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Submission on exhibited Santos coal seam gas mining project near Narrabri

Dear submission readers,

I object to this proposal.

I write as a citizen of NSW with 36 years professional experience including environmental assessment of coal and other developments; environmental planning; environmental education; wetland, river and groundwater management and policy; bushland and landscape regeneration.

Proceeding with this project would be immoral.

Climate change due to human-induced emissions of greenhouse gasses poses such a grave threat of major alteration to this planet's environment, and therefore to present and future human communities, that no projects which enable on-going dependence of NSW residents and business on fossil fuels should be approved.

By proposing to bring the energy and carbon of at least 33.5 million tonnes of methane up from its current safe underground storage for release into the atmosphere, this project heads our economy and ecosystems in the wrong direction, away from ecological sustainability.

People and other species in many parts of the world are already seriously affected by adverse consequences of climate change. These problems will get worse due to past emissions combining with ongoing emissions. Our State's emissions per capita are way above the world average so the NSW economy currently contributes disproportionately to climate change, while its impacts are or will soon be felt more by people who cannot escape to air-conditioned comfort, cannot escape sea-level-rise and still make a living, or cannot consistently obtain the food and water they need to survive. The biophysical and social impacts of climate change will be felt more in countries and poor communities with low fossil fuel use than by the beneficiaries of this project. Other species and ecological communities are similarly threatened by every delay in making the NSW economy move to net-zero emissions.

Greenhouse Gas Emissions

Using figures in the EIS Chapter 24 and Appendix R it appears that the project will contribute to annual emissions totaling 3.86% of NSW total 2014 emissions. This is an enormous contribution enabled through a single project, particularly in the context of the global aim and NSW Government aim of reducing emissions. I appreciate that Santos has included in the EIS calculation of the end-users'

emissions as well as direct project emissions. If there was no market for the gas these would not occur, but by producing the gas and somehow getting it to a market Santos will make it easy for people to keep using gas instead of changing to other energy sources that could be less polluting and/or doing things differently to reduce their energy demand.

The EIS predicts emissions from the project site equivalent to 15.5 million tonnes of CO2 (CO2e) during the project's 25 year life or 0.53 Mt CO2e per annum on average if grid-sourced electricity is used for processing, rather than power generated on site at Leewood. Since the current development application refers to facilities and activities "outlined in detail" in the EIS which only includes in the Project Description (6.2.1) an "indicative layout" of the "optional power generation" facility I believe a power generator would have to be subject of a separate DA so the emissions from it should be excluded. There will be less emissions early in construction and in decommissioning so annual emissions during most of the operating period appear more likely to be 0.665 Mt CO2e (operating total of 13.3/20 years). Grid-sourced power is predicted to involve emission of 0.72 million tonnes CO2e in a typical year (Appendix R 5.2). No assessment of emissions associated with piping of gas to market is included although emissions during maintenance of 600km of pipes within the project site are included. Emissions from combustion of the gas by consumers are estimated to be 3.77 million tonnes CO2e per annum. The total of at least 5.02 million tonnes CO2e per annum is 3.86% of NSW total 2014 emissions of 130 Mt CO2e.

Predicted emissions from accidental releases, processing and flaring are so large that other sources which are the most significant emissions from many other projects were not included in the calculations because they would be less than 1% of the total. For example emissions associated with transportation of fuel, construction materials, consumables and electricity to the project site and transportation of waste from the site will be uncalculated additions to the above amounts.

In practice the climate change impacts are likely to be worse than these figures suggest, particularly impacts over the next 20 to 40 years. As explained below, the EIS uses an out-of-date equivalence factor for warming potential over 100 years and follows guidelines for estimating greenhouse gas emissions that lack any real data from the trial CSG mining by Santos in the Pilliga or even recent data from other Australian CSG operations.

The conversion factor that should be used to equate methane with carbon dioxide is much higher for the first 20 years after emission than when predicting warming potential over 100 years. This is due to the slow break-down of methane in the atmosphere and its very high warming potential before it breaks down. The factor used in the EIS is 25: that recommended in the 4th IPCC report for how much worse than the same weight of CO2 the methane will be over 100 years. Research results led the 5th IPCC report adopted revised equivalence factors including a higher warming potential for methane over 20 years of **86 times CO2**. Global warming over the next 20 years is critical, not just because it will affect most of the people and other organisms alive today, but because tipping points are being reached and the ability of people, economies and ecosystems to adapt and survive is limited by the rapidity of current warming. Melting of arctic ice and permafrost is already causing release of methane which speeds warming. Fossil fuel emissions must be reduced urgently, particularly the emission of "super-pollutants" that are worse than CO2 including the methane, nitrous oxide and black carbon that this project will emit.

Inappropriate methodology and assumptions have been used in the EIS to produce the gas emission assessment. Real Australian methane emission data should have been used. It appears that instead of this, the assessment relies on National Greenhouse and Energy Reporting methodology which appears

to have been designed to be easily used with a minimum of actual data. From Appendix R Table 2.2 it can be seen that formulae used come from the *Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry* published by the American Petroleum Institute in 2004. Several parts of this, such as general fugitive emissions and emissions associated with maintenance of pipelines, are based on volumes of gas going through equipment or length of pipe multiplied by assumed leakage or escape factors. There are also assumptions about how much greenhouse gas is released from flaring. The factors in the formulae do not appear to relate to the actual composition of the coal seam gas being extracted or local circumstances that affect leakage or burning efficiency. The assumed leakage factors appear to have been derived in north America a decade ago. In the last 10 years much more data has become available and new equipment enables detection of low concentrations of gasses such as methane. There is evidence that leakage of gas either from equipment or from the ground in response to disturbance by gas extraction is much more significant than previously thought. I appreciate that Santos will be trying to minimise methane leaks but these may still be much worse than the old formulae assume.

Chapter 18 provides data on current and predicted levels around the project site of Nitrogen dioxide, a serious greenhouse gas with global warming potential over 100 years 298 times that of CO2, and some data on background levels of methane. The NO2 emissions are of great concern. This data, measurements of emissions from Santos' existing mining and processing equipment, flaring and pipe maintenance should have been used, along with actual data from other Australian CSG facilities, to actually predict the greenhouse gas emissions from this proposed project.

If the project is not to be immediately rejected, the proponent should be required to provide a fresh greenhouse gas emission assessment before approval is further considered that

- Uses actual data obtained with the best detection equipment available and a thorough method of leak and emission detection from both the existing Narrabri facilities and other similar Australian CSG operations
- Uses appropriate prediction methodology for this project
- Provides data on each of the greenhouse gases involved separately using the most recent IPCC global warming potentials for each
- Predicts warming potential for both a 20-year time frame and a 100-year time frame (i.e. using both sets of IPCC warming potentials). Effects over 20 and 100 years from construction and an early year of full operation should be provided as well as from the full period of emissions, as is done in the EIS but using the 2 different sets of warming potential factors.
- Predict what effects warming could have in the local area since the gases will cause local warming before they are dissipated.

The cumulative impacts chapter and the greenhouse emissions chapter both fail to acknowledge the contribution of this project to the global problem of climate change. It may seem a small contribution when put in numerical percentage terms but this giant global problem is entirely caused by cumulative impacts of small contributions. By removing more carbon from safe underground storage and by being a relatively large contributor this project has a highly significant cumulative impact.

Lack of detail such as well locations

The project description lacks specific details that are normally required for all other developments in development applications. The failure to specify locations of proposed well pads, access routes and pipelines in the DA or EIS is unacceptable. If 450 pairs of towers on clearings linked by pipes and tracks

were proposed in 95,000 hectares of public and private land close to Sydney, would a DA that did not say exactly where these facilities will go be accepted? All other developers have to work out the details before they submit a DA so why is a private mining company with a proposal that has been in the making for over a decade allowed to get away with not being specific? If this is acceptable will this precedent be allowed to be followed by every other "State Significant Development" while ordinary proponents have to bear all the costs of working out detailed proposals and sticking to these?

The lack of detail means it is not possible to be sure how much of which ecological communities will be affected, what statements about location left to be determined under the Field Development Protocol will mean in practice. For example, it is not acceptable to use broadly indicative factors such as Strahler stream order to decide how far from a watercourse a well pad or other disturbance should be: in the Pilliga and in the farmland, the extent of the ecologically essential vegetation that draws on water supplied by a stream through the connected near-surface groundwater and keeps species such as koalas alive in a drought is determined by local features not just the size of catchment and stream order. When the particular habitat features that will be destroyed, such as the number of trees with hollows used by wildlife to be cleared have not been predicted, the adequacy of mitigation measures or objectives and requirements for offsets cannot be properly assessed. Similarly, the social and cultural impacts cannot be properly assessed and mitigation cannot be properly planned. The community is just expected to trust the proponent's staff and put up with whatever the impacts turn out to be.

The basic problem is that this project is far too big and Santos is in a greedy hurry to get approval to get the methane out of it's safe underground storage and into places where it can be burnt for energy and converted into greenhouse pollution before renewable technologies and climate concerns stop them or make it uneconomic. Had they proposed a small specific development they might have had less opposition and been able to convince more people that this would be a brief transitional project.

Wildlife habitats and fragmentation

The EIS seriously under-rates the effects that clearing and fragmentation in the forest will have on wildlife. The impact will be much more extensive than the 3% of fauna habitat claimed by the EIS. Some animals will have important parts of their home ranges destroyed making the remainder inadequate. Habitat conditions in the remaining forest adjoining the clearing may be changed, for example being more exposed to wind. Openings in the forest will change movement habits (e.g. for foxes) and clearings with regeneration will suit some different species, notably Noisy Miners.

Increasing abundance of Noisy Miner birds threatens many woodland birds, even species as large as Regent Honeyeaters, because the Noisy Miners are so aggressive that other species cannot feed and breed successfully. Their expansion is listed as a Key Threatening Process. Noisy Miners increase following reduction of shrub layers or in areas where trees and shrub layers are significantly reduced. They chase other birds out of undisturbed forest and woodland areas adjoining their preferred cleared habitats. They currently occur in the Pilliga in small numbers. Ornithologists including Stephen Debus (per.com.) predict that the pattern of clearing proposed for the wells and access routes will enable substantial increase of the Noisy Miners and be followed by substantial reduction of many woodland bird species including species that currently have a stronghold in the Pilliga but are already declining in other locations.

Reduction of the plants and animals in the Pilliga forests to enable coal seam gas mining is unacceptable.

Any loss of trees or native grassland in the already-largely-cleared northern half of the project area is also unacceptable. If drilling waste, compaction or spillage of chemicals or saline water make farmland less productive in future that will be unacceptable.

Salts and chemicals

It appalls me that Santos expects to get approval to extract such a vast amount of salts - 17 B-double truckloads a week during peak production – when they do not have a plan to safely dispose of this waste. They seem to expect local councils to accept the waste in municipal landfill facilities. Local Councils are struggling to manage their facilities to meet modern standards without releasing pollutants in periods of prolonged wet weather and to have enough safe space to store their own community's waste. As my own Armidale community has found, the cost of planning and developing new landfills when the old one gets full is enormous and time consuming. Santos may claim that the brine they produce is suitable for dumping in a landfill but the modern siting and design requirements for a landfill mean that many communities do not have good locations for a new landfill with a sealed access road when the present one fills up so they should not allow it to be filled more quickly with industrial waste. I suspect that many of the existing landfills that Santos claims would be suitable disposal sites would not actually meet modern standards for disposal of brine that contains both sodium chloride and other pollutants. The salts and associated pollutants should not be permitted to leach into groundwater or streams but many landfills may not have an impervious base.

Santos should not be allowed to impose its waste burden on any local community now or into the future.

Unless the salts go into an incredibly deep hole in the ground below fresh-groundwater tables, their disposal site will have to be managed indefinitely to ensure that in periods of extreme rainfall or prolonged wet weather the salt is not washed into streams or leached into groundwater. Some landfills are managed by pumping water from a leachate pond back up onto the landfill and trying to increase evaporation so the pond doesn't overflow. If the landfill cannot be sealed when it is full this management would be required indefinitely. Preventing the salts from ever escaping may be impractical.

The current proposal should be refused consent because no safe storage of the salts is proposed.

Produced Water

As has been demonstrated by community testing of the outflow from the original Eastern Star Gas desalination plant in the Pilliga, desalination with reverse osmosis does not remove all pollutants from the produced water. I do not accept Santos claim that the produced water will be of suitable quality to be put into Bohena Creek. It is good that they do not propose to release it at times of low flow, but dilution in flows above 100ML/day is not the solution to this pollution.

Groundwater

The EIS admits that there is some risk to the groundwater resources in the Gunnedah-Oxley Basin, particularly a cumulative risk with the Narrabri coal mine.

I do not accept that there is negligible risk to other groundwater resources although I can see that the target coal seams are very deep below the fresh aquifers. I am concerned that the process of drilling down to wet pressurised layers or temporary localized depressurising of them may cause movements which later gradually allow the polluted water remaining in one of the lower layers to escape up into a fresh aquifer. I am also concerned that the metal casing of boreholes may eventually corrode (notably where it passes through saline layers) then provide a pathway for pressurized polluted water to rise up. If the existing and proposed boreholes are not all filled with a truly permanently uncorrodable substance this could be a serious issue. If this is a risk for a thousand years time not now it is still unacceptable.

Bushfire

The Pilliga forest is very fire-prone. There will be a risk of flammable invisible gas leaking from a well or pipe, perhaps at an imperfect join or after a tree falls in strong wind lifting its roots and a pipe. Neither forestry workers nor Rural bushfire service volunteers will know where such risks are so they cannot plan for them as they plan for other risks.

It is totally unacceptable that the EIS proposes a good safety plan for its workforce but expects the forestry workers to manage bushfires around the company's project site. It is not surprising that volunteer fire fighters have already said they will not fight fires in this area due to the unknown but perceived increased risks. Since this means there will be less fire fighters it also means that fires will be more extensive and become even harder to control.

The project seems to increase the risk of bushfire both from reduced control and because any 'willy-willy' wind on a hot day or any strong wind in dry conditions could blow a branch through a gas flare and onto other vegetation igniting a fire. Similarly, if there are pockets of leaked gas, sources of ignition such as sparks from equipment or cigarette lighters could start a fire. Perhaps these are of low likelihood but sometimes low likelihood events do occur with potentially tragic consequences.

Any increase in fire is likely to be bad for timber values of the State Forest. It will probably be bad for wildlife as well – while some fires may benefit some species, the Pilliga forests have had enough serious fires and some species may lose essential habitats or have their populations reduced too much if there is an increased fire frequency or severity in the next 25 years.

Social and health impacts

A vast number of people in the northwest slopes and plains region and across NSW have expressed opposition to this project.

Many farming families do not want it, as shown in the surveys of people who requested a CSG-free road or community. This is because experience in north America and Queensland has shown that CSG mines can

- significantly increase health issues that seem to emanate either from pollution of air or water or from psychological stress associated with having non-local CSG workers around, noise, extra vehicle movements, lighting and worrying about possible pollution
- bad neighbours (although they can also be sometimes be good neighbours)
- make people who are used to being able to plan and control what people do on the land they own feel pressured to allow a company to establish a well on their land

- reduce trust and agreement between neighbours if one agrees to a well on their place when a neighbour doesn't
- be a serious inconvenience to rural families and property management

I share the concern that coal seam gases (there are many mixed together not just methane) and components that may be released into the atmosphere during processing could endanger the health of mine workers or other people nearby. They could also be a risk to wildlife.

I appreciate that there are other people who do want the mine to go ahead. It will continue to be divisive if approved. If rejected, the local community will be able to get back to something like their previous life, though changed in many ways by the experience of having debated the proposal. They will be able to move on with planning and implementing their own sustainable developments instead.

Conclusion

This proposal should be rejected. The financial and human resources potentially available to the proponents should instead be directed to better ends such as efficiently speeding the reduction of our society's energy use and rapid transfer to renewable energy.

Yours faithfully
Kate Boyd