Supplementary Submission to IPC on Narrabri Gas Project

Supplementary Submission to be included with the original submission - by Tony Pickard
I oppose the NGP

Chapter 12

Example of Santos' lack of Community Consultation and Information sharing.

This supplementary submission was prompted by this email from Santos in response to a question about being not being able to find Santos Statements and News Releases Santos had made prior to those listed on the new Santos webpage. These early Statements and News Releases were available at the time they were made but for some reason they are now no longer listed and from the tone of the email below.

Tony Pickard

From: "Energy NSW" <[redacted]@santos.com>
Date: Tuesday, 4 August 2020 3:01 PM
To: "Tony Pickard" <deere@activ8.net.au>
Cc: [redacted]
Subject: RE: ![EXT]: Archives before 2014

Hello Tony

I have referred your request to our Head Office to request a search of the archives as I don't hold these records here locally. Is there a particular news item or statement that you were looking for from July 2012 that would help me with getting a response back to you as quickly as possible?

I've also been requested to follow up with you for any questions that you raised with Santos during the IPC site tour that were taken on notice so that the questions are correctly captured. If you could please email these through, I'll refer them to our team for a response.

Rgds, [redacted]

From: Tony Pickard [mailto:deere@activ8.net.au]
Sent: Friday, 31 July 2020 8:56 AM
To: Energy NSW <[redacted]@santos.com>
Subject: ![EXT]: Archives before 2014

Sir/Madam

I am looking for your Archives around Statements and News Stories of matters relating to the Santos involvement with the PEL 238.

Your Archives seem to start at 2014 with only one previous listing that being July 2013.

Can you please direct me to where I can find the earlier Archives that apply to PEL 238 and the area of the Narrabri Gas Project?

July 2012 would be very helpful.

I await your quick reply.

Mr A J Pickard

The email from Santos, in Santos blue, (top section of) also mentions the questions that that Santos could not answer, but took on notice, on the day of the IPC tour of sections of the Santos Narrabri Operation back on July 6th 2020.

If I remember correctly, at the end of the day briefing, the same Senior Santos employee made specific mention that he would pass the questions on notice to "[redacted]" to be answered. I told the Senior Santos employee that the question

around the soil testing at Leewood does not have to be answered but the rest do, he again reiterated that all the questions would be passed on and answered.

That was the 6th July and I get an email on the 4th August asking me to send Santos my questions of the 6th July to them. It would appear that had I not asked for information using the official Santos email address, that has to be recorded, I doubt if I would ever have heard back re the questions asked on the IPC Santos Tour of 6th July 2020, if I had not requested of the Head Office the information I did.

My reply to the Santos request of 4th August 2020 is below.

Tony Pickard

From: "Tony Pickard" <deere@activ8.net.au>
Date: Tuesday, 4 August 2020 3:40 PM
To: "Energy NSW" <[redacted]@santos.com>
Cc: [redacted]
Subject: Re: ![EXT]: Archives before 2014

Madam

With regard to the questions that were asked of Santos via Mr Dunn back on the IPC tour of last month, he should remember them, after all he was at great pains to repeat the promise that he would hand them on to Annie in front of the Commissioners.

I always thought that remembering the questions that were taken on notice is a big part of the Community Information package.

The information the I sought I have located from another source and is already in my submission to the IPC.

It really is a shame that Santos does not keep its Archives on the web page up to date, so to speak, especially as much of it is relevant today as it was yesterday.

Yours Sincerely
Mr A J Pickard

From: Energy NSW
Sent: Tuesday, August 4, 2020 3:01 PM
To: Tony Pickard
Cc: [redacted]
Subject: RE: ![EXT]: Archives before 2014

What I find really unusual about the email from Santos to me is that it does not have the usual Santos logo and information attached to the bottom of it (see below), almost as if the writer was ashamed and embarrassed for not having contacted me earlier with the answers to the questions from the IPC tour.

Santos

[redacted]
Team Leader Community and Land
NSW Onshore Upstream
PO Box 859, 125 Maitland Street, Narrabri NSW 2390
t: +[redacted] m: [redacted]
santos.com

I am still awaiting an answer to all the requested information.

This is a very recent example of how Santos treats those who are asking question of Santos with regard to Santos' Narrabri operation.

To be honest Santos Narrabri, since soon after Mr Banks took over from Mr P Mitchley, has a very poor record with regard to answering questions from the Community that Santos seems to think are in opposition to the Narrabri Gas Project.

This attitude is totally against what the NSW Government and its Departments are saying.

This attitude is also against the spirit of most of the Chief Scientists Recommendations.

This attitude is totally at odds with what Santos has stated in their EIS re Community Consultation.

However this attitude towards those who ask searching questions is nothing new and has been tolerated but not understood, as it would be in Santos' best interest to keep those who ask questions well informed and not give those questioners and the Community that they answer to a stick to beat Santos with.

Supplementary Chapter 13

Well Cementing.

I have attached a few of the photographs that I have with regard to the centralization of the gas well inner casing, the condition of some of the inner and outer casing surfaces and the cementing at the surface of a few of the newer gas wells. All of which is contrary to what Santos and the NSW Government Departments have been saying and to what is displayed re centralisation of the casings once cemented, in the Assessment Report and many Santos publications. I have in excess of 60 pictures not including video of gas well in the NGP which are similar to the sample displayed here.

If the Gas Companies, in this case Eastern Star Gas, cannot get the centralisation and cementing at the top right, this is despite what is claimed in the Well Completion Reports and Cementing Logs, then how can the local and wider community believe the statements and hype pic about centralisation?

As far as I know Santos never corrected the visible lack of cement at the top as shown in the images, all Santos did was to fill the area between the outer collar and the well with ballast rock.

I have no records of what the centralisation of casing in any gas wells Santos has drilled because they erected fencing around their sites which I respected.

My concerns also run to the Plug and Abandoning (P&A) procedures. It seems like everyone has it fixed in their minds that the so called Regulation and worlds best practice around this very important facet of the long term protection of the environment and groundwater, is all protecting. Yet I can assure the Commissioners that from what I have seen and recorded this is far from the case.


b2a Bohena2b leakingwell soileffectebysalts 21-07-2011.jpg


b2b Bohena2b notcental-cemen tmissing 14-1-2012.JPG


b2c Bohena2b 8-4-2012.JPG


b2dBohena2b cut-offwellheado f2ndwell leakingwater 13...


b2e Bohena2b returnedplugcem ent veryweak 30-10-2011.JPG


b4a Bohena4L on 4-4L 14-1-2012.JPG


b4b Bohena4 on 4-4L 21-1-12.JPG


b4c on Boh 4-4L plugcementseem stonothavenotatt achedtowellbor...


b5a Bohena5 innercasingsnotc entraltooutercasi ng 14-1-2012.JPG


b5b Bohena5 innercasingnotce ntral 21-1-2012.JPG


b5c Bohena5 inner casingnotcentral 22-2-2012.JPG


d5a Dewhurst5 corroded casingnowater-c ellarhas waterin...


d5b Dewhurst5 corrodedconditio ncementwillnots eal 17-09-2011.J...


D6ca Dewhurst6c casingnotcentrea ndnocement 22-1-12.JPG


D6cb Dewhurst6c notcentralandno cement 28-3-2012.JPG


d10a Dewhurst10 NO CEMENT betweencasings NOTEWATERbet...


d10b Dewhurst10 NO CEMENT betweencasings 12-5-12.JPG

Take the example of the P&A of Bohena 2, as seen in the figure. When Bohena 2 was P&A the cut off section was left at the site and when I came across it the cut-off section was still leaking salty water (see video B2f MOV025 Bohena2 Wellhead 13-4-2012.mp4.). Now if the P&A had followed the correct procedures there should have been no salty water above the second blockage plug.

So why was there salty water still leaking from the Bohena 2 cut-off section?

Was the cement used of the proper constituency in order to do the job that it was designed for?

I have my doubts as to the ability for the cement used in the P&A to do a long term job it is supposed to do, as when I was presenting to the PAC on the Dewhurst Gas Pilot Expansion of 20140619 (attached video Dew Pac 20140619), I was handling a piece of the cementing material from the P&A taken from the Bohena 2 site, when it broke in my hand with almost no pressure by me. The samples I have in my Narrabri CSG records locker are extremely light and very weak.

I also have to ask: Were the internals of the casing scraped properly in order to remove any scale build up (see picture d5b Dewhurst5) but not to much as to make adherence of the cement to the metal surface very poor to non-existent?

Note on video Dew PAC 20140619: this video is 12.09 minutes long and has been reduced from 885 Mb to 15.7 Mb as a result the picture quality has suffered sound is still very good. Also this video has references to the Road damage caused by Santos and an earlier event also the purchase of my property and other points raised and mentioned in the main submission that I have made to this NGP IPC. I have also included the written text of my address (Bibblewindi & Dewhurst PAC address 20140619).

To finish off this chapter I have placed depictions extracted from a 201303 Santos presentation to Narrabri Council, Departments Assessment Report and a Santos Fact Sheet.

Plugging and abandoning a well

- An abandonment includes filling the entire wellbore from bottom to surface with cement in cement 'plug' stages.
- Individual cement plugs are limited to 200m in length.
- All open hole 'plugs' are left to set and tagged to confirm placement before the next one is pumped.
- Once a cement 'plug' top is inside casing, it is left to set, tagged to confirm placement and pressure tested to confirm isolation.
- Cement 'plugs' are then pumped one by one to surface.

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Santos
We have the energy.

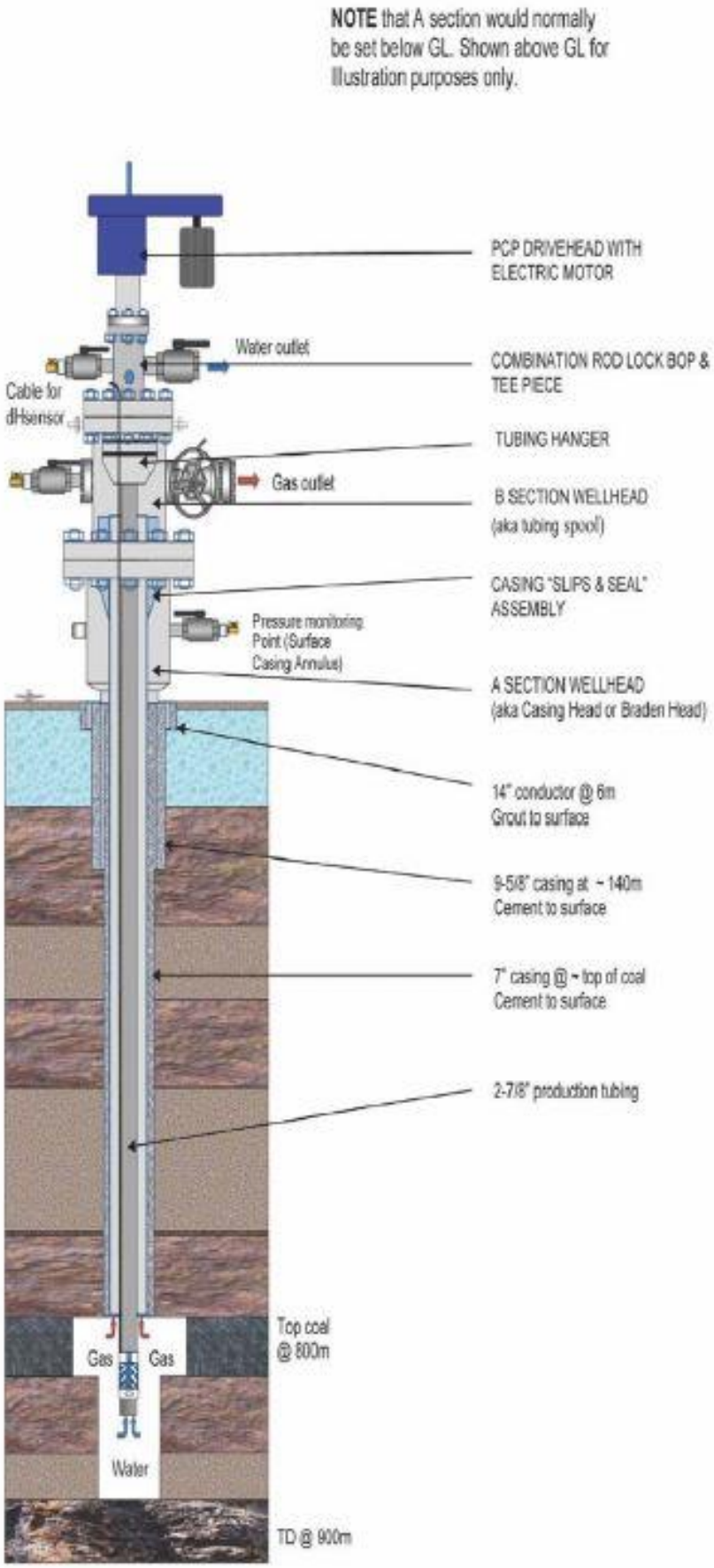


Figure 7 | Typical Coal Seam Gas Well

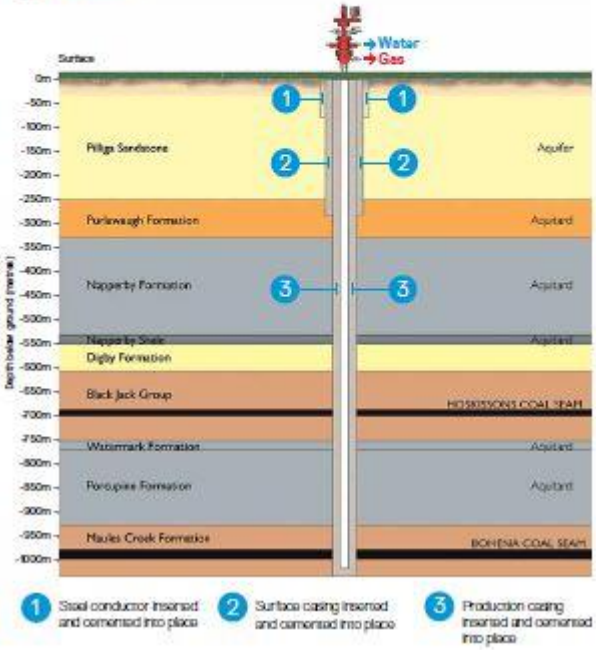
Santos wells are designed to:

- Protect the environment, particularly underground sources of water
- Minimise risk to personnel and the public
- Comply with the NSW Codes of Practice for Coal Seam Gas – Well Integrity, and meet international standards
- Maximise the production life of the well

How we drill a natural gas well:

- A 14 inch steel pipe, the conductor, is cemented 10–20 metres into the ground
- The conductor holds back the loose soil near the surface
- We drill through the conductor until we reach a geological rock layer through which substances, like water and gas, cannot easily pass. These layers are known as aquitards
- A second steel pipe, the 9–5/8 inch surface casing, is run to the bottom of the hole, into the rock layer and cemented to surface
- The surface casing is then pressure tested to ensure well integrity
- We drill through the surface casing a few metres and pressure test again ensuring the cement is bonded to the rock and steel
- Drilling continues down through the target coal seams and into the rock below
- A third steel pipe, the production casing, is run inside the surface casing
- This 7 inch production casing runs from the surface down into the coal seam and is cemented back to surface
- The wellhead is positioned on top of the well to allow production of natural gas and water

Typical vertical Narrabri coal seam gas well



Project overview

The Narrabri Gas Project could supply up to half of the natural gas used by NSW homes, small businesses, major industries and electricity generators every day

Operations will be focussed on land in and around the Pilliga, near Narrabri

The Project will create over 1,200 jobs during construction and bring substantial economic benefits to Narrabri and the region, while delivering a clean, reliable source of energy to NSW

Hydraulic fracture stimulation

- Current information on the geology of the coal seams in the Project area indicates gas flow would not be improved by hydraulic stimulation (commonly referred to as "fraccing" or "fracking")
- Hydraulic fracture stimulation (commonly referred to as 'fraccing' or 'fracking') is used to improve the flow of gas and increase the productivity of a well
- This technology has been used safely and sustainably in Australia for more than 40 years
- Over the past 65 years hydraulic fracture stimulation has been used safely on more than two million wells worldwide (naturalcsg.com.au)
- If additional geologic data supported the use of the technique to improve gas flow in the Narrabri Project area in the future, a range of additional Government approvals would be required and community consultation would be undertaken

About Santos

An Australian energy pioneer since 1954, Santos is one of Australia's largest domestic gas producers with more than 3,000 employees and a long history of safe, responsible operations.

For more information

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Gunnedah
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Open Monday to Friday
from 9.00am to 5.00pm

Please note that all of the pictorial representations show a perfect alignment/spacing of the gas well inner casings to the outer casings with perfect cementing in between yet the reality is very different as has been demonstrated.

I know that according to the Well Completion Reports that spacers are supposed to be fitted and installed when a casing is first fitted and prior to cementing, but who checks to see if all the spacers are still in position and that the casing is indeed central inside the hole into which it has been put prior to cementing? My guess is, that bit of important

confirmation is not done, mainly because if a spacer was found to be missing or extra spacers required due to the curvature of the drilling as it approaches the target seam, it would cost too much to firstly run a gamma ray or simular Data log check and if a problem were found, to pull the casing string up and correct the problem.

The IPC should look into why the facts as displayed are contrary to those put about in the glossies and in the written descriptions contained therein. There should be such a thing as "Truth in the Industry and Industry Publications" applied.

Maybe the IPC should make a pre cementing Data logging check of the casing position relative to the centre of a hole a condition in the Development Consent. To do otherwise is to sanction a very great probability of early well casing failure due to corrosion or bacterial attack and to also sanction shoddy workmanship.

My last image is one taken from the Departments Assessment Report and shows the potential pathways for leakage of both fluids and gas as well as the possible pathways for cross contamination of aquifers once a well has been plugged and abandoned.

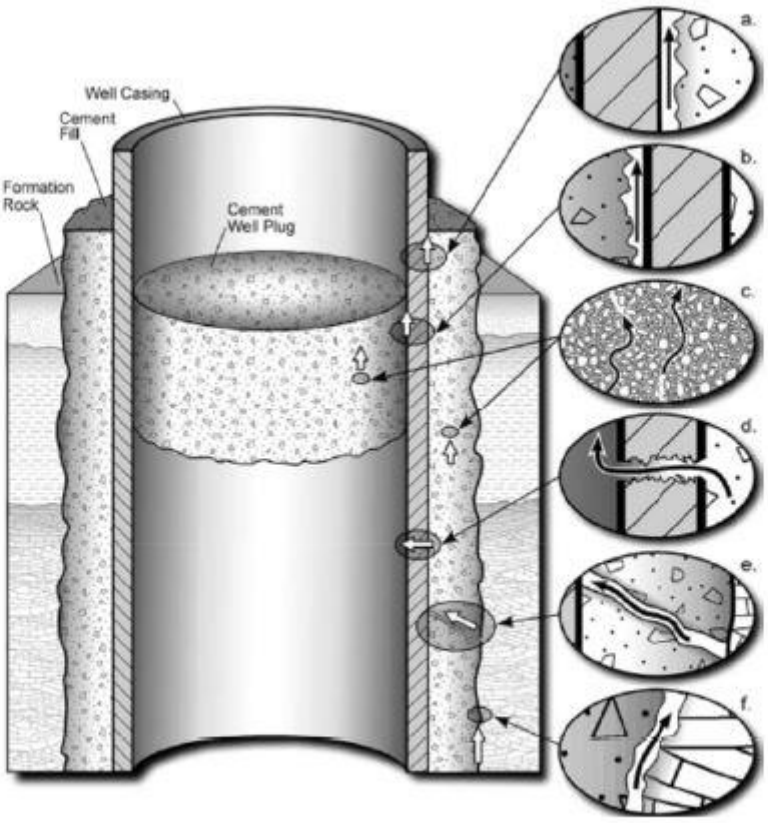


Figure 6.2. Potential pathways for leakage along an abandoned well, including flow along the material interfaces (a, b, f) and through well cements and casings (c, d, e) (After Nordbotten et al. (2005))

This image can also be used to show the potential external pathways for bacteria Iin the groundwater to attack the cement and the inner steel of the well casing (see the Microbial Corrosion Att 4.7 Sub 13 Microbial Corrosion).

This image also supports the concerns raised by many members of the questioning community including myself and now again raised in this chapter with regard to the P&A done on Bohena 2 and possibly other wells that have been P&Aed and with the lack of proper long term monitoring of either the groundwater or the well cement or casing condition (see email from WEP to DPI&I in the Assessment Report) that has been raised in the past and rejected as being impracticable by Santos, the Regulator the EPA and the Department of Planning.

The other disturbing fact as it stands today; is how is the Gas Company or that NSW Government Department going to repair any casing or cement damage, if it is ever found, once a gas well is P&A?

Supplementary Chapter 14

Narrabri Gas Project Community Consultation Committee re Discussions on CO2

I was a member of the Narrabri Gas Project Community Consultation Committee (NGPCCC or CCC) from its inception in December of 2014 until November 2019; over that period I missed only two (2) meetings due to ill health, so I could say that I should have a very good knowledge of what was discussed at the NGPCCC meetings.

I note that there was a discussion at the August 1st IPC hearing between the Department of Planning and the Commissioners on many topics including CO2. From the transcript I gather that the CO2 discussion was about the CO2 percentage content in the extracted gas with this topic being a subject discussed at the NGPCCC or CCC.

If my memory and my meeting notes serve me correctly there were a number of attempts to discuss the gases that surround the Narrabri Gas Project. These ranged from Hydrogen Sulphide to Methane (from various sources) to CO2 from combustion of the Methane and other sources (animals/humans) but I do not recall any discussion around the actual content of CO2 in the extracted Coal Seam Gas other gases especially Hydrogen Sulphide, yes, but not CO2.

Santos was always guarded about the actual make-up of the extracted gas and if a discussion topic ever got to close to what Santos regarded as "Sensitive Information" Santos Representatives would claim "Commercial-in-Confidence" and the discussion would be shut down by the "Chair". I am sure that if there was a discussion about the CO2 content in the extracted Coal Seam Gas that this would have occurred.

Information on the Gas Composition of the NGP Coal seam Gas is, shall I say, easy to find if you are prepared to spend hours looking through the Records on the DIGs site. I have and found that since July 7th 2014 there is no Gas Desorption data available for the gas in the NGP area, maybe this is because Santos has not done any core-hole drilling or maybe that information has been classed "Confidential".

I have included some Gas Desorption Records that I have. They are spread out over time and seem to indicate that the Coal Seam Gas has, over time, a varying make-up composition percentage of Methane and Carbon Dioxide and other gases.

To me it indicates that the Coal seam gas has pockets of high Methane percentage and at other times has high percentages of natural occurring Carbon Dioxide and other gases, that are drawn down from areas in the coal seams into the gas extraction column and Santos or any other person or Body such as the CSIRO and GISERA, Regulator or Authority has no knowledge of where these pockets are or when they will arrive or the actual gas composition of them.

Not being an expert, but what I see in these records is at times, an undesirable presence of Carbon Dioxide and Hydrogen Sulphide which can cause metal and cement corrosion problems when combined with water, and as a percentage in the "dry" gas presence that has to be removed from the dry extracted gas mixture in order to produce a gas which is commercially viable.

<u>In order to produce this commercially viable gas Santos has to extract the unwanted gasses most likely via some form of cyclone or cooling separation process and vent them to atmosphere.</u>

<u>The IPC should recommend investigating this separation and venting process further to ensure that the NGP is truly Carbon Neutral, and that this be one of the pre conditions added to the Development Consent to be done prior to any gas is removed for Production or Commercial selling.</u>

<u>Note:</u> What I find very interesting, and it is in the Gas Composition for Dewhurst 8A page 1, there is the mention of the presence of Hydrogen Sulphide gas in the gas samples taken for gas desorption analysis.

Hydrogen Sulphide gas is in the main is created by BACTERIA from the Sulphate Reducing Bacteria family. Santos has always maintained that there no bacteria in their wells yet there is Hydrogen Sulphide present in the gas samples taken from Dewhurst 8A.

Can someone explain the presence of this gas and exactly how wide spread in the coal seams it is?

To me the presence of Hydrogen Sulphide actually in the gas

GAS COMPOSITION ANALYSIS

Well	Sample Details						Air Corrected Gas Composition									Calculated	Calorific Value		Average	Air Content
	Date	Time	Sample #	Source	Well Status	Sample Point	N_2 MOL%	He MOL%	H MOL%	CO MOL%	CO_2 MOL%	CH_4 MOL%	C_2H_6 MOL%	C_3+ MOL%	Total MOL%	Gas Density (Air = 1)	Gross BTU/ft³	Net BTU/ft³	Molecular Weight	of Sample %
BH002	29-Apr-98	0:00	~	Hoskisson	Drilling	Coal core @ 640m	5.85				15.63	78.21	0.16	0.15	100.00	0.732	799	719	21.192	45.43
BH002	30-Apr-98	0:00	~	Hoskisson	Drilling	Coal core @ 679m	2.74				14.37	82.80	0.09	0.00	100.00	0.704	840	756	20.402	16.39
BH002	08-May-98	14:20	~	Digby Sdst	Drilling	DST #6	10.73	0.28			1.76	87.16	0.07	0.00	100.00	0.614	883	795	17.795	0.27
BH002	17-May-98	0:00	~	Maules Ck	Drilling	Coal core @ 877m	2.79				7.77	89.25	0.19	0.00	100.00	0.641	907	816	18.597	27.67
BH002	18-May-98	0:00	~	Maules Ck	Drilling	Coal core @ 890m	1.75				6.26	91.83	0.16	0.00	100.00	0.622	932	839	18.027	16.85
BH002	06-Jun-98	13:00	~	Maules Ck	Cavitating	Cav choke man	60.55	0.11			1.49	37.77	0.05	0.00	100.00	0.818	383	345	23.705	15.34
BH002	17-Jul-98	8:45	~	Maules Ck	Producing	Seperator	25.77	0.20			1.84	72.11	0.08	0.00	100.00	0.678	731	658	19.269	1.19
BH002	24-Jul-98	13:00	~	Maules Ck	Producing	Csg	19.19	0.23			2.13	78.37	0.08	0.00	100.00	0.653	794	715	18.919	1.28
BH002	28-Jul-98	13:50	~	Maules Ck	Producing	Csg	20.44	0.24			2.05	77.19	0.08	0.00	100.00	0.658	782	704	19.047	0.73
BH002	31-Jul-98	9:00	~	Maules Ck	Producing	Csg	20.59	0.24			2.12	76.96	0.09	0.00	100.00	0.659	780	703	19.085	0.73
BH002	05-Aug-98	8:30	~	Maules Ck	Producing	Csg	19.03	0.23			8.33	72.34	0.07	0.00	100.00	0.712	733	660	20.632	0.50
BH002	09-Aug-98	9:10	~	Maules Ck	Producing	Csg	19.22	0.24			2.78	77.68	0.08	0.00	100.00	0.680	787	707	19.102	0.78
BH002	18-Aug-98	18:00	~	Maules Ck	Cavitating	Csg	19.41	0.24			1.93	78.34	0.08	0.00	100.00	0.652	794	715	18.888	1.10
BH002	20-Aug-98	10:00	~	Maules Ck	Cavitating	Csg	0.00	0.26			6.37	93.22	0.15	0.00	100.00	0.615	946	852	17.830	87.17
BH002	23-Aug-98	0:00	~	Maules Ck	Cavitating	Csg	33.37	0.18		0.07	3.59	62.70	0.09	0.00	100.00	0.726	636	573	21.040	72.60
BH002	30-Oct-98	13:35	1009	Maules Ck	Producing	Csg	25.93	0.25			0.98	72.75	0.08	0.01	100.00	0.670	738	665	19.410	1.14
BH002	07-Nov-98	15:00	1020	Maules Ck	Producing	Csg	24.48	0.19			0.98	74.27	0.08	0.00	100.00	0.664	753	678	19.237	1.28
BH002	30-Nov-98	10:00	~	Maules Ck	Producing	Csg	21.89	0.13			0.15	77.76	0.07	0.00	100.00	0.646	788	709	18.701	1.46
BH002	23-Feb-99	16:10	1058	Maules Ck	Producing	Csg	10.88	0.09			16.57	72.39	0.07	0.00	100.00	0.759	734	661	21.980	1.14
BH002D	09-Sep-98	12:05	~	Digby Sdst	Shut in	Csg	11.06	0.25			1.67	86.94	0.08	0.00	100.00	0.615	881	793	17.815	0.46
BH002D	10-Sep-98	19:20	~	Digby Sdst	Shut in	Csg	11.30	0.27			1.66	86.69	0.08	0.00	100.00	0.616	879	791	17.839	0.46
BH002D	14-Sep-98	11:35	~	Digby Sdst	Shut in	Csg	30.78	0.19			2.06	66.91	0.06	0.00	100.00	0.701	678	611	20.290	1.92
BH003	29-Sep-98	14:00	~	Maules Ck	Producing	Csg	3.99	0.25			5.59	90.04	0.11	0.02	100.00	0.624	913	822	18.067	0.27
BH003	30-Oct-98	15:15	1012	Maules Ck	Producing	Csg	2.98	0.18			19.79	76.92	0.10	0.03	100.00	0.758	782	704	21.598	0.09
BH003	30-Nov-98	9:20	~	Maules Ck	Producing	Csg	3.63	0.16			6.71	89.40	0.10	0.00	100.00	0.633	907	816	18.348	0.09
BH003	23-Feb-99	16:50	1059	Maules Ck	Producing	Csg	35.39	0.18			4.05	60.31	0.07	0.00	100.00	0.739	612	551	21.398	0.00
BH004	05-Jul-98	0:00	~	Maules Ck	Drilling	Coal core @ 847m	0.57				9.10	90.22	0.11	0.00	100.00	0.645	915	824	18.676	25.94
BH004	07-Jul-98	0:00	~	Maules Ck	Drilling	Coal core @ 863m	73.79				3.16	22.98	0.07	0.00	100.00	0.890	234	211	25.770	17.40
BH004	24-Aug-98	11:30	~	Maules Ck	Producing	Csg	47.16	0.13			2.11	50.53	0.07	0.00	100.00	0.769	513	461	22.273	3.20
BH004	06-Sep-98	13:30	~	Maules Ck	Producing	Csg	29.12	0.11			4.85	65.83	0.09	0.00	100.00	0.721	668	601	20.885	2.19
BH004	30-Oct-98	14:45	1011	Maules Ck	Producing	Csg	30.03	0.14			2.26	67.43	0.10	0.04	100.00	0.701	687	619	30.311	1.92
BH004	07-Nov-98	14:40	1019	Maules Ck	Producing	Csg	24.67	0.09			4.23	70.87	0.10	0.04	100.00	0.698	721	649	20.219	1.69
BH004	23-Feb-99	16:30	1060	Maules Ck	Producing	Csg	24.10	0.16			2.12	73.53	0.09	0.00	100.00	0.674	746	671	19.514	1.37
BH005	29-Sep-98	17:00	~	Maules Ck	Flowing	Csg	13.70	0.17	1.11		37.75	47.16	0.11	0.00	100.00	0.970	483	435	28.080	7.81
BH005	07-Oct-98	15:20	~	Maules Ck	Flowing	Csg	5.77	0.35	1.99		29.07	62.66	0.16	0.00	100.00	0.848	643	579	24.564	3.42
BH005	07-Oct-98	15:30	~	Maules Ck	Flowing	Csg	4.60	0.36	1.36		24.66	68.84	0.16	0.00	100.00	0.804	704	634	23.278	3.88
BH005	30-Nov-98	11:00	~	Maules Ck	Producing	Csg	16.08	0.21			6.44	77.10	0.17	0.00	100.00	0.682	783	705	19.766	6.81
BH006	10-Feb-99	19:55	1042	Maules Ck	Producing	Csg	53.35	0.10			2.62	43.87	0.05	0.01	100.00	0.800	445	401	23.162	-
BH006H	30-Oct-98	15:30	1013	Hoskisson	Producing	Csg	14.44	0.16			13.65	71.68	0.04	0.03	100.00	0.746	728	655	21.603	4.84
BH006H	30-Nov-98	11:45	~	Hoskisson	Producing	Csg	6.78	0.11			15.69	77.40	0.02	0.00	100.00	0.733	784	705	21.233	0.37
BH007																				
WP001	03-Apr-98	17:50	~	Porcupine	Flowing	Csg	22.39	0.44			1.95	74.90	0.26	0.06	100.00	0.666	765	689	19.268	0.45
WP001	04-Apr-98	13:45	~	Porcupine	Flowing	Csg	22.50	0.43			2.01	74.75	0.27	0.04	100.00	0.666	763	687	19.302	0.46
WP001	05-Apr-98	14:15	~	Maules Ck	Flowing	Tbg	22.47	0.42			4.08	72.68	0.26	0.09	100.00	0.688	745	670	19.925	0.50
WP001	24-Oct-98	18:40	~	Porcupine	Flowing	Tbg	21.19	0.45			2.23	75.78	0.29	0.06	100.00	0.664	774	697	19.218	0.55
WP001	24-Oct-98	18:46	~	Porcupine	Flowing	Tbg	21.21	0.44			2.23	75.76	0.29	0.07	100.00	0.664	775	698	19.236	0.55
WP001	30-Oct-98	16:35	1014	Combined	Producing	Csg	21.97	0.45			2.31	74.29	0.28	0.70	100.00	0.668	766	690	19.341	0.55
WP001	07-Nov-98	13:50	1018	Combined	Producing	Csg	21.99	0.45			2.28	74.92	0.29	0.07	100.00	0.668	766	690	19.335	0.55
WP001	13-Nov-98	11:00	1022	Combined	Producing	Csg	21.93	0.46			2.24	75.03	0.28	0.06	100.00	0.667	766	690	19.310	0.55
WP001	30-Nov-98	8:30	~	Combined	Producing	Csg	21.28	0.32			2.10	75.96	0.29	0.05	100.00	0.663	775	698	19.194	0.55
WP001	11-Feb-99	7:30	1043	Combined	Producing	Csg	21.50	0.47			2.11	75.60	0.27	0.05	100.00	0.663	771	694	19.020	0.55
WP001	23-Feb-99	15:30	1061	Combined	Producing	Csg	21.32	0.45			2.44	75.47	0.27	0.05	100.00	0.666	770	693	19.282	0.59
WP003	11-Feb-99	8:20	1044	Maules Ck	Flowing	Csg	91.63	0.05			0.35	7.96	0.01	0.00	100.00	0.936	81	73	27.104	0.00
WP003	17-Feb-99	15:00	1062	Maules Ck	Producing	Csg	22.17	0.05			47.40	30.35	0.03	0.00	100.00	1.103	308	277	31.951	0.37
WP003	23-Feb-99	15:10	1063	Maules Ck	Producing	Csg	15.99	0.07			53.23	30.65	0.05	0.01	100.00	1.134	311	280	32.844	0.27
WP004																				
WP005																				

Executive Summary

In November 2013, ALS Earth Data Pty Ltd was engaged by Santos Pty Ltd to provide well site and gas desorption analysis services for the well Dewhurst 8A in New South Wales, Australia. Gas desorption properties were measured on twenty-seven (27) core samples, with a combined thickness totalling 20.270 m collected from the cored interval of Dewhurst 8A. Additional analyses were performed on the core samples once the desorption measurements were completed.

Gas Content

Confidence in these results has been determined as high as defined in Table A in Appendix V. Total gas content, on a dry, ash-free (DAF) basis, varies between 6.51 m^3/tonne and 15.18 m^3/tonne. These results are presented in Table ES-1.

Gas Composition

Three (3) gas composition samples were scheduled for collection from each desorption sample: the first at 2-6 hours after the first desorption measurement (A), the second at 12 hours after the first desorption measurement (B), and the third at time of the final desorption measurement (C). Not all desorption samples were sampled for gas composition as scheduled due to insufficient volumes of gas produced at the scheduled times.

The C gas composition samples were not analysed by ALS Earth Data as they were suspected to contain H_2S due to foul odour. H_2S combines with any moisture in the sample or moisture that is on the columns in the Gas Chromatograph (GC) to form sulphuric acid. The acid corrodes the columns in the GC and causes major damage to the instrument. These gas composition samples were instead sent to ALS Environmental for analysis, the results are presented in Appendix II.

Only the A and B gas composition results have been reported in Table ES-2 of this report.

One (1) gas isotope sample was scheduled for collection from each of the desorption samples DWH8A_004, DWH8A_010, DWH8A_012, DWH8A_014, DWH8A_017, DWH8A_020, DWH8A_024, DWH8A_025, and DWH8A_027 for analysis; at the time of the final desorption measurement (IC). These desorption samples were not selected for gas composition analysis.

The confidence in the results for cases where the air contents exceed 40 mol% is considered low as defined in Table A in Appendix V.

Methane concentrations are between 36.90 mol% and 94.50 mol% on an air-free basis.

Concentrations of methane, higher order hydrocarbons, carbon dioxide and nitrogen for all samples are presented in Table ES-2.

ALS Earth Data

Table ES-1: Desorption Sample Properties

Sample ID	Depth From (mMD)	Depth To (mMD)	Seam/Formation	Time on Test (Days)	Reservoir Temperature (°C)*	Total Raw Gas Content (m3/tonne) #	Total DAF Gas Content (m3/tonne)	Sorption Time (Days)^	Diffusivity (sec^{-1})	Relative Density	Ash (% ad)
DWH8A_001D	512.020	512.810	Black Jack Group	116	35.0	2.61	6.51	3.84	1.92E-05	1.91	55.4
DWH8A_002D	540.220	541.020	Black Jack Group	116	35.0	4.87	8.80	4.45	1.44E-05	1.72	40.2
DWH8A_003D	541.020	541.820	Black Jack Group	116	35.0	5.84	9.13	4.45	1.57E-05	1.62	31.6
DWH8A_004D	541.820	542.590	Black Jack Group	116	35.0	5.34	8.31	5.45	1.19E-05	1.62	31.4
DWH8A_005D	545.890	546.690	Black Jack Group	116	35.0	5.26	8.81	5.38	1.20E-05	1.68	35.8
DWH8A_006D	548.700	549.320	Black Jack Group	116	35.0	3.18	8.01	6.42	7.58E-06	1.91	56.6
DWH8A_007D	550.790	551.580	Black Jack Group	116	35.0	6.94	10.32	5.31	1.31E-05	1.59	28.4
DWH8A_008D	553.850	554.560	Black Jack Group	116	35.0	7.85	10.66	3.33	2.41E-05	1.53	21.5
DWH8A_009D	590.680	591.480	Hoskissons Coal	116	35.0	7.24	9.45	5.99	1.53E-05	1.50	19.0
DWH8A_010D	594.260	595.060	Hoskissons Coal	116	35.0	6.95	8.76	12.96	7.84E-06	1.46	16.0
DWH8A_011D	597.800	598.610	Hoskissons Coal	116	35.0	6.76	8.61	5.94	1.06E-05	1.51	16.6
DWH8A_012D	599.260	600.050	Hoskissons Coal	116	35.0	7.44	9.52	4.42	1.69E-05	1.49	16.8
DWH8A_013D	649.220	650.010	Arkarula	115	49.0	7.12	9.53	3.65	1.44E-05	1.53	22.0
DWH8A_014D	651.980	652.780	Arkarula	115	49.0	7.95	10.06	2.65	2.12E-05	1.47	17.8
DWH8A_015D	896.900	897.700	Rutley Seam	113	49.0	7.60	11.09	1.76	2.48E-05	1.67	29.6
DWH8A_016D	897.940	898.740	Rutley Seam	113	49.0	11.42	13.20	0.73	5.51E-05	1.42	10.8
DWH8A_017D	898.740	899.460	Rutley Seam	113	49.0	12.05	13.81	0.43	7.30E-05	1.43	9.7
DWH8A_018D	900.590	901.370	Rutley Seam	113	49.0	13.43	14.71	0.52	7.02E-05	1.38	5.0
DWH8A_019D	908.480	909.280	Namoi Coal	113	49.0	12.66	13.90	0.39	8.15E-05	1.38	5.5
DWH8A_020D	909.280	910.040	Namoi Coal	113	49.0	14.10	15.18	0.23	1.05E-04	1.37	3.5
DWH8A_021D	910.040	910.830	Namoi Coal	113	49.0	13.76	15.02	0.28	9.48E-05	1.38	5.1
DWH8A_022D	961.890	962.360	Bohena Upper Coal	112	49.0	11.11	12.27	0.70	5.78E-05	1.37	5.7
DWH8A_023D	964.370	965.170	Bohena Main Coal	112	49.0	10.18	11.16	0.45	7.92E-05	1.40	5.3
DWH8A_024D	965.660	966.470	Bohena Main Coal	112	49.0	10.77	12.60	0.42	8.00E-05	1.46	12.0
DWH8A_025D	968.130	968.930	Bohena Main Coal	113	49.0	11.46	13.56	0.44	7.83E-05	1.45	12.4
DWH8A_026D	974.730	975.030	Bohena Main Coal	113	49.0	7.82	11.60	4.90	2.09E-05	1.58	29.5
DWH8A_027D	977.600	978.370	Bohena Lower Seam	113	49.0	11.34	13.57	0.36	9.40E-05	1.45	14.0

*As prescribed by Santos Pty Ltd

#Raw Gas Content is back-calculated from the Total DAF Gas Content using moisture and ash values from both the desorption sample and the sub sample used to measure residual gas. This is not equal to the sum of Q1 (Raw), Q2 (Raw) and Q3 (Raw).

Table ES-2: Gas Composition Results

Desorption Sample ID	Composition Sample ID	Sample Timing (Days from Time Zero)	Air Content (mol%)	Methane (mol% Air Free)	C_2+ (mol% Air Free)	CO_2 (mol% Air Free)	N_2 (mol% Air Free)
DWH8A_001D	A	0.3	4.57	92.00	0.07	5.64	2.29
	B	0.5	9.84	94.50	0.02	5.48	0.00
DWH8A_002D	A	0.3	4.57	78.90	0.03	20.00	1.07
	B	0.6	4.34	77.40	0.01	21.40	1.19
DWH8A_003D	A	0.4	2.88	78.60	0.00	19.70	1.76
	B	0.6	3.64	77.10	0.00	21.50	1.40
DWH8A_004D	A	0.4	7.01	79.70	0.00	20.10	0.21
	B	0.7	4.80	77.40	0.06	21.30	1.24
DWH8A_005D	A	0.4	2.61	72.20	0.02	26.20	1.58

I am concerned that over the years there has been a concerted cover-up with regard to the presence of Hydrogen Sulphide gas in the extracted gas and produced water. There have been a number of reports to the Regulator (EPA) with regard to the smell detection of this gas, however the Regulator (EPA) has stated publically that they have never been able to detect this gas with their sampling equipment.

I do not want to think this, but the attitude of Santos, the Regulator and others seems to want to paint those who report incidents such as smelling Hydrogen Sulphide as being either “trouble makers” or worse still “Fabricators of facts – liars”.

I believe that the written word, some of which is extracted and placed here, contained within the Gas Company and Government Records to be my and others vindication on the subject and concern over the effects of BACTERIA on all aspects both internal and external of the NGP CSG infrastructure.

Supplementary Chapter 15

Leewood Ponds liner security possible problems

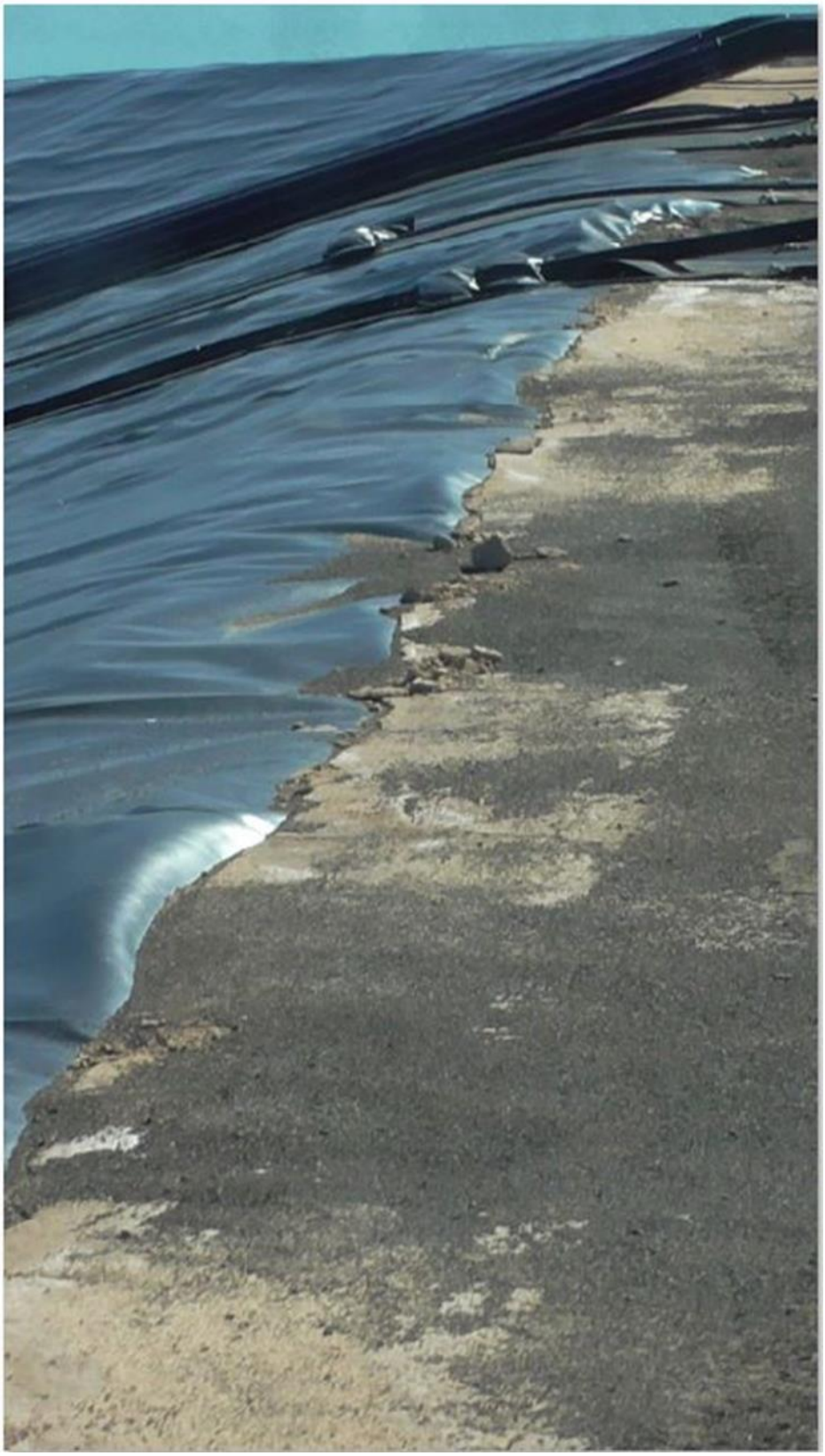
During the IPC Tour of July 6th 2020 of the Leewood Facility notably the 'Ponds' it was observed that a large amount of loose cement was at the top of the liner at a location where a trench was dug and the liner end was secured.

If my memory serves me correctly the liner was held in place by a fill that consisted of dry cement being mixed with a crusher material being placed in the trench and then watered to set the cement/crusher material mix. This material can be seen in the first lot of photographs, along with the trench with the liner in it and the trench once filled with the dry cement/small crusher material compacted by rolling awaiting 'watering'.

How do I know all this and have legal photographs? Because on the 8th of January 2014 Santos took only me on an extended tour of the Leewood Ponds site while they were being constructed. I had a full briefing on all aspects of the ponds and how they were constructed including the way the liner sections were joined (a process not unlike that which carpet layers use), how the leak detection system was intended to operate. I have 18video and 70 images of the personalised tour all totalling 447 Mb. This tour was in the days when I believe Santos was trying to "groom" me.

INTEGRATED

The following are pictures of the same trench taken on the IPC Tour of 6th July 2020.



So what is my concern? That the liner is shifting due to expansion caused by temperature changes and wind also water movement when filled, this movement has caused the liner to pull away from the cement/crusher material as a result this movement has caused the cement combination to break up into pieces which are large enough (see image) to puncture the liner material should they roll down the dam wall and strike the base at the right angle.

The Leewood ponds have the potential to be an accident waiting to happen in regards to liner leakage into the water table below.

Wind whipping the liner up when the ponds are either low or empty is a real problem as this has the tendency to drive the two outer liners into the inner lattice work which is not as continuous as the liners but joined together with Zippy ties and has sharpish ends. On a windy day the liner moves in and out banging down on the inner lattice, how long the ponds will remain secure and water tight is any ones guess.

How long before the liner pulls out of the securing trench is again any ones guess, but judging from what I saw on the Tour and given the Santos warning about not touching the liner it will not be long.

Just seeing the broken cement mixture adjacent to and on the top of the ponds walls must be ringing alarm bells with the IPC in regards to the attitude Santos has towards preventative maintenance, because they should have removed any material that could potentially cause damage to the ponds Integratory and they did not.

I also believe that the type of pond construction in the types of soils that are around and in the Narrabri Gas project area do not lend themselves to large scale dam/pond construction.

This is based on the well-known fact that when there is a water leak the soils just melt away forming large undetectable holes under the covering material, in this case the bottom liner and these holes are just waiting to cause problems should the covering material be punctured.

Santos knows of the problem as I escorted two Santos employees to a pond site at the Bohena South and showed them back in April 2012.

Conclusion

I have done my best to be factual and accurate in both the Original and in this Supplementary Submission as such it is now time to finish off this Supplementary Submission and trust that the IPC and the Minister will do the right thing and reject the Narrabri Gas Project and request of Santos to resubmit a new Application once Santos has all the required long term baseline data covering all aspects of the Narrabri Gas project, The Great Artesian Basin and the Recharge area and especially the Gunnedah/Oxley Basin along with the Coal Seams.

Acquiring this information the run and then trying to fix the problem is not the correct way of doing a project of this scale which has the potential to cause long term harm to much of the environment and many people's livelihoods.

Thankyou

Mr A J Pickard.
10th August 2020.