WorleyParsons
resources & energy

in association with
Pells Consulting

Commonwealth Department of Infrastructure and Transport

Further Analysis of Wilton

for the effects of

Mining and Mine Subsidence on Possible Airport Sites

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1 INTRODUCTION

1.1 Preamble

In May 2013, the Australian Government released *A Study of Wilton and RAAF Base Richmond for Civil Aviation Operations*[1] and, in doing so, announced that it would undertake additional analysis of the Wilton site. This additional analysis is required to take the form of supplementary advice about mining activity and mine subsidence on airport development, particularly in the context of assessing the implications for a major airport development that would need to be operational by 2030. This supplementary advice to the Wilton study was required to be in the form of a short report to be provided to Government.

1.2 Matters to be Addressed

As required by the Department's brief to WorleyParsons, this report includes:

- An outline of the current mining environment in the Wilton area including, inter alia, details of the mining extraction leases and mining exploration leases that exist within the study area, details of the leaseholders, and the types and patterns of resource extraction in the region to date;
- Supplementary advice on the longer term intentions of leaseholders – both extraction and exploration – based on discussions with senior personnel including, where mining is planned in the study area, the timeframe for this to occur and the location. Based on this information, details on the impact this may have on the options identified and the risk of future subsidence are assessed;
- A short outline of the factors that may influence a leaseholder decision to mine in the future, such as changes to the Australian Dollar or resource prices;
- Quality and value of coal seams and the implications for the question of compensation of the sterilization of resources, as well as the scale of compensation that could be expected for the preferred option/s;
- Examples of any precedent for sterilization of coal resources in the Southern Highlands and the compensation paid; and
- An assessment on which sites should be excluded from further consideration based on current and planned mining and mine subsidence risk and with a short summary on the rationale for excluding those options.

1.3 Previous Work on this Topic

This report should be read in conjunction with Section 5 Environmental Analysis, specifically Working Paper 2 Regional Geology and Working Paper 3 Regional Resources and Resource Extraction, of the report "*Further Assessment of Airport development options at Wilton",* which forms a part of Reference 1.[2]

[1] http://www.infrastructure.gov.au/aviation/scopingstudy/index.aspx

[2] http://www.infrastructure.gov.au/aviation/scopingstudy/files/Worley_Parsons-Further_assessment_of_airport_development_options_at_Wilton.pdf

These working papers broadly outline the nature of the coal resources which underlie the locality of Wilton and provide an overview of the issues involved in the mining of coal in this locality and in particular the effects on the ground surface liable to result from subsidence induced as a result of mining operations.

1.4 Principal Mining Companies Operating

The following Figure 1 shows the current mining and exploration titles as these relate to the Southern Coalfield of NSW.

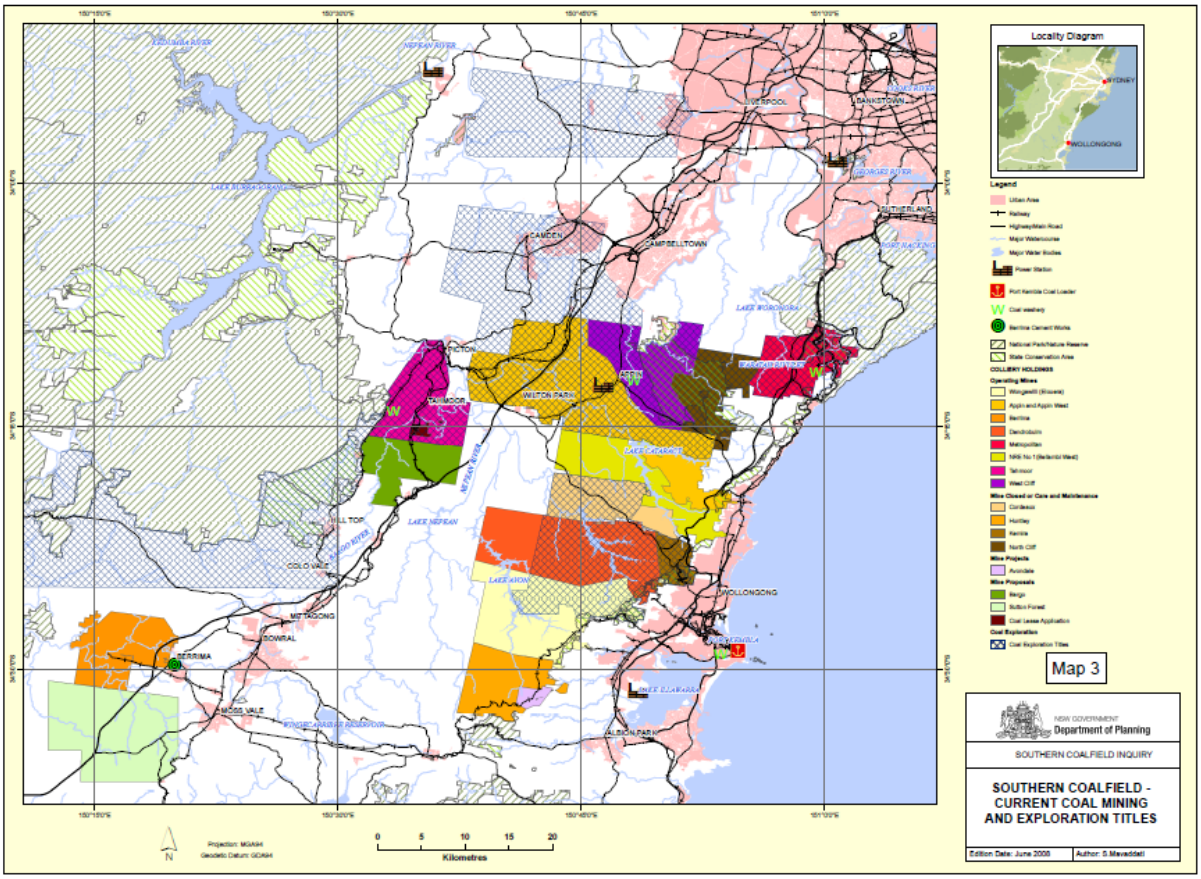

Figure 1 Southern Coalfield – Current Mining and Exploration Titles

There are three near-horizontal coal seams in the Southern Coalfield area. Most of the mining has been in the uppermost seam, the Bulli, which is at a depth of 350 m to 450 m below surface. There has been some mining in the much thinner Balgownie Seam, which is some 10 m below the Bulli, and more extensive mining in the Wongawilli seam, about 40 m below the Bulli Seam.

The extent of Coal Leases in relation to the area studied for airport sites at Wilton is shown in Figure 2.

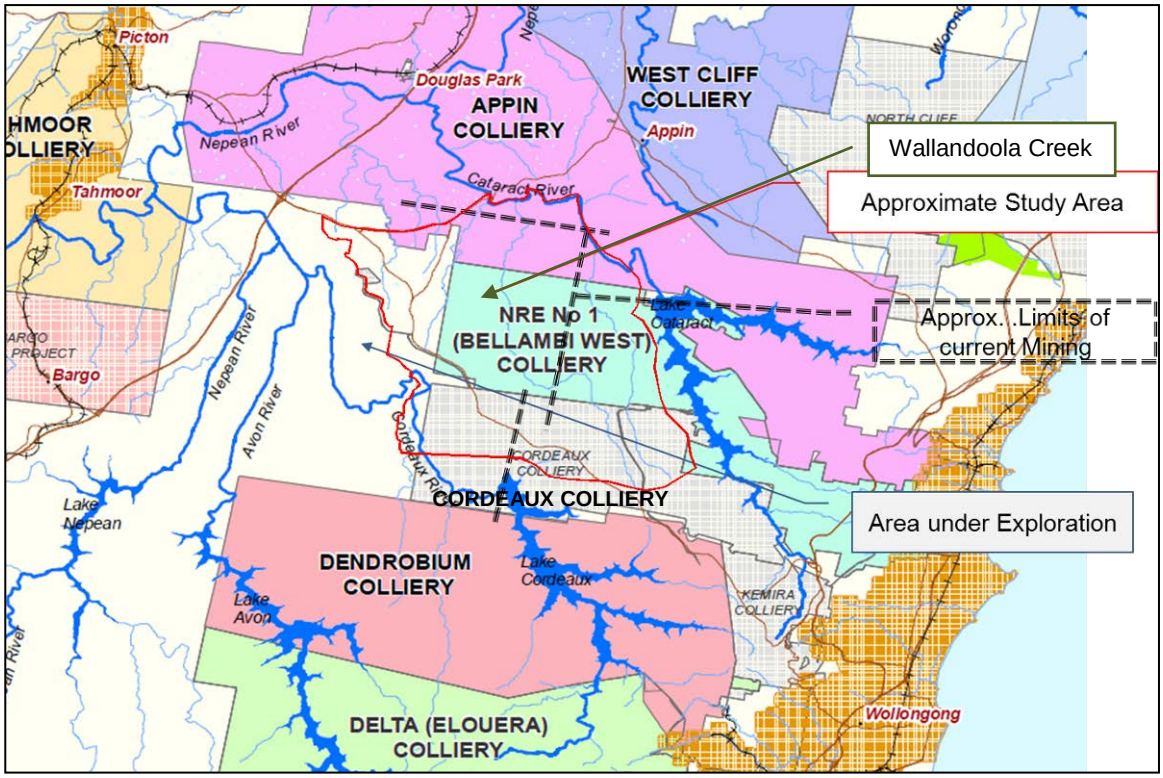

Figure 2 Coal Leases at Wilton[3] in Relation to the Study Area for Airport Sites

As shown in Figure 2, there are four principal mining areas which cover the study area for airport siting. These are:

- To the north, the Appin Colliery lease owned by Illawarra Coal Holdings Pty Ltd (a BHP Billiton company). This lease is fully operational and is being expanded into new areas of the current seam (the Bulli) being mined;
- In the east, the NRE No 1 mine lease owned by Gujarat NRE Coking Coal Limited (Gujarat NRE) – this lease is currently operational and Gujarat NRE are expanding into seams below the Bulli Seam and expect to be expanding into new areas to the west;
- In the west, an area which is not currently being mined but which was the subject of an Expression of Interest issued by the NSW Department of Primary Industries in 2009[4]. This is known as the East Bargo Exploration Area; and
- In the south, the lease associated with Cordeaux Colliery owned by Illawarra Coal Holdings Pty Ltd but currently non-operational. Coal was mined in the Bulli Seam.

1.5 Leaseholder Details

1.5.1 Illawarra Coal Holdings Pty Ltd

Illawarra Coal Holdings Pty Ltd (ICHPL) is a 100 per cent owned subsidiary of BHP Billiton and produces hard coking coal used primarily in the production of steel. The Company also produces

[3] ibid

[4] http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/285432/East-bargo-eoi-information-pack-june-2009.pdf

methane gas. It has coal preparation plants in West Cliff and Port Kembla, Australia[5]. The company was founded in 1935 and is based in Wollongong, Australia. According to its website[6]:

> *"Illawarra Coal operates three underground coal mines in the southern coalfields of New South Wales - Appin, West Cliff and Dendrobium; and two coal preparation plants – West Cliff Coal Preparation Plant and Dendrobium Coal Preparation Plant. The Port Kembla Coal Terminal is operated by Illawarra Coal on behalf of a consortium of partners (Illawarra Coal, Xstrata Coal, Peabody, Tahmoor Coal and Centennial Coal) and leased from the New South Wales Government.*
>
> *ICHPL also owns and operates the Dendrobium Mine located approximately 10 km north-west of Wollongong in NSW.*
>
> *ICHPL has a long history of working in the Southern Coalfield of NSW to provide high-value coking coal to the Australian steel industry and for export to overseas customers. ICHPL provides a significant economic contribution to the region (Illawarra and South Western Sydney, including Wollondilly). ICHPL is an important employer in the region, through both direct employment of ICHPL staff and employment of local contractors at the Appin Mine, West Cliff Colliery and Dendrobium Mine. The flow-on employment benefits of ICHPL's operations are also significant."*

The Bulli Seam project north of Wilton and centred on Appin is being developed by ICHPL.

Contact details are:

BHP Billiton Illawarra Coal Holdings Pty Ltd
Post Office Box 514
UNANDERRA NSW 2526
Phone: (02) 4255 3200

1.5.2 Gujarat NRE Coking Coal Limited

As described on their website[7]:

> *"Gujarat NRE Coking Coal Limited is an Australian public company that owns and operates two hard coking coal mines in the southern coal fields of New South Wales Australia. The mines, NRE No. 1 Colliery and NRE Wongawilli Colliery, contain estimated coal reserves of 125 million tons (MT) and resources of 651 million tons and have a potential mine life of over 30 years. Most of its coal production is sold to its parent company Gujarat NRE Coke Limited, at market price on arms' length terms. Gujarat NRE Coke Limited, an Indian public listed company, is the largest independent manufacturer of metallurgical coke in India and has a long track record as a supplier of coke in India as well as to countries around the world such as Brazil, South Africa, Malaysia, Japan and other emerging growth markets.*
>
> *The company's first mine, NRE No. 1 Colliery, contains JORC reserves of 92 MT and resources of 315 MT, has a potential mine life of over 30 years and a fiscal year 2016 production target of approximately 3 million tonnes per annum (MTPA). The second mine, NRE Wongawilli Colliery, contains JORC reserves of 33 MT and resources of 337 MT, also has a potential mine*

[5] http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=35103715

[6] http://www.bhpbilliton.com/home/aboutus/regulatory/Documents/bulliSeamSection1Introduction.pdf

[7] http://www.gujaratnre.com.au/aboutus.html

life of over 30 years and a fiscal year 2016 production target of approximately 2 MTPA. The area of New South Wales in which GNCCL operates is a long-established coal producing region with over 160 years of production history".

Contact details are:
Gujarat NRE Coking Coal Limited
NRE No. 1 Colliery
Corner Bellambi Lane and Princes Highway
Russell Vale, NSW 2517, Australia

Phone: +61 (2) 4223 6800
Fax: +61 (2) 4283 7368
E-mail: gnal@gujaratnre.com.au, community@gujaratnre.com.au

1.6 Consultation

On Thursday 13 June 2013, Peter Thornton (WorleyParsons) and Dr Phillip Pells (Pells Consulting) undertook consultation with:

- Gujarat NRE, represented by Dr Chris Harvey, Head of Technical Services and Mr Barry Clark, Geological and Quality Assurance Manager; and
- ICHPL (BHP Billiton), represented by Mr Hank Pinkster, Manager Infrastructure and Property Sustainable Development, Mr Richard Walsh, Manager Subsidence Engineering and Mr Michael Meurer, Land Holder Relations Coordination.

Some of the key points from this consultation are as follows:

For Gujarat NRE:

- East of Wallandoola Creek[8], the Mine Plan provides for mining over the next 15 years in both the Bulli and Wongawilli seams;
- West of Wallandoola Creek, the Mine Plan provides for action on the Bulli and Wongawilli seams in 20 to 30 years, which places it on the timeline for start-up of operations of a major airport;
- It is possible that the 1 m thick Balgownie Seam (which lies between the Bulli and Wongawilli seams) could also be mined in which case it would have to be mined before the Wongawilli seam. Presumably this means a longer period working in the eastern precinct; and
- Mining of the western part of the lease area could be undertaken earlier but would require new pit top facilities. This was formerly the West Bellambi Project when owned by Shell but that did not proceed. This would mean that subsidence in that precinct could occur before airport development was required.

[8] Wallandoola Creek rises in the Cordeaux Colliery lease Area, flows in NNW direction across the Gujarat NRE lease and joins the Cataract River inside the Illawarra Coal Appin Colliery Lease area downstream of Lake Cataract. It is a key feature of the region insofar as consideration of airport sites is concerned. See Figure 2.

For ICHPL (BHP Billiton):

- BHP have recently undertaken a major program of development approvals for its Bulli Seam Operations based on Appin Colliery;
- The expanded operations would have about a 30 year life;
- It is likely to be 20 years before that portion of the ICHPL lease within the study area would be mined;
- ICHPL has recently released *Wilton Junction Proposal - Review of Coal Resources 1111*, the stated purpose of this report is to address the issue of urban development taking place and proposed to take place in the vicinity of Wilton and within its mining lease area:

  > *"This report has been compiled in response to requests made by the NSW Department of Planning & Infrastructure to inform and advise Government on the issues relating to coal mining beneath the Wilton Junction development proposal supported by Wollondilly Shire Council at its meeting on 17th December 2012. It also responds to the consortium of Wilton Junction landowners 30 January 2013, submission titled "Wilton Junction co-existence of coal mining and surface development."*

  A copy of this report was provided to indicate the position of ICHPL to development, such as within its lease area;
- In the course of gaining approval for its Bulli Seam Operations Project, ICHPL undertook negotiations with the NSW Government to reduce the extent of mining beneath an area of land within their lease which previously had been designated as a State Recreation Area (SRA) in which mining is permitted but which had later been gazetted as Dharawul National Park – beneath which mining is not permitted.

  According to ICHPL[9,10:]

  > *"The Modified Project results in significantly reduced mining within the Dharawul State Conservation Area and Sydney Catchment Authority controlled catchments. As a consequence, ICHPL proposes a revised commitment in regard to implementing research, offset and compensatory measures."*

  This is possibly the most contemporary example of resource sterilization in the vicinity of Wilton and in the Southern Highlands;
- In regard to further mining of the Cordeaux Colliery lease, the time scale for mining the Wongawilli Seam under Cordeaux Colliery was thought to be greater than 10 years hence and the resource would likely be accessed from BHP's Dendrobium mine[11]; and
- While a lease gave general rights to extract the resource, the actual approvals required very extensive documentation for the operation and the surface facilities. Currently, requirements

[9] http://www.bhpbilliton.com/home/aboutus/regulatory/Documents/Bulli%20Seam%20Operations/Preferred%20Project%20Report.pdf

[10] http://www.bhpbilliton.com/home/aboutus/regulatory/Documents/Bulli%20Seam%20Operations/Preferred%20Project%20Report_Supplementary%20Information.pdf

[11] http://www.bhpbilliton.com/home/aboutus/regulatory/Documents/Cordeaux/Pollution%20Incident%20Response%20Management%20Plan_EPL%20611.pdf

under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are more difficult to address than those of the State.

Consultation with the NSW Department of Primary Industries and the NSW Mine Subsidence Board were also sought. However at the time of writing consultation had not been able to be conducted due to lack of response and return communication from these agencies.

Relevant declared Mine Subsidence Districts[12] are shown in Figure 3. This indicates that, while no mining has as yet taken place, Airport Sites Options 1,1S, 2, 6 and 7 partially fall within the southern portion of the Wilton Mine Subsidence District.

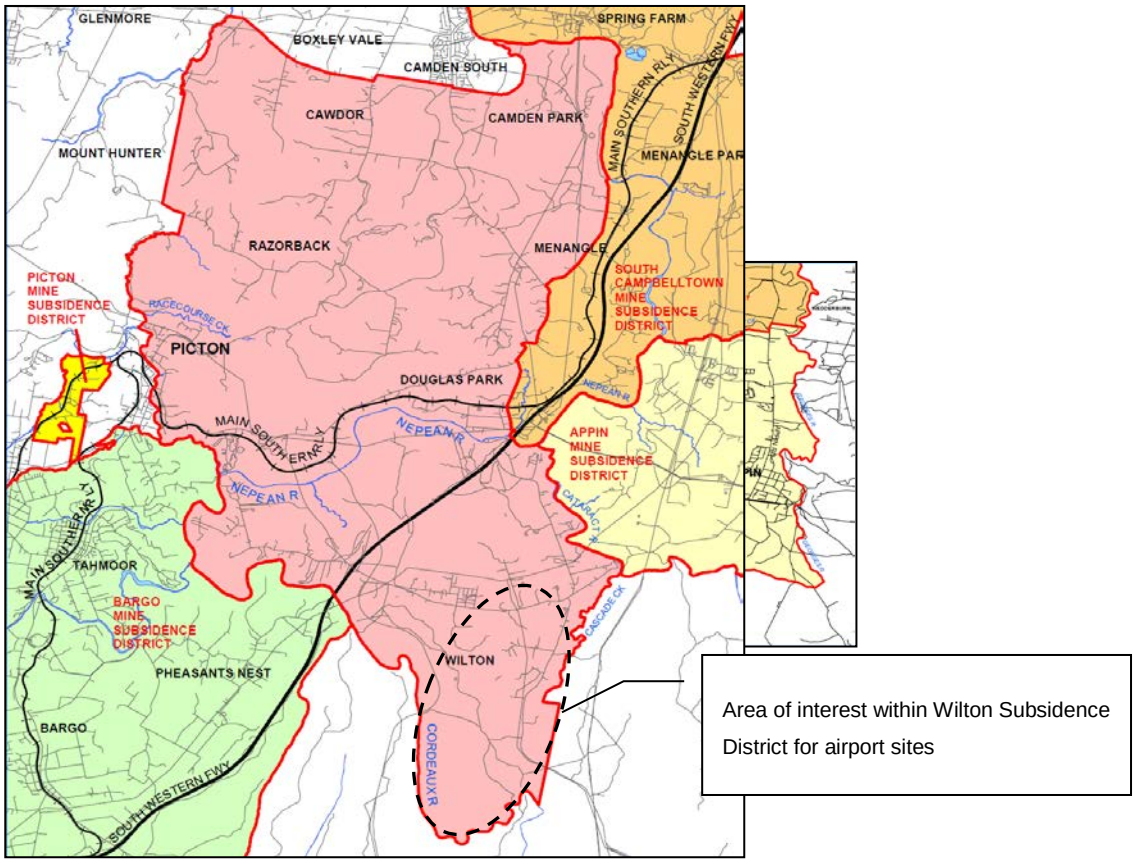

Figure 3 Declared Mine Subsidence District at Wilton

1.7 Acknowledgement

All photomontages showing airport sites are based on Google Earth.

[12] http://www.minesub.nsw.gov.au/templates/mine_subsidence_board.aspx?pageID=3758

1.8 Glossary

Term / Acronym	Definition
BSO/BSP	Bulli Seam Operations/Bulli Seam Project
DFAT	Department of Foreign Affairs and Trade
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FOB	Free on Board
ICHPL	Illawarra Coal Holdings Pty Ltd
JORC	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code') is a professional code of practice that sets minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves
Maximum airport	Twin parallel 4000 m runway airport with cross runway
Mt	Million tonnes
Mt/yr	Million Tonnes Per Year
MTPA	Million Tonnes Per Annum
PAC	NSW Planning Assessment Commission
ROM	Run of Mine
SCA	Sydney Catchment Authority
SEPP	State Environmental Planning Policy
SRA	State Recreation Area
Type 1 airport	Single 4000 m runway airport
Type 3 airport	Single <2600 m runway airport
Type 4 airport	Single <1650 m runway airport

2 MINERAL RESOURCES PRESENT AT WILTON

2.1 Nature of the Resources

The principal resources present at Wilton are coal measures, as described in Section 5 Environmental Analysis, specifically Working Paper 2 Regional Geology and Working Paper 3 Regional Resources and Resource Extraction, of the report "*Further Assessment of Airport Development Options at Wilton*", which forms a part of Reference 1.

Figure 4 is a simplified stratigraphic column which shows the relationship of the principal coal seams[13] and their names.

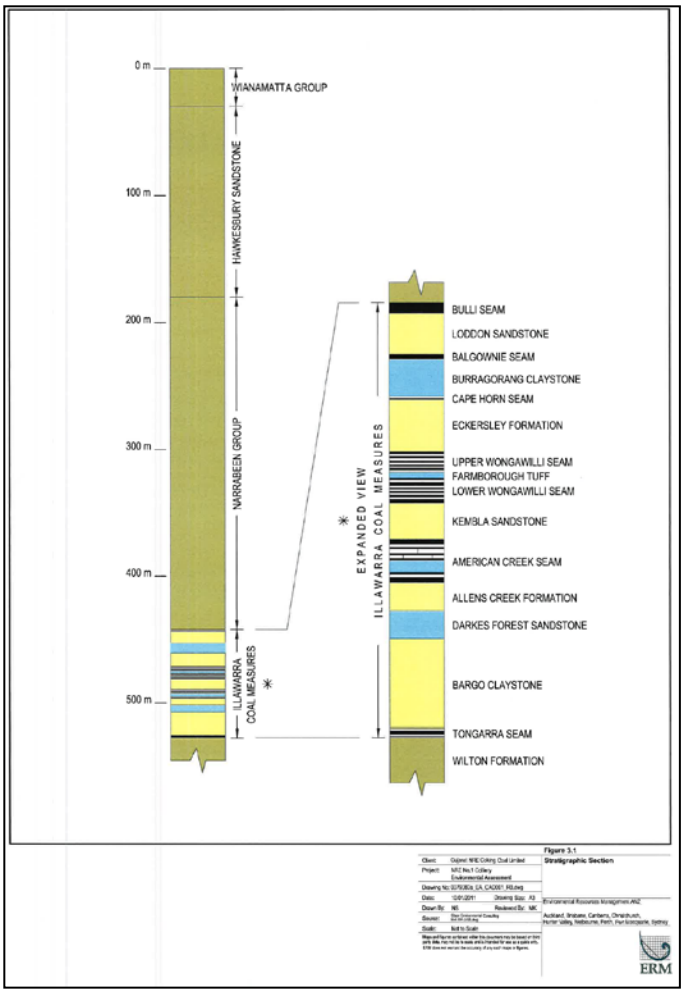

Figure 4 Stratigraphic Column showing Principal Coal Seams

[13] http://115.249.74.43/Environmental/NRE%20No.1/Underground%20Expansion%20Project%20(MP09_0013)/Volume%20I/0079383RP01_Part%20A.pdf

In addition, Reference 8 states:

> *"The gas content of the potentially mineable seams or surrounding strata in the East Bargo exploration area has not been evaluated";* and
>
> *"A current Petroleum Exploration Licence overlies the area."*

In respect of gas resources Gujarat NRE[14] state that:

> *"There is scope to develop extensive high quality methane gas resources (estimated in excess of 50 years), existing within the Wongawilli seam which contains the largest field of gas in the region. The presence of gas up to 10m^3/t with acceptable CO_2 ratios in the Bulli and Balgownie seams may also be exploited for gas sales or power generation. Government incentives and grants are available in projects, which reduce greenhouse gas (methane) emissions for which the Balgownie project may qualify."*

However, these resources and their potential, if any, to impact on airport development at Wilton have not been considered in this report since, as was noted in Working Paper 3 Regional Resources and Resource Extraction, exploitation of these resources would have a far lesser effect than would longwall coal mining.

Of interest is the fact that, as described in Appendix 1, Denver International Airport has 76 operating oil wells on its 34,000 acres site.

2.2 Quality and Value of Coal Seams.

The quality and value of the coal resources which underlie the entire Study area in which all the airport site options are located are described by ICHPL[15] as follows:

> *"This is the only region in NSW which produces high quality hard coking coal – an essential resource for the domestic and international steel industry";*
>
> *"Coal resources in the Wollondilly Shire are predominantly premium quality hard coking coal. This is a scarce and highly valuable asset of the State;"* and
>
> *"The importance of coal mining to NSW is inherent in its designation as "State Significant Development" within the State Environmental Planning Policy (SEPP) (State and Regional Development) 2011."*

In regard to the market demand for *"Balgownie"* formation coal, Gujarat NRE state that[16]:

> *"The coal products from the NRE No. 1 Colliery are world class due to their very low phosphorous levels (<0.005ppm), high calorific value, low ash coal and low sulphur content and their suitability for direct feed into coke oven to produce blast furnace coke, ranked among the best in the world.*
>
> *The low phosphorous level in Balgownie Seam coal (Balgo) represent some of the lowest known levels of phosphorous in the world.*

[14] http://www.gujaratnre.com.au/resources.html

[15] "Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND

[16] http://www.gujaratnre.com.au/

The merits of the Balgownie low volatile metallurgical coals are:

- *Strong coke*
- *Low phosphorous*
- *Low sulphur*
- *Good fluidity*
- *Nil oven wall pressure*
- *Adequate reflectance*

There is also a strong, diversified demand for the Bulli coals, due to its quality characteristics. By mining to produce a blend of Balgownie and Bulli coal, the quality of both the hard coking coal and the thermal coal products are enhanced. The low phosphorous coking coal will be a premium product in the world coal market and be in high demand by European steel mills."

In its East Bargo Expression of Interest Information document, the NSW Department of Primary Industries states[17]:

"The East Bargo Expression of Interest area is approximately 96 sq. km and is expected to contain underground coal resources of export and domestic quality coking and thermal coal"; and

"Within the East Bargo coal exploration area the Bulli and Wongawilli seams are expected to contain more than 330 million tonnes of in situ coal resources at depths ranging from 360 metres to over 500 metres."[18]

It goes on to describe the two principal coals seams within its area as follows:

"The Bulli seam occurs at the top of the coal bearing sequence. The seam thickness ranges from 1.2 to 2.2m and contains bright and dull coal. The working section of the Bulli seam usually corresponds to the geological seam thickness. The raw ash varies from 10 to 22% and CSN values of 3 are reported. Sulphur contents are typically less than 0.5% and phosphorous is less than 0.1%"; and

"The Wongawilli seam is 35 - 55m below the Bulli seam. The full seam thickness is approximately 10m with an average 2m working section at the base. The working section raw ash is approximately 35%."

However, as was reported previously, the coal in this area, while still valuable, is understood to be more difficult to extract by virtue of being in a thinner seam and as a result of some geological intrusions as well as possibly being of a somewhat lesser quality.

2.3 Relationship to Airport Sites

Figure 5 shows the relationship of the airport sites identified in the previous study in relation to the coal leases and existing mine workings. As shown in Figure 6, these sites fall into two groupings: one group comprising Options 1,1S, 2, 6 and 7 to the west of Wallandoola Creek; and the other group comprising Options 3, 4 and 5 to the east of Wallandoola Creek.

[17] East Bargo Expression of Interest Information Southern Coalfield New South Wales June 2009

[18] East Bargo Expression of Interest Information Southern Coalfield New South Wales June 2009

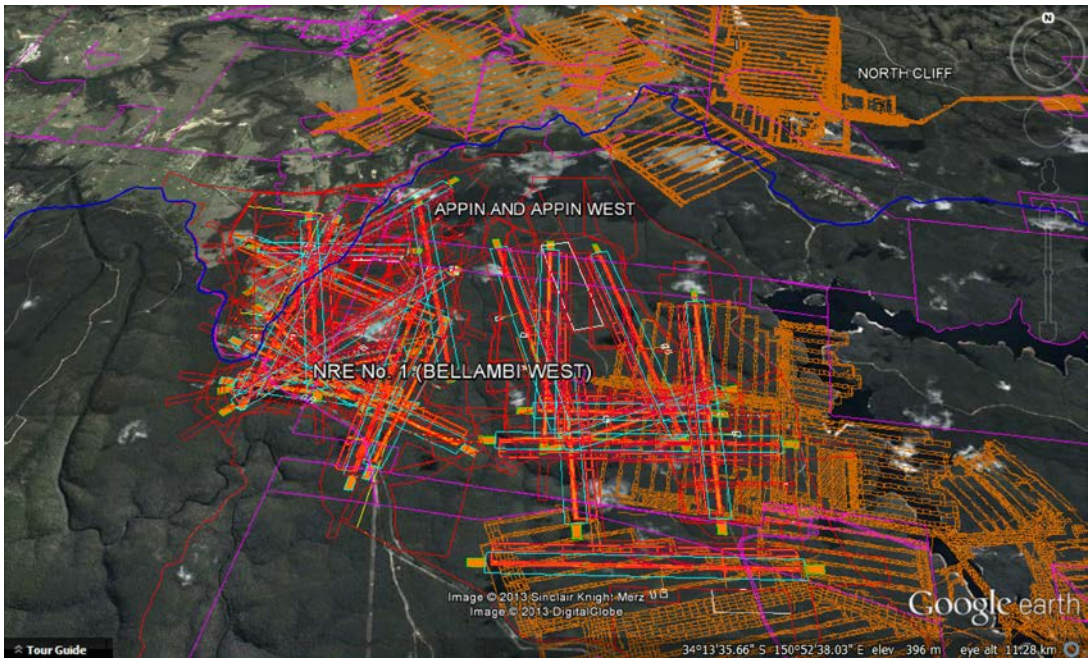

Figure 5 Airport Site Options in relation to Mining leases and Existing Workings[19]

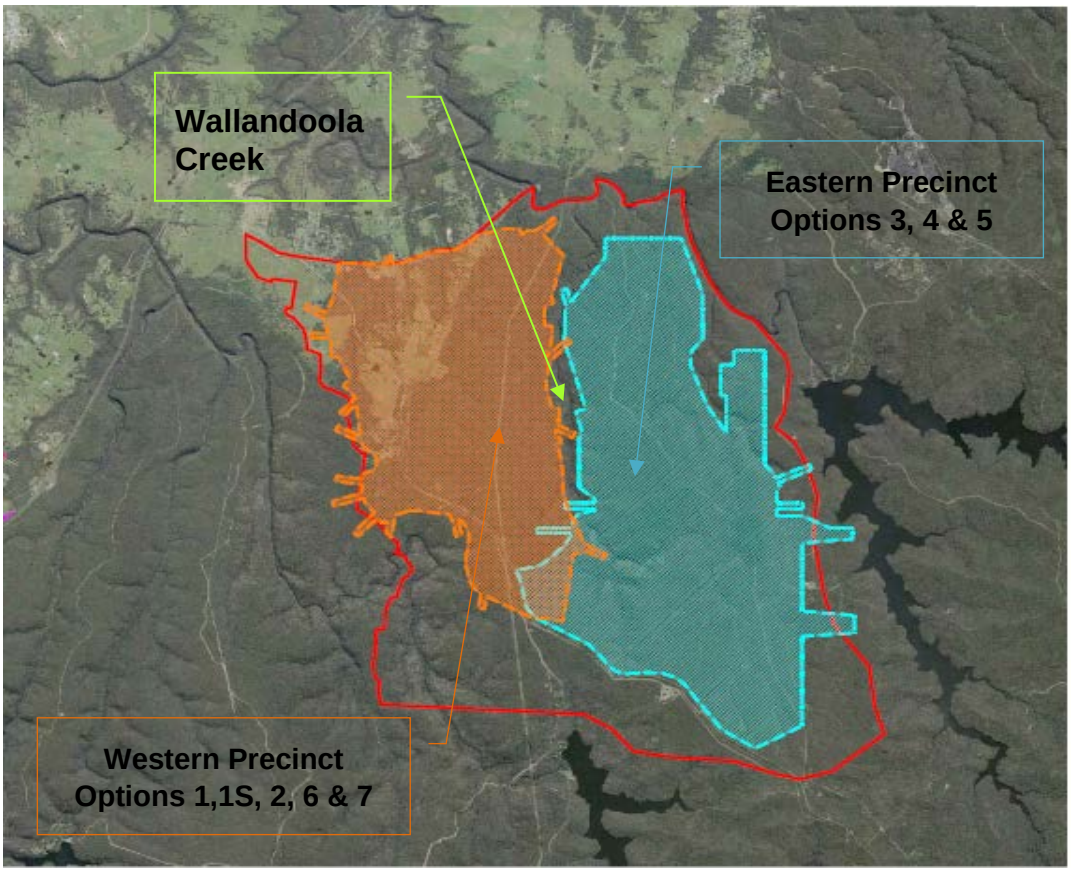

Figure 6 Airport Site Groupings

[19] Base figure Source: Google Earth

3 CURRENT MINING IN THE WILTON AREA

3.1 Illawarra Coal Holdings Pty Ltd

ICHPL describes its operation in the Appin and Westcliff Colliery areas in these terms[20]:

> *"Illawarra Coal has held Mining Lease CCL767 since 1991, which is a consolidation of 69 mining titles acquired by the Company since the 1920s. In 2008 the Company submitted a development application for the Bulli Seam Operations (BSO) Project. The Company did this to modernise its consent. NSW Project Approval was granted on 22 December 2011 by the PAC under delegation of the NSW Minister for Planning.*
>
> *The approval was granted under Part 3A of the NSW EP&A Act 1979 and allows for the extension of coal mining at Appin Mine and West Cliff Colliery for 30 years.*
>
> *The following outcomes were achieved with the NSW Approval:*
>
> - *Modern approval based on community expectations*
> - *30 years of production for West Cliff and Appin*
> - *Maximum rate of extraction of 10.5Mt/yr*
> - *Flexibility for first and second workings*
> - *Delegated approvals for Management Plans, including extraction, surface gas management etc*
> - *Performance measures set for subsidence impacts (environment and built features)*
> - *Approval for transporting coal on public roads".*

In respect of their Cordeaux Colliery, ICHPL says:

> *"Cordeaux Colliery is located adjacent to Picton Road, approximately 20 km North West of Wollongong. The site is on land owned by the Sydney Catchment Authority (SCA).*
>
> *Construction of the mine commenced in 1976 with the first coal being produced from the underground workings in 1980. In 1985, Cordeaux holed into Corrimal Colliery workings to officially merge the two collieries in January 1986. BHP (now BHP Billiton Illawarra Coal) has continuously owned and operated the mine and continues to be responsible for the 'care and maintenance' of the Cordeaux pit top site and other relevant sites.*
>
> *The economically recoverable Bulli Seam coal reserves in the Cordeaux Colliery holding were extracted by the year 2001. The colliery ceased coal production on the 23/03/2001 and has been on care and maintenance since 14/04/2001 to date."*
>
> *"The pit top covers approximately 10.7 ha of land on the Picton Road site and includes the infrastructure which was required to support the mining operations.*
>
> *Illawarra Coal's exploration, survey and environmental field crew personnel still utilise the Cordeaux pit top site as the base for their operations."*

[20] "Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND.

3.2 Gujarat NRE Coking Coal Limited

According to its website[21]:

> *"Gujarat NRE has invested approximately US$ 750 million over the past 8 years to expand the production capability of its mines and to improve infrastructure. The company has recently commenced operations utilizing new longwall mining equipment at the NRE No. 1 Colliery. The utilization of new longwall equipment at NRE No. 1 Colliery and the existing longwall equipment at NRE Wongawilli Colliery, which commenced operations in 2008, along with other contemplated capital improvements and upgrades at the mines, will boost total production capacity from approximately 1.1 MTPA in fiscal year 2012 to approximately 5 MTPA in fiscal year 2016. The company also enjoys the advantage of having close proximity to a low demurrage port facility, Port Kembla Coal Terminal. The access to this terminal provides with favorable transportation logistics and materially reduces the transportation costs".*

In its Annual Report[22] for 2012, NRE Gujarat states in respect of NRE No.1 Colliery that

> *"The Company had during the financial period received the approval from the NSW Planning Assessment Commission (NSW PAC) to its Preliminary Works Project relating to the proposed upgrade to the infrastructure at NRE No.1 Colliery. The NSW PAC approval includes continuing the extraction of up to 1 million tonnes of coal per annum from the Bulli and Wongawilli seams for the next 3 years; continuation of the coal being transported by truck to Port Kembla Coal Terminal and upgrades to the existing surface facilities and infrastructure.*
>
> *The finalisation of the plans for the Major Expansion Project has continued to make progress during the year. The submission for the final approval is expected to be done before August 2012 and the approval for the same is expected to be received before the end of the year. The key section of the Major Expansion Project is that it is expected to increase production levels up to 3mtpa along with ongoing endorsement of all operations for the next 18 years."*

According to its Environmental Assessment report[23]

> *"The Project Application Area comprises Consolidated Coal Leases (CCL) 745, Mining Purposes lease (MPL) 271 and mining lease (ML) 1575 and covers an area of approximately 6,973 hectares (ha)."*

3.3 Types and Patterns of Resource Extraction

3.3.1 Illawarra Coal Holdings Pty Ltd

ICHPL report[24] that their approach to resource extraction will be as follows:

> *"The development stage of mining is responsible for the preparation of the large rectangular blocks of coal that are then extracted using longwall equipment. Development roadways, which form the borders of a longwall block, must be constructed before mining of a longwall can commence.*

[21] http://115.249.74.43/aboutus.html

[22] http://115.249.74.43/AnnualReports/GNCCL%20Annual%20Report%2031%20March%202012.pdf

[23] http://115.249.74.43/Environmental/NRE%20No.1/Underground%20Expansion%20Project%20(MP09_0013)/Volume%20I/0079383RP01_Part%20A.pdf

[24] "Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND.

Development roadways not only form the roads that the workers and the machines use to get to and from work each day, but also provide access for important underground services such as water and electricity. Development roadways are also used to allow for the movement of air through the mine to provide fresh air for people working underground.

Roadways (usually known as main heading development) are also developed in order to help Illawarra Coal gain access to new areas where mining has been approved, known as mining domains, for the installation of underground services, conveyors and airways for mine ventilation.

Mining of development roadways does not result in subsidence on the surface as the roadways are supported with roof and wall supports, and are much narrower in width (approximately 5 metres) than a longwall block. The preparation of future longwall blocks for mining is vital to Illawarra Coal in order to ensure a continued supply of coal to its customers.

It is optimal for a mine to have the roadways ready for the next longwall before the previous longwall finishes. If the roadways aren't completed, operations cannot commence in the next mining area because equipment has no place to be installed. This results in a cessation of production.

Development is undertaken using a continuous miner, which has a rotating cylindrical cutting head, fitted with a number of picks, which cuts away the coal as the machine moves forward";

"Once development of a mining area is complete, longwall mining can take place. In longwall mining, two parallel tunnels or roadways are formed which are approximately 2-3 kilometres long as part of the development activities. A third tunnel (200-300 metres long) is then driven to intersect the end of these two parallel tunnels. This results in three sides of a rectangular block of coal being defined for extraction using longwall equipment"; and

"As the coal is sheared away from the face and the equipment progresses, the chocks also move forward to support the roof where operations are taking place. As the chocks move forward, the roof behind is allowed to collapse safely behind the longwall equipment. This forms what is known as the goaf."

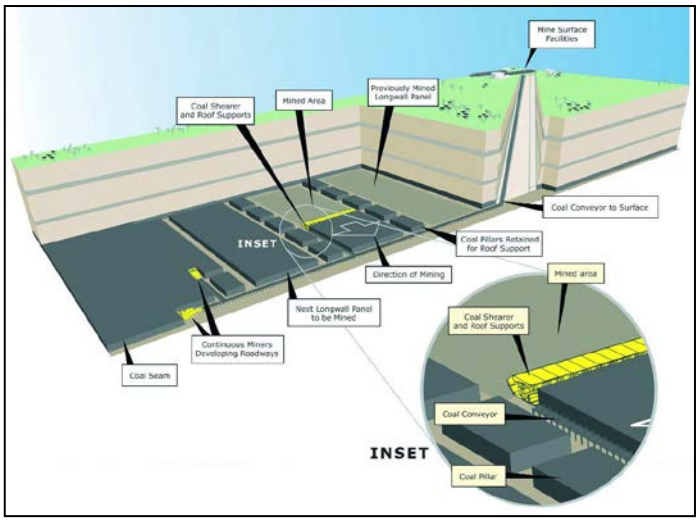

Figure 7 Long Wall Mining

3.3.2 Gujarat NRE Coking Coal Limited

According to the company's website the type and pattern of mining proposed by Gujarat NRE is as follows:

> *"Gujarat NRE has adopted new approaches to mining in the NRE No 1 Colliery as compared to what was being practiced by the earlier owners. Where mining has for a number of decades been conducted using Longwall mining, it intends to use Pillar extraction method to increase the recovery level in the remaining levels. While mining in the colliery has always been concentrated on the Bulli seam, the Balgownie and the Wongawilli seams have hardly seen much activity.*
>
> *Pillar extraction mining in the Bulli seam uses the Continuous Miner method supported by BLS (breaker line support). Continuous miner is a speedy and efficient process having high productivity and is designed for a variety of seams and mining conditions. The continuous miner cuts a network of "rooms" into the seam. As the rooms are cut, the continuous miner simultaneously loads the coal onto a shuttle or ram car where it will eventually be placed on a conveyor belt that moves it to the surface. The roof is supported by installation of steel "roof bolts" into the stone above the coal seam, and pillars of coal are left behind to support the roadways. These pillars are later removed with the continuous miners and the roof is allowed to collapse in a controlled manner. The breaker line support helps to provide a safe working environment near the continuous miner by pushing upwards against the roof.*
>
> *The company further intends to mine the Wongawilli seam also using Longwall Mining Machines.*
>
> *It proposes to mine the Balgownie seam using Thin Seam Mining methods which as the name suggests is used for mining coal seams with thickness less than 1.5 metres. Hence, this method is most suitable for mining Balgownie seam, the thickness of which ranges from 0.46 to 1.5 metres. Thin seam differs in that it involves forming smaller pillars of coal that would be found in the Bulli or Wongawilli seam. Each mining "panel" forms up to seven roadways. The miner cuts these road ways in a sequence that allows a mobile bolting machine to come in after the coal has been removed for up to 15 metres, and to support the roof the miner is driven on the tracks (fitted) to another roadway where it cuts another 15 metres. This is known as the "cut and flit" method. In this system, the pillars of coal are not removed by pillar extraction methods. This mining system achieves a higher-than-normal recovery of the resources on the advance."*

3.3.3 Cordeaux Colliery

Coal extraction methods can be expected to be the same or similar to those used by ICHPL and Gujarat NRE.

3.3.4 East Bargo Exploration Area

Coal extraction methods can be expected to be the same or similar to those used by ICHPL and Gujarat NRE.

4 FUTURE MINING AND CONSENT TO MINE

4.1 Illawarra Coal Holding Pty Ltd (BHP Billiton)

The NSW Department of Primary Industries states that in respect of the Southern Coalfield[25]:

> *"BHP Billiton received approval from the NSW Government for the $367 million Bulli Seam Project in December 2011. The project will involve the continuation of underground mining operations at the Appin Mine and West Cliff Colliery, extending the life of the operations by approximately 30 years. Continued development of underground mining operations within existing and new mining leases will facilitate a total ROM coal production rate of up to 10 Mtpa. The project also includes the upgrade of the existing West Cliff Washery to support the increased ROM coal production and continued generation of electricity by the existing Appin-Tower Power Project, utilising coal bed methane drained from the underground mine workings."*

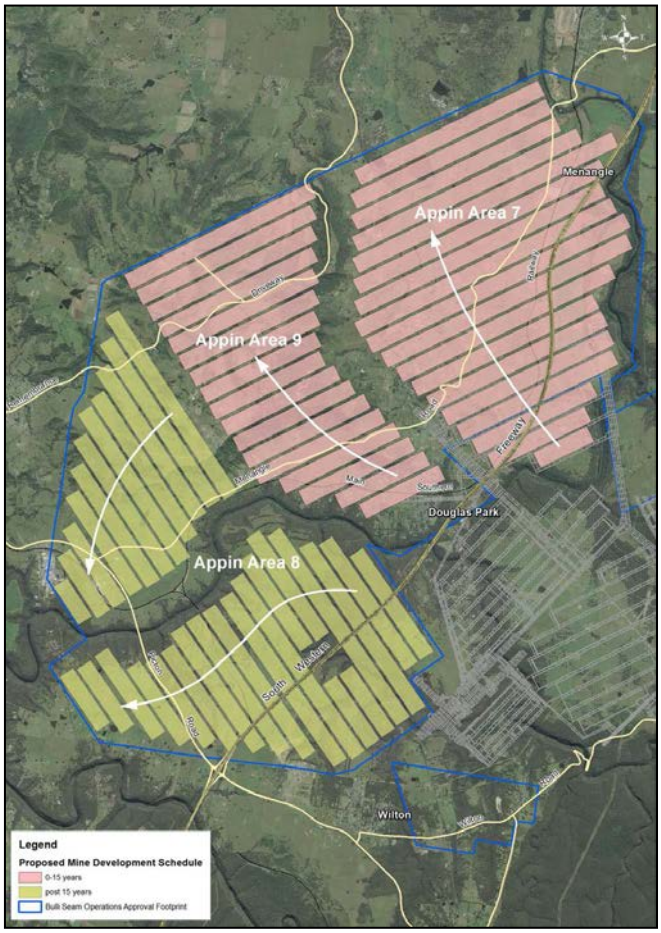

Figure 8 Approved Bulli Seam Longwall Mining Layout

[25] http://www.resources.nsw.gov.au/resources/coal/new-mines-and-projects#Southern-Coalfield

In regard to timing of mining according to ICHPL[26]:

> *"Detailed mine designs are not typically locked in more than five years prior to extraction";* and
>
> *"Within the BSO approval it is planned to mine the Appin Area 7 and Appin Area 9 domains first before proceeding to Appin Area 8. The main reason for this sequence is, until Appin Area 9 is developed underground, access to Appin Area 8 would require significant costly roadway development mining. Mining is more efficient and economical where development immediately precedes longwall mining.*
>
> *Appin Area 7 and Appin Area 9 have sufficient resources to continue our concurrent two longwall operations in the Bulli coal seam for approximately another 10-15 years. Therefore it is anticipated that mining in Appin Area 8 would not commence before this timeframe".*

In regard to subsidence occurring from its future operations and with specific reference to recent proposal for a major development of housing at Wilton, ICHPL states:

> *"Illawarra Coal believes that proceeding with Wilton Junction proposal is likely to sterilise the scarce and highly valuable hard coking coal resource. Mine subsidence, mining activities on the surface and the addition of 34,200 residents are just some of the reasons for the conflict between mining and urban development. In Illawarra Coal's view it is not possible to avoid these conflicts and protect the resource once urban development has occurred."*[27]

However, as can be seen from the above Figure 8, Appin Area 8 is remote from the study area for airport sites. Only a small portion of the approved Bulli Seam Project to the north east of Wilton township and mostly to the north of Wilton Road has any potential to interact with airport sites in the western grouping (Options 1,1S, 2, 6 and 7). It is possible that modifications to those options could be made to remove any interaction with ICHPL's lease areas.

However, it is also relevant to note that, as the figure shows, there are no plans to mine that area within 15 years and, given its small size, it may be decided not to mine it at all.

The Appin Area 3 Extended which would affect the northern parts of several of the airport sites appears to have been removed from the approved Bulli Seam project. (See Figure 9 below: Blue = longwall mining areas; Red = longwall mining areas no longer sought.)

[26] "Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND.

[27] "Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND.

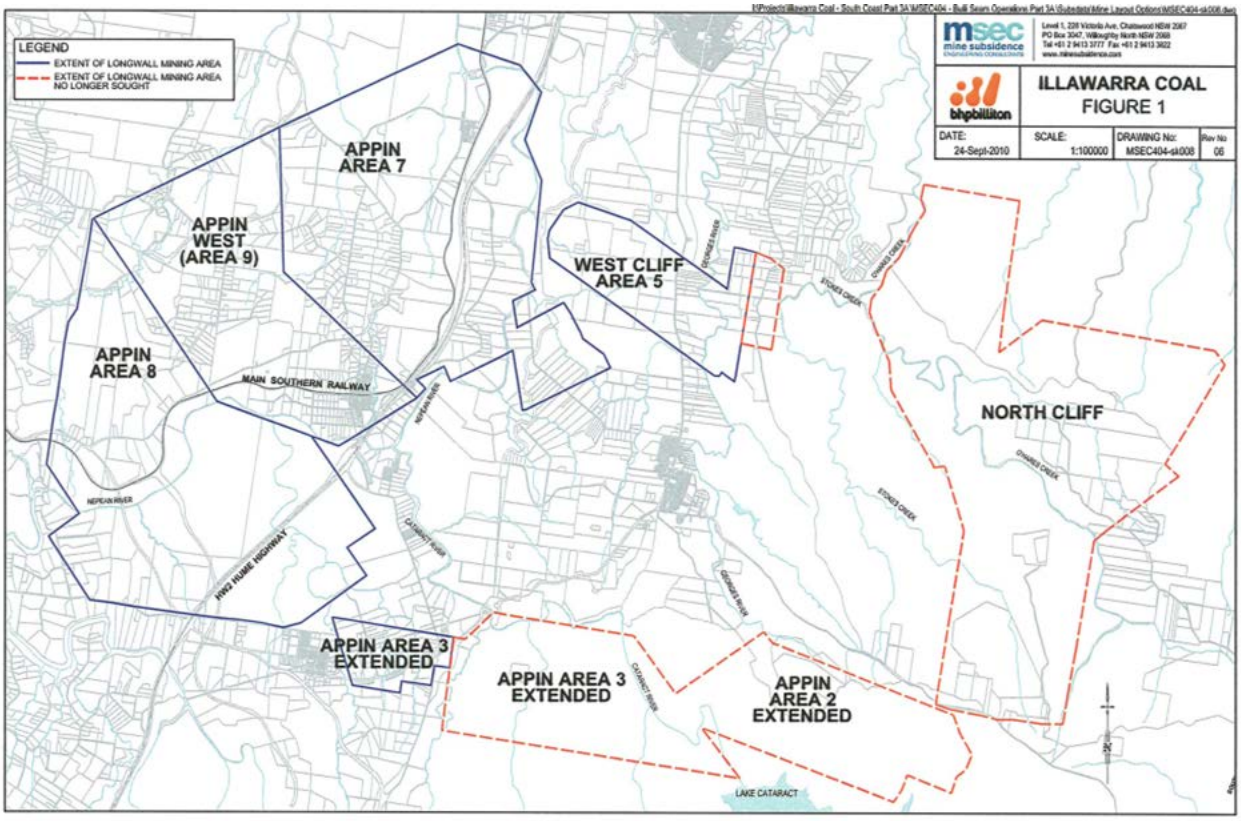

Figure 9 Amended Bulli Seam Mining Areas

4.2 Gujarat NRE No. 1 Colliery

The NSW Department of Primary Industries states that in respect of the Southern Coalfield:

> *"Gujarat NRE Coking Coal Limited received approval for the consolidation and continuation of mining operations at Gujarat NRE No. 1 Colliery in November 2011. Gujarat anticipates construction of the surface facility upgrades will provide 65 full time equivalent jobs, with the mine operation permanently employing 350 people. The estimated capital cost of the expansion is approximately $250 million."*

The current focus of Gujarat NRE's operations is on mining the Wongawilli seam, in areas effectively immediately below the existing Bulli Seam Workings. Gujarat NRE is concentrating on two areas. Wonga East is already in production and lies close to the Mount Ousley Road locality. As such it is of no consequence for any airport sites. Wonga West is beneath the original Bellambi Colliery mine workings in the Bulli Seam, on the western side of Cataract Dam (see Figure 8). Wonga west is expected to commence operations in the next two years and these workings will affect airport sites Options 3, 4, and 5.

As Figure 10 shows, Gujarat NRE's mining lease however, extends further to the west beyond these workings, beneath Wallandoola Creek and to approximately the midpoint of the western precinct of airport sites (Options 1, 1S, 2, 6 and 7). This area was formerly known as Bellambi West and was investigated in about 1983 by Shell when it owned and operated the mine. Although these mining proposals did not proceed, this area still forms part of the lease and is available for extraction.

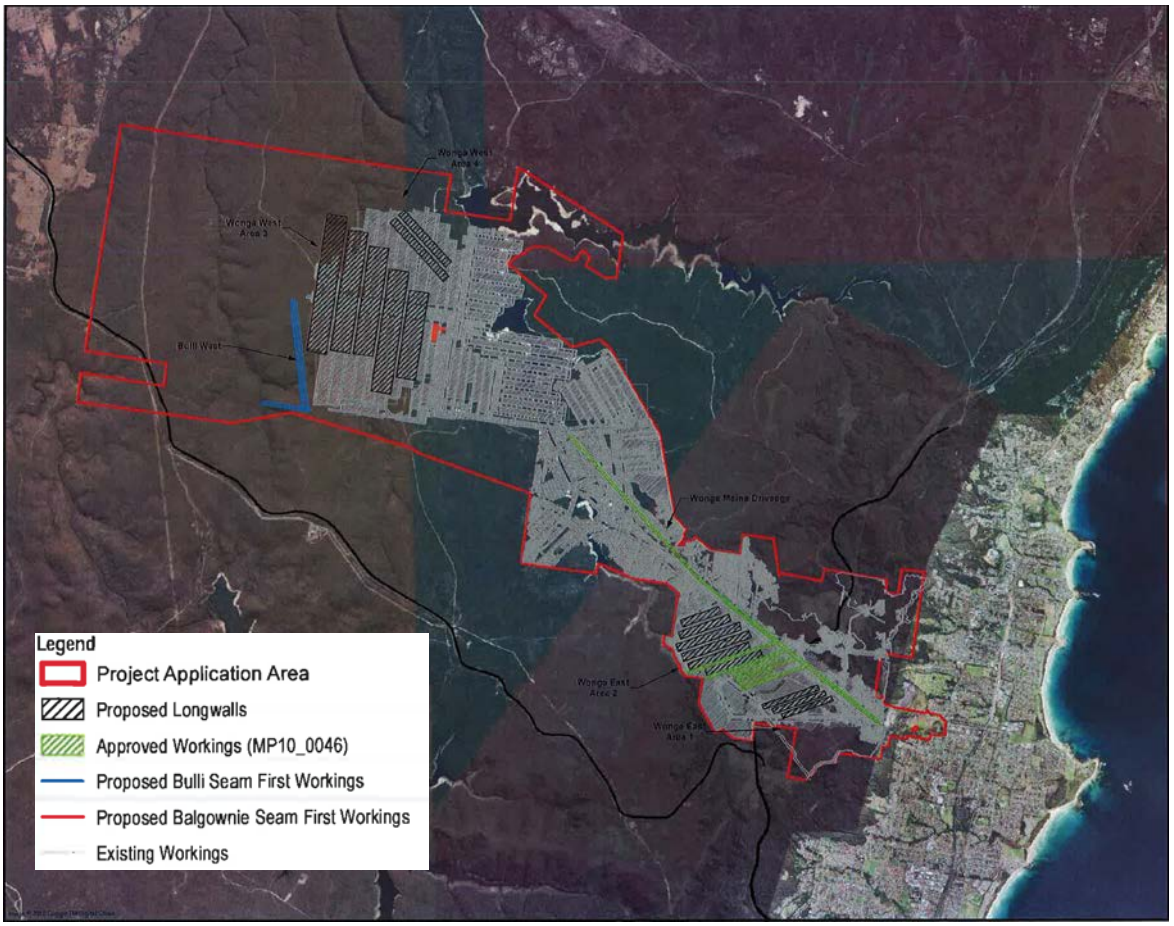

Figure 10 Gujarat NRE's Current Operations with Proposed New Working Superimposed

Under current mining practice, longwall or other forms of extraction which are liable to cause subsidence of the surface are not permitted under major watercourses and the steep sided gorges that characterise this locality. Accordingly, the mine plan would set out the patterns of extraction in order to preclude such surface effects from occurring. Therefore, Wallandoola Creek forms natural constraints to both Gujarat NRE's mining operations and the two principal airport site precincts at Wilton.

Under its lease, Gujarat NRE has the right to proceed to install first workings without further approval. First workings are effectively the passages through the seam that would both enable the installation of mine infrastructure and allow later second working in the form of longwall or other forms or extraction of the majority of the resource in the seam. First workings do not normally result in any surface subsidence or other deleterious effects but second workings normally do. In view of this, and also due to the potential need to install additional infrastructure such as vent shafts and the like, development consent is required for second workings.

Currently, while Gujarat NRE has formal plans to undertake mining in the areas of its lease to the east of Wallandoola Creek in the Wongawilli seam beneath its current workings in the Bulli seam, it has developed indicative, informal plans to mine within its lease area to the west of these works up to and to the west of Wallandoola Creek. Given the scale and value of this resource however, it is likely that such a plan would be developed for mining to commence somewhere in the next ten years and under current rates of production for mining to occur over a 20 year period from commencement.

In view of the stratigraphy, the uppermost seam, the Bulli, is mined first. Thereafter in the same manner as is occurring in Gujarat NRE's existing operations, the next level economic seam below the Bulli would be mined. This could be the thinner Balgownie Seam or most probably would be the yet lower Wongawilli Seam. This latter operation in the lower seam might then occur over a subsequent period of say 20 years.

As noted, the western precinct of airport sites is about fifty per cent underlain by Gujarat NRE's lease area. However, the nature of subsidence is that, depending on the depth of the seam and the geology, the surface area affected by removal of the coal is relatively greater than the area of coal removed itself. Thus Gujarat NRE's extraction of coal up or close to its lease boundary could still affect those areas of the airport sites that are not directly underlain by its lease.

In view of this and accepting that airport infrastructure, especially runways, are not compatible with subsidence of the scale liable to occur from mining in either the Bulli or Wongawilli seams:

- Development of an airport in the western precinct would not be possible until up to 50 years from now when all mining has ceased and ground settlements from subsidence had reached practical cessation;
- Based on the current airport site options and the lease boundary, if development of an airport to its full Maximum template is required, that portion of the Gujarat NRE lease lying to the west of Wallandoola Creek would most likely need to be sterilized in its entirety;
- It may be possible that an airport on the scale of a Type 4 or possibly up to a Type 3 airport could be developed to the west of Gujarat NRE's lease boundary, subject to further and more detailed airport planning and in conjunction with Gujarat NRE's mine planners; and
- Such a limited scale airport may then be able to be developed into a Maximum airport later by expanding into those lands eastwards towards Wallandoola Creek which have been affected by Gujarat NRE's final extraction of coal. The timing of when this might be possible is not clear.

Gujarat NRE states that on top of the 120 years that the mine has been operating, there is the potential for another 30 years or more of mining within NRE No.1 Colliery[28].

Gujarat NRE's current and future activities and operations have by far the greatest interaction with the sites identified for airport at Wilton. All options identified are, to some greater or lesser degree, affected by, or if proceeded with before mining occurred would affect, Gujarat NRE's lease areas. Under the mining methods proposed, significant subsidence[29] would be expected through the Gujarat NRE lease areas.

[28] http://www.gujaratnre.com.au/

[29] Refer to http://www.infrastructure.gov.au/aviation/scopingstudy/files/Worley_Parsons-Further_assessment_of_airport_development_options_at_Wilton.pdf Working Paper 3 – Regional Resources and Resource Extraction

Under its approved Subsidence Management Plan[30], it must:

> *"ensure that operations do not result in subsidence impacts or environmental consequences that exceed the following performance measures."*

Feature	***Performance Measure***
Any watercourse, including Wallandoola Creek	*Negligible loss of stream flow* *Negligible diversion of stream flow* *Negligible change in the natural drainage behavior of pools*
Swamp/s associated with Wallandoola Creek	*Negligible reduction of swamp groundwater levels* *No net loss of water from unconfined swamp aquifers* *Negligible change in the natural drainage behavior of pools*

Clearly, these performance measures are focused on waterways and not on forms of development such as housing or infrastructure, which reflects the areas below which Gujarat NRE's approved future operation will lie.

4.3 BHP Cordeaux Colliery

As noted earlier, ICHPL advised that, in regard to further mining of the Cordeaux Colliery lease, the time scale for mining the Wongawilli Seam under Cordeaux Colliery was thought to be greater than 10 years hence and the resource would likely be accessed from BHP's Dendrobium mine further to the south from the Cordeaux Mine lease and airport study area.

Accordingly however, the lands within the Cordeaux mine lease, which partially underlies airport Options 3, 4 and 5 would be subjected to mine subsidence occurring.

4.4 East Bargo Exploration Area

While there was no take-up of the East Bargo exploration area (see Figure 11) from the Expression of Interest process in 2009, this does not preclude the possibility that it could be offered again in the future and that part or all of that lease area could be taken up at that time.

If mining were to occur it would probably include longwall mining and, as a result, mining subsidence would be substantial. In regard to the study area examined for airport sites the East Bargo Exploration area coincides with the south west corner and those areas of land lying northwards from the gorge of the Cordeaux River. This area is potentially the most accessible from existing road transportation links as well as from a possible future Maldon Dombarton Railway. However, at least a portion of this is also covered by current urban development proposals.

[30] Subsidence Management Plan Approval Gujarat NRE No 1 Colliery "V Mains" ML1575 August 2010

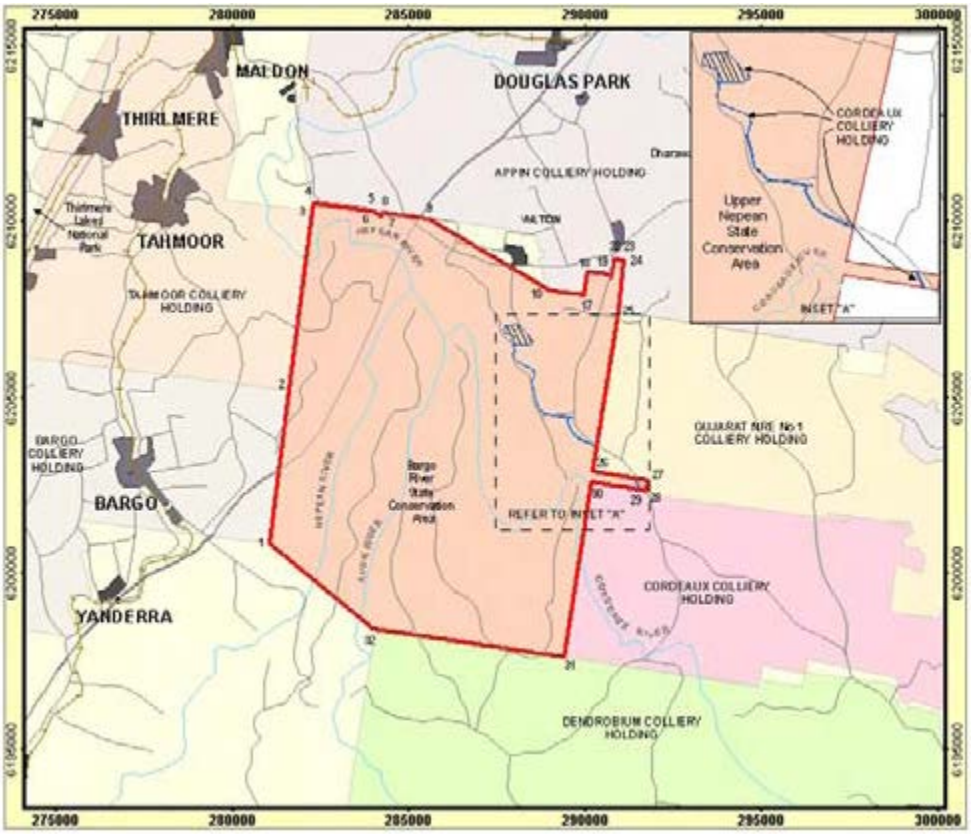

Figure 11 East Bargo Exploration Lease Area

4.5 Comparative Assessment to Effects on Airport Sites

Table 1 summarises the effects of coal mining on the options identified previously for Maximum scale airport sites in the locality of Wilton, in terms of their current and known future mining activities. *"Direct Effect"* denotes that the site is entirely within the lease area and fully affected by that company's mining activities. *"Partial Direct Effect"* denotes that a part of the airport site is within that particular mining lease and partly affected by that company's mining activity.

Table 1 Comparative Assessment of Airport Options for Mining Subsidence

Airport Option	ICHPL BSO Lease	Gujarat NRE Lease	Cordeaux Colliery Lease	East Bargo Exploration Area
1	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under future mining west of Wallandoola Creek	No Direct or Partial Direct Effect	Partial Direct Effect under future mining if lease taken up
1S	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under future mining west of Wallandoola Creek	No Direct or Partial Direct Effect	Partial Direct Effect under future mining if lease taken up
2	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under future mining west of Wallandoola Creek	No Direct or Partial Direct Effect	Partial Direct Effect under future mining if lease taken up

Table 1 Comparative Assessment of Airport Options for Mining Subsidence				
Airport Option	ICHPL BSO Lease	Gujarat NRE Lease	Cordeaux Colliery Lease	East Bargo Exploration Area
3	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under current approved mining plan and Partial Direct Effect under future mining east of Wallandoola Creek	No Direct or Partial Direct Effect	No Direct or Partial Direct Effect
4	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under current approved mining plan and Partial Direct Effect under future mining east of Wallandoola Creek	Partial Direct Effect under future mining	No Direct or Partial Direct Effect
5	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under current approved mining plan and Partial Direct Effect under future mining east of Wallandoola Creek	Partial Direct Effect under future mining	No Direct or Partial Direct Effect
6	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under future mining west of Wallandoola Creek	No Direct or Partial Direct Effect	Partial Direct Effect under future mining if lease taken up
7	No Direct or Partial Direct Effect under current approved mining Plan	Partial Direct Effect under future mining west of Wallandoola Creek	No Direct or Partial Direct Effect	Partial Direct Effect under future mining if lease taken up

In summary:

- Options 1, 1S, 2, 6 and 7, although within both the Gujarat NRE lease area and East Bargo exploration area, are not subject to the effects of mining subsidence as a result of current or approved mining plans. These options are not within the ICHPL lease area and not affected by the current, approved or future mining plans of ICHPL;
- Option 3 is within the Gujarat NRE lease area and is subject to the effects of mining subsidence as a result of current and approved mining plans. Option 3 is liable to be subject to the effects of mining subsidence resulting from future mining plans for east of Wallandoola Creek; and
- Options 4 and 5 are within the Gujarat NRE lease area and are subject to the effects of mining subsidence as a result of current and approved mining plans. These options are liable to be subject to the effects of mining subsidence of future mining plans for east of Wallandoola Creek. They are partially also within the lease area of Cordeaux Colliery and therefore potentially subject to the effects of mining subsidence as a result in the future.

It is relevant to note that this assessment is in terms of the airport sites themselves and does not consider the effect on ancillary and supporting infrastructure such as freeway and rail links. However, such linear infrastructure is currently being operated or is under construction within areas such as the lower Hunter Valley and is or will be subject to mine subsidence. Design techniques have evolved to permit such infrastructure to accommodate the deformations and ground strains that mining subsidence causes.

Table 2 provides an indication of the relative timings for extraction of coal resources within mining leases relative to each Airport site option.

Table 2 Timing for Extraction of Coal Resources within Lease Areas.

Airport Option	ICHPL BSO Lease[31]	Gujarat NRE Lease	Cordeaux Colliery Lease	East Bargo Exploration Area
1	+ 20 years	+20 to 50 years	Not affected	+15 – 50 years?
1S	+ 20 years	+20 to 50 years	Not affected	+15 – 50 years?
2	+ 20 years	+20 to 50 years	Not affected	+15 – 50 years?
3	Not affected	0-10 and then 10 – 20 years	+10 years	Not affected
4	Not affected	0-10 and then 10 – 20 years	+10 years	Not affected
5	Not affected	0-10 and then 10 – 20 years	+10	Not affected
6	+ 20 years	+20 to 50 years	Not affected	+15 – 50 years?
7	+ 20 years	+20 to 50 years	Not affected	+15 – 50 years?

In respect of the East Bargo exploration area, timings are liable to be entirely dependent upon the market interest in and price for coking coal.

[31] Noting that the area of the Bulli Seam Project which affects these options is small and only has a slight overlap.

5 FACTORS INFLUENCING FUTURE MINING

5.1 Generally

The factors influencing the decision to mine the Illawarra Coal Measure resources which underlie the airport site options at Wilton are many and varied and include:

- The availability of a market for the commodity;
- The Free on Board (FOB) sale price of that commodity;
- The cost of transportation to the purchaser;
- The global price competition for that commodity;
- The exchange rate of the Australia Dollar versus the currencies of competitor countries;
- The cost to extract that commodity and hence the profitability of the operation;
- The scale of the resources, which is a de facto measure of the life of the project, and its variability in quality; and
- Availability of skilled workforce to undertake the operation.

The cost of extraction embodies a set of other factors including:

- Exploration and resource proving;
- The planning and mining consent approvals processes;
- The licenses and royalty fees payable to government;
- Capital investment and setup costs;
- Operations costs including labor and energy;
- Environmental protection measures; and
- Remediation measures post resources extraction.

5.2 Value of Coking Coal

The Department of Foreign Affairs and Trade (DFAT) reports that[32]:

> *"World trade in metallurgical coal in 2011 was estimated at 270 million tonnes and Australia continued its rank as the number one exporter of this commodity, accounting for about half (49.3 per cent) of the total";* and
>
> *"Metallurgical coal exports rose from $7.6 billion to $31.1 billion (up just over 300 per cent), and just shy of the 2008 high of $32.3 billion."*

This indicated an average in 2011 of about $234 per tonne for metallurgical or coking coal, which is the prime resource in the Illawarra coal measures.

[32] Australia's Coal and Iron ore exports 2001 to 2011 an update of the DFAT article "Australia's Coal and Iron ore exports 1999 to 2009" published in March 2010.

In regard to thermal or steaming coal used for power generation, DFAT reported that:

> *"Thermal coal exports rose from $4.8 billion to $15.6 billion[33] (up well over 200 per cent)";* and
>
> *"In 2011, the volume of world trade in thermal coal was estimated at 837.0 million tonnes. Australia ranked as the world's second largest exporter, accounting for 16.8 per cent of that trade."*

This indicated an average in 2011 of about $111 per tonne for Australian thermal coal which, by comparison, further indicates the value of the Illawarra coking coal resources.

5.3 Future Demand

An indication of the future demand can be gained from the following commentaries:

> *"China, India, Japan and South Korea will continue their healthy appetite for Australian metallurgical coal for power generation and steelmaking, propping up the price of such coal at $US150 a tonne for the next five years, says Cougar Energy chief executive Rob Neill.[34]*
>
> *Neill expects the price of coking coal to be $US190 to $US200 a tonne in the next five years. Metallurgical coal is usually priced at a 20 per cent discount to coking coal, says Neill, who expects such coal to be priced by the market at $US150 to $US160 a tonne over the next five years. The latest price for PCI coal is $US142 a tonne."*

And as reported by the Strategic Research Institute:

> *"Most of the developing economies are undergoing demographic transition with nearly 3 billion people are moving into the middle class. India alone with projected steel production of at least 150 million tonnes by 2017 expects to touch nearly 100 million tonne of import from 31 million tonne in 2012. Like-wise in China the unbridled steel production remains reality despite the growing shrill of over production. China's economy continues its expansion at an amazing pace with focus on rural and semi-urban regions. Even though any meteoric turn of fortunes is ruled out with government remaining focused on stability the demand for raw material is unlikely to wane.*
>
> *Despite recalcitrant economic crisis in Europe US and Japan are showing distinct signs of turnaround. Once global steel production returns to healthy levels, it won't take long for coking coal prices to rise above USD 200 per tonne."[35]*

DFAT reported that[36]:

> *"Export volumes of metallurgical coal are forecast to increase by an average 8 per cent per annum out to 2016-17 after a rise of 6 per cent in 2011-12. Increased steel production in India, China and Brazil is expected to underpin growth in demand. Growth in Australia's exports will be supported by start-ups of new projects and expansion of current ones, as well as increased infrastructure capacity in Queensland. However with softer prices, in real terms BREE expect*

[33] in 2011

[34] Read more: http://www.businessspectator.com.au/article/2013/5/7/financial-markets/markets-spectator-asias-coal-craving#ixzz2WWGiyt58

[35] Source – Strategic Research Institute (www.coalguru.com)

[36] Australia's Coal and Iron ore exports 2001 to 2011 an update of the DFAT article "Australia's Coal and Iron ore exports 1999 to 2009" published in March 2010.

the value of Australia's metallurgical coal exports in 2016-17 to be about the same as in 2010-11."

5.4 Summary

The companies mining the Illawarra coal measures for coking coal are well established and have approved plans to continue resource extraction for at least 10 to 20 years and beyond.

The resource that they are mining is the most highly prized of Australian coal and is used to support both domestic and international steel production.

According to DFAT, demand for this resource will continue grow though the price is expected to stay steady at current levels which have averaged AU$234/tonne. This is somewhat higher than other commentators who are suggesting US$200/tonne.

A range of about AU$200/tonne to say $220/tonne would seem reasonable as benchmark in the context of this study for the sale price of coking coal from the Illawarra region. This is consistent with the value ascribed to coking coal in the 2012 Study (Reference 2).

6 RESOURCE STERILISATION

6.1 Potential for Sterilization of Resources

Given that coal seams are present beneath the entire study area, development of any of the airport options at Wilton would require to some extent the sterilization of coal resources.

On the basis of the assessment in Tables 1 and 2, resources within the leases currently held by ICHPL are least likely to be affected by any airport site option, if at all, based on the current approved mining plan. Accordingly, the need to sterilize these resources in order to protect assets within any of the airport sites boundaries is low although supporting infrastructure such as rail links may traverse lands which, if not also sterilized, may be subject to subsidence.

In order to develop any of airport site Options 3, 4 and 5 (see Figure 12) it would be necessary to sterilize resources beneath the majority of the airport site areas for which there is a current and active mining plan by Gujarat NRE and for which there are future mining plans. Additionally, Option 5 would, without modification of its layout, also require sterilization of coal for which there are future mining plans in the Cordeaux Colliery Lease. Accordingly, adoption of these sites would require either:

- If airport development must proceed in the next 10 years, immediate negotiations with Gujarat NRE to amend their mining plan to sterilize resources; or
- Deferral of any airport development until the all the site required has been mined and subsidence has occurred.

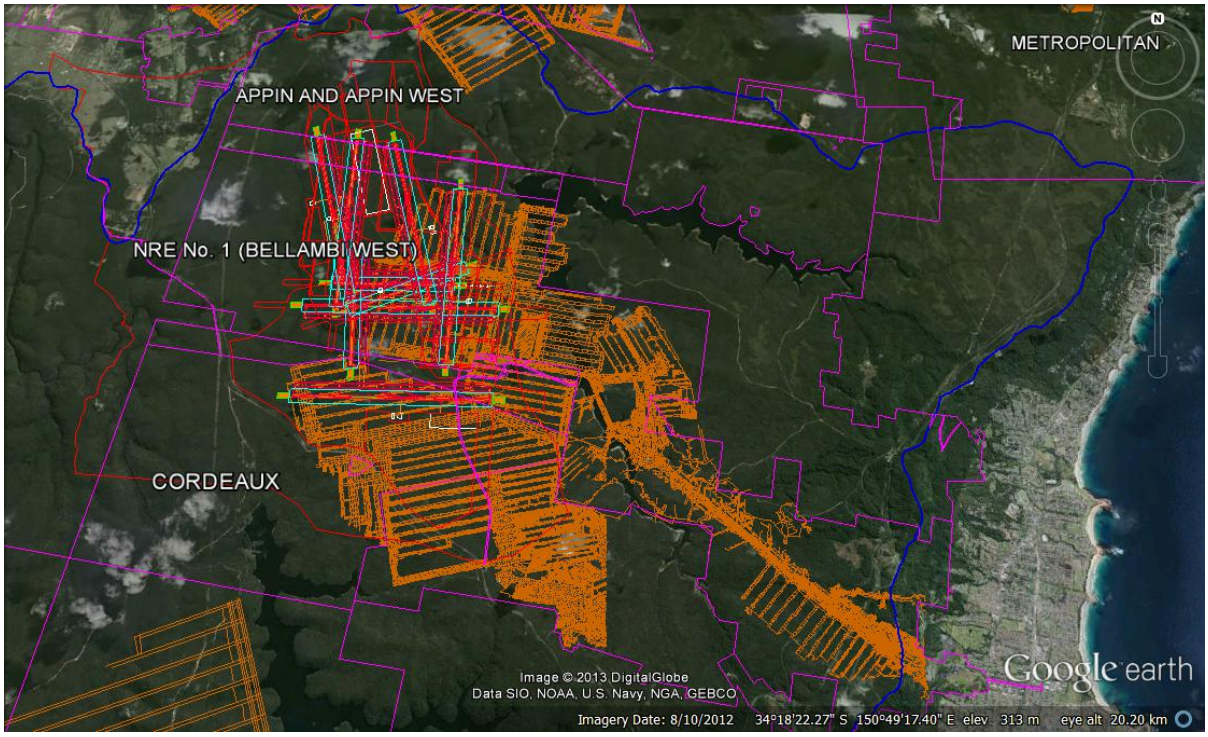

Figure 12 Airport Site Options 3, 4 and 5 overlaid on Existing Mine Workings

Options 1,1S, 2, 6 and 7 (see Figure 11) all lie partially within the mining leases held by Gujarat NRE, although in the portion of the lease which will not actually be developed or coal extracted for at least 10 years from now and do not affect resource extraction which will occur in the next ten years. Without sterilization of coal however, these sites will eventually be subjected to subsidence.

All these sites also lie partially with the East Bargo exploration area and, without sterilization of resources in that lease, would be subjected to subsidence, at some as yet unknown date but which would probably be more than 15 years from now.

Accordingly, adoption of any of these sites would require:

- Negotiations with Gujarat NRE in order to sterilize the required site under which mining will not occur until at least 10 years in the future and up to 20 years;
- Negotiations with the NSW Government to sterilize the required portions of the East Bargo exploration area for which there are no known plans or extraction timescales as yet; or
- Alternatively, deferral of any airport development until all resources extraction from either of these two leases had been completed.

There is however, a hybrid possibility, as shown in Figure 13, offered by at least Option 1. As this shows, land within the East Bargo exploration area could be sterilized for development of a single western runway, possibly a cross runway and airport facilities. Any second parallel runway, which would be located within Gujarat NRE's lease area, would need to be deferred until mining has been completed. Alternatively, negotiations could be held to sterilize that portion of Gujarat NRE's lease that lies to the west of Wallandoola Creek and which is not planned to be mined for at least 10 years and up to 20 years.

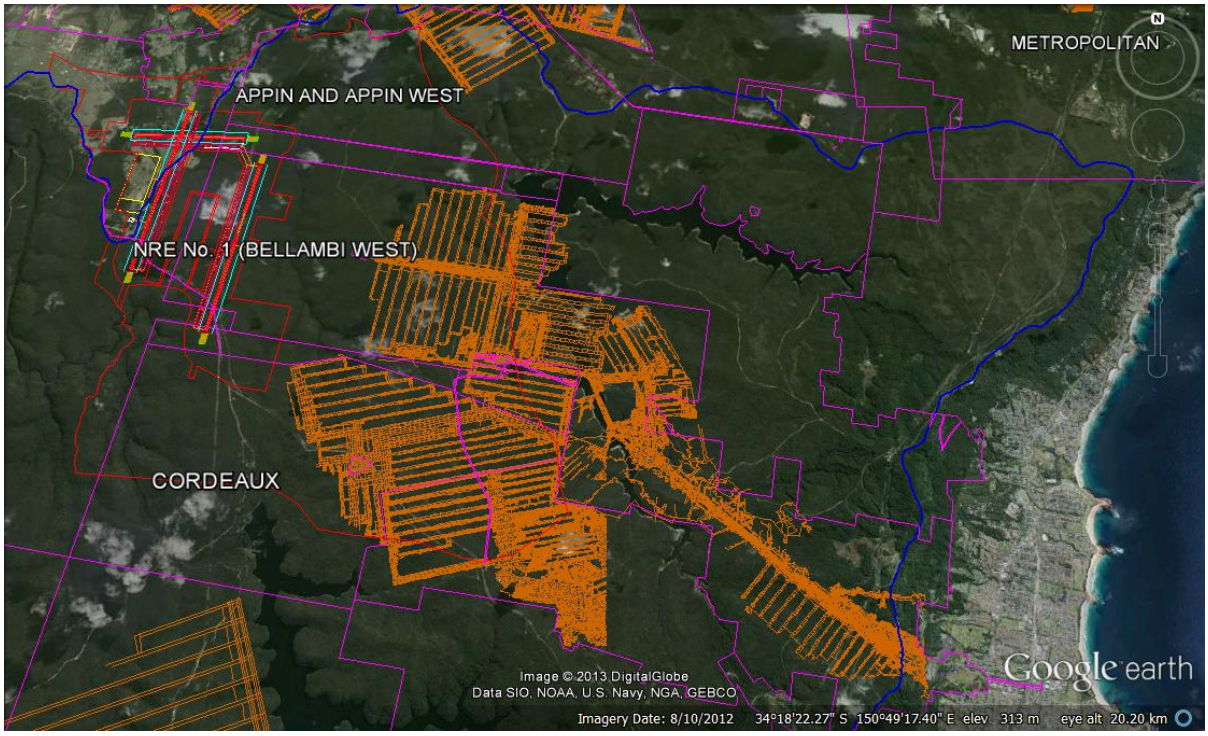

Figure 13 Airport Site Options 1, 1S, 2, 6 and 7 overlaid on Existing Mine Workings

While Option 1 is probably the most compatible with the mining leases due to the alignment of the western runway with the western lease, the two options identified previously as being preferred

overall, Options 1S and 7, may be able to be modified to minimise interactions with Gujarat NRE's lease while still retaining their other relative benefits.

6.2 Precedent for Sterilization of Illawarra Coal Measures

While there may have been other examples, the most contemporary example of an active decision to sterilize resources in the Illawarra coal measures appears to be that of ICHPL in relation to Dharawal National Park.

In 1998, the NSW Government in the form of the National Parks and Wildlife Service and the Department of Mineral Resources entered into an agreement with BHP Steel (AIS) Pty Ltd[37], which enabled continued exploration and mining in leases held by BHP Steel and which overlapped significantly with lands reserved as a State Recreation Area (SRA) under the *National Parks and Wildlife Act 1974*. Such activities are explicitly permitted under the Act within an SRA.

However, in March 2012[38] the majority of the SRA became incorporated into the new Dharawal National Park, covering an area of 6,508 hectares. Mining in or under National Parks is explicitly not permitted and accordingly BHP Steel (now ICHPL) was required to modify its Bulli Seam Project to accommodate this change in designation. However, three small areas 71 totaling hectares were retained as SRAs in order to allow coal mining to continue.

Of this action, ICHPL has said[39]:

> *"In recent years Illawarra Coal has made responsible environmental decisions such as not to mine beneath rivers and to facilitate the creation of the Dharawal National Park by relinquishing mining tenure over the land. These decisions have been made due to increasing Government and community expectations as well as the Company's commitment to environmental sustainability."*

The effect of this loss of mining lease areas was to cause a reduction in the total recoverable coal reserve from approximately 306 million tonnes (Mt) to approximately 209 Mt of run of mine (ROM) coal, giving a net loss of 97 Mt of ROM coal. If the previously suggested sale values are correct, then this would have a contract sale value of about $20 billion.

In its publication *"Guidelines for Coal Mining and Roads with Respect to Subsidence",* the NSW Mine Subsidence Board states[40]:

> *"Once the total quantity of coal to be sterilised, both directly and indirectly, has been determined, the next step is to assign a value to it. For the purposes of these guidelines, the value per tonne of coal sterilised will be taken as being the difference between the market price (at the mine gate) and the incremental cost per tonne of winning the coal. This value of coal might be higher if other factors have stronger influences, such as export demands, etc. Users should check this value at time of estimate."*

This approach, however, is for the purposes of assessing whether to sterilize the coal resources or protect infrastructure from damage by either relocating the infrastructure or repairing it after subsidence rather than valuing the resource in order to pay compensation to the coal lease holder for

[37] Bulli Seam Operations Attachment 6 Dharawal State Conservation Area Memorandum of Understanding

[38] http://www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N0627

[39] Wilton Junction Proposal Review of Coal Resources" BHP Billiton Illawarra Coal icenquiries@bhpbilliton.com, ND.

[40] http://www.minesub.nsw.gov.au/SiteFiles/minesubnswgovau/MSBguidlinesRoads32ppA4.pdf

the loss of that part of the lease. However, it is evident that the approach adopted would result in value which is significantly less than the sale price. Analysis of Gujarat NRE's production costs since 2010 indicate an average cost of sales of $111/tonne which, if the selling price is $200/tonne, would indicate a net value of $89/tonne.

In its *"Preferred Project – Supplementary Information Report"*[41], ICHPL provided information on the effect that this reduction in the Bulli Seam project would have on the economy, as shown in Table 3 below.

Production Costs and Benefits are defined as being:

Costs:

- Opportunity cost of land;
- Opportunity cost of capital;
- Capital costs of establishment and construction including ancillary works and sustaining capital; and
- Operating costs, including administration, mining, processing and transportation.

Benefits:

- Sale value of export and domestic coal;
- Residual value of capital and land at the cessation of the Project; and
- Delayed decommissioning and rehabilitation costs.

The net benefit is the production benefit less monetized values for externalities and environmental costs such as, for example, impacts on streams, aboriginal heritage, transport noise, greenhouse gas generation and plus benefits such as economics and social effects of employment.

Table 3 Social and Economic Effects of Reducing the Bulli Seam Project to enable Dharawal National Park (AU$) (after Ref 41)

Approximate Social and Economic Benefits	*EA Project*	*Modified Project*	Reduction	Value Reduction Per Tonne of ROM Reduction
Net production Benefit	*$10,300,000,000*	*$6,600,000,000*	$3,700,000,000.00	~$38
Net benefit	*$8,300,000,000*	*$5,500,000,000*	$2,800,000,000.00	~$29
Contributions to the State of NSW [42]				
Royalties	*$3,000,000,000*	*$2,000,000,000*	*$1,000,000,000*	~$10
Employee and Contractor payroll	*$274,000,000*	*$205,000,000*	*$69,000,000*	~$0.7
Contributions to Regional Economy				
Annual Direct and Indirect Regional Output or business turnover	*$2,074,000,000*	*$1,581,000,000*	*$493,000,000*	~$5
Annual Direct and Indirect Regional Value added	*$1,197,000,000*	*$861,000,000*	*$336,000,000*	~$3.5
Annual Household income	*$298,000,000*	*$236,000,000*	*$62,000,000*	~$0.65
Direct and indirect jobs	*3296*	*2639*	*657*	~0.000007 Jobs

[41] Bulli Seam Operations Project (MP 08_0150) Preferred Project Report − Supplementary Information

[42] Estimated total over 30 years.

Table 3 Social and Economic Effects of Reducing the Bulli Seam Project to enable Dharawal National Park (AU$) (after Ref 41)				
Approximate Social and Economic Benefits	*EA Project*	*Modified Project*	Reduction	Value Reduction Per Tonne of ROM Reduction
Contributions to NSW Economy				
Annual Direct and Indirect Regional Output or business turnover	*$2,822,000,000*	*$2,192,000,000*	*$630,000,000*	~$6.5
Annual Direct and Indirect Regional Value added	*$1,615,000,000*	*$1,202,000,000*	*$413,000,000*	~$4.3
Annual Household income	*$516,000,000*	*$415,000,000*	*$101,000,000*	~$1.0
Direct and indirect jobs	*5791*	*4676*	*1,115*	0.0000114948 Jobs

These values could be used to estimate the social and economic effects of resource sterilization caused by an airport at Wilton. However, consideration would have to be given to the fact that for some of the airport options at least there is no current mining plan and hence no ability to crystalize these values. Additionally, it may be possible to substitute other areas for mining to compensate for the areas sterilized.

No specific contemporary example of compensation being paid has been identified, although as a result of the NSW *Coal Acquisition Act 1981*, prior to which coal resources could be privately owned, a Coal Compensation Board was established:

> *"The board was established under the Coal Acquisition (Compensation) Arrangements 1985 (NSW). Those arrangements are made by the Governor of New South Wales under the Coal Acquisition Act 1981 (NSW), a law which entitles the governor to determine what compensation should be payable for the acquisition of coal in 1981."*[43]

An even more contemporary situation which has as yet not been resolved is the effect of the Wilton Junction Urban Development Proposals on Bulli Seam Operations mining.

6.3 Summary

The cost to the Government, if any, as a result of sterilizing an area of coal could only be determined once the site for an airport has been finalised and negotiations with the State and mining leaseholders have taken place. On the basis of past precedent, there may be no direct compensation paid but there may be other in-kind forms of compensation such as consent to mine other areas.

In theory, this could cause the loss of coal available to be extracted with a sale value of the order of $1 billion per square kilometre, with consequent loss of net profit to the company, royalties to the state and economic multiplier benefits.

However, short to medium term effect of this may be lessened or even negated if there are other resources released to those companies or other interested parties to replace the sterilized resources. This would maintain the level of economic activity in the area associated with coal mining but not increase it. However, in place of the sterilized coal would be the economic activity associated with building and operating an airport.

[43] http://en.wikipedia.org/wiki/New_South_Wales_Coal_Compensation_Board

7 SUMMARY ASSESSMENT OF MINING EFFECTS ON AIRPORT SITES IN THE WILTON LOCALITY

- All sites identified (Options 1, 1S, 2, 3, 4, 5, 6 and 7) are underlain by economically valuable coal resources and would either require sterilization of coal resources or waiting until all mining has occurred and subsidence has ceased;
- The sites for Options 3, 4 and 5 will certainly be partially subjected to mine subsidence under current Gujarat NRE approved mining plans and such subsidence will not be completed for at least 10 to 15 years hence;
- The remainder of the sites for Options 3, 4 and 5 will be subjected to mining subsidence, from about ten years hence and out to 15 to 20 years hence, as a result of future Gujarat NRE mining plans. Additionally, Option 5 could be subjected to mining subsidence from about 10 years hence and out to 20 years hence as a result of future ICHPL mining plans for Cordeaux Colliery;
- Options 3, 4 and 5 were also identified previously (see Reference 1) as being the least attractive, on all factors considered other than relative remoteness from current and future urban areas;
- On the basis of the planned mining activities extending out at least 20 years, the known scale of subsidence that will occur, the possible complexities of negotiations for sterilization and taking account of the above point, Options 3, 4 and 5 (the eastern grouping of airport sites) should be excluded from further consideration;
- As was pointed out in Reference 1, the area west of Wallandoola Creek, in which airport site Options 1, 1S, 2, 6 and 7 all lie, is of the order of 4000 hectares, which is still smaller than many sites around the world on which Maximum scale airports are being built. Therefore, it can be considered for planning purposes, the airport site within which there are a range of runway headings and configurations and which are yet to be optimised[44];
- This area is also:
  - not affected by current mine workings;
  - least affected by future (beyond twenty years) contemplated mine workings; and
  - partial overlapping on an NSW Government exploration area for which there is no current commercial development interest;
- Accordingly, negotiations for resource sterilization with the NSW Government and with the lease holder Gujarat NRE are likely to be less complex for this area;
- The advantage of the western grouping of sites is that they keep to a minimum any possible effect on the Gujarat NRE lease area. Mining of the area west beyond Wallandoola Creek would be made very difficult and expensive if an area east of Wallandoola Creek were to be sterilized for an airport site, as the infrastructure needed to access that coal would have to extended from their current workings across the airport site or new pit top infrastructure would need to be established;

[44] Taking account of all other airport planning and development criteria as outlined in Reference 2.

- Within this area there is at least one option, Option 1, which is able to be configured to be least affected by planned mining activities in the form of a Type 3 (single 2600 m runway) or Type 1 (single 4000 m runway) and which possibly can be staged into a maximum runway by building the second parallel runway once all mining activity has been completed between the western boundary of Gujarat NRE's lease and Wallandoola Creek. The timing of this is uncertain but probably beyond 20 years; and
- On this basis, the western grouping of airport sites is the preferred airport location at Wilton.

Appendix 1 Oil Wells at Denver Airport

DIA Looks At Drilling Oil Wells at Airport[45]

Airport Generated $7 Million from Existing Wells

“Denver International Airport is looking into whether to drill more oil and gas wells on airport property.

A number of oil and gas companies have inquired about leasing and drilling on the airport's property recently. The airport says it has hired a consultant to examine what options the airport's management has and what the next steps would be in tapping into these underground resources.

Jenny Schiavone, spokeswoman for DIA, said the airport hasn't signed any drilling leases at this point.

The new oil exploration interest at the airport is tied to the Niobrara Formation. The geological formation has been found to have bigger and deeper reservoirs of oil and natural gas than previously estimated.

Furthermore, drilling technology has made it economically viable to tap these energy reserves.

Oil Drilling Already At DIA

Schiavone said oil and gas wells would not be new to the airport. There already were drilling rigs on the property before DIA opened in 1995.

The airport holds 76 oil and gas wells on its property, Schiavone said. In 2010, the airport bought back the leases on 27 oil wells on its land and now owns all 76 wells outright.

The revenue generated by the wells owned by DIA equaled $7 million in 2010, Shiavone said.

"It is worthwhile for us to explore the options with the rest of our mineral rights," Schiavone said.

All of the existing oil and gas wells on airport property are in outlying areas. Any new wells would have to be approved by the FAA and would not interfere with flight paths or runways, Schiavone said.

DIA is the largest airport in the U.S., encompassing 34,000 acres.

According to figures from the Colorado Oil & Gas Conservation Commission, Colorado produced 6.6 million barrels of oil and 420 million cubic feet of natural gas in 2011”

[45] http://www.thedenverchannel.com/news/dia-looks-at-drilling-oil-wells-at-airport