who will get the jobs	Number	% of Total (rounded)
Operational Phase for lifetime of project	Existing Narrabri Roles	50 (actually 22)	15%
	New Narrabri-filled Roles	44.5	13%
	People relocating to Narrabri	50	15%
	People filling roles and living elsewhere	200.5	58%
	TOTAL	345	
Construction Phase (3-4 years)	Narrabri-filled Roles	105	8%
	People filling roles and living elsewhere	1,195	92%
	TOTAL	1,300	

It is worth noting that the current number of local jobs is inaccurate. Currently only 22 local jobs (7% of the total operational jobs) are provided by Santos.²¹

It is also estimated that 50 people will move to Narrabri for the jobs in the operational phase (in blue) as the true growth created by the project. However, in a construed sense of logic, section 26-13 assumes that an average family is 2.6 people and it goes on to state that if 50 people move to Narrabri to run the operation of the project then that is a population increase of 130 people, or 1.7%. It is ludicrous to use a family size multiplier that includes children in a family, into an increase in overall population size. This gives an exaggerated estimation of population growth designed to give ammunition to the argument of the pro-population growth media driven elements in the community. Based on a LGA population of 12,925 in 2011 census the true population growth is 50 people plus partners (estimate 80 people) would be 0.62%, less than half of that stated. This exaggeration is again perpetrated on page 61 of Appendix T2.

Whilst the creation of 44.5 new jobs for local Narrabri people appears to be advantageous to our community, it is now well known that these jobs are filled by workers currently employed in agriculture and manufacturing, therefore actually creating a drain on the employment resources of the community.

The Australia Institute reviewed CSG industry funded research in their paper "Be Careful What You Wish For" and found "that while there was an increase in short term construction related jobs, there

²¹ Pers comms Tony Meppem asked of Annie Moody 27/4/17

were virtually no additional jobs in retail or manufacturing as a result of unconventional gas development²².

A subsequent study by the same authors found that for every ten people employed in CSG, eighteen agricultural jobs were lost²³.

In other words, the unconventional gas boom had virtually no employment benefits outside of the gas industry itself. In the words of the authors, “job spillovers into non-mining employment are negligible”. It also shows that agricultural jobs were lost and that the jobs benefits employment gains were almost entirely short term construction jobs and (largely construction phase related) professional services jobs.”

A Santos funded study into the Economic Impacts of the Narrabri Gas Project indicated that Australia wide, the development of the CSG sector is not expected to increase or decrease Australia’s total labour supply. The employment impacts of the project are instead likely to manifest mainly as changes in the composition of the labour force and the mix of different industries. They identified different sectors of the economy will be impacted in different ways; with an increase in economic activity concentrated in the construction sector (additional growth of 0.16 per cent) and mining (additional growth of 0.11 per cent). The sectors of agriculture will see a net loss of -0.07%, manufacturing -0.06% and transport -0.03%²⁴ as workers shift to the CSG industry.

The negative impacts created by this project are all justified on the basis on the employment outcomes created. When in reality the benefits to the Narrabri region are extremely limited.

CSG Industry Divides Communities

Section 26-13 utilises a single study from Queensland to ascertain that the CSG industry doesn’t divide the community. The EIS quotes Coote (2013) that identified in Queensland the CSG industry is “not dividing the community”.

Whilst on the ground, everyday, at sports events, dinner parties, coffee dates, meetings and street chats we know that this statement is completely untrue of Narrabri, we also have highly credible qualitative study that confirms this. The University of Newcastle undertook detailed work in 2016, publishing in December 2016 that identified that “social division has already occurred” in Narrabri Shire²⁵.

²² Fleming,D.and Measham, T. (2013) Local economic impacts of an unconventional energy boom: the coal seam gas industry in Australia. Report to the Gas Industry Social and Environmental Research Alliance (GISERA). June 2013. CSIRO, Canberra.

²³ Flemming D and Measham T (2015a) Local economic impacts of an unconventional energy boom; The coal seam gas industry in Australia, The Australian Journal of Agricultural and Resource Economics 59(1) pp 78E94

²⁴ The Allen Consulting Group, The Economic Impacts of Development Coal Seam Gas Operations in Northwest NSW, December, 2011

http://www.santos.com/library/1112_The_economic_impacts_of_developing_CSG_operations_in_NW_NSW.pdf

²⁵ Local Attitudes to Changing Land Use – Narrabri Shire, University of Newcastle, Michael Askew, December, 2016.

In an attempt to win the hearts and minds of the farming community in 2012 Santos employee Warwick Moppett posed for pro-CSG ads in front of crops he didn't farm, on land he didn't own, deliberately deceiving the community²⁶ and further driving wedges into the community.

The rhetoric used by the industry often asserts that CSG is just like the cotton industry as a new industry coming to town that is met with scepticism. It often asserts that drilling wells is just like drilling water bores done by agriculture. It often asserts that anyone questioning the industry is a blow in from outside the industry. These deliberate, well planned ploys pit sections of the community against each other in order to create division and garner favour with different people. These are not tactics used by a company that has the communities' best interests at heart and who are looking for equitable and cooperative ways to create a new and productive future for all involved.

People for the Plains have had personal experiences where the industry is dividing community. As one example, when we attempted to hold a community meeting at the Narrabri Golf Club, pressure was exerted by Santos to cancel our booking the day before the event (Santos is a sponsor of the Club of around \$10,000 at the time we believe). An industry truly interested in social cohesion would not have turned this venue against a regular, long-term customer such as us.

In the lead up to the last NSW Election ABC NENW Radio ran a live radio program in the bakery, Watson's Kitchen, in Narrabri. Whilst people were being interviewed upstairs in the bakery, people gathered in the street, with pro and anti CSG signs. This was a peaceful gathering without disrespect, until Kevin Humphries stood up on a chair to present to the pro-CSG side yelling "You don't need to listen to these non-locals". A 70 year old man standing with the those questioning the CSG industry said, "hang on, I am a local farmer". To which our MP turned to him and said, "And you can go back to what you had before, nothing!" and roused the pro-CSG protestors to yell and cheer.

Furthermore, we know division is also created by the industry in Queensland, once again from first-hand experience and secondly from industry funded work by GISERA. The survey of the Western Darling Downs found that almost half the local population was "only just coping" with, "not coping" with or actively resisting the changes to their communities caused by unconventional gas development. Less than a quarter of people surveyed approved of the unconventional gas industry.

Only 6% of people felt the community was improving as a result of the industry, while many were struggling to cope with the changes the industry had brought.²⁷

University of Queensland outlined the exaggerating effect that the industry has, blowing up previous smaller tensions that are currently managed at an acceptable level. "The CSG industry, in other words, has exacerbated certain prior community tensions, which inform current disputes. Forms of social stratification and power struggles have important historical dimensions." ²⁸

Sadly, our federal politicians create further divides by using landholder compensation to drive bigger wedges between neighbours such as Barnaby's suggestion to pay royalty payments to people with gas

²⁶ <https://independentaustralia.net/environment/environment-display/sneaky-santos-caught-out-in-csg-con,4686>

²⁷ CSIRO survey of Community Wellbeing and responding to change: Western Downs region in Queensland Andrea Walton, Rod McCrea and Rosemary Leonard September 2014

²⁸ Coal Seam Gas and Social Impact Assessment: An Anthropological Contribution to Current Debates and Practices. Kim de Rijke <http://epubs.scu.edu.au/cgi/viewcontent.cgi?article=1250&context=iesp>

wells²⁹. This is not a strategy that will address landholder concerns nor make up for the negative impacts this industry creates. All it will do is further divide communities.

University of Queensland study found “The small Queensland town of Miles, for example, has a steady town population of around 1,200 with estimates of the non-resident workforce in town and in camps ranging up to 1,000. One interviewee lamented how “nine out of ten people you see on the street are strangers”. In a small country town with traditionally strong social cohesion, the presence of “strangers”, mostly men, was described by local residents as being “disturbing”.”³⁰

GISERA (CSG industry funded) has already undertaken quantitative work in Narrabri around the social impacts and community division created. It is too pre-emptive to continue with the assessment of the EIS without waiting for the science to be completed.

Man Camps as a Solution to Housing Demands

The EIS has a heavy reliance on temporary accommodation to alleviate housing demand problems in Narrabri as 90% of construction phase workers are expected to be FIFO or DIDO. It is well known that the FIFO and DIDO workforces reduce the positive benefits to the community.

The Office of the Chief Economist for the Federal Government quoted a report by Rolfe that found that “positive impacts of resource projects on economic growth in the Surat Basin are very sensitive to the extent that the existing workforce can be utilised and the level of non-resident workforce based outside the region. If workers commute, the positive impacts will be much smaller.”³¹

Many negative impacts can be generated directly by the poor behaviour that such a housing system naturally creates, but also indirectly by what having FIFO/DIDO workers in a community takes away from a normal live-in workforce. The region already suffers from this due to the reliance on in temporary worker’s accommodation to date in both Narrabri and Boggabri, which will be further increased due to the Narrabri Gas Project.

The first paragraph of 26-13 under 26.3.3 states there wouldn’t be a significant impact on the demand for housing, yet the EIS states there are 3 new housing estates planned for Narrabri. It is difficult to follow the reasoning of these seemingly contradictory statements. It would appear that the proponent is selling the community two different stories – one of development opportunities concurrently, one of no negative impacts.

That is exactly how communities become over-capitalised and how towns become left with housing developments that are completely unlive in such as in Chinchilla in Queensland. A number of media articles in the last six months have sought to bring to light the housing impacts created throughout the entire life cycle of CSG projects.

Even in Gladstone rents doubled over night, as did house values in town. The kinds of impacts seen were summed up “rents skyrocketed, with seniors no longer able to afford to live in the community they'd known all their lives. Teachers, nurses and police were either forced to move away by the high

²⁹ <http://www.smh.com.au/federal-politics/political-news/barnaby-joyces-forecast-of-csg-royalty-riches-compared-to-100-lamb-roast-claim-20170323-gv4lqs.html>

³⁰ http://gastoday.com.au/news/lessons_csg_operators_can_learn_from_southern_queensland_towns/91959

³¹ <https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/coal-seam-gas/Socioeconomic-impacts-of-coal-seam-gas-in-Queensland.pdf>

costs, or threw in their day job to join the crews constructing the plants. Business owners, too, lost staff to jobs that were paying "obscene amounts" of money and struggled to maintain a grip on wages as house and rental prices soared through the roof."³²

In Miles, Dalby Chinchilla and Roma house prices and rents increased then crashed below their original values with people quoting "in the past 12 months more than 1,000 houses have been listed for sale in the region but only 325 have been sold" and "the value of her unimproved land tripled in three years, before dropping more than \$20,000 below its original value."³³

"In Dalby, many homes are worth \$50,000-\$100,000 less than they were at the height of the boom, and rents are \$50-\$60 a week lower. Miles and Chinchilla saw even higher peaks and bigger falls."³⁴

Increased house prices put upward pressure on rates with locals bearing the brunt. "Local residents incur the majority of the costs in the form of rising house prices (for aspiring owners) and rising rates".³⁵

This in turn often drives our low-income earners including senior citizens³⁶. "Rapid change can often lead to social instability, a reduction of community cohesiveness, and individual and community wellbeing decline." "Also, affecting the character of certain towns is an outward migration of older residents who took the opportunity to sell their house for a good price. As a result, there are reports that towns are losing their volunteering resources and their informal childcare providers."³⁷

Roma in Western Queensland provides a stark and obvious picture of the way house prices and rents rise quickly in the construction phase and drop rapidly, afterwards, often lower than prior to the "boom".

³² <http://www.smh.com.au/queensland/the-biggest-loser-of-australias-gas-shortage-is-the-city-thats-sucking-it-all-up-20170316-guzwbf.html>

³³ <http://www.abc.net.au/news/2015-04-20/report-reveals-fall-in-qld-mining-town-property/6405190>

³⁴ <http://www.abc.net.au/radionational/programs/breakfast/csg-boomtime-over-for-south-west-qld/6050560>

³⁵ <http://www.northerndailyleader.com.au/story/4562970/what-does-the-csg-industry-do-to-the-price-of-nearby-houses/>

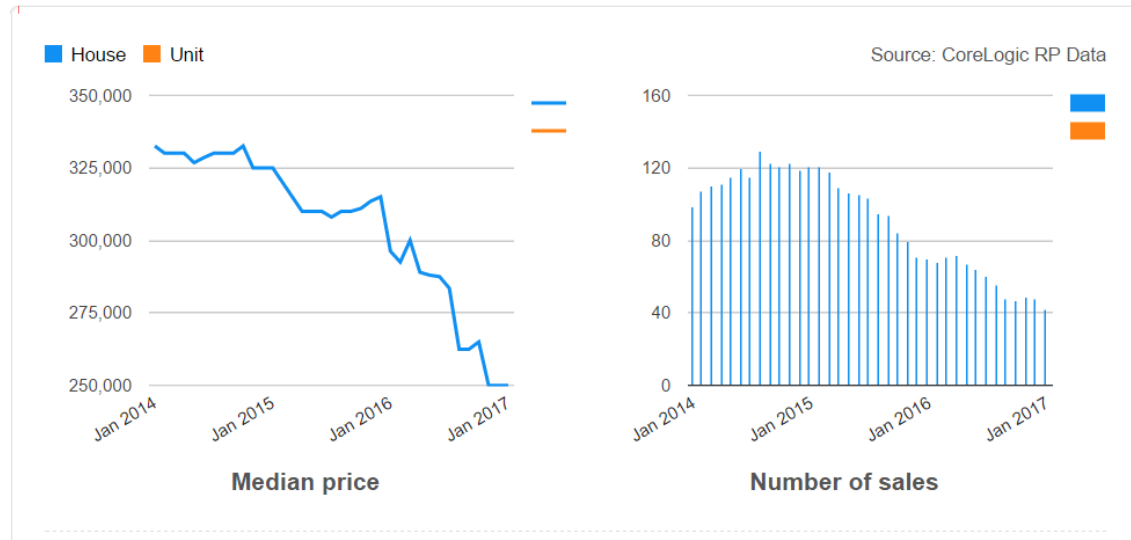
³⁶ <http://www.northerndailyleader.com.au/story/4562970/what-does-the-csg-industry-do-to-the-price-of-nearby-houses/>

³⁷ http://gastoday.com.au/news/lessons_csg_operators_can_learn_from_southern_queensland_towns/91959

Suburb Profile Report For Roma QLD (4455)



Roma House: Median price \$250,000, Annual capital growth 2.54%, Number of sales 42, Weekly median advertised rent \$270



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There is an expectation within the community that the proponent would provide honest information about the expected roll out of the project so that they may make these extremely important decisions about their investments.

We have seen time and again in the lifecycle of a CSG project, the rapid boom and bust that ravages communities. Yet the EIS chooses to ignore these impacts, disregard the changes over time and essentially lie to the community about what to expect. Not only is this morally apprehensible it is completely impractical as it robs community service organisations and people of the opportunity to properly prepare so they can proactively respond.

Cost of Living and Cost of Doing Business Rise

Rifkin et al stated that "Lower income households are pressured by increases in the cost of living in the region due to increased demand for goods and services, potentially leading to the outmigration of these households, something that has been reported in the Darling Downs."³⁹

An extractive industries study of the Darling Downs in Queensland asked stakeholder groups for their perceptions on how their financial capital had changed in the last five years since the rapid expansion of the resources sector. Stakeholder groups from the CSG and mining industries stated they were financially better off, while others such as agriculture, advocacy groups, community and government

³⁸ <http://www.yourinvestmentpropertymag.com.au/top-suburbs/qld-4455-roma.aspx>

³⁹ <https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/coal-seam-gas/Socioeconomic-impacts-of-coal-seam-gas-in-Queensland.pdf>

all stated that they were financially worse off than five years ago. Interestingly, the business stakeholder group believed themselves to be financially worse off than 5 years ago⁴⁰.

What the business group noted was an increase in economic activity within the resources sector creating inflationary pressure on services, transport, rentals, living costs, council rates and labour costs. Whilst these businesses had not seen the economic gains from direct involvement in the resources sector, they had the borne the accompanying cost increases, ultimately leading to a decreased economic position.

The business mix has been altered in the Darling Downs, with some small businesses such as car sales, coach charters and bakeries flourishing as a result of resources development, others have closed or lost profit. The opportunities created by the resources sector were ideal for chains such as KFC, Woolworths and McDonalds⁴¹.

A CSIRO study of the Darling Downs concluded that less than 5% of people living in CSG fields believe it will lead to a better life⁴².

The industry creates the “haves” and the “have nots”

Due to the hype created by the gas companies, often businesses will take risks and over-capitalize leaving themselves exposed when business drops away, as has been seen in Queensland already⁴³. Whilst businesses are responsible for their decisions they are undoubtedly influenced by the company, their local Council and Chamber of Commerce. Often these bodies heavily promote the benefits and overstate the gains to be made, which leads businesses into trouble.

In the EIS process the proponents have an obligation to provide honest and accurate information so there are no casualties to the hype.

There Will be Significant Impact on Health (including but not limited to, Facilities)

The EIS identifies there will be no great impact to the health facilities (26.3.4) in the shire as only 50 people are identified as moving to the town. However, when the positive population growth numbers are identified (and exaggerated) they are stated at 130 people. Again, two stories for the community. Whilst 50 people may not have a considerable impact on the health facilities of the shire, these must be considered in conjunction with other new developments in the Shire. For instance, the Maules Creek Whitehaven coal mine identified that they would have a significant impact on the health

⁴⁰ Centre for Social Responsibility in Mining, Sustainable Minerals Institute, The University of Queensland, Australia (September, 2013) Energy resources from the food bowl: an uneasy co-existence. Identifying and managing cumulative impacts of mining and agriculture

⁴¹ Centre for Social Responsibility in Mining, Sustainable Minerals Institute, The University of Queensland, Australia (September, 2013) Energy resources from the food bowl: an uneasy co-existence. Identifying and managing cumulative impacts of mining and agriculture

⁴² Centre for Social Responsibility in Mining, Sustainable Minerals Institute, The University of Queensland, Australia (September, 2013) Energy resources from the food bowl: an uneasy co-existence. Identifying and managing cumulative impacts of mining and agriculture

⁴² Andrea Walton, Rod McCrea and Rosemary Leonard (September 2014) CSIRO survey of Community Wellbeing and responding to change: Western Downs region in Queensland

⁴³ <http://www.couriermail.com.au/business/santos-blamed-for-company-collapse-after-delayed-payment/news-story/c996a46b27fa03a14ac43cf9befd08c3>

facilities in Boggabri therefore their mitigation and management strategy included the financial support of the Boggabri Medical facility to the tune of \$20,000 per annum. Whilst this amount has not yet been received by the facility (despite the condition coming into play in 2012) this project must take into account the cumulative impact to this facility. Gas worker health problems, on top of the Maules Creek mine demands (as well as the other open cut and underground operations) would have a significant impact on the health facilities of Boggabri.

There have been incidences in Queensland where gas workers were treated after being exposed to gas leaks.⁴⁴ It would be more prudent to assume the same would occur in Narrabri, and be prepared for this rather than to pretend nothing will go wrong.

Brisbane based GP Dr Geralyn McCarron outlined to a meeting in Chinchilla in 2016 the statistics for that region "Between 2007 and 2012 the population of the Darling Downs increased by 7% from 235,193 to 251,893.

"During the same time frame, acute hospital admissions for respiratory conditions increased by 124%, acute hospital admissions for circulatory conditions increased by 114%, invasive cancer incidence increased by 14%, and hospital admissions for attempted suicides increased by 50%."⁴⁵

It is not enough to simply classify that there will not be significant impact on health facilities. One thing is certain, there will be significant impact on mental health services in the Shire should this project proceed.

Emissions from CSG Do Create Negative Health Impacts

Section 23.3.6 states that emissions from the CSG development are "not expected to impact directly on health" and it fails to assess the methane emissions from all aspects of CSG infrastructure. However, recently released footage of the FLIR camera shows significant releases of methane gases from all gas infrastructure (pipelines, compressor stations, ponds, wells etc). CSG is recognised to be up to 86% made up of methane. It is unrealistic to state that there will be no health impact when this level of methane is constantly emitted.

Whilst the EIS has stated there will be no impact on health, nowhere has a health baseline been established, nor is there any suggestion that a baseline be identified before the project starts. The EIS itself states "there is limited data available" on the current health of the Shire residents (section 26.2.9 or page 14). How can we know the level of impacts if we don't know what the current situation is?

The negative health impacts generated by the project has been completely disregarded on the basis of a single 2013 Queensland Health report that stated there is "no clear link between health complaints of Tara residents and natural gas".

Whilst it is only now being discovered, we are of the opinion that CSG is the new asbestos scourge. An assessment of all the peer-reviewed science reports on the health impacts of Unconventional Natural Gas Developments (UNGD) in USA showed an extremely significant growth in the number of reports completed more recently. "Of the 685 papers reviewed it established that 84% of public health studies contain findings that indicate public health hazards, elevated risks, or adverse health outcomes; 69%

⁴⁴ <https://www.sunshinecoastdaily.com.au/news/sick-fear-it-csg-exposure/1481344/>

⁴⁵ <https://www.chinchillanews.com.au/news/lack-of-investigation-into-health-statistics-conce/3124489/>

of water quality studies contain findings that indicate potential, positive association, or actual incidence of water contamination; and 87% of air quality studies contain findings that indicate elevated air pollutant emissions and/or atmospheric concentrations. This paper demonstrates that the weight of the findings in the scientific literature indicates hazards and elevated risks to human health as well as possible adverse health outcomes associated with UNGD.”⁴⁶

“Further, UGDP affects human health and well-being not only through direct exposures to toxic chemicals in air, water and soil, but also through many stressors introduced into communities. These include excessive noise and light pollution, increases in traffic accidents and fatalities, increases in domestic violence, alcohol and drug use, crime and disruptions of family and community relationships”.⁴⁷

According to submissions made to the NSW Chief Scientist & Engineer by Ablett, “Under natural conditions, fossil fuels contribute a relatively small volume of PAHs (Poly Aromatic Hydrocarbons) to the environment. Because most coal and oil deposits are trapped deep beneath layers of rock, there is little chance to emit PAHs to the surface environment. For the first time, Coal Seam Gas mining will allow large amounts of these chemicals to be solubilised from coal seams and leached out into ground water, and fracking chemicals to be released into our atmosphere. This poses a new major health risk for NSW, with a possible increase in cancer cases on par with or greater than asbestos.”⁴⁸

PAH exposure during prenatal and/or early life have been found to impact children’s’ self-regulating behaviours and social competency. Children with poor self-regulation skills have difficulty managing disruptive thoughts, emotions, and impulses; poor social competency limits their ability to get along with others. This leads to the development of many childhood psychopathologies... such as ADHD, OCD, substance use disorders, and eating disorders.”⁴⁹

In his report, Dr Wayne Somerville outlines the ways humans’ health can be impacted by CSG through soil, water and air polluted by the chemicals used, by the dust and particulate matter generated and by the water and its components brought up from the coal seams.

Dr Somerville also provides an alternative view to Santos’ EIS on the health impacts from CSG in the Tara region, quoting a variety of studies, compared to the single report quoted in the EIS about the Tara residents. “In 2013, medical tests found a high level of hippuric acid, a metabolite produced following exposure to toluene, in the blood of a young boy who lived in the Tara estates. In 2013, Dr Geralyn McCarron obtained information from 113 people and found 58% of surveyed residents reported that their health was definitely adversely affected by CSG mining, and a further 19% were uncertain. The reported symptoms were outside the scope of what would be expected for a small rural community, and resembled the “down-winder’s syndrome” found in overseas communities exposed to gas mining pollutants. In the McCarron (2013) Tara study, there were reported increases

⁴⁶ Hays and Shinkoff, Towards an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of Peer Reviewed Scientific Literature 2009-2015
<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154164>

⁴⁷ <http://www.marcellushealth.org/final-report.html>

⁴⁸ Ablett, E. (2013). Undetected Chemical Carcinogens released by CSG mining: A new major health risk for NSW, Submission to the NSW Chief Scientist & Engineer. <http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/?a=29876>

⁴⁹ <https://www.mailman.columbia.edu/public-health-now/news/prenatal-exposure-air-pollution-linked-impulsivity-emotional-problems-children>

across all age groups in coughing, chest tightness, rashes, difficulty sleeping, joint pains, muscle pains and spasms, and nausea and vomiting.⁵⁰

Table 6.2 in T2 outlines ways human health can be impacted from spills, leaks or contaminations of drilling fluids or produced water. This is all based on the assumption of zero human error, yet Mary O’Kane, Chief Scientist said in her report that human error was inevitable. The EIS must work on the assumption that at some stage human error will occur and proactive management and mitigation strategies must include this. The current strategies do not therefore this EIS must be rejected.

The EIS Appendix T2 on page 63 mentions a few studies into the health impacts of CSG that are still not published. We believe it is prudent and sensible to await the results of these and other studies and develop proactive and appropriate mitigation measures before pushing ahead with the project.

It is simply unacceptable (and laughable) to use one Queensland study to assume no negative health impacts will be created by the NGP.

Air Quality Measures Unsuitable

The EIS states that an air quality management plan will be developed and “include a suite of measures that “could” be implemented to avoid, mitigate and manage potential air impacts”. How can the community have confidence in such weasel words as “could”? These mitigation strategies are unsuitable for the level of risk to the community.

In Appendix L (air quality assessment) summary it states that all air impacts were reviewed including PAHs and VOCs yet the mitigation and management strategies don’t seem to incorporate these leaving the community concerned about air quality.

All aspects of air quality must be measured and managed and if breaches occur swift consequences must be felt, including: emissions of nitrogen dioxide, carbon monoxide, particulate matter (PM10/PM2.5), ozone as well as acrolein, formaldehyde and acetaldehyde (volatile organic compounds) and polycyclic aromatic hydrocarbons (PAHs) associated with the operation of the Leewood gas processing and power generation facility.

Land Access Agreements Are a Poor Way to Deal with Health Impacts

As often stated in Appendix T1, section O “Santos will not place infrastructure on land without an Access Agreement”. However past experience of their modus operandi we know the ways that this agreement is reached is often reprehensible. Therefore, this statement provides no confidence to landholders that their best interests will be considered, making this an ineffectual mitigation strategy.

Page 24 of Chapter 26 states that the health impacts of the project will be managed and formalised through Land Access Agreements (LAA). This is a non-sensical mitigation strategy. It is a ridiculous assumption that the only people who will suffer health impacts will be those that enter a Land Access Agreement to have wells installed on their property.

It is highly reasonable that those suffering the greatest mental health impacts through stress and anxiety caused by the industry, do not have gas wells on their farm and therefore do not have a LAA.

⁵⁰ <http://www.ntn.org.au/wp/wp-content/uploads/2013/12/CSG-Health-Impacts-Dr-W-Somerville.pdf>

It is worth noting that people who have other gas infrastructure (such as roads, powerlines, pipelines, dams, compressor stations etc) on their land do not have LAA's.

During the Exploration phase of this project we have already seen those landholders suffering the greatest stress are those not entering agreements with the proponent and this is unlikely to be different in the production phase. Personal stories have already arisen within the project area and immediate surrounds, of self-harm risks and even suicide, and again we are only in the Exploration phase.

This industry causes devastating personal costs and it is simply not acceptable to brush it under the carpet. The proponent must take responsibility for their role and the government must take responsibility for their role, before we will see an end to the pain, torment and deaths.

During the LAA process all the power for the negotiation process lies with the proponent. They hold the purse strings with the threat of litigation the only option for landholders. What's more, is that most LAA also feature confidentiality clauses so neighbours cannot discuss with each other to ensure equity for all.⁵¹ This power imbalance is highly likely to further compound the feelings of powerlessness and stress and is a completely inadequate solution to the health impacts of the project, in fact the irony is that the LAA process is often the cause of the health impacts.

In Queensland, under the constant bullying and stress caused by QGC, George Bender took his own life. It is well understood that the primary reason for his suicide is the CSG industry, their tactics for getting agreement and the legislature under which these agreements must be reached.⁵² By no stretch of the imagination is it acceptable to assume that the health impacts of the project can be managed through the LAA process. What a joke! It would be funny if we weren't playing with actual peoples' lives.

There must be alternative solutions to access resources and support for those impacted by the health impacts of the project. It is suggested that a health fund be established to provide emotional and physical support to those suffering from the project.

A former CSG Landholder Liaison Officer, John Wilcox publicly stated, "The negotiating tactics by some of the team I would say were 'unreputable'. That was only a small part of the team but they are employed by the gas companies and they are there to deliver what keeps the CSG companies going."⁵³

GISERA has been charged with a number of research projects including "Human Health Impacts of CSG Activity" which is currently underway and proposed to be completed by August 2017. We insist that this project cannot progress until the industry funded research by GISERA is completed.

There Will Be Visual Impact Around Yarrie Lake

26.3.5 States there will be a 200m exclusion zone around Yarrie Lake to ensure there is no visual impact on the recreational values of the Lake. 200m is far too short given the geography of the area.

⁵¹ <http://www.abc.net.au/news/2011-09-30/coal-seam-gas-rights-feature/3193840>

⁵² <http://www.couriermail.com.au/news/queensland/george-bender-a-bitter-harvest/news-story/71f04e163f143a1cc699a90b9356b944>

⁵³ <http://www.abc.net.au/news/2013-10-08/former-gas-consultant-says-landholders-lack-sufficient-csg-adv/5008546>

It is flat, with limited vegetation, meaning line of sight could reach at least 500m. Exclusion zones around Yarrie Lake must be at least 500m.

Training Needs Not Being Managed Appropriately

26.3.7 page 25 outlines adequate and relevant training available at Tamworth TAFE to help community members upskill to meet the demands of jobs created. Firstly, this is a huge time commitment to travel two hours one-way to Tamworth for training. Or are they suggesting people should live in Tamworth or Gunnedah, in which case Narrabri will not benefit.

GISERA has outlined a more detailed direct and indirect impacts of CSG and has made specific mention of the importance of local workers having the appropriate skills in order to minimise the negative impacts and maximise the positive impacts of the industry. "Labour force skills: the skills that local workers possess are crucial in filling new jobs produced by resource sector expansions. In this regard, the role of initial skills, training opportunities and labour migration combine to determine how much local labour is used"⁵⁴.

At Narrabri Shire Council meeting in March 2017 Santos' Peter Mitchley commented that Narrabri doesn't have the skills need for the project and therefore they would need to bring people in from outside the area. A company interested in the wellbeing of the community would put practical steps in place to build the capacity of local community people. These steps could include funding the Narrabri Trade Training School, resourcing the Narrabri High School and the Narrabri TAFE.

NGP Will Compete with Agriculture

The EIS states that the project "may" compete with agriculture (and mining), however for staff causing a potential impact (on page 26) of "heightened cost of labour" for the agriculture industry.

NGP WILL compete with agriculture for jobs and it will drive up the cost of doing business for the other sectors.

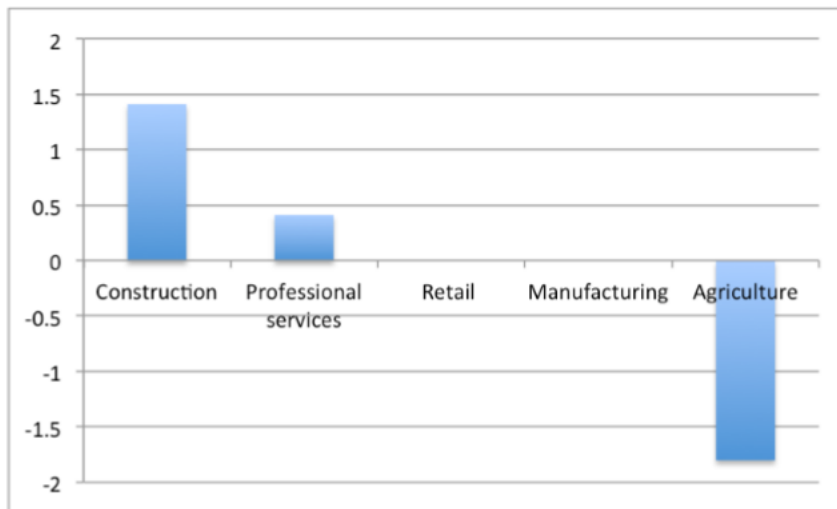
The Australia Institute found that for every ten people employed in CSG, eighteen agricultural jobs were lost⁵⁵.

⁵⁴ Measham, T. "Lessons from development of resource extraction industries in rural areas: a literature review report to the Gas Industry Social and Environmental Research Alliance"

https://www.researchgate.net/publication/239524839_Lessons_from_development_of_resource_extraction_industries_in_rural_areas_a_literature_review_report_to_the_Gas_Industry_Social_and_Environmental_Research_Alliance

⁵⁵ Flemming D and Measham T (2015a) Local economic impacts of an unconventional energy boom; The coal seam gas industry in Australia, The Australian Journal of Agricultural and Resource Economics 59(1) pp 78E94

Figure 9 Spillover job impacts per CSG job.



Source: Flemming and Measham 2013 and 2015a

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Furthermore, at a national scale an increase of 50,000 jobs in the mining sector correlates to a loss of 80,000 jobs in the agricultural sector⁵⁷.

The gas industry's own work by GISERA plainly outlines that one of three impacts created by the CSG industry is "a movement of labour from manufacturing and/or agriculture (tradable goods sectors) to the resources sector is likely to occur as the manufacturing and agricultural sectors, in general, cannot compete with the wages offered by the resource extraction industry."⁵⁸

Peer reviewed studies in USA show that gas drilling is shrinking the Pennsylvania dairy industry. "During the period of fracking expansion (2007-2011) the most heavily drilled counties experienced a 30% loss of milk cows compared to a 3% loss in counties with fewer than 100 wells. Milk production dropped 23% in the heavily drilled counties and 1% in counties with under 100 wells."

As second study by Timothy W. Kelsey, stated "Changes in dairy cow numbers also seem to be associated with the level of Marcellus shale drilling activity. Counties with 150 or more Marcellus shale wells on average experienced an 18.7 percent decrease in dairy cows, compared to only a 1.2 percent average decrease in counties with no Marcellus wells. The NASS and Department of Environmental Protection data suggest that increases in the number of Marcellus shale wells are associated with declines in cow numbers and milk production."⁵⁹

⁵⁶Ogg, Mark, "TAI Be Careful what you wish for" November 2015

⁵⁷Ogg, Mark, "TAI Be Careful what you wish for" November 2015

⁵⁸ Measham, T. "Lessons from development of resource extraction industries in rural areas: a literature review report to the Gas Industry Social and Environmental Research Alliance"
https://www.researchgate.net/publication/239524839_Lessons_from_development_of_resource_extraction_industries_in_rural_areas_a_literature_review_report_to_the_Gas_Industry_Social_and_Environmental_Research_Alliance

⁵⁹ <http://www.slopefarms.com/2013/04/01/open-letter-to-the-ny-farm-bureau-research-shows-that-fracking-is-shrinking-the-pa-dairy-industry/>

A Lack of Well Placement Map is Unprecedented

It is concerning that there is now map outlining well placement. The EIS points out that the placement of wells depends on the Field Development Protocol which will be worked out later. This is an unusual and unprecedented approach which is less than satisfactory and provides no security to landholders surrounding the project. This EIS should not be approved until a map of well placement is provided in a appropriate level of detail.

Narrabri Gas Project Will Impact Land Values

The impact to land values by the NGP has not been addressed. The EIS identifies the appropriate mitigation strategy for any negative impact to the agricultural industry to be landholder compensation, in order to recompense landholders for the loss of agricultural productivity.

However, a CSIRO study has for the first time put a dollar figure on the losses to farmers due to coal seam gas (CSG) mining on their land. Using 24 different scenarios the sample area averaged a loss of \$2.17 million over 20 years when CSG mining activity was present. It found the biggest cause of losses to agricultural production was from gas industry access tracks and lease areas.⁶⁰ At the proposed level of \$30,000 p.a. for the lifespan of the project, say 20 years, \$600,000, leaving a landholder \$1.57 million out of pocket, purely based on the loss of production. Therefore, this in no way meets the loss of land value as well.

Work done in the USA lists countless examples⁶¹ of losses in land value as prospective buyers are driven away by the noise, vehicular movements, and health impacts and stresses caused by living next to gas infrastructure including one Texan court case in 2014 where a family was awarded just under \$3million including \$275,000 for the loss in market value of their property caused by the drilling.⁶²

Whilst in Australia we are continually told that not enough properties have changed hands to be able to determine if land values have been impacted by CSG developments.

However, a study on the impact of the Coal Seam Gas industry on land values in NSW Report for: NSW Valuer General February 2014 it reviewed many USA and Canada studies that largely showed a reduction in land values impacted by drilling. It pointed out that the Queensland State Valuation Service will reduce the valuation of lands with CSG wells on their place of an allowance of between 2.5% and 20%.⁶³

Aside from decreasing land values, is the inability to borrow money due to CSG wells. We have also seen a loan denied by the Commonwealth Bank with the letter showing the presence of four wells on the 240-hectare property, currently on the market, as the sole reason given for refusing the owners' application for a \$500,000 bridging loan to buy a new home.⁶⁴

⁶⁰ <http://www.abc.net.au/news/2016-12-16/coal-seam-gas-mining-costs-farmers-millions-csiro-study-finds/8124834>

⁶¹ <http://www.resource-media.org/drilling-vs-the-american-dream-fracking-impacts-on-property-rights-and-home-values/>

⁶² <http://www.resource-media.org/drilling-vs-the-american-dream-fracking-impacts-on-property-rights-and-home-values/>

⁶³ http://www.valuergeneral.nsw.gov.au/about_us/announcements?a=197003

⁶⁴ <https://www.theguardian.com/environment/2016/sep/30/commonwealth-bank-coal-seam-gas-makes-property-unacceptable-as-loan-security>

There is no way landholder compensation can fully reimburse landholders for the far-reaching and complex impacts of having CSG on their farms.

The EIS fails to consider the broader landholder impacts such as spread of noxious weeds due to huge number of vehicular movements.⁶⁵

The EIS fails to address the risks created by spills or accidents, such as the blowout at an Arrow Energy well that spewed produced water for 24 hours⁶⁶ nor to properly identify suitable mitigation strategies for such occurrences.

My personal experience from friends and relatives in Queensland who are landholders is the sheer amount of time spent policing Agreements and ensure the gas companies meet their obligations is in itself a great burden on the agricultural industry.

26.2.6 quotes Narrabri Shire Council's Extractive Industries Policy stating, "demanding a nil net effect on surface water and aquifers used by the community", when in fact council's Policy is to "demand a 'Nil' effect position in regard to the quality of surface water, domestic, stock and irrigation aquifers used by our community." The difference is that the EIS has included "net" effect which in effect has the potential to reduce the strength of the policy.

Proactive Approach to the Social and Health Impacts

Not only is the EIS badly lacking in applicable mitigation and management measures for the likely negative social and health impacts of the Narrabri Gas Project, it completely misses out on any proactive mitigation and management measures for creating positive impacts from the project for our community.

A raft of proactive measures are demanded of the project proponent to ensure that the Narrabri community is not only not worse off after this industry wreaks its devastation, but that it is better off after the industry comes to town. This includes better off economically, physical infrastructure, in social capital and in community health.

Some suggested measures are listed below; however, we firstly recommend that no approval be given to this project until the social and health impact studies are completed and the science is well understood, and therefore the applicable management strategies are well known:

- Procurement policies of the proponent and all sub-contractors are to include the use of local labour where possible (during construction phase AND particularly during operational phase). Simple tactics could include:
 - advertising for roles locally first
 - working with Narrabri, Coonabarabran, Wee Waa, Moree and Gunnedah High Schools to develop trainee programs
 - working with Narrabri TAFE to establish applicable courses

⁶⁵ <http://www.abc.net.au/news/2014-08-23/farmer-claims-csg-companies-spread-weeds-on-southern-qld-property/5661016>

⁶⁶ <http://www.smh.com.au/business/blowout-at-well-fuels-concerns-over-coal-seam-gas-20110523-1f0us.html>

- consider the establishment of a purpose-built training facility for the ongoing training of operational staff
- regular local recruitment drives using a visual prop such as a bus to accept applications (been done in Qld)
- special consideration or pay incentives given to local employees
- disincentives given to employees in FIFO accommodation
- a guarantee from the proponent that they will never force staff to choose to live in FIFO accommodation if they have local accommodation (as we have seen happen in Qld)
- serious repercussions should these not be undertaken
- Workers (including those living in worker's camps) given rosters that allow them to engage in the community. Simple tactics could include:
 - Flexibility in work roster to allow participation in mid-week or weekend adult sports competitions, hobbies and training events
 - Flexibility to in work roster to allow parents to attend children's school, sport or hobby activities
 - holidays for important community events such as the Narrabri Show, ANZAC day etc
- Complementary industries encouraged to establish locally. Inexpensive CSG provided locally with infrastructure to support it could create new industries, expand existing industries or value add.
- A petroleum rates program should be introduced to allow Council's to recuperate the increase in costs of maintaining infrastructure utilised by the CSG industry, similar to the system used in Queensland or similar to Voluntary Payment Agreements used by the coal industry in NSW.
- Health services, particularly mental health services should establish an independent body to oversee these impacts and make recommendations to the proponent and government as to where increased spending should be put to counteract these impacts.

STRATEGIC NEED AND JUSTIFICATION

The basic justification for the NGP is summed up in Chapter 32 of the EIS, wherein it is stated that:

“The Narrabri Gas Project has significant energy benefits; including:

1. The capacity to deliver up to 200 terajoules of gas per day.
2. The capacity to produce half of NSW’s natural gas demand. The ability of the project to contribute substantially to the amount of gas available for the NSW market saw it designated as a strategic energy project by the State Government in 2014.
3. Being an appropriate and positive response to the changing eastern Australian gas market. It would help NSW achieve greater energy security and economic sustainability. The project would also result in NSW being less reliant on gas from Victoria, and therefore, would help to reduce supply risk inherent in over-reliance on few gas sources.
4. Lifecycle emissions for energy produced from the combustion of the natural gas delivered by the project will be nearly 50 per cent less than for electricity that is currently supplied to the NSW grid.
5. The natural gas produced by the project would be made available to supply the NSW gas market.”

While the first two points above might be considered statements of facts, even these are open to question. Santos has written down its reserves and the EIS does not substantiate that amount of gas that would be produced. As outlined elsewhere in this submission, the methane content of the coal seam gas produced might be much lower than assumed. Losses are likely to be far higher than assumed.

The third point above is simply propaganda, along with the statement taken from the Executive Summary, that: “The primary objective is ... to support the energy security needs of NSW”, a statement that has been consistently shown by energy industry analysts to be false.

The primary objective of the Narrabri Gas Project is, in fact, to replace gas diverted from Moomba to Gladstone, to meet Santos’ over-commitment of export orders. The EIS admit to this. This over-commitment has placed east coast gas supplies in jeopardy. The Narrabri community in particular and the global community in general is being asked to pay the price of Santos’ over-exuberance, as it seeks to bring more gas to market, with the commensurate greenhouse gas impacts.

Over the past few months, national media have picked up on the fact that price and not supply is the major contributor to the current “gas crisis”. As pointed out by the University of Melbourne’s Climate and Energy College:

“These high prices are a result of the eastern-Australian gas market being linked to overseas benchmarks, over-building of gas export capacity with contractual export over-commitments, opaque gas market and gas producer behaviour, and the high costs of producing unconventional CSG (now estimated to be around \$7/GJ, excluding pipeline transportation costs). “

The Australian public has now become aware of this nefarious strategy and has reacted. Prime Minister Malcolm Turnbull now wishes to take control of the issue, stating “It is not acceptable for

Australia to be shortly the world's largest exporter of LNG and yet, to have a gas shortage on the east coast in its domestic market. That is clearly unacceptable".

The question of supply risk due to being dependent on Victorian gas, referred to in the EIS (third point above), is no justification. It would be cheaper to build redundant capacity in the supply system than to develop the NGP, which Santos estimates at \$3.6 billion. Even though an assessment of alternatives is required of the EIS, this alternative has not been considered.

The current gas needs of NSW can be met by supply from Bass Strait, which has more than 200 years of supply for the east coast of Australia, according to BHP/ExxonMobil. The NGP is not required.

The 4th point above repeats the furphy that developing the NGP will result in less greenhouse gas emissions. This myth was exposed earlier in this submission.

The 5th point has been discredited by the recent announcement of the pipeline route for gas from the project, to the south west, to join the Sydney to Moomba pipeline west of Condobolin. Calls to use a shorter route to join the existing pipeline through the Hunter Valley have been ruled out by Santos. Clearly, the objective is to be able to send NGP gas north to Gladstone.

The NGP cannot be justified on any grounds and should not proceed.