<table>
<tr><th>Submitter</th><th>Submission</th><th>Draft Response</th></tr>
<tr><td>DECCW</td><td>Unable to support the proposal in its current form because the loss of approximately 100 Prickly Bush-pea individuals and 0.66ha of habitat is not considered to maintain or improve environmental outcomes for the species.</td><td>
There is a significant difference between what Niche identified and described at the site and the data that DECCW are relying on. The species is far more abundant than officially recognised. The large size of the populations of this species is readily attested to by people who work in the area from both mining companies and Government groups.

Populations of Pultenaea aristata within the region are not uncommon and, in suitable habitat the species is often found to be a dominant shrub, in excess of thousands of individuals (pers. obs.). There are many known large populations of this plant species occurring within the O'Hare's Creek Catchment to the south west of the borehole site (pers. obs.) which are not included in the NSW Wildlife Atlas data illustrated on Figure 4 of Niche Environment and Heritage (2010), indicating that the NSW Wildlife Atlas does not include all known records in the local area. A search of some recent reports detailing survey work for Pultenaea aristata within the regional catchment areas illustrates the density of local populations of the species in the region:
<table>
<tr><th>Location</th><th>Estimated population size of Pultenaea aristata</th><th>Report</th></tr>
<tr><td>Dendrobium Area 3, east of Lake Avon and west of Lake Cordeaux</td><td>Density estimate of ~27,550 individuals per ha (average of 177 to 424 plants per 10 x 10 m quadrat) within upland swamps.</td><td>Biosis Research (2007) Dendrobium Area 3 Species Impact Statement. Report for BHP Illawarra Coal. October 2007.</td></tr>
<tr><td>Dharawal State Conservation Area, east of Appin</td><td>Estimated population size of 2,000 plants.</td><td>Biosis Research (2007) Dendrobium Area 3 Species Impact Statement. Report for BHP Illawarra Coal. October 2007. Data</td></tr>
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		quoted within above report from Biosis Research (2007) *West Cliff Colliery Stage 3 Coal Wash Emplacement Species Impact Statement.* Biosis Research, Sydney
O'Hares Creek Catchment, Woronora Plateau,	Widely dispersed and locally common in the east of the study area. Estimated around 20 plants in marginal habitats to many thousands in suitable swamps. Large populations in the order of thousands of plants are common.	FloraSearch (2009) *Illawarra Coal Bulli Seam Operations Project Terrestrial Flora Assessment*. Prepared by Colin C. Bower PhD. July 2009.

It is stated in Niche Environment and Heritage (2010):

The species was found to be a common shrub species both along the access track and at the borehole site as well as in the vegetation surrounding these areas. It was therefore not possible to either map the extent of the local population of this species or to accurately record the population size. It is estimated that many hundreds and possibly thousands of individual plants occur in the locality with only a small proportion of this larger population being subject to disturbance by the proposal.

The DECCW estimate of 'a local population size upwards of 269 individuals' is likely to be an underestimate. The impact of the proposal on the local population of *Pultenaea aristata* is likely

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		to be minimal given the extensive population in the immediate vicinity of the proposed disturbance and the fact that this species is known to colonise disturbed areas, as shown by the large numbers of the species recorded along the previously cleared fire trail in the Niche Environment and Heritage (2010) survey and assessment. Therefore, it is highly likely that the individuals impacted would recolonise after rehabilitation works have been undertaken along the access track and at the proposed borehole site. **The following is a quote from the Niche Flora and Fauna Report included in the EA.** **The species (Prickly Bush-pea) is often associated with the upland swamp vegetation complex and has been recorded from several locations within the sub-communities of Banksia Thicket and Restioid Heath. The species is also known to occur in association with areas of impeded drainage and creek lines within sandstone woodland and gully forest plant communities (NPWS, 2003).** **The species was found to be a common shrub species along the access track and at the borehole site as well as in the vegetation surrounding these areas. Niche estimated that many hundreds and possible thousands of individual plants occur in the locality with only a small proportion of this larger population being subject to disturbance by the proposal.** **This species is known to occur in localised but none the less quite large populations on the Woronora Plateau with some populations estimated to be in the thousands and possibly tens of thousands.**
Sydney Catchment Authority.	SCA has concerns about the proposed borehole location. The SCA has an established preference that any mining exploration activities proposed for SCA land, including site access, should be located on previously disturbed or cleared sites and only where the environmental assessment can demonstrate that the proposed activities are likely to have a neutral or beneficial effect on water quality.	**Apex selected the proposed site based on the need to determine gas presence in this area and the existing disturbed nature of the vegetation. Apex acknowledges that vegetation will be disturbed but also emphasises that the proposed site is centred on the closed fire trail that supports regenerating vegetation. The closed road has previously been disturbed.**

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	As establishing the proposed borehole and site access will require primary vegetation disturbance and re-clearing along a closed fire road, the SCA would prefer the borehole not be located as proposed. The SCA has no operational reasons to re-open the fire road. The SCA is also aware that Apex has identified and evaluated an alternative strategy for obtaining their required information from a previously approved borehole (AI06)	**The site and access track will be rehabilitated at the completion of activity in the area.** **It is incorrect to state that Apex has an alternative strategy for obtaining their required information from a previously approved borehole (AI06). Apex understands that the SCA view is based on an internal Apex report that identifies AI06 as a fall back option if AI19 is not approved.** **Apex already has approval for 15 exploration boreholes, including AI06. Borehole AI19 is subject to a current application (not yet approved) to modify the original project approval for the 15 boreholes. It is prudent planning on Apex's behalf to have alternatives should AI19 not be approved for proper and correct reasons. The document that SCA refers to does this. However, it clearly states that:** • **AI19 is an ideal location.** • **AI06 will not give the same extent of resource definition as AI19. The coverage is reduced by approximately 28 square kilometres and potential reserves of 20 PJ.** **AI06 is a possible contingency site only and is only relevant should AI19 not be approved for fair and valid reason. It is not an alternative for obtaining the best information.**
Sydney Catchment Authority.	SCA is aware of the DECCW submission which does not support the current proposal due to the potential impacts on Prickly Bush-pea which is listed as threatened under the Threatened Species Conservation Act 1995. The SCA considers the impacts identified by DECCW are not considered consistent with the protection of ecological integrity, which is one of the SCA's main goals in the management of the Special Areas.	**Covered by meeting with SCA/DECCW.**
Sydney Catchment Authority.	If the above objections by SCA are not accepted, the SCA recommends that the following issues be considered. Soil and Water management be undertaken in accordance with that described in the EA.	**Emphasises the need to establish that AI19 cannot be replaced by AI06.**

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	The SCA then state that, "As borehole AI06 is located at a cleared site with appropriate access, the SCA recommends this modification application not be approved".	
NSW Office of Water	Provided comments with the following recommended conditions of approval that are additional to those already imposed by the original determination for the project. An authorisation under the *Water Act 1912* or the *Water Management Act 2000* is to be obtained from the NSW Office of Water with the appropriate purposes identified for any activity relating to the taking of or interception of groundwater prior to that activity commencing. Structures for the containment of drilling water and produced groundwater are to be either above ground or fully lined. Off-site disposal of these materials should be addressed in the Water Management Plan. Construction of all wells must be undertaken by a driller holding a water driller's licence, valid in New South Wales. A groundwater quality and quantity monitoring plan is to be established and maintained which incorporates a monitoring schedule and adopted parameters to be monitored and agreed to by the NSW Office of Water. • The monitoring program should establish appropriate sites for monitoring bores. • Monitoring bores should monitor discreet aquifers and not be open hole. All major aquifers should be monitored using data loggers, with emphasis on the aquifers where extraction occurs or the environment relies on groundwater (e.g. baseflow to rivers, Groundwater Dependent Ecosystems). • The monitoring program should include reporting of water level and quality in both the target and overlying aquifers. • The results of the monitoring are to be reported to the NSW Office of Water regularly, at a frequency consistent with the reporting arrangements required by other authorities or agencies to avoid duplication of effort where practical.	**Apex will utilise the services of a licensed group to dispose of all drilling water and produced groundwater. Transpacific Industries Group Limited of Unanderra has been approached to provide these services. They have advised that water with less than 20% solids can be disposed at either Transpacific Waste Services facility in Homebush or at the LVRA facility in Appin. These facilities can receive up to 60 tonne and 20 tonne per day respectively. Material that contains greater than 20% solids can be taken to the Transpacific Technical Services facility in Newcastle.** **The mud pits and drill sumps would be constructed by excavation into the Hawkesbury Sandstone. These pits and the sump are on a small scale (totalling less than 100 cubic metres in volume) and are designed to enable accurate monitoring to identify if losses of recirculating water are occurring or inflows of water are being experienced. The Apex Groundwater Contingency Plan details how water levels in the mud pits and drill sump would be suitably monitored to detect small volume losses or gains. SCA, DECCW and NOW have never before required the lining of mud pits and sumps during drilling operations on the Woronora Plateau because it is commonly accepted that the transmissivity of the weathered Hawkesbury Sandstone was sufficiently low.** **Well construction will be undertaken by a driller holding a water driller's licence, valid in New South Wales.** **The Soil and Water Management Plan details under what conditions monitoring of the both the quantity and quality of produced groundwater would be undertaken in this Exploration Program and has assessed the maximum degree of loss of drilling fluid to any aquifers encountered.** **The assertion that there are 'coal seam aquifers' in the**

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		Southern Coalfield is untrue. The typical maximum storativity of such seams is well know from underground mining assessment and is of the order of 3 – 4% and the horizontal transmissivity of such seams is very low. It has been known for over 100 years that the Southern Coalfield is not characterised by 'wet coal seams'. This supposed issue (of 'coal seam aquifers') has been comprehensively assessed, and debunked by Dr. Noel Merrick and other competent hydrogeologists in various reports which are in the public domain and are known to have been provided from time to time to NOW. **Establishment of a 'network of monitoring bores around the site to collect baseline data' would be highly complex (requiring the packing off of water-bearing intervals and numerous other construction detail demands). It would also require additional disturbance to the exploration sites, which would contradict the objective of minimising disturbance during exploration activities.** **Given that there are no recognised aquifers in the Southern Coalfield, the demand by NOW for a water quantity and quality monitoring plan to support what is just an exploration program is unrealistic and unreasonable. Apex make this statement supported by the knowledge that the exploration proposals are in detail little different to numerous prior coal seam quality and seam gas content assessment programs carried out in the same area over the last century, none of which have caused any adverse hydrogeologic impact.**
Heritage Branch NSW Planning.	The Heritage Branch has no comments.	**No response required.**
NSW Industry and Investment.	I&I NSW supports the proposed modification subject to the following 7 conditions being met. • A Surface Disturbance Notice must be submitted to I&I prior to commencement of any activities on site. • Clearing of intact native vegetation communities should be avoided, or at least minimised.	**Apex will submit Surface Disturbance Notice as requested.** **Proposals are based on avoiding or minimising disturbance to intact native vegetation.** **Drilling proposals incorporate isolation of encountered aquifers.**

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	• Aquifers encountered in the drilling must be isolated to ensure there is no mixing of waters. • Boreholes when no longer required must be grouted for the full length of the hole ensuring (1) isolation of aquifers, (2) no gas is escaping, and (3) mine safety. • A method of determining rehabilitation success must be described in the Surface Disturbance Notice. • Before and after photographs are to be submitted with the Exploration Rehabilitation and Relinquishment Report (EDG13), which is required upon completion of the Exploration Program.	**Boreholes no longer required will be grouted for the full length.** **Surface Disturbance Notice will include methodology for determination of rehabilitation success.** **Before and after photographs will be submitted with the Exploration Rehabilitation and Relinquishment Report which will be submitted at the completion of the Exploration Prgram.**
Wollongong City Council.	To ensure that all the recommendations in the consultant's report are complied with.... it is recommended that all the proposed activities be supervised and certified by a qualified environmental consultant.	**The following management structure is included in the Environmental Management Strategy adopted by Apex for the proposed Exploration Project.** **The Apex Energy NL (Apex) Gas Exploration Project was approved by the Minister for Planning on 23rd September 2009 under the Environmental Planning and Assessment Act 1979. Since that time Apex has investigated bringing involvement of other groups into the Project, and an operating structure has now been agreed to enable implementation of the project. This section describes that structure.** **A Farm-in and Purchase Agreement was concluded between Apex and Ormil Energy Limited (ASX OMX), and its operating subsidiaries, in September 2010. Subsequently the Petroleum Exploration Licences 442, 444 and 454, plus other interests in the southern Sydney Basin, are held 80% by Apex and 20% by Ormil Energy (via subsidiary Sydney Basin CBM Pty Ltd). In addition, under the farm-in and Joint Venture arrangements, Ormil shall fund a three staged Works Program for a total $10.5 million to earn up to a further 30% interest.** **Ormil Operations Pty Ltd (subsidiary of Ormil Energy Ltd) has been appointed the Project Operator and an oversight Committee will be formed under the Joint Operating Agreement.** **The parties have appointed Mr Gerard Pol as Exploration**

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		Manager under the Petroleum (Onshore) Act 1991 and he holds the same position on behalf of the Joint Venture to manage the operations in accordance with their objectives. **The Apex Energy/ Ormil Energy Joint Venture will establish the following Project Management Structure to ensure that the objectives of this EMS are met.** **The JOA Committee will manage the project on behalf of the Joint Venture partners.** **The EM will have the day to day responsibility of ensuring that all site activities are undertaken by employees and contractors in accordance with this EMS.** **The Joint Venture Exploration Manager (EM) is responsible for all matters relating to Environmental Management of the Project.** **The EM will appoint or commission environmental experts for any advice and recommendations in order to undertake an internal auditing/inspection and consulting role as required.**
	The Vegetation Clearing and Rehabilitation Management Plan should include the requirement for an ecologist who is familiar with Pultenaea aristata and Cryptostylis hunteriana to be present on site during clearing operations. Ideally, a rapid, pre-clearing survey should be carried out by the ecologist prior to commencement of clearing.	**Apex has always proposed a Pre-construction site inspection involving a number of stakeholders including a qualified ecologist. One of the objectives of this inspection was to confirm that identified species were avoided during clearing. The Pre-construction site inspection would define the final site layout and Apex will circulate copies of the Final Site Layout following the Pre-construction site inspection.**
	The Vegetation Clearing and Rehabilitation Management Plan should also refer to DECCW (2009) Infection of Frogs by amphibian chytrid causing the disease chytridiomycosis and Threatened Species management Information Circular No 6- Hygiene Protocols for the Control of Disease in Frogs. A Hygiene Protocol according to these publications should be included in the Plan.	**Apex would be prepared to discuss this matter with DECCW and SCA at the Pre-construction site inspection and act according to their requirements. The Environmental Assessment does not identify Frogs as being susceptible to the activity. In addition DECCW have not raised this issue. The cited materials apply to collection of frog and tadpole specimens and do not appear to be relevant to the proposal.**

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	Visibility splays at the access entrance are to be maintained in accordance with AUSTROADS, "Guide to Traffic Engineering Practice, Part 5: Intersection at Grade".	**All traffic display signs will be maintained as specified by Council and RTA requirements.**
	The proposed security gate at the intersection of the fire trail is to be located at least 12.5m back from the road to allow vehicles to wait safely without obstructing traffic while the gate is unlocked and opened. The proposed gate should be designed to open inwards so as not to obstruct a waiting vehicle.	**This can be implemented provided SCA agree.**
Otford Protection Society. Typical submission. Felix Bronnenberg.	Apart from the extensive bushland clearing and risk of pollutant waste water, exploration will lead to applications for commercial extraction – an – enterprise that should never be allowed in such a highly biodiverse conservation and water catchment region. The risk of methane and heavy salt poisoning the catchment, combined with subsidence is far too great.	**Apex has adopted a site selection process based on avoiding or minimising disturbance to intact native vegetation.** **The exploration program will not inevitably lead to an application for commercial extraction. It will determine whether there is potential for commercial extraction and what that could possibly be.** **Commercial extraction would require a new application and assessment procedure and Apex have always understood that to be the case. If an application is made for commercial extraction Apex would follow all the appropriate procedures for making the application and undertaking an Environmental Assessment, including issues of pollution and subsidence.**
Otford Protection Society. Typical submission. Ian Fletcher. Ron Hensen. Guy Reynolds. Simone Seeley. Julius and Felicity Timmerman.	The Sydney Water Catchment land is also home to several endangered wildlife species and forms part of the essential remaining wildlife corridor linking the National Parks to the Illawarra Escarpment and Dharawal SCA. To fragment it further by clearing bushland and fencing will place these species in greater jeopardy.	**The proposal for an exploration well at AI 19 does not fragment bushland in a way that affects wildlife corridors. Apex's EA has identified endangered flora and fauna matters and provides appropriate management responses for any identified issues.**
Otford Protection Society. Typical submission. Felix Bronnenberg.	It should also be noted that Borehole AI19 is stated as a Borehole type 3. The current EA statement only briefly refers to early clarifying documents, however, Type 3 Boreholes (as per Apex Energy's documentation) require hydraulic fracturing (fraccing) as the drilling will take place on unworked coal seas devoid of 'goaf' gas.	**Exploration borehole AI19 will not require fraccing.** **Apex Energy NL intends to carry out business in an environmentally and socially sustainable manner. The company does not intend to utilise the well completion**

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		technique known as hydraulic fracturing (fraccing) in PEL's 444, 442, 454 and any other area in the Sydney Basin.
Denis Wilson.	Risk of contamination of groundwater.	**Apex has assessed the potential for groundwater contamination and in accordance with the original approval for 15 exploration bore holes are required to prepare a Water Management Plan. This Plan has to be submitted prior to the commencement of construction activities at the first borehole site. It must include measures to minimise impacts on groundwater quality, including the potential for cross-contamination. It must include a Groundwater Contingency Plan to address groundwater brought to the surface that exceeds the capacity of on-site detention structures. It must be prepared in consultation with SCA and DECCW by a qualified expert. A draft of the Plan is currently being discussed with SCA and DECCW prior to submission to DoP.** **Apex has understood that the proposed additional borehole AI19 will be subject to the same condition if approved.**
Denis Wilson. **Jeremy Townend.** **Greer Taylor.** **Anthony Phillips.** **Daniel Osborne.** **Eleanor McPhee.** **Anne Kennedy.** **Nikki Hensen.** **Karin Hensen.** **Catherine Hensen.** **Patricia Gauci.** **Maurice Dowson.** **Juliet Dingle.** **Stephen C Dillon.** **Ben Crosby.** **Kay Blanch.** **Heather Fisher.** **Heather Seigh.**	Requests Department of Planning to immediately stop all Part 3A applications.	**Decision for Department of Planning.**

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Denis Wilson. Jeremy Townend. Greer Taylor. Anthony Phillips. Daniel Osborne. Eleanor McPhee. Anne Kennedy. Nikki Hensen. Karin Hensen. Catherine Hensen. Patricia Gauci. Maurice Dowson. Juliet Dingle. Stephen C Dillon. Ben Crosby. Kay Blanch. Heather Fisher. Heather Seigh.	Requests Department of Planning to include all previous submissions opposing inappropriate development in this area.	**Decision for Department of Planning. Apex does not agree with the contention that exploration in this area is inappropriate development.**
Denis Wilson. Jeremy Townend. Greer Taylor. Anthony Phillips. Daniel Osborne. Eleanor McPhee. Anne Kennedy. Nikki Hensen. Karin Hensen. Catherine Hensen. Patricia Gauci. Maurice Dowson. Juliet Dingle. Stephen C Dillon. Ben Crosby. Kay Blanch. Heather Fisher. Heather Seigh.	A two week period for submissions on such an important issue is clearly not in the public interest. I look forward to the premier personally intervening to stop this project.	**Decision for Department of Planning. Apex has followed the legislated procedures for Project Application and Application to Modify a Project Approval. This submission topic should be reviewed in light of this being a modification application that has been subject to a review process involving public submissions. The original Project Application was on public display for a longer period (approximately 1 month in early 2009).**
Greer Taylor.	Fraccing puts the environment at risk.	**AI19 proposed modification does not include fraccing. Nor**

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Karin Hensen. Maurice Dowson. Ian Fletcher.		**does any exploration work for the already approved 15 boreholes.**
Karin Hensen.	Opening cracks in the surface rock can only further exacerbate the loss of water from dams.	**Apex does not expect that undertaking AI19 (and the already approved 15 boreholes) will result in cracking of surface rock.**
Maurice Dowson.	The film GasLands exposed the hitherto unrecognised risks to public health, drinking water supplies and un-audited releases of methane to the atmosphere.	**Apex has assessed environmental impact in a scientific way and does not expect adverse public health or water quality impacts as a result of construction and operation of AI19.**
Juliet Dingle.	There are too many unknown consequences of gas seam mining associated with groundwater quality and quantity.	**Groundwater quality and quantity impacts will be managed in accordance with Water Management Plan as discussed above.**
Juliet Dingle.	The gas mining companies should not be allowed to make enormous profits and breach MSDA and pollution regulations at the cost of our present and future wellbeing.	**Apex plans to comply with MSDA (Material Safety Data Sheet) and pollution regulations. Apex will be investing (not making enormous profits) during the exploration phase. The data will be made available to the Stage Government and will provide base data for future energy sources for the State.**
Total Environmental Centre.	The process to develop the NSW Coal and Gas Strategy has commenced. The TEC have outlined their position in the formulation of the Strategy including a moratorium on new CSM extraction in NSW, and establish areas that are off-limits to longwall mining and CSM extraction including Sydney's Metropolitan Special Areas.	**Apex is not aware of any moratorium on new CSM extraction projects in New South Wales.** **.**
Total Environmental Centre.	The proponent's previous project approval in this area appears to have breached some very basic conditions of its approval. A number of plans were required of the proponent and environmental monitoring plans and results were required to be displayed on the company's website. As of February 2011, the proponent had still not displayed any results and in September 2010 stated that no fieldwork had taken place. Not only is this a breach of the consent conditions for the initial project but also it denies the public and other entities the ability to properly assess the current proposal in what is a highly sensitive environment. This is unacceptable.	**Apex acknowledges that it has to prepare a number of plans. These plans have to be produced generally, "prior to the commencement of construction activities at the first borehole". Construction activities have not commenced and consequently Apex has not breached the Project Approval. Drafts of all the plans have been submitted to the Department of Planning for review and discussion. Plans that are being developed in consultation with SCA and DECCW have been forwarded to those organisations for similar review and discussion. Following review and discussion, these plans will be finalised and lodged with the Department of Planning for approval as required by the Project Approval dated 23rd September 2009, prior to the commencement of construction activities.**

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		In addition, they will be made available on the company web site once they have been approved. This is also in accordance with the Project Approval.
Total Environmental Centre.	TEC also believes that no boreholes or the clearing of native vegetation for these should encroach upon upland swamps in the project area. Twelve of the fifteen boreholes proposed appear to be in close proximity to upland swamps.	**Apex will install water control systems to avoid adverse impact to any nearby swamps. The access track to AI19 traverses an area identified as Upland Swamp, but the access track will follow the existing alignment of the closed fire road and will avoid clearing any new alignment.** **In relation to the 15 boreholes already approved the area of Upland Swamp potentially affected is a maximum of approximately 0.56 ha. It is emphasised that this is the maximum potential area potentially affected. Final site design and operational layout will minimise the area eventually affected.**
Total Environmental Centre.	The details of how much contaminated groundwater will be brought to the surface where it will be transported and the impacts of truck movements on what have until now been little used fire trails is also insufficient. The project should not be approved unless the chances of an overflow of groundwater in extreme rainfall are completely nullified.	**Apex believes their proposals for groundwater management as described and committed to in the Water Management Plan address groundwater impacts. It is acknowledged that the Water Management Plan is currently in draft form, however it will be finalised in consultation with DECCW and SCA before approval by the DoP.**
Total Environmental Centre.	With policy in this area steering towards an examination of cumulative impacts, TEC recommends that consideration of surface disturbance by pipelines, holding ponds, contaminated groundwater etc. Be undertaken in the context of a fully functioning gasfield, which according to the proponent's website is clearly what the company expects approved. The impacts of the existing longwall mining operation in the project area should also form part of this consideration.	**Apex contend that the impacts need to be assessed for this project i.e. exploration well AI19. Should the exploration prove encouraging any further work (which could be additional exploration to the already approved 15 boreholes or a gas production exercise) would be subject to another application, environmental assessment and project approval process. Mining at AI19 was undertaken approximately 20 years ago and used the pillar extraction method. AI19 is targeting a remnant coal pillar and is not subject to any influences from longwall mining.**
Peter Turner.	The assessment of the exploration well proposal should include an assessment of that well then becoming a production well. It would be folly to approve a gas mining exploration well without assessing whether the project area was suitable for subsequent gas extraction by horizontal hydraulic fracturing or fracking.	**The exploration borehole at AI19 will be filled with cement at the completion of exploration. If the site is to be used for any future gas extraction a new borehole would be required and a new Project Application and associated Environmental**

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	Apex Energy documents indicate that fracking would be used at the well for which approval is being sought, well AI19, should that well prove commercially viable. Further, as is now recognised in the US and UK, the full project envelope and its likely cumulative impacts have to be taken into consideration, and not just the individual well being considered for approval. A 'case by case' approach is inadequate, irresponsible and not in the public interest. A recent edition of the ABC Four Corners documentary series has highlighted the 'foot in the door' approach of gas mining companies.	**Assessment and approval process would be initiated.** **Fraccing will not be used for AI19 exploration. It is not Apex's intention to use fraccing for future gas extraction.** **This is not a foot in the door approach. Apex needs to determine gas reserves in order to decide whether a viable gas project is possible. This decision will include environmental as well as commercial considerations.**
Peter Turner.	The submission lists a number of shale gas mining areas where moratoria have been implemented and inquiries initiated. The submission then goes on to state, "Shale gas and coal seam gas (CSG) mining have in common the technique of horizontal hydraulic fracturing or 'fracking'. Apex documents show that the company will use fracking at the AI19 well and other wells should they prove commercially viable, as anticipated.	**Apex will not be using fraccing at AI19 during exploration. It is Apex's intention to not use fraccing for future extraction should a gas extraction project ever be proposed.**
Peter Turner.	A moratorium on coal seam gas exploration and mining in the Illawarra, NSW and Australia should be put in place until an independent and comprehensive inquiry establishes the requirements and boundary conditions for environmentally safe and financially viable operations. The broader impacts of gas mining must also be considered, including the green-house gas footprint.	**Apex has the PEL and associated rights to explore for gas. It has yet to establish that a viable gas reserve exists. It does not have the right to develop a gas extraction project. This right would only be properly granted by appropriate review and assessment of any proposal by State and Federal Governments and the acquisition by Apex of appropriate Mining Title.**
Peter Turner.	The submission lists the following impacts and hazards associated with CSG mining and fracking. • Aquifer contamination by fracking fluid additives and contaminants leached from strata, including naturally occurring radioactive materials. It's recently been reported that only two of the more than twenty chemicals used for fracking in Australia have been assessed by the national industrial chemical regulator. In NSW there is currently no regulation of fracking. • Catchment contamination by so called produced water returned to the surface for storage or treatment. The amount of fluid returned varies between 15 and 80 percent of that injected. • Drainage of surface waters and aquifers. Departmental advice to the federal government expresses concern that the Great Artesian Basin aquifers may not recover for 1000 years. • Sourcing, use and contamination of very large volumes of water that will	**Fraccing will not be used by Apex for AI19 during exploration. It is not Apex's intention to use fraccing for future gas extraction exercises. Consequently, the comments about returned water volumes and impacts on the great Artesian Basin are not relevant to this application.** **Fraccing will not be used. Apex water consumption estimates are able to be supplied as required by water tanker. Consequently, there will not be high levels of traffic either.** **Apex has considered rig noise during drilling of AI19. (Refer Section 4.6 and Appendix 3 of EA). Apex will incorporate management practices to reduce noise levels. Monitoring will also be undertaken to confirm noise criteria are achieved. Action will be undertaken to address noise issues and should**

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	subsequently require treatment. Each stage in a multi-stage hydraulic fracturing requires some 1 to 2 megalitres of water and the entire multi-stage fracturing operation for a single well requires around 9 to 29 megalitres of water. A single site may have six production wells, requiring between 54-174 megalitres of water for the first fracking operation. The fracking may later be repeated. • High levels of truck traffic associated with water delivery and/or its removal for treatment. • Rig noise in the vicinity of dwellings. • Methane gas emissions from leaking wells, inadequate capping of abandoned wells, ground fissures, storage tanks and gas pipelines. • Methane is a highly flammable gas and the Apex Energy gas wells are in a high conservation value area that will suffer increasing numbers of severe bush fires as a result of global warming.	**they not be able to be rectified, drilling would be limited to periods where criteria are met after implementation of amelioration measures.** **Apex intends to carry out all operations including well design, construction and maintenance in line with best industry practice under the supervision of appropriate government agencies. Apex has a current well situated within PEL444 that demonstrates the standard of construction intended and demonstrates the ability to construct sites that are fit for purpose, including fire prevention and protection aspects. Apex has already consulted with RFS officers in the Illawarra and Wollondilly areas on fire prevention, protection and fire proofing and any future operations and/or construction will occur following proper risk management and consultation with key stakeholders. These measures are required by law.** **SCA in their response dated 2/3/11 state that they consider the fire prevention and protection measures proposed by Apex to be adequate. The SCA would require Apex to meet its requirements relating to Bushfire Season and Hot Works on SCA land. These requirements should be specifically included in a Project Commitment or Condition of Approval. Apex supports this requirement.**
Peter Turner.	The new well is identified as AI19 and is located within the upper reaches of the Forest Gully catchment, and is within a Sydney Catchment Authority Special Area. The envelope of the Apex Energy project submitted in 2007 (07_0103) encompasses PEL 442 and PEL 444 and CCL703 though a joint venture agreement with Peabody Energy. Apex documents from 2010 relevant to and discussing the joint venture and its future confirm Apex aspirations to mine gas in CCL703, with the cooperation of joint venture partner Peabody. These plans include pipelines and a gas fired power station near Darkes Forrest. CCL703 includes the Metropolitan mine expansion area approved in 2009, and his are lies under Woronora Dam and is catchment water ways, including the Waratah Rivulet. The now damaged Waratah Rivulet has in the past supplied about 29% of the water flow to Woronora dam.	**Apex Energy NL has a JV with Peabody only in relation to Metropolitan Colliery tenures. No JV exists between the companies for any other areas. Apex's relationships with other organisations are clearly stated on its web site www.apexenergy.com.au.** **The Apex document frequently referred to is an internal document referring to Apex's ongoing feasibility studies and its relationship with Metropolitan Colliery. The Sydney Morning Herald report on this JV and actions taken in relation to Part 3A submissions is incorrect. The contradictions in Apex's response to the Sydney Morning Herald article result from the article's inaccuracies. Apex provided the SMH with written**

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	The project for which Apex Energy is now seeking an expansion was approved in 2009, the same year that the Metropolitan Coal Project proposal to expand the Helensburgh coal mine was approved, again following delegation by then Planning Minster Keneally. That is, both projects were being assessed by the Department of Planning at much the same time. Although in the same area of the Illawarra, neither project assessment and approval makes reference to the other. It is now widely known that the Metropolitan Mine expansion proponents, Peabody Pacific, are joint venture partners in the Apex Energy project and that Peabody have sought to keep their association with the gas mining project hidden from public attention in order to avoid scrutiny and hindrance to their project application and mining activities in the area. This included the temporary withdrawal from the Apex Gas exploration Project application of three well sites on areas operated by Peabody, specifically to avoid any " ... *possible disruption to the then Metropolitan mine Part3A (now approved)*" and " *Subsequently Peabody asked Apex if it would remove the three planned wells on CCL703 from its application so as not to provide added complication for the mine in its planning approval process.*" The intention being to reinstate those three wells at a later date. That the two projects were each considered for approval in isolation, knowing their relationship, reflects a serious lapse of responsibility on the part of the NSW Department of Planning. The response from Apex to the Sydney Morning Herald reporting of the Apex, Peabody and Department of Planning discussions, directly contradicts Apex documents, and so calls into question their credibility. The Southern Coalfield Inquiry (SCI) and the 2009 NSW Planning Assessment Commission review of the Metropolitan Coal Project (MCP) make clear the damage caused by longwall mining in the Illawara, and this includes ruptured and drained watercourses, and the release of methane and carbon dioxide gases. The 2009 mine expansion review notes "*The environmental consequences for watercourses impacted by subsidence can be severe. There is abundant evidence of this in the reaches of the Waratah Rivulet that have been undermined by previous longwalls.*" The Waratah Rivulet is within CCL703, where Apex Energy aspires to mine gas, including the use of fracking. Gases released by mining activity travel upwards through any cracks in the strata and may escape from surface fissures. Where the cracks emerge under surface waters, gas bubbles can be seen. The Southern Coalfield Inquiry documents include photographs of gas bubbling out of the Cataract and St	**responses to questions and spoke verbally to the SMH reporter Apex's information was not incorporated into the article. Furthermore, the SMH were provided with a written response to its inaccurate reporting (see Apex web site news articles) and declined to publish this response.** **In consultation with Metropolitan Colliery management and immediately prior to the submission to the DoP of both Part 3A applications, it was recognised that the extraction of gas from Metropolitan Colliery tenures for commercial use had not been addressed. For this reason Peabody consulted with Apex to assess the criticality of the three potential borehole sites sited on CCL703 contained within Apex's preliminary submission. Subsequently Apex determined that the three sites were low priority and indeed impracticable. Two of the three sites in question were in the path of the new longwall blocks and the third site was in a highly geologically disturbed region. Therefore in consultation with the DoP, Apex withdrew its application for these three sites from its final Project Application and proceeded with 15 potential sites in its Part 3A submission.** **Any future CSG activity within the boundaries of the Metropolitan Colliery tenures would be subject to further planning activities and subject to stakeholder approval.** **Apex must assess project feasibility. Apex has done many desk top studies of the regions in which it operated including the Darkes Forest and Helensburg areas. However, these studies are simply desk top studies as stated in the documents. Clearly any desk top study only represents a high level assessment of possibilities and would be subject to far more in depth future studies and stakeholder consultation. Apex holds Petroleum Exploration Licenses granted by the NSW Government. These licenses not only entitle Apex to explore and assess feasibility, they require Apex to explore and assess feasibility. The desk top studies and other exploration activities are in accordance with these obligations placed on Apex by the terms of the licenses.**

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	Georges rivers. The southern coal fields suffer both conventional and non-conventional subsidence, and the MCP review makes it clear that non-conventional subsidence is poorly understood and cannot be reliably modelled or predicted. The expansion of the Metropolitan mine is therefore an experiment being conducted in an important catchment area with little real understanding of the acknowledged risks. The introduction of gas mining in the same region will compound the manifest risks associated with longwall mining, and an assessment of a gas mining project must surely include any compounding or multiplier effect arising from coal mining in that same region. Not only must the full project envelope be taken into consideration when assessing the Apex project modification application, the full context of the project must be taken into consideration and this includes coal mining operations and impacts in the area. The MCP review notes "*The potential loss of catchment yield was a strongly contested issue that could not be resolved beyond doubt on the information available. However, the Panel's view is that the risk of any significant loss is very low unless a major geological discontinuity is encountered during mining that provides a direct hydraulic connection between the surface and the mine workings. This is considered unlikely*." The introduction of fracking in the same area may well provide a sufficient geological discontinuity. The current low level of the Woronora Dam has resulted in speculation of mining related damage, and the Metropolitan Mine is known to contain high volumes of water. Fracking in the same area compounds the risks to the Illawarra water catchment.	**Apex agrees that detailed consideration should be given to combined gas extraction and longwall mining activities. It is for this very reason that the three exploration boreholes referred to in Apex's preliminary Part 3A submission were removed in consultation with Metropolitan Colliery.**
Peter Turner.	**Green House Gas Emissions.** The recently released Tyndall report on shale gas mining in the UK observes "*If carbon emissions are to reduce in line with the Copenhagen Accord's commitment to 2°C, urgent decarbonisation of electricity supply is required*." Investment in gas fired power stations, with a likely working lifetime of more than 20 years, will delay the introduction of renewable energy sources and so hinder or oppose rapid reductions in GHG emissions. Gas combustion can only be a low carbon energy source if coupled with carbon capture and storage technology (CCS) and there is little or no prospect of that being deployed on the scale required in the short to medium term, if at all. The Tyndall report points	**Apex considers that this is a matter not directly relevant to an exploration proposal** **Apex is currently attempting to define if there is a gas resource in the PELs it holds. Only after gas quantities and quality is defined can thought be given to a specific future use, which may or may not be power generation. The assessment of that yet to be defined future gas project would rightly include a greenhouse gas assessment component.**

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	out that in an expanding global economy gas fired power stations are more likely to augment than replace coal fired power stations. It's also worth noting that the Federal Governments Cleaner Future for Power Stations programme does not include gas fired power stations. While electricity generation from gas combustion produces around half as much carbon dioxide as does coal combustion, recent preliminary full life cycle studies suggest any potential benefit is significantly undermined, and perhaps negated, by energy consumption for well operations, truck movements, produced water treatment, and the leakage of methane gas from well sites, surface fissures, containers and pipelines. Referring to the same study, the World Coal Association recently made the same observation in a submission to the shale gas inquiry initiated by the UK Energy and Climate Change Committee and now underway. Apex plans recognise that CSG and goaf gas in the new Metropolitan Mine workings have high levels of carbon dioxide. They would mix this gas with gas having higher methane content from other Apex mining sources. Doing so would add to the green house gas burden of the Apex gas.	
Peter Turner.	**NSW Regulation of Coal Seam Gas Mining.** Coal seam gas mining and fracking are essentially unregulated in NSW. There is a restriction on well placement; CSG companies cannot drill a well closer within 200m of homes or within 50m of orchards, vineyards, rivers or streams. However, this does not include horizontal drilling which may extend several hundred meters from the central well. While Premier Keneally proclaimed ""*tough new rules for coal seam gas exploration*" in December 2010, in reality they are largely ineffectual and change little: • The requirement for the NSW Department of Industry and Investment to only "take into consideration" Department of Energy Climate Change and Water recommendations is much the same as was previously required of the DoP and is entirely inadequate. Given the risks, DECCW should have a matching approval role. • There is no significant change to community notification and consultation processes. • There is no requirement for documents to be made public, such as new work plans and the Review of Environmental Factors documents. Fundamentally the approval process remains opaque.	**Essentially a matter for the State Government.** **Apex will work within the NSW Planning and regulatory system in place now and in the future. It is committed to carrying out its business in an environmentally and socially responsible manner. Apex's current project and its permitted activities are for exploration only. No approach has been made to the NSW government in relation to fraccing or any other gas production stimulation technique. Such production methods and approval for such methods is subject to future application.**

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	• There is no commitment to ban the use of BTEX fracking fluid additives; these additives have been banned in Queensland. • There is no commitment to develop legislation governing CSG mining. • There is no commitment to halt CSG mining while a cumulative environmental impact assessment is made for each of the effected regions in NSW.	
Peter Turner.	**Concluding Remarks** The Apex Project modification application is not just an application for an additional exploration well in the northern Illawarra catchment area. It's effectively an application for confirmation of the implicit determination made in the original Apex project approval, that the northern Illawarra is a suitable location for full production coal seam gas mining essentially collocated and undertaken concurrently with longwall coal mining. Apex documents make this clear, and a 'case by case' assessment is in adequate as experience in the US and now Queensland has demonstrated. Previous reports and reviews have highlighted the lack of knowledge and understanding of the risks associated with these activities. Past approvals have been in effect an expression of hope that everything will turn out 'OK'. The consequences of such hope being misplaced are dire. There must be a moratorium on CSG mining related activity in the Illawarra until the risks are better understood. This assessment must include the risks to water supply and the emission of green house gases arising from all mining activity in the region – including GHG arising from domestic combustion and the combustion of exported coal and gas.	**The Apex application for AI19 is an Application to Modify a Project Approval. Appropriate exploration activity will enable the definition of the quality and quantity of gas within PEL. This is an essential pre-requisite before Apex can determine whether the resource is able to be developed further. Gas quality and quantity information will enable a correct, accurate and appropriate assessment of a future gas utilisation project.**
Sally Chapman. **Felix Bronnenberg.** **Ian Fletcher.** **Benjamin Hammond.** **Ron Hensen.** **Guy Reynolds.** **Simone Seeley.** **Julius and Felicity Timmerman.**	Extensive clearing of pristine bushland will be required.	**Extensive clearing of pristine bushland is not required. Refer EA Section 4.3.1.** **A total of 0.66 ha of vegetated area will be disturbed for the current proposal. The proposal will involve the primary disturbance of 0.16 ha of vegetation at the borehole site. Site works will involve levelling a drill pad, development of drill sumps and soil containment and erosion and sediment control. Approximately 0.50 ha of secondary disturbance of rehabilitated vegetation along the disused Fire Road is required (1000 m x 5 m wide).**

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		• **The majority of the length of the overgrown Fire Road 9A traverses the Exposed Sandstone Scribbly Gum Woodland vegetation community. Further the borehole site is located within this vegetation community. In all an estimated total of 0.16 ha of this community will be disturbed for the development of the borehole site and a further 0.34ha of this vegetation community which is regenerating on the abandoned fire road will be disturbed by the proposal.** • **Approximately 250 m of the overgrown Fire Road 9A traverses the Upland Swamp Fringing Eucalypt Woodland vegetation community and could be considered to represent this community in its regenerating state. In all an estimated total of 0.13 ha of this community will be disturbed for the development on the abandoned fire road.** • **Within the study area, approximately 80m of the overgrown Fire Road 9A traverses the Upland Swamp-Banksia Thicket vegetation community and could be considered to represent this community in its regenerating state. In all an estimated total of 0.04 ha of this community will be disturbed for the development on the abandoned fire road.**
Sally Chapman. Darren Agar. Felix Bronnenberg. Ian Fletcher. Wendy Fuller. Benjamin Hammond. Ron Hensen. Guy Reynolds. Simone Seeley. Julius and Felicity Timmerman.	Proposal is located in a key Sydney water catchment.	**All documentation submitted by Apex for this application clearly acknowledges the location as being within Sydney water catchment.**

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Sally Chapman. Kim Freil. Ian Fletcher. Benjamin Hammond. Ron Hensen. Guy Reynolds. Simone Seeley. Julius and Felicity Timmerman.	The contamination of groundwater supplies is an identified risk in the process of "fraccing". Impact of BTEX chemicals.	**Fraccing will not be undertaken for AI19. AI19 is an exploration core hole location for strata sampling and assessment. Future activities are yet to be determined.**
Sally Chapman.	The leaching of methane gas has serious health and climate effects.	**Apex has both coal mine gas (CMG) and coal seam gas (CSG) within its tenures. CMG is gas produced by mining activity. Apex's is committed to reducing fugitive CMG emissions. Any methane gas contained within and active or abandoned coal mine is a resource and for that reason it is Apex's intention to capture as much of this gas as possible. Indeed Apex's intention is to reduce total regional fugitive gas emissions. This makes good business sense. Furthermore, activities in relation to CSG exploration as well as any future commercial gas production can only be undertaken on the basis of effective risk management and engineering design. Any fugitive gas produced as a result of Apex activity will be addressed through effective management processes. In terms of the quantity of gas emissions produced as a result of Apex activities, it is anticipated that this quantity would be minute and that its fugitive gas emission capture initiatives would offset any fugitive CSG emission.**
Debby Avis.	My home is located right next to a proposed well with the only access being my dirt road, this will ruin my lifestyle and my being.	**The address given for this submission was 70 Princes Highway Helensburgh. AI19 is located along Darkes Forest Road, Darkes Forest.**
Sarah Daniel.	There is no purpose into exploration into this dangerous practice that is being marketed as the answer to our reliance on dirty coal. It is no better. The chemicals used are highly toxic and there are very high possibilities of these contaminating important water systems that we rely on for survival.	**The purpose for this exploration is to determine whether a gas resource exists. Chemicals proposed to be used are KCL and a biodegradable drilling fluid polymer. Cement will also be used as well as livestock grade bran.**
Kim Feil.	Please refrain from approving any drilling until the EPA water study is	**Apex is not aware of any EPA water study underway or**

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	completed.	**proposed.**
Heather Fisher. Justin Guest. Nikki Hensen. Ron Hensen. Yvette Johnson. Guy Reynolds. Dr Paul Rustomji. Simone Seeley. Julius and Felicity Timmerman.	Our water supply and ground water will become irrevocably contaminated.	**Apex assessment does not reach this conclusion.**
Ian Fletcher.	Exploration approval will lead to applications for full scale extraction which should never be allowed in this area.	**The exploration program will not inevitably lead to an application for full scale extraction. It will determine whether there is potential for commercial extraction and what that could possibly be.** **Commercial extraction would require a new application and assessment procedure and Apex have always understood that to be the case. If an application is made for commercial extraction Apex would follow all the appropriate procedures for making the application and undertaking an Environmental Assessment.**
Nikki Hensen.	Increased risk of fire in local area.	**Apex acknowledges the need for fire control and management. SCA in their response dated 2/3/11 state that they consider the fire prevention and protection measures proposed by Apex to be adequate. The SCA would require Apex to meet its requirements relating to Bushfire Season and Hot Works on SCA land. These requirements should be specifically included in a Project Commitment or Condition of Approval. Apex supports this requirement.**
Yvette Johnson.	The risk to the local community of Helensburgh, Otford and Stanwell Park is unacceptable.	**Construction and operation of an exploration well at AI19 (and the already approved 15 exploration boreholes) does not pose a risk to Helensburgh, Otford and Stanwell Park.** **Risks associated with any future developments (should they be**

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		shown to be feasible) will be appropriately assessed at that time.
Yvette Johnson.	This is the first paper work I have seen in relation to this project and I received it today 22nd February 2011, one day before the submissions close. The date on one of the forms was 2007. I object to the fact that there has been no consultation with the community until now.	**Matter for Department of Planning.**
Charmaine Knight.	I am very concerned regarding the proposal and its devastation it will place on the environment and surrounding communities as well as the additional traffic with trucks on our roads which are not adequate to support this proposal.	**Apex contends that there will not be devastation associated with AI19 (or the already approved 15 boreholes). Additional truck traffic will be minimal for the exploration activity**
Leila Kraushaar.	Not completed sufficient research into coal seam gas mining to establish whether or not it is safe, and assess what implications it will have on the environment. I am terrified of the potential environmental consequences of expansion of gas exploration and mining. Having seen a recent 4 Corners program into the myriad of problems being faced by Queensland land owners, I believe this technology is either not ready to be used, or that companies are not bothering to utilise the technology safely.	**Apex emphasise our commitment and willingness to cooperate fully with regulators and other stakeholders to ensure that operations are carried out in an environmentally sustainable manner.**
Dr Anne Young.	I object to the approval of this proposal on several grounds: • Apex NL has not demonstrated its ability to deliver acceptable environmental outcomes for the project 07-0103 already approved • there is no provision for community scrutiny of the existing project and thus no community confidence that an environmentally valued area is being protected • the environmental impacts, especially on swamps and under extreme rainfalls, may be significant • approval further encourages the company to expect to develop resources in a highly sensitive area (as shown by its listing under SCA and National Parks & Wildlife Service) and indeed in an area from which another company has just withdrawn following public outcry.	**Apex has not demonstrated its ability to deliver acceptable environmental outcomes for the project 07-0103 already approved because those operations have not yet commenced. However, systems are being devised in consultation with relevant experts and government agencies as Apex moves towards drilling activities. When such activities commence, Apex will demonstrate its ability to deliver acceptable environmental outcomes as it works within its detailed and thorough management system put in place in line with the requirements of Project 07_0103.**

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Dr Anne Young.	**Performance of already approved drilling operations** The Project 07-0103 approved in September 2009 envisaged a 3-year project, base on an 11 week period for each of 15 boreholes. The Approval for the Project required, among other matters, a water management plan, an erosion and sediment control plan, and a vegetation clearing and rehabilitation plan. Also, within one month of the approval, the environmental monitoring plans and a summary of monitoring results of the project were to be publicly available on the company's website. The website http://www.apexenergy.com.au/illawarraregion/ describes the assets in PEL 444 and 442 but has no information about any activities. I understand that the company submitted an AEMR in September 2010 stating that no fieldwork had taken place. Presumably this is still the case.	**Apex acknowledges that it has to prepare a number of plans. These plans have to be produced generally, "prior to the commencement of construction activities at the first borehole". Construction activities have not commenced and consequently Apex has not breached the Project Approval. Drafts of all the plans have been submitted to the Department of Planning for review and discussion. Plans that are being developed in consultation with SCA and DECCW have been forwarded to those organisations for similar review and discussion. Following review and discussion, these plans will be finalised and lodged with the Department of Planning for approval as required by the Project Approval dated 23rd September 2009, prior to the commencement of construction activities.** **In addition, they will be made available on the company web site within one month of their approval which is in accordance with the original Project Approval.**
Dr Anne Young.	Dr Young expresses concerns about her previous requests not being included in the Consent Conditions.	**Apex responded in detail to Dr Young's previous submission. Appendix A to this submission includes the original response prepared by Apex.**
Dr Anne Young	**Proximity to an upland swamp** The location of the proposed borehole A119 is constrained by the old workings and geological anomalies below the site, and its proximity to the upland swamp has been taken into account. However avoiding damage to the swamp depends on the runoff controls and especially any stored subsurface water being contained. The controls may well be in accordance with set standards but I reiterate and emphasise the concerns I expressed in respect to the original project and I quote: p 2. **Although the drill sites are mainly near or on existing tracks, and the total area to be cleared is not large, this does not mean that environmental impacts are negligible**. As the Google images on pp 20-26 show clearly, only AI14, AI16 and AI18 are on wooded ridges. All other sites are beside upland swamps, and a 50-60m radius of disturbance as indicated on p31 would encroach into the swamps. This means that there would be a	**This is quoted from Dr Young's submission on the original Environmental Assessment for the 15 borehole drilling programme. The following is an extract from Apex's response to Dr Young's original submission and all references in it refer to the original EA, not to the EA for AI19 currently under assessment as part of a Project Modification application.** The area of disturbance of each vegetation type by the proposed development is identified in Section 5.1 (p53) of the Biosis Research Flora and Fauna Assessment. • In the original EA, a total of 1.2 ha of Upland Swamp vegetation had been identified as being disturbed by the proposal. Apex has revisited and re-assessed Borehole Site AI10 and decided to relocate the borehole to more

Submitter	Submission	Draft Response
	significant increase in the existing disturbance, and the additional impacts of compaction and channelled runoff across the surface. Also, **while many of the sites lie beside existing fire trails, these trails are not heavy duty access roads. To give the drill rigs and other large vehicles access along them is likely to cause significant widening and disturbance**, especially for the work-over rigs (p40). This project will NOT simply operate without any noticeable change in the local environment. Similarly, the comment that these corridors would be used for subsurface reticulation of any developed wells (p9) glosses over the impacts of the traffic needed to dig trenches, lay pipes etc. And as is shown by Figure 3.5 (p32) and the details of sumps etc on p 56, **there will be drains, bunds and levelled areas constructed, not just a small area 'cleared'.**	elevated land immediately south of the Fire Road. This removes the site from Upland Swamp and reduces the area of Upland Swamp potentially affected to 0.56 ha. It is emphasised that this is the maximum potential area potentially affected. Final site design and operational layout will minimise the area eventually affected • It is emphasised that access to lay trenches etc is not part of this current proposal. Any additional works will be subject to a separate and subsequent approvals process and they will be assessed on their merits. Any future development application will be required to consider cumulative impacts of any and all previous development/disturbance (including the current proposal). Apex selected the sites to minimise vegetation disturbance. The sites were selected initially to meet drilling operational requirements and geological targets. The selected sites were then inspected over three days between 3rd to 5th September 2008 by a team consisting of the Apex representative, a drilling contractor representative, three representatives from the Aboriginal community, fauna and flora specialists, surface and groundwater specialists, archaeologists and Apex's Environmental Consultant. During the inspections and in response to actual site conditions, the selected sites were then re-located if necessary to avoid potential impacts. In addition, Apex committed to implementing a similar review and selection process, (including a representative from SCA as appropriate) at the final site selection immediately prior to drilling set up. Immediately prior to site set up, the site layout would be confirmed with an objective to maximise use of disturbed area eg along tracks and fire roads, the site layout can be "stretched" and narrowed to maximise utilisation of the already cleared land associated with the track or road.

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		The comment about subsurface pipelines and associated traffic relates to a potential future EA that may, or may not, be submitted depending on the exploration results. The information about pipelines was provided in the current EA to enable the proposed exploration and monitoring program to be understood in the context of potential future development. It is not directly relevant to impact assessment of the proposed works. (**Refer EA Section 2.2**).
Dr Anne Young	**Groundwater Contamination.** p32. There is too little detail here to judge the impacts of groundwater transfer to the surface. For example, there is no indication of how much groundwater make is expected. This is not a small issue. **The groundwater is expected to be contaminated, as detailed on p52. If this is to be removed by tanker, where is it to be sent? If extreme rainfalls cause an overflow, what will the impacts on the nearby environment be?**	**This is quoted from Dr Young's submission on the original Environmental Assessment for the 15 borehole drilling programme. The following is an extract from Apex's response to Dr Young's original submission and all references in it refer to the original EA, not to the EA for AI19 currently under assessment.** **Apex will utilise the services of a licensed group to dispose of all drilling water and produced groundwater. Transpacific Industries Group Limited of Unanderra has been approached to provide these services. They have advised that water with less than 20% solids can be disposed at either Transpacific Waste Services facility in Homebush or at the LVRA facility in Appin. These facilities can receive up to 60 tonne and 20 tonne per day respectively. Material that contains greater than 20% solids can be taken to the Transpacific Technical Services facility in Newcastle.** Extensive detail has been provided in the EA on site containment of drilling fluid (which, below the Hawkesbury Sandstone, would generally be 3% potassium chloride (3% KCl). This additive is required to both ensure drilling through hard and dispersive clay shales and to provide weighting to the fluid so that it overcomes any pressure of water exogenous to the hole which may have gas pressure behind it. All spent drilling fluid, including any groundwater adventitiously transferred to the surface with the recirculating fluid will be tankered off site.

Submitter	Submission	Draft Response
Dr Anne Young.	**The sensitivity of the area** The proposed borehole is in an environmentally sensitive area. The location maps (figures 1 and 2 of the main document) give no indication of this. Yet in the Appendix dealing with flora and fauna (p 33), the location is - properly! - shown as very close to the Dharawal State Recreation Area and the major swamps of that protected area such as Iluka and Dahlia Swamps. Another company has just withdrawn application for longwall mining under these areas, and I appreciate that Apex envisages no significant subsidence if full-scale gas extraction were to occur in the future. BUT the problem is that extraction of any gas reserves proven from the area would involve very significant surface disruption. How closely spaced would extraction boreholes be? How much surface disruption would there be also from connecting pipelines to transport the gas, and from access roads for maintenance vehicles and tankers to remove contaminated water from bunds? Even if the pipes are laid in trenches, the trenches need to be cut and then revegetated. Would there need to be power lines to each drillhole/ pumping point? Where would the material taken from multiple boreholes be disposed of? The approved exploration project will disturb 9 ha in total, of which about half is undisturbed native vegetation. And even the 'disturbed' areas are largely re-grown from previous disturbance. Obviously a fullscale development would require many holes in undisturbed native vegetation. **The bushland in much of the area is pristine because it has been set aside for water catchment. Are we now to undo this good by permitting extensive surface disruption?** It is not good enough to simply argue that any such considerations can be left to the future when another major project application would be necessary. The reality is that companies, having received permission to explore and to prove up reserves, expect to be given permission to develop those resources. **The present application values this one borehole as having a capital investment value of $1 million, and the original project was valued at $7.4 million. The company must be carrying out the project in clear expectation of approval to develop**.	**Apex acknowledges the sensitive nature of the area. It emphasises that this current proposal is for an exploration borehole. The matters raised by Dr Young would be properly considered should a Project Application be made for a gas extraction project.**

APPENDIX A

Excerpts from Submissions Response for Original EA highlighting Dr Anne Young's submission.

APPENDIX A.

Excerpt From EA Submissions Response Apex Energy Project Application No: 07_0103

Jointly Prepared by Apex Energy NL, EcoEngineers Pty Ltd, Biosis Research Pty Ltd and Olsen Consulting Group Pty Ltd

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3. Dr Ann Young.	Dr Young has combined the gas exploration phase and the gas utilisation phase. These are two distinct and separate stages. Whether or not gas utilisation is eventually undertaken will depend on exploration results and will be subject to a separate application at some future time. 3.1 Comment re p2 of EA. Questions the areas of disturbance.	The area of disturbance of each vegetation type by the proposed development is identified in Section 5.1 (p53) of the Biosis Research Flora and Fauna Assessment. • In the original EA, a total of 1.2 ha of Upland Swamp vegetation had been identified as being disturbed by the proposal. Apex has revisited and re-assessed Borehole Site AI10 and decided to relocate the borehole to more elevated land immediately south of the Fire Road. This removes the site from Upland Swamp and reduces the area of Upland Swamp potentially affected to 0.56 ha. It is emphasised that this is the maximum potential area potentially affected. Final site design and operational layout will minimise the area eventually affected • It is emphasised that access to lay trenches etc is not part of this current proposal. Any additional works will be subject to a separate and subsequent approvals process and they will be assessed on their merits. Any future development application will be required to consider cumulative impacts of any and all previous development/disturbance (including the current proposal). Apex selected the sites to minimise vegetation disturbance. The sites were selected initially to meet drilling operational requirements and geological targets. The selected sites were then inspected over three days between 3rd to 5th September 2008 by a team consisting of the Apex representative, a drilling contractor representative, three representatives from the Aboriginal community, fauna and flora specialists, surface and groundwater specialists, archaeologists and Apex's Environmental Consultant. During the inspections and in response to actual site conditions, the selected sites were then re-located if necessary to avoid potential impacts. In addition, Apex committed to implementing a similar review and selection process, (including a representative from SCA as

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		appropriate) at the final site selection immediately prior to drilling set up. Immediately prior to site set up, the site layout would be confirmed with an objective to maximise use of disturbed area eg along tracks and fire roads, the site layout can be "stretched" and narrowed to maximise utilisation of the already cleared land associated with the track or road. The comment about subsurface pipelines and associated traffic relates to a potential future EA that may, or may not, be submitted depending on the exploration results. The information about pipelines was provided in the current EA to enable the proposed exploration and monitoring program to be understood in the context of potential future development. It is not directly relevant to impact assessment of the proposed works. (**Refer EA Section 2.2**).
Dr Ann Young.	3.2 Comments re p3 of EA. Clarification of topsoil storage for rehabilitation and sediment controls/silt fences.	Site preparation will typically involve the disturbance of soils resulting from the development of drilling sumps (surface and subsurface soil disturbance) and through general site access and activity (surface soil disturbance). • Only soil liberated from the sumps will be stockpiled for any length of time (duration of the borehole development and drilling operation is typically 10 weeks maximum). • Assuming the absolute maximum area cleared at 50 m x 60 m, the volumes of soil to be stockpiled at each site is in the order of 150 m^3 of O horizon soil and 300 m^3 of A horizon soil. • Soils associated with Upland Swamps are typically very sandy and do not provide a suitable substrate for the development of drilling sumps. • Section 5.2 (p54) of the Biosis Research Flora and Fauna Assessment identified the recommended amelioration measures to minimise impacts on terrestrial ecological values due to vegetation clearing and soil disturbance. **The recommendations included:** • Sediment and erosion control measures should be implemented on all sites to prevent erosion during and after construction; • Disturbance to native vegetation should be minimised, or, where disturbance is unavoidable, borehole sites should

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		be rehabilitated using locally sourced tubestock and brush-matting. Rehabilitation should be undertaken by suitably qualified bush regenerators; • Where clearing of native vegetation is unavoidable, native shrubs, logs and bush-rock should be stockpiled on the side of the proposed boreholes and access routes and replaced following completion of the works. • These recommendations will be incorporated into a site Environmental Management Plan that will include specific requirements for soil stock piling and vegetation stock piling. The Environmental Management Plan may include but will not be limited to the following general best practise activities. **Soil Translocation** **Background and Justification** Soil translocation is likely to be the most successful and cost effective form of rehabilitation/revegetation for the project. Topsoil harvested from cleared remnants should be viewed as a valuable resource containing a significant supply of seed (and other propagules), beneficial soil micro-organisms and essential plant nutrients. It is estimated that > 65% of native plants within plant communities such as those of the study area are not readily propagated. As a result, revegetation projects which rely on planting only generally appear as highly simplified ecosystems. Large scale soil translocation has been successfully utilised on the Tomago sand beds and in different parts of south-eastern Australia for the rehabilitation plant communities with a similar composition and structure as those that appear within the study area. **Soil Salvage and Handling** *Vegetation Clearing and Stockpiling* Vegetation shall be removed from boreholes sites and stockpiled further downslope of the downslope runoff detention bund wall, to protect it from erosive effects in storm events. Further seed collection from felled trees will be undertaken immediately post clearing. Rocks and logs which may be disturbed will be stockpiled separately e.g. above or on the run-on diversion bund or in the downslope runoff detention bund wall.

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		Soil Stockpiling Where practical, soil stockpiling will be minimised. Soils will not be stockpiled for long periods of time (N.B. short term stockpiling [several weeks] will be crucial to maximising the level of success). If topsoil is stockpiled for greater than 3 months, testing will be undertaken to account for any potential changes in nutrient status. Soil horizons will not be removed during or immediately following rain in order to minimise the composting process during stockpiling. Soil stockpiles shall be no greater than 2 metres high, and located immediately downslope of the downslope runoff detention bund wall, where they cannot be impacted by water inundation or vehicle traffic. All stockpiles will be pegged and appropriately labelled. A register of all stockpiles (soil horizons and vegetative waste) shall be maintained with reference to dates, donor site locations and recipient site locations. *Stripping of Soil Horizons* Avoiding excessive mixing of soil horizons will be crucial to maximising vegetation re-establishment. Plant operators will ensure that appropriate machinery is utilised to effectively undertake the soil translocation. Small scale soil translocations have been previously been achieved using an excavator with tilting bucket and a truck. The top 50 mm of soil (O horizon) will then be stripped and stockpiled in a separate stockpile located immediately downslope of the downslope runoff detention bund wall, covered by either a plastic membrane or a layer of woody material. This layer of soil contains the majority of soil stored seed and propagules, plant nutrients and beneficial soil microbes. The next 100 mm of the topsoil layer (A horizon) will then be stripped and stockpiled in a separate stockpile located immediately downslope of the downslope runoff detention bund wall, covered by either a plastic membrane or a layer of woody material. Some minor stripping and stockpiling of subsoil horizons (e.g. B and C soil horizons) may then be undertaken depending on depth of bedrock. Similar material will be obtained from excavation of the two ~25 m^3 sumps. This material being generally comprised of sandy soil and clayey material will be used to construct the downslope runoff detention bund wall and mechanically compacted. **Soil Translocation**

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		Respreading Soil Horizons Subsoil horizon material (B and C) will first be spread back over the allocated recipient sites (including back filling the sumps) in an upslope direction. Translocation of A horizon over B and C horizons will then be undertaken. Finally, the O horizon will be spread over the A horizon. *Redistribution of Logs, Rocks and Seed Bearing Vegetation on Recipient Sites*. All remaining stockpiles of rocks, logs and vegetation will then be redistributed over the recipient site. In the case where the area of disturbed soil is greater than the volume of vegetated material to be replaced over the top of the site, brush matting, involving the collection by hand of branches containing seed material (typically from myrtaceous plants or nearby native grasses) would be employed at the site. This is a relatively low cost, but effective mechanism of revegetation that has been successfully employed at drills sites throughout the Woronora Plateau, and across the entire Illawarra region. Avoiding excessive soil compaction (other than during construction of the downslope runoff detention bund wall) will be crucial to maximising plant establishment and all traffic should be excluded from the translocated soil horizons once all materials have been spread on the surface. **Revegetation Supplementary to Soil Translocation – in the event that natural regeneration of the site is not progressing quickly.** If necessary seed from nearby native vegetation could be collected prior to development and would then be spread over bare areas of the rehabilitating borehole sites in the unlikely event that natural regeneration did not result from the processes outlined above. Direct seeding will only be undertaken in spring and autumn where necessary. Where required (i.e. in areas that remain without any, or indeed poor natural regeneration for a period longer than 6 months), supplementary planting of local provenance tubestock may be undertaken to ensure vegetation is progressively reinstated. A list of suitable plant species for collection, propagation and installation has been derived from the terrestrial flora and fauna assessment. Where revegetation is required, site specific requirements will be identified including appropriate species mixes, planting densities and strategies. In order to achieve optimal species richness, structural diversity and genetic integrity at the borehole

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		site(s), a provenance native plant nursery would be engaged to undertake this work in consultation with the land owner. **References:** DITR 2006, *Mine Rehabilitation - Leading Practice Sustainable Development Program for the Mining Industry*, Commonwealth Government Department of Industry Tourism and Resources.
Dr Ann Young.	3.3 Comments re p5 of EA. The gas generation is predicted to supply only a 15MW turbine.	The comment about a 15 MW turbine relates to a potential future Major Project Application that may, or may not, be submitted depending on the exploration results. The information was included in the EA to enable the proposed exploration and monitoring program to be understood in the context of potential future development. It is not directly relevant to impact assessment of the proposed works. (**Refer EA Section 2.2**). This is an essential potential future stage of any logical development of the gas reserve.
Dr Ann Young.	3.4 Comments re p28 of EA. Ensure surface aquifers are not depleted.	The Hawkesbury Sandstone of the Woronora Plateau and the exploration area in particular is comprised of significantly weathered Hawkesbury Sandstone to depths of up to approximately 75 m maximum. The Sandstone often forms 'hillslope aquifers' with an average storativity around 0.05 and mean bulk hydraulic conductivity to at least 30 m depth typically in the 10^{-7} – 10^{-6} m/s range i.e. generally the most permeable strata. It is now recognised these hillslope aquifers sustain downslope upland swamps, particularly through periods of drought and during recovery from wild fires and provide baseflow to draining streams. Supporting studies in respect of this view are as follows: Gibbins, L. (2003) A geophysical investigation of two upland swamps, Woronora Plateau, NSW Australia: Unpublished BSc (Hons) thesis, Macquarie University. BHP Billiton Illawarra Coal (2004) Deep Borehole Investigations of Swamp 18a above Elouera Longwall Panels 9 and 10. April 2004. BHP Billiton Environment and Sustainable Development Dept. Ecoengineers Pty Ltd (2006) Assessment of Catchment Hydrological Effects of Longwall Mining by Elouera Colliery Stage 1: Establishment of a Practical and Theoretical Framework. Report 2006/05A for BHP Billiton, August 2006. Russell, G.N. (2007) Hawkesbury Sandstone groundwater attributes and geological features. Poster paper in CD Proceedings, Hydrogeology over the Years UTS/UNSW 20th Anniversary Symposium, July 2007. Hammond, M.S., 2007, Baseline Study of Hydrogeology above a Longwall Mine in Cordeaux Catchment Area. B.Env.Sci (Hons) thesis, Faculty of Science, University of Wollongong.

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		Ecoengineers Pty Ltd (2007) Surface Water Quality and Hydrology Assessment Dendrobium Mine Area 3. September 2007 (for Cardno Forbes Rigby Pty Ltd). Short, S. A., Waring, C. L., Peterson, M. A., Hammond, M. S., and Wood, J. (2009) Studies of near-surface hydrology and hydrogeology of the Woronora Plateau. Proceedings of the Groundwater in Sydney Basin Symposium. International Association of Hydrologists, Sydney 4 – 5 August 2009. Measures will be put in place to avoid contaminating these near–surface hillslope aquifers and their upland swamp and draining steam (shallow) groundwater dependent ecosystems or depleting them. The principal means of protection of the hillslope aquifers will involve: • Drilling the Hawkesbury Sandstone with a Sydney drinking water-based drilling fluid which contains no additive other than possibly a biodegradable starch gel to at least the base of the Hawkesbury. • All wells drilled will have a surface casing set to a nominal depth of 100 m. This will case off (i.e. isolate with cement and steel casing) the upper Hawkesbury Sandstone (the top 75m of concern), from any further losses from the rest of the well. • Estimated drilling time through the Hawkesbury Sandstone is 24 hours. It is believed that the leakage of drilling fluid into the weathered bedding planes etc of the Hawkesbury Sandstone should be minimal over such period. • The incremental time of exposure from drilling for the Hawkesbury Sandstone formation, between setting surface casing at 75 m and 100 m depth, at which it is proposed, is less than 2 hours. Casing to the 100 m will provide safety on casing off the upper sections of concern. The extra efflux or influx during the two hours required to drill from 75 m to 100 m would be minimal.
Dr Ann Young.	3.5 Comments re p32 of EA. Too little detail to judge the impacts of groundwater transfer to the surface. Series of questions directed at practical drilling activities.	Extensive detail has been provided in the EA on site containment of drilling fluid (which, below the Hawkesbury Sandstone, would generally be 3% potassium chloride (3% KCl). This additive is required to both ensure drilling through hard and dispersive clay shales and to provide weighting to the fluid so that it overcomes any pressure of water exogenous to the hole which may have gas pressure behind it. All spent drilling fluid, including any groundwater adventitiously transferred to the surface with the recirculating fluid will be tankered off site.

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Dr Ann Young.	3.6 Comments re p38 of EA. How quickly can flaring be stopped?	Flaring can be stopped instantaneously with manual valves and automatically operated valves that are designed to close during emergency fire events. The wellhead arrangements would be designed to withstand bushfire conditions. The proposed flaring unit is able to withstand fire and is designed to minimise the risk of fire escape. Apex recognises the risks associated with the exploitation of Coal Seam Methane and Coal Mine Methane. Apex's operational personnel are experienced drilling, mining and risk managers who have and will ensure that hazards are adequately identified and risks assessed and controlled. Apex recognises the need to work with the local community and local authorities such as the Rural Fire Service (RFS). Intensive liaison has already taken place between Apex and the RFS and this relationship will continue. Liaison so far includes RFS headquarters meetings, local meetings, liaison with local RFS personnel and an RFS presentation given by Apex to the Darkes Forest RFS personnel. Fire mitigation measures will also be developed by consultation with the Sydney Catchment Authority, the Department of Environment and Climate Change and the Department of Primary Industries. Flaring facilities will be provided by Apex to comply with appropriate legislation and for gas monitoring purposes. These are discussed below; **Compliance with Schedule of Onshore Petroleum Exploration and Production Safety Requirements** Clause 214 of the Schedule of Onshore Petroleum Exploration and Production Safety Requirements requires the following: **Precautions Against Fire** In all cases where internal combustion engines are used as prime movers for the operation of a drill rig and its ancillary-equipment, such engines, if permanently installed, shall be, if practicable, diesel engines. These shall be provided with efficient flame and/or spark arresters on their exhausts and be regularly checked and continuously used. No naked lights, smoking, or motor vehicles not provided with efficient flame and/or spark arresters shall be permitted within 30 metres radius of the hole provided that in any event requiring the use of welding plant or other equipment the site manager may permit the use of such motor vehicles, welding plant or blow torches under his personal supervision and subject to such special precautions as appear necessary. Where inflammable gas is met in a well and cannot be contained, it shall be conveyed away from the bore-hole head fittings by means of a flare line to a distance of not less than 30 metres from the well and ignited. The discharge end of such flare line shall set up in such a way that any condensate can be collected and the flame is contained so as no environment damage may result. The discharge end of such flare line shall be isolated so that no risk exists for people or animals.

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		Clause 728 of the Schedule of Onshore Petroleum Exploration and Production Safety Requirements requires the following: **Approval to Vent or Flare** The titleholder must ensure that except in an emergency the flaring or venting of petroleum is not carried out without approval. Therefore, in order to comply with the safety schedule as above as well as for testing purposes, Apex will be required to operate approved flaring facilities. Apex recognises that such flaring must take place in a controlled manner in order to protect persons associated with the drilling works, to protect the environment by mitigating the risk of bush fires being caused and adverse noise and light being emitted. In addition, the design and construction of the well head facilities must be fire proof with adequate intrinsic safety for the protection of personnel and the environment. The NSW Occupational Health and Safety Act 2000 requires construction work to be carried out after risk management processes have been applied to identify hazards, assess risk and control risk as appropriate. A full high level operational risk assessment was carried out for the drilling and construction phases in accordance with; • AS NZS 4360 2004 Risk Management • MDG1010 Risk Management Handbook for the Mining Industry • MDG 1014 The Apex operational risk assessment was completed on the 8th of April 2009 and included such measures as; • Control of hotwork to mitigate the risk of bushfire • Liaison with the rural fire service (the RFS were invited to the risk assessment but did not attend) • Liaison with the Department of Primary Industry and the Sydney Catchment Authority on fire control matters and flare facilities as per the Petroleum Act. • The provision of surface facilities designed and constructed so as to prevent and be protected from fire. • The provision of safety devises such as automatic shut down valves (activated by fire to stop gas flow). • Provision of other safety devices such as non return valves. • The use of flare chambers for environmental protection (see below) **AGL Flare Chambers** Apex has recognised the need to carry out flaring in a controlled manner so as to protect the public and the environment. There is a need to reduce flaring affects such as; • Noise

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		• Light • Heat. Apex plans to use a purpose designed flare chamber to meet the needs of Apex whilst operating around the Illawarra. This type of flare chamber is currently used by AGL at Camden. The provision of such a facility will follow detailed HAZOP analysis to assist in the design. The HAZOP analysis will address a range of issues including the following: • Transportability • Visibility • Fire risk mitigation • Noise • Controllability • Safety devices • Materials • Training of personnel • Maintenance **Figure 1** shows a wide view of similar gas flaring facilities used near Camden.

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		 **Figure 1 – Wide view of Flare Box and Control Trailer** **<u>Description of General Facilities</u>** Flame control will be via an external and separate control facility as shown in **Figure 2**. This trailer arrangement contains the ignition control, flame arrestors, shut down facilities and indeed all the facilities needed to make the facility fully controllable remotely. This arrangement allows for the ignition of the facility manually and automatically to comply with legislation and the ability to shut down the flare automatically or manually.

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		 **Figure 2 – Control Trailer** **Figure 3** shows the interior of the flare chamber. The chamber is lined with fire proof and noise absorbing material. Gas is flared by means of a burning element as shown in **Figure 3**. The gas entering the chamber is spread along a long burner arrangement and the gas exits into the chamber via a series of nozzles on the burner. This arrangement therefore does two things; • Reduces nozzle pressure and therefore noise • Reduces flame height and therefore height (this also serves to contain the flares within the chamber and thus gives flame control)

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		Therefore in summary, these flare facilities are designed through engineering and environmental risk management and provide remote controllability. However, no flare will be lit whilst the facility is unattended and continuous liaison with the Rural Fire Service will take place during operations.  **Figure 3 – Interior of Flare Chamber**

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Dr Ann Young.	3.7 Comment re p41 of EA. Clarification of groundwater quality and quantity matters. Surprised that there is no provision for analysis of the nature and volume of groundwater extracted.	This has been partly clarified in our response to **DWE Item 2.1**. However, it is also noted that: • Groundwaters encountered during coal mining in the area over more than a century have been found to be of low flow/volume and variable quality. It is expected that only minor amounts of groundwater, perhaps driven by initial 'pulses' of gas pressure would be brought to the surface with recirculating drilling fluid. Any groundwater make will be continually monitored in real time through increased surface volume in pits/tanks, and water-diluted fluid returns. • It is not practical to either monitor-for, or sample for such minor amounts of groundwater. This results from the fact that the pH and salinity (Electrical Conductivity; EC) will be greatly affected by the geochemical effects of comminution of strata encountered, cation exchange of the majority potassium (noting the drilling fluid is 3% KCl below the Hawkesbury Sandstone) for other cations, and out gassing of dissolved CO_2. For these and other reasons it would therefore generally not be meaningful or productive to run a program of quality monitoring of any groundwaters encountered until well after completion, flushing with clean water and development of the wells for groundwater extraction. • EC measurements can be carried out but for the above reasons would generally not be too indicative of actual groundwater conditions. The drilling fluid system will be slightly overbalanced pressure-wise to the formation pressure (due to friction, rock chips, cuttings etc). It is typically difficult to see significant impact of formation waters into/on an overbalanced fluid system unless there is a very strong and productive (high flow rate) water 'kick' from a high pressure zone (e.g. artesian, gas over pressure) into the well. There is no reason to believe such conditions would be encountered in the exploration area. • As this is a coal seam gas exploration program there is no brief or need to flush completed boreholes with water or develop them for groundwater extraction.
Dr Ann Young.	3.8 Comment re p46 of EA. Requests a clearly coordinated strategy for project monitoring incorporated into the approval conditions.	It is most likely that Apex will have to submit to the DoP an environmental monitoring program for approval prior to commencing operations. This would form part of the EMP.

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Dr Ann Young.	3.9 Comments re p48 of EA. There is no indication of just how much community consultation occurred.	The community consultation undertaken by Apex was suitable for an exploration drilling program. Apex undertook several face to face meetings with landholders potentially affected by the project. Apex met with Darkes Forest Community at the initiation of Rural Fire Services and they gave a presentation of their proposals. Should a future Major Project Application be made as a result of the proposed gas exploration, a community liaison program suitable for that possible future development would be implemented.
Dr Ann Young.	3.10 Dr Young's first conclusion. A detailed and workable rehabilitation Plan be established for each site.	An Environmental Management Plan (EMP) will cover the entire operation. Site specific EMPs will be developed for each site by the contractor and these will be consistent with the overall EMP. The overall EMP will have a generic description of site rehabilitation procedures and objectives, while the site specific EMP will have a rehabilitation plan for each site. In addition, arrangements with landholders including SCA, will require Apex to rehabilitate the site. The DPI-Mineral Resources will hold an Apex rehabilitation bond, which would encourage appropriate rehabilitation performance and provision of finances for rehabilitation should the proponent fail to adequately rehabilitate any disturbed areas.
Dr Ann Young.	3.11 Dr Young's second conclusion. Drilling at each site should not commence before the previous site has been cleaned up, re-shaped where necessary, mulched or otherwise protected from rainfall, wind erosion and seeded or planted to begin re-vegetation.	This is unnecessary and would make the process discontinuous. SCA, DPI – Mineral Resources and landholders will be observing Apex's performance and there is appropriate control in that to ensure the rehabilitation performance is acceptable. Additionally, DPI-Mineral Resources will hold a rehabilitation bond to address rehabilitation performance and provide funds if the DPI have to repair any sites.
Dr Ann Young.	3.12 Dr Young's third conclusion. Extracted groundwater should be assessed for volume, quality and likely geological stratum source.	Refer to our responses to **Items 3.5** and **3.7** above.

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Dr Ann Young.	3.13 Dr Young's fourth conclusion. The proposed sites be re-assessed to prioritise them in order of likely significance so that if possible, fewer sites will be drilled.	Sites will be drilled in a priority order. Commercial reasons should ensure that Apex is unlikely to drill more sites than are necessary to define the resource.
Dr Ann Young.	3.14 Dr Young's fifth conclusion. A clear coordinated strategy for environmental monitoring by relevant authorities be imposed on the company, with approval for continuing operation dependent on satisfactory environmental management. Ideally, a community consultative committee to involve other stakeholders should be part of this strategy.	Apex expect Project Approval to include a condition requiring appropriate environmental monitoring. A community consultative committee is not justified for a 15 borehole gas exploration activity.