

5 March 2019

The Secretary
Department of Planning and Environment
GPO Box 39
Sydney NSW 2000

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By email

Dear Ms McNally

Tahmoor South Coal Project – SSD 17_8445: Underground longwall mining, and associated activities, to extract coal from the Bulli seam within CCL 716 and CCL 747; Coal Extraction of up to 4Mtpa of ROM Coal; Coal processing and handling at the existing Tahmoor Colliery Coal Handling Preparation Plant and Rail Facilities (the Project)

1. We act for Ironlaw Pty Ltd (**Ironlaw**), the owner of 95 Great Southern Road, Bargo (the **Property**).
2. The Property is located within the proposed project area subject of SSD 17_8445 (**Application**).
3. This letter outlines our objection to the Project made on behalf of our client, Ironlaw.

Summary of Objection

4. Ironlaw objects to the Project on the following grounds:
 - (a) The Project is contrary to the aims of the *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (**Mining SEPP**), in particular clause 2:
 - (a) *to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
 - (b) *to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
 - (c) *to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.*

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- (b) The Project is incompatible with the existing, approved and likely preferred uses of land in the vicinity of the proposed mine, under clause 12 of the Mining SEPP.
 - (c) The Project should be refused due to the adverse social impacts of the Project, including social and economic impacts caused by the subsidence impacts of the underground mining.
 - (d) The economic and public benefits of the Project are uncertain, overstated and not shown to be greater than the public costs of the Project.
 - (e) The Project is not in the public interest because:
 - (i) of the matters at 3(a) – (c) above; and
 - (ii) it is contrary to the principles of ecologically sustainable development because the direct and indirect greenhouse gas emissions of the Project will contribute to climate change, particularly having regard to the recent decision of *Gloucester Resources Limited v Minister for Planning* [2019] NSWLEC 7 (**Gloucester Resources**).
5. For these reasons, the Application should be refused. Alternatively, if the Minister or delegate is minded to approve the Project, then:
- (a) the Proponent should be required to provide an additional assessment of the Project to address the deficiencies of in its Application, including an assessment of subsidence impacts and the resultant sterilisation of surface development for future uses consistent with the character of the area; and
 - (b) appropriate conditions should be imposed requiring the proponent to mitigate such risks.
6. This Project should not be allowed to proceed at the expense of the personal and property rights of landowners. To do so is clearly contrary to the aims and objectives of the Mining SEPP and the *Environmental Planning and Assessment Act 1979* (**EP&A Act**).

Relevant planning framework

7. As you would be aware, section 4.15 of the EP&A Act is relevant to the assessment of applications for State Significant Development. Relevantly, this section requires the consent authority to take into consideration the provisions of any environmental planning instrument (**EPI**) as relevant to the development the subject of the development application.
8. The EPIs relevant to this Application include the Mining SEPP and the *Wollondilly Local Environmental Plan 2011* (**WLEP 2011**).
9. Of note, clause 12 of the Mining SEPP provides that:
- Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:*
- (a) *consider:*
 - (i) *the existing uses and approved uses of land in the vicinity of the development, and*
 - (ii) *whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to*

land use trends, are likely to be the preferred uses of land in the vicinity of the development, and

(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and

(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

10. In addition, clause 14 of the Mining SEPP provides that before granting consent for development for the purposes of mining, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure that greenhouse gas emissions are minimised to the greatest extent practicable.

Grounds for objection

Failure to consider WLEP

11. No assessment of the Project has been carried out as required under section 4.15(1)(a)(i) of the EP&A Act under the WLEP. However, this assessment is also required to be carried out within the context of clause 12(a) of the Mining SEPP when considering the existing, approved and likely approved uses.

Incompatibility of the Project with the existing, approved and likely preferred uses of land in the vicinity of the proposed mine (clause 12(a) Mining SEPP)

12. The Project is incompatible with existing, approved and likely preferred uses land uses in the vicinity of the Project. This is because, as outlined below, the Project, if approved in its current form, will have the effect of sterilising any further subdivision or building works on the surface until such time as undermining has ceased.
13. At paragraph [66] in *Gloucester Resources* it was agreed between the experts (and ultimately by the Court) that (emphasis added):

*indicators of land use trends, giving rise to likely preferred uses, are: the historical, current and approved uses of the land; the **planning controls under the applicable land use zonings**, including the **range of permissible uses in each zone**, the **objectives of each zone**, and the development standards for development in the zone, such as the minimum lot size; **uses identified in State, regional and local strategic plans, studies and strategies as being preferred future uses**; and economic circumstances.*

14. In circumstances where mining is prohibited within a zone, it should not be considered the preferred use and an assessment against the objectives of that zone and a comparison against the other land uses within that zone that are permitted with consents is required. This has not been

undertaken. The assessment that is required to be undertaken in relation to clause 12 of the Mining SEPP, as highlighted by Preston CJ in *Gloucester Resources* has not been undertaken.¹

15. In particular:

(a) No assessment has been undertaken against the aims and objectives of the other zones which the Project site traverses, in particular against those zones within which mining is prohibited. The assessment of the Project against these objectives, is required under clause 12 of the Mining SEPP as identified in *Gloucester Resources*.

(b) No assessment has been undertaken against the aims of the WLEP 2011, in particular subclauses:

(2)(a) “to provide for the management of natural resources and the protection of the natural landscape character”;

(2)(b) “to protect, conserve and enhance the built, landscape and Aboriginal cultural heritage”; and

(2)(d) “to encourage development that provides for an integrated transport and infrastructure system and adequate facilities and service provision for future growth”.

16. As we discuss in further detail below, the zoning of the land which will be impacted/undermined as a result of the Project includes RU1 Primary Production, RU4 Primary Production Small Lots, R2 Low Density Residential, R5 Large Lot Residential, B2 Local Centre, R3 Medium Density Residential, IN2 Light Industrial, SP2 Infrastructure, E2 Environmental Conservation and RE1 Public Recreation. Extractive industries are prohibited in all zones save for RU1 Primary Production.
17. The uses of the land in the vicinity of the Project include residential (including rural-residential estates), Bargo Sports Ground and Sports Clubs, Bargo Public School, the Bargo Train Station, the Bargo Post Office, Retirement Villages, Rural Agriculture including Ingham’s Enterprises, Town Centre Businesses, Bargo Tip and substantial tracks of land earmarked for future residential development.
18. In addition, Wollondilly Shire Council in its Growth Management Strategy 2011 has indicated that they expect a population increase of 20,000 over the next 25 years, and they plan to deliver 7,500 new houses over the next 25 years. In Bargo itself, they expect a need for 2000 new dwellings.
19. The Applicant’s Environmental Impact Statement (EIS) makes it clear that there will be impacts on the protection of the natural landscape character as a result of subsidence caused by the proposed mine. There will also be significant impacts on the built landscape with the most severe impacts resulting from subsidence occurring underneath longwalls 107 and 108 (Fig. 11.9 on page 181 of the Subsidence Report). These are within the most built up areas of Bargo, including the Public School, the Great Southern Road, the train station and the Moomba-Sydney Gas Pipeline.
20. Further, the site will impact items of Aboriginal heritage, local and state listed items of non-aboriginal heritage and it will cover an area of and is adjacent to the Sydney Drinking Water Catchment. In addition, the EIS at 5.3.3 has indicated that ‘measuring and predicting the impact of single activities is difficult’ due to the lack of a unified data set.

¹ *Gloucester Resources Limited v Minister for Planning* [2019] NSWLEC 7 at [80] – [86]

21. As discussed in more detail below, the sterilisation of vast tracks of land within the vicinity of the Bargo Town centre is a strong indication of the incompatibility of the Project with the land uses which will be impacted by the Project, all being existing, approved and likely preferred uses.

Sterilisation of land uses above proposed longwall mining areas

22. The effect of the Project will sterilise all surface ground development until that land has been undermined. This could be until after 2035 and beyond, based on previous indications from Subsidence Advisory NSW (**SA NSW**).
23. In Table 4.1 of Appendix F to the EIS (Subsidence Impact Assessment) prepared by MSEC on December 2018 (**Subsidence Report**), the maximum tilt for longwalls 101 to 109 range from 8.0mm/m to 11.5, all above the maximum tilt permitted by Guideline 4. It is inappropriate that the information in table D.02 and D.03 make it impossible to tell on a site by site basis what the effects of an approval of the Project would be. However, it is generally admitted in the Subsidence Report that the impacts will be in excess of the minimum allowed for development under Guideline 4.
24. Fig 1.6 below is taken from page 10 of the Subsidence Report. Next to it is an extract from the map NSW Planning Portal showing the various zones in the WLEP that will be undermined and impacted by subsidence. These include RU1 Primary Production, RU4 Primary Production Small Lots, R2 Low Density Residential, R5 Large Lot Residential, B2 Local Centre, R3 Medium Density Residential, IN2 Light Industrial, SP2 Infrastructure, E2 Environmental Conservation and RE1 Public Recreation. It is evident that a significant area will be undermined if this Project is approved.

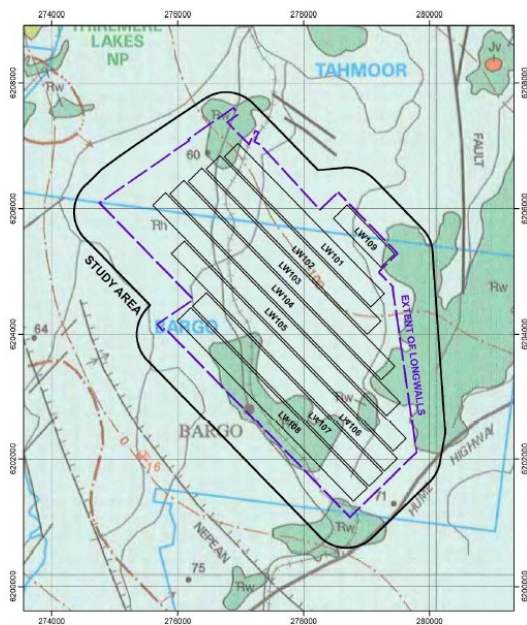
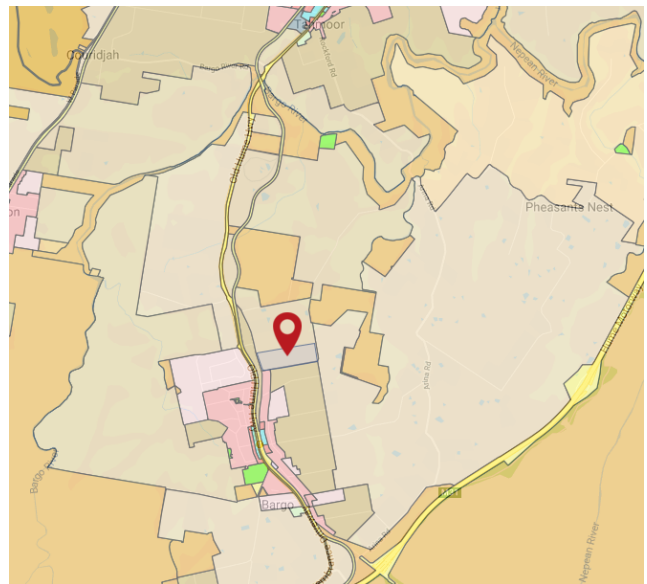


Fig. 1.6 Surface Geology within the Subsidence Study Area (DTIRIS, Geological Series Sheet 9029-9129)



25. We note that out of all of these zones which will be undermined or impacted by mine subsidence, the mining is prohibited in all but RU1 Primary Production. Especially in those areas that are zoned as residential, or will be rezoned as residential, development will be sterilised as a result of the subsidence predicted in the Subsidence Report.

26. In particular, the Project will cause subsidence beyond that which SA NSW will provide approvals for development under section 22 of the *Coal Mine Subsidence Compensation Act 2017 (CMSC Act)*. In SA NSW's *Guideline 4 Surface Development Guideline 4 – Active mining areas – High predicted subsidence impact (Guideline 4)*, the maximum subsidence-induced ground movements where they will provide approval for development are:
 - (a) Maximum Horizontal Ground Strain: 5mm/m tensile or compressive
 - (b) Maximum Tilt: 7mm/m
 - (c) Minimum Radius of Curvature: 3km (hogging and sagging).
27. Our client has engaged Garry Mostyn of Pells Sullivan Meynink (CV **enclosed**) to review the Subsidence Report and Guideline 4. Mr Mostyn agrees that the projected impacts in the Subsidence Report will exceed the maximum permitted levels of subsidence that they will approve development under the CMSC Act.
28. In summary, Mr Mostyn has advised that the projected levels of subsidence appear to be reasonable in that they do not under represent the projected subsidence levels. The prediction of impacts are not overly conservative but the assessment of damage assumes a housing form that is reasonably susceptible to damage (that is, it is conservative in this regard).
29. Furthermore, according the SA NSW, studies commissioned by them show that between 30-40% of structures are damaged when longwall mining takes place.
30. As a result, if the Project is approved, it will mean that no future development will be approved by SA NSW in any areas of the proposed longwall mining which will have a direct impact on the provision of adequate facilities and service provision for future growth.
31. Of note, while our analysis indicates that our client's land is within an area that is only projected to have 0-7mm of potential tilt, SA NSW appear to be taking the very conservative position that the risks associated with undermining are too great and all development should be put on hold until the undermining has ceased.
32. One of the considerations of SA NSW in assessing any application for development on land within a mine subsidence district appears to be the potential compensation costs that Tahmoor mine would have to pay out to affected land owners whose buildings and improvements on the land are damaged as a result of subsidence. Whether this position is correct in their exercise of their statutory obligations is another question altogether. However, it is a clear indication of the incompatibility of this Project in its current form with any further development on the surface as landowners will be unable to obtain relevant approvals under the CMSC Act, thereby sterilising further development, as discussed below.
33. To illustrate, we **enclose** a letter to Wollondilly Shire Council (**Council**) dated 21 November 2018 indicating that SA NSW intends to refuse the application TSUB 18-00353 (the **SA Application**) for the 15 Lot Subdivision at the 95 Great Bargo Road, Bargo pursuant to section 22 of the CMSC Act. This letter indicates that the SA Application has been assessed in accordance with section 22 of the CMSC Act which indicates that the relevant land will be impacted by future mine subsidence as a direct result of the Project.
34. SA NSW later sent a letter to Council on 27 February 2019 indicating that it would not give general terms of approval to the SA Application on the following grounds:
 - (a) the proposed subdivision is located within a consolidated coal lease held by Tahmoor Coal;

- (b) Tahmoor Coal have lodged an application (the Project subject of this SSD Application) to extract coal by Longwall mining methods directly under the proposed subdivision and provided plans showing their proposed mining layout to SA NSW the positioning of the proposed longwall panel makes it likely that the site of the proposed subdivision will be impacted by subsidence.
 - (c) SA NSW considers the Colliery's statement of its intention to undermine the site to be credible (we note that this is despite not consent having yet been granted for this Project).
 - (d) recent studies commissioned by SA NSW on mining in the Tahmoor area indicate that between 30% - 40% of structures are damaged when longwall mining takes place.
 - (e) the positioning of the proposed longwall panel makes it highly likely that the site of the proposed subdivision will be impacted by subsidence if mining occurs.
 - (f) concentrated ground strains are expected to exceed the subsidence impact parameters in the active mining guidelines developed by SA NSW. It is also considered likely that the concentrated ground strains that may occur will not be able to be satisfactorily mitigated against by design.
 - (g) SA NSW therefore considers that the proposed new road and associated stormwater works proposed with the subdivision and future purchasers of the subdivided land will be adversely impacted if mining takes place.
35. Of note, this is despite *no decision having yet been in relation to the Project*. We also **enclose** letter from Joseph D'Ermillo to us dated 27 February 2019 in this regard.
36. This is a clear indication that if the Project were approved, the result would be the sterilisation of all other land uses above the Project area. The result of approval of the Project will be catastrophic for any future development of land which is proposed to be undermined. This is contrary to clause 12 of the Mining SEPP, the aims and objectives of the WLEP, and section 4.15(1)(a)(i), (b) and (e) of the EPA Act.

Comparative public benefits of the mine and other land uses (clause 12(b) Mining SEPP)

37. The assessment undertaken in relation to the comparative public benefits of the mine and other land uses is deficient for a number of reasons. In particular:
- (a) no assessment has been undertaken as to the sterilising of other land uses above the Project area; and
 - (b) no assessment has been undertaken regarding the social impacts that this will have on the community, who cannot have any development approved that would be covered by the compensation scheme under the CMSC Act.
38. This will mean that there will be no opportunity for new housing to be built in the area, pushing up the price of housing. Furthermore, it will have a significant impact on both Council and the Department being able to reach its housing targets.
39. There will be no new infrastructure for industry and business built which will have social and economic impacts upon the community which is being undermined.

40. The EIS has not addressed the possibility of mental health issues arising from increased cost of living and lack of employment opportunities. This Project will not be creating a surplus of jobs, merely extending the life of the existing mine.
41. If a landowner cannot obtain approval under the CMSC Act, they are not entitled to any compensation under that Act. This would directly impact the value of that land which will be undermined, as well as any improvements on that land, it would also cause a great deal of stress and anxiety to those affected landowners. No assessment of these impacts has been undertaken.
42. Further, an assessment of the cost of this loss of development to the area has not been undertaken in the Economic Impact Assessment report at Appendix R to the EIS. Subsidence costs have been generally quantified as \$11.8 million in NPV terms, but this appears to be based only upon mitigation measures and does not include the loss of developable land, and the value to the economy lost as a result of this. We note that the consultants used in the EIS, Cadence Economic, and their methodology in applying the *Guidelines for the economic assessment of mining and coal seam gas proposals* dated 2015 were strongly criticised in *Gloucester Resources*. The Applicant should review this report in light of His Honour's decision in that matter and reassess their projected economic projections.
43. The methodology for the estimated net benefits on page 40 of Appendix R, appears to suffer from the same issues and assumptions that were criticised by His Honour in *Gloucester Resources*. The net cost, having not been quantified and assessed, means that the benefits (as opaque and potentially inflated as they appear to be) and the cost to the community affected by the Project has not been properly undertaken.
44. As a result, the Project has not carried out an assessment of the Project as required under clause 12(b) of the Mining SEPP.

Social impacts (section 4.15(1)(b) of the EPA Act and requirement of SEARs)

45. The assessment of the social impacts of the mine are inadequate and do not satisfy the 9 key requirements at page 5 of the *Social Impact Assessment Guideline* (Department of Planning and Environment, 2017) (the **Guideline**).
46. The Guideline states:

"As a guide, social impacts can involve changes to people's:

way of life, including:

o how people live, for example, how they get around, access to adequate housing

o how people work, for example, access to adequate employment, working conditions and/or practices

o how people play, for example, access to recreation activities

o how people interact with one another on a daily basis

community, including its composition, cohesion, character, how it functions and sense of place

access to and use of infrastructure, services and facilities, whether provided by local, state, or federal governments, or by for-profit or not-for-profit organisations or volunteer groups

culture, including shared beliefs, customs, values and stories, and connections to land, places, and buildings (including Aboriginal culture and connection to country)

health and wellbeing, including physical and mental health

surroundings, including access to and use of ecosystem services, public safety and security, access to and use of the natural and built environment, and its aesthetic value and/or amenity

personal and property rights, including whether their economic livelihoods are affected, and whether they experience personal disadvantage or have their civil liberties affected

decision-making systems, particularly the extent to which they can have a say in decisions that affect their lives, and have access to complaint, remedy and grievance mechanisms

fears and aspirations related to one or a combination of the above, or about the future of their community."

47. As raised above in this submission, the social impacts of the subsidence and the sterilisation of the land within the Project area have not been addressed or assessment by the Applicant. For example, personal and property rights at 4.8 of the Social Impact Assessment at Appendix Q of the EIS (SIA) does not even consider the impacts upon the sterilisation of land which is proposed to be undermined by the Project which is a clear violation of property rights. Proposed mitigation measures within this paragraph are vague and uncertain. Further, the Fears and Aspirations section of the SIA does not even address any of the types of issues and social impacts that would arise from the sterilisation of land being undermined by the Project.
48. The Department does not have sufficient information to be assured that the Project will not have unacceptable social impacts.
49. The known negative impacts of sterilising land above the proposed longwall undermining within the Project area would outweigh the purported public benefit of the Project.

Greenhouse gas emissions and ecologically sustainable development (clause 14 Mining SEPP)

50. In addition, limited assessment has been undertaken by the Applicant in relation to 'upstream' (Scope 2) and 'downstream' (Scope 3) Greenhouse Gas Emissions. The emissions have been summarised as follows (in the table at page "x" of the EIS):
 - (a) Scope 1 – 13.5 million tonnes of CO₂-e over the life of the mine;
 - (b) Scope 2 – 1.5 million tonnes of CO₂-e over the life of the mine;
 - (c) Scope 3 – 104.5 million tonnes of CO₂-e over the life of the mine.
51. The total emissions for Scope 1, 2 and 3 would equate to 119.5 million tonnes of CO₂-e over the life of the mine. Which according the Applicant's calculations in their EIS (in the table at page "x"

of the EIS) would equal 1.68% of Australia's portion of Australia's commitment under the Paris Agreement.² This is a significant contribution for a single project.

52. In *Gloucester Resources*, Chief Justice Preston said at [525]:

There is a causal link between the Project's cumulative GHG emissions and climate change and its consequences. The Project's cumulative GHG emissions will contribute to the global total of GHG concentrations in the atmosphere. The global total of GHG concentrations will affect the climate system and cause climate change impacts. The Project's cumulative GHG emissions are therefore likely to contribute to the future changes to the climate system and the impacts of climate change. In this way, the Project is likely to have indirect impacts on the environment, including the climate system, the oceanic and terrestrial environment, and people.

53. Like the proposed coal mine in that case, this Project would have a significant impact on Australia's ability to meet its obligations under the Paris Agreement 2015. The proposed mitigation in the Applicant's EIS is vague and uncertain and simply says (in the table at page "x" of the EIS):

Management and mitigation measures would be incorporated into the proposed development to reduce Scope 1, 2 and 3 emissions where feasible and practical.

54. As a result, the EIS is deficient and has not addressed this critical issue which is required to be addressed by clause 14(2) of the Mining SEPP.
55. The Project is therefore contrary to section 4.15(1)(b) of the EP&A Act due the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.
56. Further, the development is not ecologically sustainable development in that it will give rise to additional GHG emissions, and will cause impact to the environment which is not sustainable and for which no suitable mitigation measures have been proposed. As a result the Project is not in the public interest (section 4.15(1)(e) of the EP&A Act).

The Project is contrary to the EP&A Act

57. For the reasons outlined above, the Project also fails to satisfy the objects of the EP&A Act, in particular section 1.3:

(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources;

(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment";

(c) to promote the orderly and economic use and development of land;

² The proponent states in the table at page x of the EIS "The proposed development would generate an annual average of 0.84 million tonnes CO₂-e of Scope 1 emissions, equating to approximately 13.5 million tonnes CO₂-e over its life. Importantly, average annual Scope 1 emissions would represent a very small portion of Australia's commitment under the Paris Agreement, at about 0.19%." Based upon this figure, 119.5 million tonnes would equate to 1.68%.

(d) to promote the delivery and maintenance of affordable housing;

*(f) to promote the sustainable management of built and cultural heritage
(including Aboriginal cultural heritage);*

(g) to promote good design and amenity of the built environment; and

*(h) to promote the proper construction and maintenance of buildings, including
the protection of the health and safety of their occupants.*

58. The development is contrary to section 4.15(1)(a)(i), (b) and (e) of the EP&A Act on the grounds listed above.

Conclusion

59. For the above reasons, we submit that the Application should be refused.

60. Alternatively, if the Minister or delegate is minded to approve the Project, then:

- (a) the Applicant should be required to provide an additional assessment of the Project to address the deficiencies of in its Application, including an assessment of subsidence impacts and the resultant sterilisation of surface development for future uses consistent with the character of the area; and
- (b) appropriate conditions should be imposed to mitigate the issues identified.

61. The Applicant could reduce impacts by only mining half height seam. Otherwise, if the Applicant is confident of the projected impacts, the Applicant should agree to a condition that it will not cause impacts beyond those in Guideline 4 development so as not to sterilise surface development.

62. This Project should not be allowed to proceed at the expense of the personal and property rights of landowners. To do so is clearly contrary to the aims and objectives of the Mining SEPP.

63. If you have any questions regarding the abovementioned, please do not hesitate to contact Breellen Warry, Partner or Blake Dyer, Senior Associate.

Regards



Holding Redlich

Enclosures: 3



GARRY MOSTYN

BE (Hons), MEngSc, BA (Geology), FIEAust, CPEng, RPEQ

Country of Citizenship:	Australia
Educational Qualifications:	BE (Hons), UNSW, 1974 MEngSc, UNSW, 1977 BA (Geology), Macquarie University, 1980
Professional Associations:	Fellow, Institution of Engineers, Australia Registered Professional Engineer of Queensland (RPEQ)
Publications:	Over 90

Garry Mostyn graduated from the University of New South Wales in civil engineering in 1973. He subsequently completed a master's degree in geotechnical engineering at UNSW and a bachelor's degree in geology and statistics at Macquarie University. He worked as a cadet and engineer with the NSW Department of Public Works and with consulting geotechnical engineers from 1970 until 1986. He joined the School of Civil Engineering at the University of New South Wales as a senior lecturer in civil and environmental engineering practice and geotechnical engineering. He returned to consulting at PSM in 1997 as a Principal and has been an Adjunct Associate Professor at UNSW. He remains a senior Principal and Director at PSM.

FIELDS OF SPECIAL COMPETENCE:

His fields of specialist expertise are:

- foundation engineering
- deep fills, earthworks and embankments
- slope engineering
- rock mechanics
- pavement engineering
- geotechnical risk analysis
- forensic engineering

He has lectured extensively in geotechnical engineering including presenting postgraduate courses in foundation engineering, slope stability, dam engineering, rock mechanics and underground structures. He has completed research on the stability and reliability of slopes and the engineering properties of rocks and rock masses. Previously he has completed the training for and been graded as an arbitrator by the Institute of Arbitrators and Mediators, Australia.

He has undertaken or supervised geotechnical investigations for several hundred projects and has experience in most aspects of geotechnical engineering. He has worked on major projects throughout Australia and in Thailand and PNG. He has provided expert advice and evidence in numerous disputes.

He has been an active member of several national and international code and practice committees and been involved at the highest levels of the Australian Geomechanics Society and the International Society for Rock Mechanics. He is a frequent speaker at professional society meetings and symposia both in Australia and overseas. He has authored or co-authored over 80 journal and conference papers in his fields of expertise. He has been a member of the Standards Australia drafting committees for AS3798, the Earthworks Code and AS4678, the Earth Retaining Structures Code since their inception in the 1980s..

He specialises in producing geotechnical designs that meet clients' needs and are economical to construct. He is often used in challenge roles within design teams.

EXPERIENCE:

1997 – Present	Principal, Pells Sullivan Meynink, Sydney
1986 – 2008	Senior Lecturer, University of New South Wales, Sydney Adjunct Associate Professor, University of New South Wales, Sydney
1981 – 1986	Senior Engineer, Dames & Moore, Sydney
1978 – 1981	Senior Engineer, McMahon, Burgess & Yeates, Sydney
1976 – 1978	Engineer, Department of Public Works, NSW
1974 – 1976	Engineer, Longworth & McKenzie Pty Ltd, Sydney
1970 – 1974	Cadet Engineer, Department of Public Works, NSW

SOCIETIES/STANDARDS:

- Australian Geomechanics Society
 - National Committee Member, 1988 – 2001
 - Chairman, 1994-1995
 - Editor, Australian Geomechanics Journal, 1998 – 2001
- International Society for Rock Mechanics
Vice President, 1995 - 1999
- Member Standards Australia Committee - CE/27 producing AS3798 "Guidelines on Earthworks for Commercial and Residential Developments"
- Chairman of Standards Australia Committee - CE/32 producing AS4678 "Earth-retaining Structures"
- Standards Australia Committee - BD/90/3 Foundations – Past Member
- ISSMGE - TC23 Limit State Design in Geotechnical Engineering – Member, 1995 – 2002

GENERAL:

1 of 1

- Responsible for completing or supervising geotechnical investigations for several hundred projects. Involvement on each project varied from a few days to several months and included extensive contact with owners, consultants and contractors and preparation of reports presenting the results of the studies.
- Have acted as expert witness in over one hundred matters over last twenty five years involving several separate fatalities and many large civil and contractual claims.
- At UNSW, actively involved in research and development work in many areas of risk, rock engineering, slope stability and foundation design.
- Has taught extensively at postgraduate level including 42 hour subjects in: Slope Stability and Stabilisation; Foundation Engineering; Rock Engineering; Applied Soil Mechanics. Has contributed to graduate teaching subjects in: Embankment Dam Engineering; Site Investigations; Underground Structures in Rock; Geological Engineering; Qualitative Risk Assessment of Landslides.
- Applied probabilistic, statistical and risk based methods to various engineering problems including slope design, parameter selection, &c.
- Responsible for the overall supervision and completion of geotechnical site investigations for numerous residential, commercial, industrial and public buildings.
- Extensive experience in all aspects of geotechnical engineering as applied to mining, especially design of pit slopes and waste dumps.
- Involved in the geotechnical aspects of the design and construction of several dams including as principal designer of earth dams.
- Involved in setting up and operation of several geotechnical laboratories and actively involved in hardware and software applications of microcomputers since 1978.
- Water management and contaminant movement studies for major proposed uranium mines in the Northern Territory.
- Involved as principal in investigations, design and monitoring for rectification works at East Arm Port, Darwin.
- Assisted with PSM investigations and advice to NSW Coroner on Inquiry into Thredbo Landslide and principal investigator for RMS submissions to the Somersby Inquest
- Supervised 5 doctoral theses and co-supervised 5 doctoral theses.
- Completed General and Advanced Arbitration courses conducted by the Institute of Arbitrators, Australia, passed Grading Examination, graded Grade 3 Arbitrator (1993).
- Geotechnical design, project management and auditor for several deep quarry fills for residential or industrial development.
- Numerous forensic investigations, analyses and advice/opinions for legal matters.
- Epping Chatswood Rail Link, monitoring 10m deep cofferdam for river crossing.

PRINCIPAL INVESTIGATOR FOR THE FOLLOWING MAJOR PROJECTS:

1 of 2

Ok Tedi Project Western PNG	Two tailings dams, a hydroelectric dam, 150 km of road through extremely inhospitable terrain, two towns, two airfields and river and ocean port facilities. Recently completed geotechnical aspects of due diligence study and provided advice on slope failures on access roads.
Mae Moh Lignite Mine Northern Thailand	Geotechnical investigations, consisting of 240 m high slopes in steeply dipping, very weak and extensively faulted rocks. Sixty geotechnical and over fifteen hundred exploration boreholes completed. Each degree of slope angle had a present value cost of well over \$30 million.
Woodside, North Rankin A Flare Tower	Review of all information relating to very loose calcareous soils forming foundation to large offshore platform. Information had been collected during ten years of detailed investigations utilising virtually all available in-situ and laboratory techniques. A gravity based anchor system was then designed to provide foundation support to portions of the structure. This system has now been implemented.
Burnley Tunnel, Melbourne Citylink Victoria	Investigation of cause of wall failure, design of rectification works. Investigation and design of improvement works to north and south walls of tanked tunnel.
Gladstone Coal Stockpile Central Queensland Ports Authority	Detailed investigation and design for site improvement works for major coal stockpile and reclaim tunnel on soft soil site.
Greystanes Estate Development	Geotechnical advice regarding industrial developments of large quarry, including batter stabilisation and earthworks.
Whisper Bay, Airlie Beach, QLD	Site improvement over old quarry for waterfront apartments.
Rydalmere, NSW	Site improvement over very poor ground for industrial development.
M2 Shaft, Chatswood Epping Rail Link	Major investigation into the cause of distress to tunnel at M2 Shaft at base of deep fill.
Dendrobium Mine, Wollongong	Dyke assessment.
Mermaid Marine, Barge Berth Extension Dampier, WA	Site supervision port extension, including: <ul style="list-style-type: none">• Earthwork construction, field testing and interpretation• Sheet pile installation• Concrete pin construction, comprises sub-surface assessment during drilling to achieve the required capacity Slipway screen foundation design
The Entrance, NSW	Stability assessment of an existing seawall for local Council, including stability analysis and provision of recommendation for the seawall.
Sydney Coastal Councils Groups	Under collaboration with Worley Parsons, provided significant inputs to a geotechnical guideline for Sydney Coastal Group to assess seawall stability and the effect of climate change to coastal structure.

PRINCIPAL INVESTIGATOR FOR THE FOLLOWING MAJOR PROJECTS:

2 of 2

Port Waratah Coal Services, Kooragang Island, Port of Newcastle, NSW	Investigation into design and construction issues associated with water ingress into dump station and conveyor tunnel.
Barangaroo, Sydney, NSW	Classification of rock class in proof cores.
Karara Iron Ore Port Train Unloader	Investigation and advice related to construction stage failure associated with dewatering.
Burrinjuck Dam, Yass, NSW	Rock fall risk assessment
Wynyard Walk pedestrian tunnel, Sydney CBD	<p>300 m long tunnel/shaft/cut and cover/bridge linking Wynyard Station with Barangaroo, beneath operational roads, rail, and buildings.</p> <p>Geotechnical investigations, preparation of geotechnical model.</p> <p>Shaft excavation and underpinning design.</p> <p>Ground movement assessment and monitoring plan.</p>

EXPERT ADVICE/WITNESS:

1 of 3

Devonshire St, Sydney.	Expert advice, 8m deep contiguous pile retaining wall failure.
Coledale, NSW	Review of previous work and supervision of design of remedial work for failed railway embankment. This failure had tragically resulted in two fatalities.
Rushcutters Bay, NSW	Expert advice, effect of contiguous pile wall on adjacent residence.
Denistone, NSW	Review of design of remedial works for embankment failure.
Schofields, NSW	Expert advice on leaking dam.
Bayswater Colliery, NSW	Advice on highwall failure.
Wollongong, NSW	Expert advice, fatality due to excavation failure.
Wentworth Park Greyhound Track, NSW	Expert advice, design and contract for track design.
Bungan Head, NSW	Expert witness, cliff line stability.
Kiewa, VIC	Expert advice, McKay Power Station stability.
Gilmandyke, NSW	Advice on land stabilisation.
Bayview, NSW	Expert witness, retaining wall failure.
Pambula, NSW	Expert witness, damage to motel.
Sth Alligator R Bridge, NT	Expert advice on foundation design.
Paddington, NSW	Expert advice on conservation options, terraces.
Bolton Pt, NSW	Expert advice, earthquake damage to house.
Barnsley, NSW	Expert advice, use of coal refuse.
Chatswood, NSW	Expert advice, underpinning failure.
Punchbowl, NSW	Expert advice, murder victim.
Various NSW	Expert advice on many cases of damage to houses.
Alexandria, NSW	Expert advice on cable creep.
Kidston, QLD	Expert advice on slope design.
Laverton QLD	Expert advice, reinforced soil wall.
Kogarah, NSW	Expert advice on fatal gas explosion.
Rydalmere, NSW	Expert advice, reinforced soil wall.

Griffith, NSW	Expert advice, fatality due to trench collapse.
Lake Macquarie, NSW	Expert advice, cracked houses.
Lismore, NSW	Expert advice, damage to motel.
Thredbo, NSW	Member of PSM team acting as advisers to the NSW Coroner on the causes of the 1997 landslide at Thredbo, NSW.
Wetherill Park, NSW	Impact of retaining wall construction on existing factory and retaining wall.
Western Ring Road, VIC	Provision of expert opinion on deformation of reinforced soil wall.
Cooks River, NSW	Investigation and expert opinion on cause of failure of construction cofferdam.
Aquatic Centre, NSW	Provision of expert opinion on reinforced earth wall and deformation of Aquatic Centre
Ok Tedi Mine, PNG	Road and pipeline failures due to landsliding
Sydney, NSW	Independent Property Impact Assessment Panel for the Cross City Tunnel.
Eastern Distributor, NSW	Expert panel assisting with resolution of final 40 damaged properties.
Darwin, NT	Detailed analysis of fill placement behind very large sheet pile wall.
Clovelly, NSW	Damage to block of strata units.
Niddrie Quarry, Victoria	Provision of Expert Advice on contract dispute for deep fill.
Mona Vale, NSW	Expert opinion on damage to building.
Wallsend, NSW	Provision of expert opinion on retaining wall failure and slope instability.
Manly, NSW	Provision of expert opinion on damage to building.
Howlong, NSW	Advice on effect of dam on road fatalities.
Old Pacific Highway, Somersby, NSW	Expert Advice to RTA on road failure and fatalities.
Apollo Bay and Lorne, Victoria	Expert Advice on Failure of Aeration Tanks at WWTPs.
Woollahra, Waverley and Leichhardt Councils	Expert Advice on various Development Applications.
Alexandria, NSW	Expert opinion on retaining wall failure.

EXPERT ADVICE/WITNESS

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Kingscliffe, NSW	Provision of expert opinion on a development application.
Whitebridge, NSW	Provision of expert opinion on damage to residential building.
Lilli Pilli, NSW	Expert opinion relating to a landslip.
Somersby, NSW	Expert opinions on geotechnical and engineering matters relating to retaining walls.
Bellevue Hill, NSW	Provided expert opinion on geotechnical issues related to overturning or toppling of a piling rig.
Port Waratah Coal Services	Expert opinion on design and construction issues in regard to dump station and load out tunnel.
Epping Chatswood Rail Line	Expert opinion on damage associated with shaft excavation and tunnel.

- General Reporter - *Slopes* at the 5th Australia-New Zealand Conference on Geomechanics, Sydney, 1988.
- Chairman's Address *Probabilistic Methods of Slope Analysis* presented to Sydney Group of the Australian Geomechanics Society, November, 1988.
- Technical Convenor - *7th Australian Tunnelling Conference, Sydney, September, 1990.*
- Member of Standards Australia Committee CE/27 - Earthworks standard (issued as AS3798-1990)
- Member of Standards Australia Committee CE/32 - Reinforced soil and retaining walls.
- Address on *Design of Coledale remedial works* to Sydney Group of the AGS, May, 1990.
- Seventh Peter McAnally Memorial Lecturer, Queensland University of Technology, May, 1991.
- Preparation and presentation of two papers in Seminar by Standards Australia entitled *Earthworks for commercial and residential development*, March, 1991 in Brisbane, Sydney, Adelaide and Perth.
- General Reporter - *Stability Analysis* at the 6th International Symposium on Landslides, Christchurch, 1992.
- Chairman - *Analytical and Probabilistic Methods* at the 6th Australia-New Zealand Geomechanics Conference, Christchurch, 1992.
- Address on *Rippability of rock* to Sydney Group of the AGS, October, 1992.
- Invited lecturer - *Probabilistic Slope Analysis* at the Conference on Probabilistic Methods in Geotechnical Engineering, Canberra, 1993.
- Address on *Limit state design in geotechnical engineering* to Sydney Group of the AGS, October, 1993.
- Chairman, Organising Committee - First ANZ Young Geotechnical Professional Conference, Sydney, February, 1994.
- Presented four day course with Prof Fell on *Slope stability and stabilisation* in Kuala Lumpur, Malaysia, August, 1994, Kuching, Sarawak, June 1995, three day course by self in Kuala Lumpur, 1995, 1996 & 1997.
- Address on *Domestic footing failures and remediation* with Mr D. Smee to Sydney Group of the AGS, August, 1995.
- Preparation and presentation of paper in Seminar by Standards Australia entitled *Earth Retaining Structures Workshop* Nov/Dec, 1994 in Melbourne, Adelaide and Perth.
- Chairman - *Strength Properties of Rock and Rock Masses* at the ISRM International Symposium, NY Rocks'97, New York, July 1997.

- Awarded UNSW Vice Chancellor's Award for Teaching Excellence in 1998.
- Address on *Rock Mass Strength* with Mr K Douglas to Sydney Group of the AGS, October 1998.
- Presented one and two day courses with Professor Fell on [*Quantitative Risk Assessment of Slopes*] in Sydney 1997/1998 and Auckland in 1999.
- Strength of Intact Rockmass. Rock Mass Invited Lecture to GeoEng2000.
- Landslide Risk Management Seminars, Facilitator and Speaker, Sydney, Wollongong, Brisbane, Adelaide & Perth, 2002
- Senior Mentor and Invited Speaker, 5th ANZ Young Geotechnical Professional Conference, Rotorua, NZ, 2002
- Paper and presentation with Ms I Chan on *Climatic Factors for AS2870 for the Sydney Region* to the 6th Young Geotechnical Professionals Conference, Gold Coast, July 2004.
- Mentor to Mr D Piccolo for his award winning presentation on *Design of Deep Fills for Residential Development. Enfield Brick Pit* to the 7th Young Geotechnical Professional Conference, Adelaide, October 2006.
- Paper and presentation on *ACI Stage 6 Foundation Analysis and Design. An "Upside-down Site"* with Mr D Piccolo to the 7th Young Geotechnical Professional Conference, Adelaide, October 2006. Also presented to the Footings and Foundations Society Annual Conference, Sydney 2007.
- *AS3798 – 2007 Guidelines on Earthworks for Commercial and Residential Developments – Recent Revision* with Mr Max Ervin. Presented to the Australian Geomechanics Society, 2007 Symposium "Engineering Advances in Earthworks", Darling Harbour 2007.
- Paper and presentation with Ms I Chan on *Climatic Factors for AS2870 for the Sydney Region* to the Foundations and Footings Society, Sydney, September 2009.
- Awarded the Australian Geomechanics Award 2008 for the best paper in Australian Geomechanics Journal and the Warren Medal for the best paper in the discipline of civil engineering for "*Experiences with post-construction retesting of engineered clay fills*", co-authored with B Burman and D Piccolo.

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1. **Sutcliffe G. & Mostyn G.** (1983). Permeability testing for the Ok Tedi Project. *Proc Int Symp on Soil & Rock Investigations by Insitu Testing in Engineering Geology*, Paris (Also *Bulletin Int Assoc of Eng Geol*, No 26-27, pp501-508).
2. **Mostyn G.** (1983). A statistical approach to the determination of the permeability of a mass. *Proc 4th Int Conf on the Application of Statistics and Probability to Soil & Structural Engineering*, Florence, V2, pp1031-1042.
3. **Mostyn G. & Ferguson A.** (1984). Analysis of strength test results - Pnyang Formation, Papua New Guinea. *Proc 4th Australian and New Zealand Conference on Geomechanics*, Perth, pp112-117.
4. **Walker B., Dale M., Fell R., Jeffery R., Leventhal A., McMahon M., Mostyn G. & Phillips A.** (1985). Geotechnical risks associated with hillside development. *Australian Geomechanics News*, Number 10, pp29-35.
5. **Mostyn G. & McMahon B.K.** (1986). Application of microcomputers to slope design at Mae Moh Lignite Mine, Northern Thailand. *Proc Symp on Computer Aided Design in Geotechnical Eng*, AIT, Bangkok, pp167-183.
6. **Mostyn G. & Small J.** (1987). Methods of stability analysis, Chapter 3 in *Soil Slope Instability and Stabilisation*, (eds Walker B. & Fell R.), Balkema, pp71-120.
7. **Leventhal A.R. & Mostyn G.** (1987). Slope stabilization techniques and their application, Chapter 5 in *Soil Slope Instability and Stabilisation*, (eds Walker B. & Fell R.), Balkema, pp183-230.
8. **Hudson M.J., Mostyn G., Wiltse E.A. & Hyden A.M.** (1988). Properties of near surface Bass Strait soils. *Proc Int Conf on Calcareous Sediments, Perth, Engineering for Calcareous Soils* (eds Jewell R.J. & Andrews D.C.), V1, pp25-34, Balkema.
9. **Mostyn G.** (1988). Statistical evaluation of design parameters for gravity based anchor system. *Proc Int Conf on Calcareous Sediments, Perth, Engineering for Calcareous Soils* (eds Jewell R.A. & Andrews D.C.), V2, pp711-717, Balkema.
10. **Fell R., Mostyn G.R., Maguire P. & O'Keefe L.** (1988). Assessment of the probability of rain induced landsliding. *Proc 5th Australia New Zealand Conf on Geomechanics*, Sydney, V1, pp73-77.
11. **Mostyn G.** (1988). General report on slope stability. *Proc 5th Australia New Zealand Conference on Geomechanics*, Sydney, pp435-445.
12. **Mostyn G., De Wit B., Knoop B., Small J. & Kurzeme M.** (1989). Prediction of earth pressures on culvert, F3 Freeway, Wahroonga, NSW. *Australian Geomechanics*, Special Issue for the 5th ANZ Conference on Geomechanics, pp97-106.
13. **Mostyn G. & Taylor H.** (1989). A preliminary study of first year civil engineering students at the University of New South Wales. *First Australian Association for Engineering Education Convention and Conference*, Sydney, pp220-225.
14. **Mostyn G.** (1990). Discussion of "Procedure of slope failure prediction during rainfall based on the back analysis of actual case records" by H. Suzuki and M. Matsuo, *Soils and Foundations*, Vol 30, No 2, pp135-138.
15. **Mostyn G. & Gallagher P.** (1991). The implementation and application of AS3798. *Earthworks for Commercial and Residential Developments*, Standards Australia, Sydney, March, pp18-26.

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16. **Mostyn G. & Redman P.** (1991). The role of the Geotechnical Testing Authority. *Earth-works for Commercial and Residential Developments*, Standards Australia, Sydney, March, pp27-31.
17. **Koczanowski M., Mostyn G. & MacGregor F.** (1991). An expert system for rock rippability assessment. *7th Int Cong on Rock Mechanics*, Aachen, Germany, September, 1991 Vol 1, pp 275-279.
18. **Mostyn G. & Adler M.** (1992). Design of the remedial works for the Coledale landslide. *Sixth Int Symp on Landslides*, Christchurch, NZ, February, 1992, Vol 1, pp791-796, Balkema.
19. **Gu Dazhao & Mostyn G.R.** (1991). The study of a method of making equivalent material models. *2nd Int Symp Mining Technology and Science*, Zushou, China, October, 1991.
20. **Gu Dazhao & Mostyn G.R.** (1992). A casting method for artificial rock specimens. *11th Int Conf on Ground Control in Mining*, The University of Wollongong, N.S.W., July, 1992.
21. **Mostyn G.R. & Waters M.** (1992). Small scale variability of reactive soils in western Sydney. *Proc 6th Australia-New Zealand Conf on Geomechanics*, Christchurch, NZ, February, 1992, pp353-357.
22. **Mostyn G.R. & Soo S.** (1992). The effect of auto-correlation on the probability of failure of slopes. *Proc 6th Australia-New Zealand Conf on Geomechanics*, Christchurch, NZ, February, 1992, pp542-546.
23. **Mostyn G.R.** (1992). Theme report - Stability analysis techniques. *Sixth Int Symp on Landslides*, Christchurch, NZ, February, 1992, Vol 3, pp1631-1639.
24. **Jafari M.R., Mostyn G. & MacGregor F.** (1992). Preliminary results of quarter scale modelling bulldozer excavation of jointed rock. *Western Australian Conf on Mining Geomechanics*, Kalgoorlie, WA, pp247-253.
25. **Jafari M.R., Mostyn G. & MacGregor F.** (1993). Mechanisms of failure of artificial jointed rock due to ripper penetration. *Int Sym on Assessment and Prevention of Failure Phenomena in Rock Engineering*, Istanbul, Turkey, pp417-423.
26. **Yu Y.F. & Mostyn G.R.** (1993). Spatial correlation of rock joints. *Proc Conf on Probabilistic Methods in Geotechnical Engineering*, Canberra, Australia, February, 1993, pp241-255.
27. **Mostyn G.R. & Li K.S.** (1993). Probabilistic slope analysis - State-of-play. *Proc Conf on Probabilistic Methods in Geotechnical Engineering*, Canberra, Australia, February, 1993, pp89-109.
28. **Gu D.Z., Jafari M.R. & Mostyn G.R.** (1993). An artificial soft rock for physical modelling. *Geotechnical Aspects of Hard Soils-Soft Rocks*, (eds, Anagnostopoulos et al), Balkema, pp517-524.
29. **Mostyn G.** (1993). Research in geomechanics in Australia. *Australian Geomechanics*, No 23, March, 1993, pp7-8.
30. **Poulos H.P., Johnston I.W. & Mostyn G.R.** (1993). Priority areas in Australian geomechanics research. *Australian Geomechanics*, No 23, March, 1993, pp14-17.

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32. **Jafari M.R. & Mostyn G.** (1993). An experimental investigation of deep cutting forces in artificial rock. *Proc 8th Australian Tunnelling Conf*, Sydney, August, pp 175-179.
33. **MacGregor F., Fell R., Mostyn G., Hocking G. & McNally G.** (1994). The estimation of rock rippability. *Quarterly J. Engineering Geology*, V27, pp123-144.
34. **Mostyn G., Khalili N. & Small J.** (eds) (1994). *Proc First Australia-New Zealand Young Geotechnical Professionals Conf*, Sydney.
35. **Nash P. & Mostyn G.** (1994). Deformations about excavations in highly stressed rock. *Settlement 94*, Texas A&M University.
36. **Yu Y.F. & Mostyn G.** (1994). Bounds on system reliability for a rock slope. *Proc Int Conf Computational Methods in Structural and Geotechnical Engineering*, Hong Kong, V4, pp1443-1448.
37. **Gu Dazhao, Mostyn G. & Jafari M. R.** (1995). Making of the equivalent materials used for studying rock rippability. *Journal of China University of Mining & Technology*, V5, No 1, pp49-57, June.
38. **Mostyn G. & Bagheripour M.H.** (1995). Shear strength of discontinuously jointed rock masses - Theoretical approaches. *8th International Congress on Rock Mechanics*, Tokyo, V3, p1209-1212.
39. **Mostyn G. & Bagheripour M.H.** (1995). A new model material to simulate rock. *Proc of Second Int Conf on Mechanics of Jointed and Faulted Rock*, Vienna, Austria, pp225-230.
40. **Mostyn G. & Black J.A.** (1995). General education and environmental issues in a civil engineering degree. *Australian Association for Engineering Education Conference 1995*, Melbourne, pp442-446.
41. **Mostyn G. & Luketina D.** (1995). Major curriculum reform for environmental engineers. *Education '95 - The Changing University*, UNSW, pp274-282, Sydney.
42. **Fell R., Finlay P.J. & Mostyn G.** (1996). Framework for assessing the probability of sliding of cut slopes. *Seventh International Symposium on Landslides*, Trondheim, Norway, Balkema, pp201-208, Vol 1.
43. **Yu Y.F. & Mostyn G.** (1996). An extended point estimate method for the determination of the probability of failure of a slope. *Seventh International Symposium on Landslides*, Trondheim, Norway, Balkema, pp429-434, Vol 1.
44. **Finlay P.J., Martin R.P. & Mostyn G.** (1996). Use of discriminant functions in assessing the probability of slope failure. *Seventh International Symposium on Landslides*, Trondheim, Norway, Balkema, pp209-214, Vol 1.
45. **Jones M.A. & Mostyn G.R.** (1996). Modelling Sydney Opera House Underground Parking Station. *Seventh ANZ Conference on Geomechanics*, Adelaide, pp197-202.
46. **Davis S. & Mostyn G.R.** (1996). Numerical modelling of contaminant transport using random fields *Seventh ANZ Conference on Geomechanics*, Adelaide, pp772-778.

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48. **Bagheripour M. & Mostyn G.** (1996). Prediction of the strength of jointed rock - theory and practice *EUROCK'96, International Symposium on Prediction and Performance in Rock Mechanics and Rock Engineering*, Torino/Italy, Balkema, pp231-238, Vol 1.
49. **Wong P.K. & Mostyn G.** (1996). Earth retaining structures - Scope, Investigation & Construction *Earth Retaining Structures Workshop, Seminar Papers*, Seminar 115, Standards Australia.
50. **Mostyn G. & Luketina D.A.** (1996). A new curriculum for environmental engineers. *Australian Association for Engineering Education Conference 1996*, Sydney, pp274-278.
51. **Mostyn G. & Black J.A.** (1996). Towards the development of a final year environmental engineering practice subject. *Australian Association for Engineering Education Conference 1996*, Sydney, pp283-287.
52. **Brown P., Cavanaugh L., Harding R., Moore S. & Mostyn G.** (1996). Environmental education for engineers: Explaining the relationship between professional, contextual and citizenship objectives *Australian Association for Engineering Education Conference 1996*, Sydney, pp292-295.
53. **Mostyn G., Helgstedt M. & Douglas K.** (1997). Towards field bounds on rock mass failure criteria *International Journal of Rock Mechanics and Mining Sciences*, Vol 34, No 3-4, Paper No 208.
54. **Jafari M.R. & Mostyn G.** (1997). Laboratory investigation into ripping *International Journal of Rock Mechanics and Mining Sciences*, Vol 34, No 3-4, Paper No 209.
55. **Fague P. & Mostyn G.** (1997). Predicting acid rock drainage in waste rock dumps. *GeoEnvironment 97, First ANZ Conference on Environmental Geotechnics*, Melbourne, pp 413-420.
56. **Helgstedt, M.D., Douglas K.J. & Mostyn G.** (1997). *A re-evaluation of in-situ direct shear tests, Aviemore Dam, New Zealand.* Australian Geomechanics, June pp 56-65.
57. **Mostyn, G. & Fell, R.** (1997). Quantitative and semi-quantitative estimation of the probability of landsliding *Landslide Risk Assessment* (eds Cruden D and Fell R), Balkema, pp 297-315.
58. **Pells, P.J.N., Mostyn, G. & Walker, B.F.** (1998). Foundations on sandstone and shale in the Sydney Region *Australian Geomechanics*, No 33, pp 17-29.
59. **Finlay, P.J., Mostyn, G. & Fell, R.** (1999). Landslide risk assessment: Prediction of travel distance. *Canadian Geotechnical Journal*, Jun 1999; 36, 3. No. pp 556-562.
60. **Finlay, P.J., Mostyn, G. & Fell, R.** (1999). Landslides: Prediction of travel distance and guidelines for vulnerability of persons *Eighth ANZ Conference on Geomechanics*, Hobart, pp 105-113, Vol 1.
61. **Eggers M.J., Mostyn G. & Sullivan, T.D.** (1999). Probabilistic stability assessment of a high slope in variable strength rocks *Eighth ANZ Conference on Geomechanics*, Hobart, pp 91-98.

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63. **Glastonbury, J., Mostyn, G. & Fell, R.** (1999). Analysis and prediction of pre-collapse deformation of cut rock slopes. *9th International Congress on Rock Mechanics*, Paris/France, pp 95–100, Vol 1.
64. **Mostyn, G. & Douglas, K.** (2000). Strength of intact rock and rock masses. *GeoEng2000*, Volume 1 (Invited papers), Technomic Publishing Co, pp 1389-1421.
65. **Mostyn, G. & Sullivan, T.** (2002). Quantitative risk assessment of the Thredbo landslide. *Australian Geomechanics*, V 37 No 2, May, pp 169-181.
66. **Mostyn, G. & Douglas, K. J.** (2004). The Shear Strength of Rock Masses, *9th Australian New Zealand Conference on Geomechanics*, Auckland - Feb. 2004, Vol 1 pp 166-172.
67. **De Ambrosis, L.P. & Mostyn, G.** (2004). An Example of a Qualitative Terminology and Risk Matrix for Use in Landslide Risk Assessments, *9th Australian New Zealand Conference on Geomechanics*, Auckland - Feb., Vol 1 pp 398-404.
68. **Picarelli, L., Oboni, F., Evans, S.G., Mostyn, G. & Fell, R.** (2005). Hazard characterization and quantification. *Landslide Risk Management* (eds Hungr, Fell, Couture & Eberhardt), pp27-61, Balkema.
69. **Chan, I. & Mostyn, G.** (2004). Climatic Factors for AS2870 for the Sydney Region. *Proc 6th Australian New Zealand Young Geotechnical Professionals Conference*, Gold Coast, AGS, pp 28-33.
70. **Piccolo, D & Mostyn, G.** (2006). Engineering Issues relating to filling of deep pits for residential and light industrial development. *Australia New Zealand Young Geotechnical Professionals Conference*, 18-21 October 2006, Adelaide, South Australia, pp 168-173.
71. **Lai, Z.H.F., Douglas, K.J., & Mostyn, G.** (2007). The strength of rock defects – numerical analysis of scale effects. *ISRM Congress*, Lisbon, Portugal, pp 481-484.
72. **Douglas, K.J., Hemraj, D., & Mostyn, G.** (2007). SPT – CPT correlations for Botany Sands. *Common Ground 10th ANZ Geomechanics Conference*, Brisbane, pp 486-491.
73. **Mostyn G.R. & Ervin M.C.** (2007). AS3798 – 2007 Guidelines on Earthworks for Commercial and Residential Developments – Recent Revision. *Australian Geomechanics* Vol 42 No 4 December 2007.
74. **Chan, I & Mostyn, G.** (2008). Climatic Factors for AS2870 for the Metropolitan Sydney Area. *Australian Geomechanics*, Vol 43 no.1, March 2008.
75. **Burman, B.C, Mostyn, G & Piccolo, D.** (2008). Experiences with post-construction retesting of engineered clay fills. *Australian Geomechanics*, No 43, December, 2008, pp 1-29.
76. **Chan, I. & Mostyn, G.** (2009). Climatic Factors for AS2870 for New South Wales. *Australian Geomechanics*, Vol 44 no.2, June 2009.

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78. **Piccolo, D. & Mostyn, G.** (2011). Quantitative Risk Assessment for Urban Redevelopment Adjacent to Quarry Slopes. Australian Geomechanics. Landslide Risk Management Roadshow 2011 National Seminar Series. Vol 46 No 2 June 2011, pp 15-40.
79. **Nielsen, A.F. and Mostyn G.** (2011). Consideration in Applying Geotextiles to Coastal Revetments, Australian Geomechanics Society Sydney Chapter Symposium October 2011.
80. **Fowler, M., Weir, F.M., Sullivan, T.D. & Mostyn, G.R.** (2012). Application of discrete fracture networks for open pit slope design. 11th Australia New Zealand Conference on Geomechanics, Melbourne, July 2012.
81. **Shen B. & Mostyn G.** (2012). Characterisation of Structural Fills for Industrial Developments, 11th Australia New Zealand Conference on Geomechanics, Melbourne, July 2012.
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83. **Salim A., Clarke S & Mostyn G.** (2012). Eight years of monitoring reactive soils along the Epping to Chatswood Rail Link. 11th Australia New Zealand Conference on Geomechanics, Melbourne, July 2012.
84. **Bishop, D.T., Fityus, S., Piccolo, D., Mostyn G.** (2014). Rock fall case study: Hawkesbury Sandstone. Australian Geomechanics Vol 49 No 1 Month 2014.
85. **Green D.K.E., Douglas K. & Mostyn G.** (2015). The simulation and discretisation of random fields for probabilistic finite element analysis of soils using meshes of arbitrary triangular elements. Computers and Geotechnics, V68, pp 91-108.
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89. **Bertuzzi, R., Douglas, K. & Mostyn, G.** 2016a. An approach to model the strength of coal pillars. International Journal of Rock Mechanics and Mining Sciences, 89, 165-175.

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90. **Bertuzzi, R., Douglas, K. & Mostyn, G.** 2016b. Comparison of intact rock strength criteria for pragmatic design. *Journal of Geotechnical and Geoenvironmental Engineering*.
91. **Bertuzzi, R., Douglas, K. & Mostyn, G.** 2016c. Comparison of quantified and chart GSI for four rock masses. *Engineering Geology*, 202, 24-35.
92. **Bertuzzi, R., Douglas, K. & Mostyn, G.** 2016d. Improving the GSI Hoek-Brown criterion relationships. *International Journal of Rock Mechanics and Mining Sciences*, 89, 185-199.
93. **Piccolo D, Nash T. & Mostyn G.** (2017) Excavation and rockfall protection adjacent to live rail. *Australian Geomechanics*, V52, No 2, June, pp45-58.
94. **Rogan A. C., Piccolo D. and Mostyn G.** (2018), Case Study: Impact of Jet Grouted Column Variability on a Base Block in Sand, *Proceedings of the 12th Australian and New Zealand Young Geotechnical Professionals Conference, Hobart*, November 2018.
95. **Salim A. and Mostyn G.** (2018). Industrial Slab on Ground Design over a highly reactive site. Conference: AGS SA-NT Annual Seminar 2018 "Design and construction of earthworks and pavements on expansive clay".
96. **Stocker R., Piccolo D. and Mostyn G.** (2019). Erosion and weathering rates of Sydney sandstone. *13th ANZ Conference on Geomechanics, Perth*, April, 2019.
97. **Piccolo, D. and Mostyn G.** (2019). A cliff regression model to estimate the travel distance distribution of boulder falls and risk to persons and property downslope of the cliff, Sydney, Australia. *13th ANZ Conference on Geomechanics, Perth*, April, 2019.
98. **Clarke S.J., Mostyn G, and Shen B.** (2019). Collapse of the Old Pacific Highway, Piles Creek, Somersby. *13th ANZ Conference on Geomechanics, Perth*, April, 2019.
99. **Toh, J.C.W., Teoh, M.L. and Mostyn, G.** (in Press). Recent experiences in design and construction of high consequence temporary soil nail walls.



Wollondilly Shire Council
ATTN: Mark Tonkikh
via email: mark.tonkikh@wollondilly.nsw.gov.au

Dear Mark

RE: PROPOSED 15 LOT SUBDIVISION AT 95 GREAT SOUTHERN ROAD BARGO
TSUB18-00353 - DA 010.2017.00000492.001

I refer to your request for Subsidence Advisory NSW's determination for the Integrated Referral for a subdivision at 95 Great Southern Road Bargo dated 3 September 2018 (the Application), DA 010.2017.00000492.001.

Proposed refusal of your application

Your Application has been assessed in accordance with section 22 of the *Coal Mine Subsidence Compensation Act 2017* (the Act). This assessment indicates that the relevant land will be impacted in the future by mine subsidence.

The Mine Subsidence Board (the Board) intends to refuse your Application pursuant to section 22 of the Act for the following reasons:

- The proposed subdivision is located over a proposed Tahmoor Coal longwall panel, which is likely to be extracted prior to 2035;
- The positioning of the proposed longwall panel makes it likely that the site of the proposed subdivision will be impacted by subsidence.

Submissions on the proposed decision

If you wish to make submissions in relation to the intended decision to refuse your application, you must do so in writing by **1 December 2018**.

Please address any submissions to:

Subsidence Advisory NSW

Shane McDonald

Senior Risk Engineer

Ground Floor, Government Offices, 117 Bull St Newcastle West, NSW 2302

Or

Email: shane.mcdonald1@finance.nsw.gov.au

If you do not provide any written submissions to Subsidence Advisory NSW by 1 December 2018, the Board will finalise its decision about your application and notify you accordingly.

Should you have any questions in relation to the proposed decision, please feel to contact me by phone on 02 4908 4300 or by email at shane.mcdonald1@finance.nsw.gov.au

Yours faithfully,

A handwritten signature in dark ink, appearing to read 'Shane McDonald', is positioned above the printed name.

Shane McDonald
Senior Risk Engineer
21 November 2018



Mr M Tonkikh
Wollondilly Shire Council
via email: council@wollondilly.nsw.gov.au

Copy to:
Blake Dyer
Holding Redlich
via email: Blake.dyer@holdingredlich.com

Dear Mr. Tonkikh

RE: PROPOSED 15 LOT SUBDIVISION AT 95 GREAT SOUTHERN ROAD BARGO

PROPERTY: Lot: 1 DP: 996286, 95 Great Southern Road BARGO.

TSUB18-00353 - DA 010.2017.00000492.001

I refer to your request for comments from Subsidence Advisory NSW (SA NSW) for a development application referral for a subdivision at 95 Great Southern Road Bargo dated 3 September 2018 (the Application), DA 010.2017.00000492.001 and the response from SA NSW on 21 November 2018.

I note that SA NSW has received submissions from Holding Redlich on behalf of the Applicant in relation to this Application dated 7 December 2018. SA NSW has also received a copy of a letter to the Council from Precise Planning dated 27 November 2018.

SA NSW has reviewed and carefully considered the material in the Application and the further material provided on behalf of the Applicant.

SA NSW provides the following comments:

- The proposed subdivision is located within a consolidated coal lease held by Tahmoor Coal.
- Tahmoor Coal have lodged an application to extract coal by Longwall mining methods directly under the proposed subdivision and provided plans showing their proposed mining layout to SA NSW.
- Subsidence Advisory NSW considers the Colliery's statement of its intention to undermine the site to be credible.

- Recent studies commissioned by SA NSW on mining in the Tahmoor area indicate that between 30% - 40% of structures are damaged when longwall mining takes place.
- The positioning of the proposed longwall panel makes it highly likely that the site of the proposed subdivision will be impacted by subsidence if mining occurs.
- Concentrated ground strains are expected to exceed the subsidence impact parameters in the active mining guidelines developed by SA NSW. It is also considered likely that the concentrated ground strains that may occur will not be able to be satisfactorily mitigated against by design.
- SA NSW therefore considers that the proposed new road and associated stormwater works proposed with the subdivision and future purchasers of the subdivided land will be adversely impacted if mining takes place.

In light of the above considerations, SA NSW is writing to confirm that it does not provide general terms of approval to the proposed subdivision of land.

SA NSW has written to Holding Redlich today to respond to their letter and inform them of SA NSW's position.

Should you have any questions, I can be contacted by phone on 02 4908 4300 or by email at shane.mcdonald@finance.nsw.gov.au .

Yours faithfully,



Shane McDonald
Senior Risk Engineer

27 February 2019



Mr B Dyer
Senior Associate
Holding Redlich

By email blake.dyer@holdingredlich.com

Dear Mr Dyer

RE: PROPOSED 15 LOT SUBDIVISION AT 95 GREAT SOUTHERN ROAD BARGO

PROPERTY: Lot: 1 DP: 996286, 95 Great Southern Road BARGO.

TSUB18-00353 - DA 010.2017.00000492.001

I refer to your letter dated 7 December 2018 to Subsidence Advisory NSW (SA NSW) regarding your client's development application for a subdivision at 95 Great Southern Road Bargo, DA 010.2017.00000492.001 (the Application).

The Application has been made to Wollondilly Shire Council (the Council) for integrated development under the *Environmental Planning and Assessment Act 1979*.

In your letter, you refer to correspondence from SA NSW to the Council dated 21 November 2018 and provide submissions that SA NSW's refusal to grant general terms of approval is invalid and based on inadequate reasoning.

You have invited SA NSW to reconsider its position and propose conditions.

We have carefully considered the submissions made in your letter, and respectfully do not agree with the proposition that SA NSW's advice to Council is in any way invalid or unreasonable.

SA NSW provides the following comments:

- The proposed subdivision is located within a consolidated coal lease held by Tahmoor Coal.
- Tahmoor Coal have lodged an application to extract coal by Longwall mining methods directly under the proposed subdivision and provided plans showing their proposed mining layout to SA NSW.
- Subsidence Advisory NSW considers the Colliery's statement of its intention to undermine the site to be credible.
- Recent studies commissioned by SA NSW on mining in the Tahmoor area indicate that between 30% - 40% of structures are damaged when longwall mining takes place.

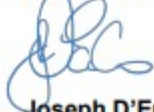
- The positioning of the proposed longwall panel makes it highly likely that the site of the proposed subdivision will be impacted by subsidence if mining occurs.
- Concentrated ground strains are expected to exceed the subsidence impact parameters in the active mining guidelines developed by SA NSW. It is also considered likely that the concentrated ground strains that may occur will not be able to be satisfactorily mitigated against by design.
- SA NSW therefore considers that the proposed new road and associated stormwater works proposed with the subdivision and future purchasers of the subdivided land will be adversely impacted if mining takes place.

In light of the above considerations, SA NSW has informed the Council that it does not grant general terms of approval.

We appreciate the complicated position all parties in this matter face, and would be pleased to meet with your client to discuss the matter further if that would be of assistance.

Should you have any questions, please contact me by phone on 02 4908 4300 or by email at joseph.dermilio@finance.nsw.gov.au.

Yours faithfully,



Joseph D'Ermilio
Chief Executive

27 February 2019