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Coal seam gas extraction: Does landholder compensation match the mischief?

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ABSTRACT

Coal seam gas (CSG) extraction is set for expansion in New South Wales. However, controversy accompanies its introduction in that the present law grants miners access to private lands for the purposes of exploration and production. The NSW Petroleum (Onshore) Act 1991 regulates compensation for land access, and a number of questions have been raised about the adequacy of its compensation provisions. Additionally, compensation for coal seam gas poses a challenge for the valuation profession in that valuation theory has yet to be developed in this emerging sphere of practice.

This paper compares the legal and physical impacts of coal seam gas infrastructure on private lands with the current provisions of the NSW Petroleum (Onshore) Act 1991 and questions if the present compensation provisions match the injury inflicted upon the holders of private land by coal seam gas occupation. The paper reviews the NSW legislation and case law relating to coal seam gas acquisition to identify the legal affects, whilst field observation and remote sensing techniques identify physical effects. The physical effects are then categorised according to the heads of compensation that apply to the compulsory taking of parts of property in Australia. A comparative analysis determines if all of the various “harms” that result from coal seam gas occupation are compensable under the current law. The research indicates that “severance” and “injurious affection” are key issues for landholder compensation where CSG plant occupies parts of land; however, the right to claim for “injurious affection” is unclear in the present legislation.

Keywords: Coal seam gas (CSG), landholder compensation, injurious affection, severance.

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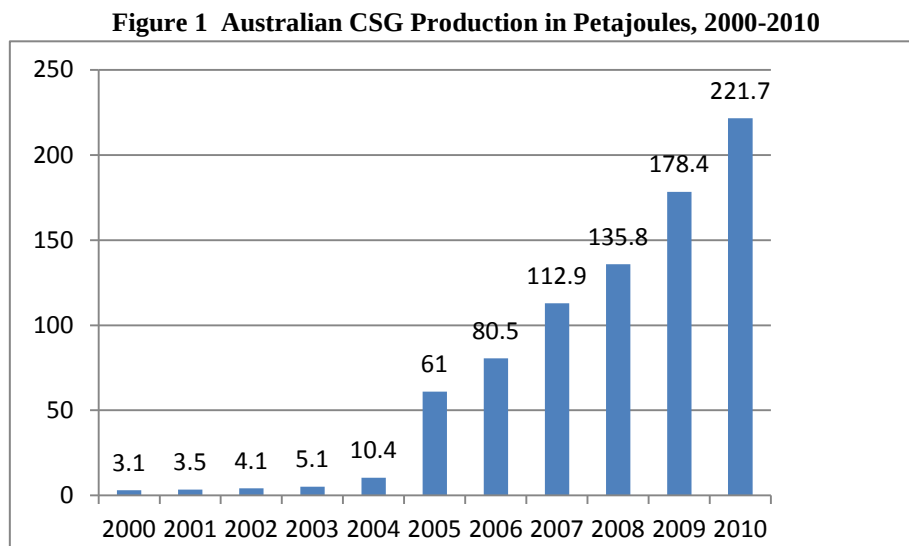
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BACKGROUND OF FAIR COMPENSATION

The theory of compensation for compulsory acquisition accepts that the dispossessed landholder has "*the right to be put, so far as money can do it: in the same position as if his land had not been taken from him*" (Jacobs, 2010, 265, quoting *Horn v Sunderland Corporation*). In New South Wales, Section 3 of the Land Acquisition (Just Terms Compensation) Act 1919 guarantees compensation at *not less than market value* and *ensures compensation on just terms*. In view of the emphasis on "fairness" in the existing law, and its application to a wide range of property acquisitions for public purposes, it comes as a surprise to find that where private land is occupied for the purposes of coal seam gas extraction different rules apply.

COAL SEAM GAS

Coal seam gas is methane (NSW Department of Primary Industry - Minerals and Petroleum, 2011) and it is present within coal seams. Producers also refer to it as natural gas (Santos, 2011, 15) and coal bed natural gas (CBNG). Coal seam gas offers considerable economic benefits (Australian Petroleum Production and Exploration Association [APPEA] 2011, 1) and these are important in the current financial climate in Australia. Most importantly, CSG offers an alternative source of energy. Australia is experiencing significant activity growth in coal seam gas production. The APPEA points to a significant expansion of CSG production in the last decade, as shown in Figure 1.



Source: APPEA in Deloitte Access Economics 2012, 9.

In NSW, AGL has conducted the longest running coal seam gas extraction operation in the Camden area (AGL Camden Gas Project, 2011). A project at Bibblewindi is reported as comprising some 12 wellheads (Eastern Star Gas, August 2008). Additionally, Santos (which has recently taken over Eastern Star Gas) has exploration leases on the Liverpool Plains near Gunnedah. AGL has started exploration work on its Gloucester project (AGL 24/11/11), and this company is currently undertaking work on its Hunter Gas Project with exploration in the Cessnock – Scone areas of NSW (AGL 2011, 3).

Metgasco has exploration leases in the Casino and Grafton areas (Metgasco 2011,3), and Dart Energy has exploration leases in the greater Sydney and Newcastle areas, western Hunter Valley and Narrabri – Gunnedah area (Dart Energy 2011,10). A lot is happening in coal seam gas in NSW at the moment.

Coal seam gas extraction

Coal seam gas is extracted from the coal measures by drilling. This is relatively deep (to a *depth of about 800 metres*, Australian Senate, 2011 Canberra, 32). As a result, drilling can penetrate aquifers used for farming purposes, and this is of concern to farmers, who rely on this source of water.

One of the other issues concerns the amount of water extracted from coal seams during the initial mining.

A defining characteristic of nearly all CBNG developments is the requirement to initially pump large quantities of formation water from the coal seams (dewatering) to reduce the reservoir pressure and allow the methane to desorb and flow into the cleat or fracture system (Australian Senate. Interim report, November 2011, 1.14).

The dewatering process has raised concerns about contamination of farmland with brine (Australian Senate Interim Report, 2011, 16). Figure 2 shows a well (apparently undergoing maintenance) near Camden in NSW with small dam located just south of the well.

Figure 2 Well undergoing maintenance south western Sydney NSW circa 2007



Source: Google Earth Image, Sinclair Knight Merz 2012. 34° 4.890' S 150° 44.361'E

Hydraulic fracturing

Two processes enhance the ability of wells to collect gas: these are drilling long horizontal wells through the coal seam; and fracture stimulation of the coal seam to connect the wellbore to the *existing natural fracture network* (APPEA op cit, 3). The fracture stimulation referred to is called fraccing (or fracking) in the industry. At page 34 Santos (op cit) comments as follows on the process of fraccing.

Hydraulic fracturing is a process used in circumstances where gas is tightly held in dense coal seams. When used, its advantage is that it substantially enhances the productivity of a gas well and, as a result, reduces the number of wells that would otherwise be required on the surface.

However, a degree of scepticism exists in the general community regarding the process of hydraulic fracturing and drilling in general (see for instance New South Wales Farmers (2011, 17).

METHODOLOGY

The case of Halfpenny Investments Pty Ltd V Sydney Gas Operations (Mining Warden) 2003/44 is one of the few court cases in New South Wales relating to coal seam gas. This litigation involved a property of 229.5 hectares in a “well field” in south-western Sydney. The property was affected by ten wells and associated infrastructure and the litigation encompassed issues relating to access, the affect of works and landholder compensation. This case provides an important means of understanding the operation of the NSW Petroleum (Onshore) Act 1991 and the issues affecting landholders (including compensation).

The “well field” in south western Sydney provides a number of examples of CSG well construction and locations (with ample remote sensing information being available for examination). Field investigations and remote sensing reveal important information about the way in which CSG infrastructure affects property. The research is also informed by research into the submissions and evidence furnished in the Australian Senate Murray Darling Basin Inquiry and the New South Wales Coal Seam Gas Inquiry. Both of these Inquiries have produced reports (Australian Senate, Interim report: the impact of mining on the management of the Murray Darling Basin, November 2011 and New South Wales Legislative Council General Purpose Standing Committee No. 5 Coal Seam Gas May 2012).

This paper provides a comparative study that contrasts the affects of CSG infrastructure (as discovered in the field and through interrogation of the Australian Senate and New South Wales inquiries) with the compensation provisions of the NSW Petroleum (Onshore) Act 1991 and identifies apparent disparities.

INTRODUCTION TO THE PROBLEM

Early in this research, an enquiry was made of NSW Trade and Investment Resources and Energy regarding the nature of the interest acquired for coal seam gas projects. The response was unequivocal.

The Petroleum (Onshore) Act does not have any provisions to acquire land. Land required by gas companies must be purchased in the market in the same way as anyone else... NSW Trade and Investment Resources and Energy Communication dated 22 December 2011.

Although coal seam gas miners¹ do not have explicit powers to acquire formal freehold interests in land, the Act does provide them with powers to enter land and occupy it for the purposes of exploration and production.

The Crown owns all minerals in NSW (APPEA, 13). The Petroleum (Onshore) Act 1991 (the Act) licenses miners to explore and produce coal seam gas. The Act also provides that miners can enter private land subject to the requirement that miners enter into *access arrangements* with landholders. In the event of agreement not being reached, the matter of access can be arbitrated (Section 69F). Put simply, landholders cannot avoid occupation by arbitrarily withholding access to miners under the present New South Wales legislation (see discussion in Australian Gaslight Company v O’Grady & Ors, Mining Warden, 4 Feb 1986; Ulan Coal Mines Limited v Minister for Mineral Resources and Anor NSWSC 2007, 1299, 274 (a case relating to the Mining Act 1992) and Halfpenny Investments Pty Ltd V Sydney Gas Operations (Mining Warden) 2003/44.

Amey (2004, 385), in a discussion of the South Australian situation, indicated that the system of granting of mining rights over freehold property that is owned by someone else effectively creates *equally subsisting rights in property*. He proposed that as mining law has *developed it became apparent that the freehold owner was on a collision course with the miner*. This was becoming increasingly evident during the submissions to the New South Wales Inquiry into coal seam gas in the latter half of 2011.

¹ For the sake of brevity, this paper uses the term *miner* to describe gas and petroleum explorers and producers.

The rights granted to CSG miners by the Petroleum (Onshore) Act 1991 have the following impact on private lands.

1. The Act creates a form of occupation (or tenancy), and this is determinable at the will of persons other than the landholder.
2. The Act authorises miners to enter private property and undertake activities and works (including the erection of structures).

Entry and occupation: a pragmatic view

In some cases coal seam gas entities have purchased freehold property on the open market (as an example, AGL Hunter Project Information Release [2011] advised Hunter residents that AGL had acquired four properties in the Broke, Milbrodale and Bulga localities). Acquisitions of freehold property at full market value are unlikely to generate controversy as to the adequacy of “compensation”.

Additionally, occupation of wellhead sites can be secured through the access provisions of the Petroleum (Onshore) Act 1991 (the Act). Sections 29, 33 and 41 of the Act provide petroleum producers with the right to be on private land for the purposes of exploration (prospecting), assessment and production, and the Act requires the miner to have an access agreement with the owner for “*prospecting titles*” (Section 69C). Section 69D lists the matters for which an access arrangement may provide.

Access arrangements have similarities to ground leases in that the tenant occupier is permitted to take possession of part of the property (for the construction of wellheads and roads), make improvements; and like leases, a periodic payment is made for the occupation. An upfront payment may also be made (see *Halfpenny Investments Pty Ltd V Sydney Gas Operations (Mining Warden) 2003/44*). The right to make improvements is also similar to rights reserved by public authorities under easement arrangements. However, unlike easements and leases, access arrangements are apparently not registered on title.

While not constituting an acquisition of freehold land, coal seam gas access arrangements can tie up land for the term of occupation. There is some uncertainty about the duration of occupation in that: *A typical coal seam gas well can last 10 to 15 years. It depends on the well. Obviously as time goes on you may want to abandon one well and drill one or two others*” (AGL, *Australian Senate Management of the Murray-Darling Basin System* 9 September 2011 Canberra, 18). Anecdotal reports indicate that gas companies seek occupation of well sites and associated roads for up to 20 years and even beyond. A range of estimates of the length of occupation exists. One of these puts the probable time of occupation as 42 years (Australian Senate August 2011, Canberra, 32).

In reality, the task of estimating the length of occupancy is beset with difficulty, and at the outset of the arrangement (although individual access arrangements may specify a time in years) the eventual length of occupation is uncertain. Established wells at Menangle have existed for approximately nine years. The most likely determinate of the length of occupation is the economic life of the resource (while extraction remains viable, it is likely that miners will remain in possession). Although the actual term is hard to define, this is not a temporary occupation of land. From a market perspective, the inability to determine the total term of the arrangement is something that would concern the hypothetically prudent purchaser.

Existing compensation theory

Existing compensation theory in Australia has evolved over a very long time and is the product of a great deal of deliberation of a wide range of property acquisition problems. It is relevant to this study for a number of compelling reasons.

Firstly, it provides a discussion of the principles of fair compensation for the compulsory taking of land. In so doing, it provides a useful measure against which other approaches to compensation can be assessed.

Secondly, a great deal of compulsory acquisition relates to partial taking of land for things such as electricity, water and sewer easements, electricity sub stations, water and sewage pumping stations, easements for flooding, and the resumption of land for railways and road widening. Coal seam gas infrastructure occupies part of land. Accordingly, the heads of compensation for partial taking (and the rules that have grown up around these) are

useful in assessing the ways in which coal seam gas infrastructure interferes with the property rights of landholders.

Precedent exerts a profound influence on valuation theory. Although the right to compensation is very much dictated by statute (Brown, 2004, 14), the valuation of land is *largely the creation of the common law and which has its source in judicial precedent* (Brown, *ibid*). The precedent relating to compulsory acquisition (especially acquisition of part of property) provides a rich source of theory relating to the practice of the valuation for compensation.

The Australian literature (for example, Brown, 2009, Hyam, 2009, Jacobs, 2010, Rost and Collins, 1990) identifies heads of compensation that address the value of the land taken and the affect of the acquisition on the part of the property that is not taken (through severance and injurious affection). Compensation is also usually available for all out of pocket expenses (including legal and valuation fees).

However, in the occupation of land by coal seam gas, the applicable statute is the *Petroleum (Onshore) Act 1991*. This act contains markedly different provisions in respect of compensation.

The Petroleum legislation and compensable items

The acquisition of sites for coal seam gas differs to acquisitions of land for public purposes in respect of the interest acquired and the acquisition process. Brown (2009, 5) proposed that activities for mining on private lands are usually compensated under mining legislation. Importantly, Brown *op cit*, 6 pointed out:

The critical difference is that the owner is not dispossessed and the access is in most instances not permanent. The procedure does not involve eviction.

Perhaps the perception that all exploration activities are temporary explains why the provisions of the NSW Petroleum (Onshore) Act 1991 remain as they are.

Section 107 of the *Petroleum (Onshore) Act 1991* Act provides:

- (1) *The holder of a petroleum title, or a person to whom an easement or right of way has been granted under this Act, is liable to compensate every person having any estate or interest in any land injuriously affected, or likely to be so affected, by reason of any operations conducted or other action taken in pursuance of this Act or the regulations or the title, easement or right of way concerned.*

The key to the assessment of compensation under the Act is found in Section 109, which provides.

109 Measure of compensation

- (1) *If compensation is assessed under this Act by the Land and Environment Court, the assessment is to be of the loss caused or likely to be caused:*

- (a) *by damage to the surface of land, and damage to the crops, trees, grasses or other vegetation on land, or damage to buildings and improvements on land, being damage which has been caused by or which may arise from prospecting or petroleum mining operations, and*
- (b) *by deprivation of the possession or of the use of the surface of land or any part of the surface, and*
- (c) *by severance of land from other land of the landholder, and*
- (d) *by surface rights of way and easements, and*
- (e) *by destruction or loss of, or injury to, or disturbance of, or interference with, stock on land, and*
- (f) *by damage consequential on any matter referred to in paragraphs (a)–(e).*

Because the compensable items in Section 109 are quite different to the heads of compensation for just terms acquisitions there is initial difficulty in assigning claims for things such as loss in the value of the land occupied to the list of compensable items in the Act. Indeed, valuers preparing claims for the Mining Warden's Court appear to have encountered problems with this. In *Halfpenny Investments Pty Ltd V Sydney Gas Operations* 2003/44 (Mining Warden) the court remarked *no claim has been made for compensation in respect of the matters outlined in S. 109(1) (a)–(e)* (Mining Warden, at page19). Interestingly, the judgement in *Halfpenny*

made no apportionment between the heads in Section 109, and simply assigned a value per well and per square metre of road (with the following remarks).

It is common practice within the industry that when compensation is agreed for an exploration licence under the Mining Act 1992, a sum is agreed generally for the type of individual wells which are drilled and furthermore for the roadways which would be used by the mining companies, (page20).

The practice sets compensation value according to the attributes of the work (number of wells and area land under of roads) as in the Halfpenny case cited above. Similar approaches to the calculation of compensation have been undertaken in a number of cases under the NSW Mining Act (1992) which contains similar (but not identical) provisions as to compensation. It was adopted in *Morgan Mining and Industrial Group Pty Ltd v WW Norris*, Wardens Court October 1977 and *Newbridge Slate PTY Ltd v Dapila Mining LTD Mining Warden* 9 May 1997. A variation of the approach makes allowances for items of disturbance during occupation for exploration (which can be brief). In *Reynolds v Electricity Commission of NSW Mining Warden*, 1978 5 December 1978 the court made an allowance per drill hole per week and added allowances for vehicle movements.

The valuation theory for partial taking

Valuation theory for partial taking of land is well established in Australia. Brown, 2009, Hyam, 2009, Jacobs, 2010, Rost and Collins, 1990 identify the main heads of compensation for partial taking as:

- Value of the land taken ²
- Severance
- Injurious affection
- Disturbance.

These heads provide an important framework for the consideration of the losses incurred by landholders. The following discussion addresses each head in the context of land occupation by coal seam gas infrastructure.

Value of the land occupied by coal seam gas infrastructure.

Coal seam gas exploration and extraction processes often involve the construction of infrastructure on private lands. Section 41 of the Act empowers holders of production leases to make improvements on the land, and access agreements such as that imposed by the court in *Halfpenny Investments Pty Ltd V Sydney Gas Operations* 2003/44 (Mining Warden) also authorise the making of improvements, which can include wellheads; access roads and buried gas lines.

Santos (2011, 24) provide a description of the physical dimensions of CSG wells.

The surface footprint of CSG extraction is small and temporary in nature. During their construction phase, well construction normally requires one hectare for approximately one year, and then decreases to approximately 25m by 25m, or 0.07ha...

Estimates of the area of wells vary, APPEA indicate an area of *15m x 15m plot* for production wells (APPEA, op cit, 2). However, rather more property than this can be used by CSG miners. Scaling the dimensions of well sites from air photographs indicates a substantial variation in actual areas of well sites under hardstand. The average area of hardstand (including well sites, but excluding roads) for a small sample of 22 wells around Menangle was 179 m². The range of areas was 130 – 239 m². Roads can occupy substantial areas. In the Halfpenny case, ten well sites were said to occupy 320 m² and roads 16,418 m² (total 16,738 m²), and this averages 1,674 m² per well.

Whilst *landholders are not dispossessed* (Brown 2009,6) of the whole property, they are dispossessed from the part occupied by CSG infrastructure and compelled to endure CSG wells and other infrastructure on their land in much the same manner as an owner affected by an easement (acquisition of easements is compensable under the NSW Land Acquisition (Just Terms Compensation Act) 1991).

² In addition to the concept of market value, “special value” recognises that land may have a special value to its owner because of some *attribute or use made of the land* (Brown, 2009, 127).

Land under wellhead sites and roads is lost to landholders for the term of occupation. Evidence suggests it is often compensated based on a rate per well site plus roads (as per Halfpenny above). Varying rates per well are reported as being paid. Metgasco Sept (2011,22) reports that ... *an equities research paper on the coal seam gas sector, published by Investment Advisory Group, Wilson HTM, states that landowners "are typically paid ~\$5k/well for the disturbance caused during drilling and ~\$1.5k/year/well for the life of the well."* The figure of \$1,500 per well per annum was cited on SBS Insight, 20 September 2011 (at page 10 of the transcript).

The New South Wales Legislative Council (2012, 149) reports a payment by Santos of \$5,000 for non-permanent works and (at 150) *'if it is a pilot well that remains on the property the landholder receives between approximately \$1,500-\$3,000 per well per annum'*. The Committee heard evidence (at page 150) that AGL Energy: *currently pays on average a \$3,000 to \$5,000 one off payment for short-term exploration wells. The total average annual compensation paid for production wells to June 2011 was \$2,382 per well.*

The going rate is apparently escalating. The Newcastle Herald (14 Jan 2012, M Kelly) *Mr Harris, 42, chose the well's location* and received a \$17,000 payment after signing an access agreement. He also receives \$4000 year on an ongoing basis. Additionally, Santos has recently announced a new compensation scheme that offers an upfront payment of \$30,000 and (for the first year) 120% of the value of the land occupied. The annual payment is then reported to reduce to 60% of the value of the land occupied (Macdonald-Smith, 2012).

The Halfpenny judgement awarded compensation of \$64 per annum for the ten well sites (\$6.40 per well); \$24.04 per annum to cover the workover area required for annual maintenance (where the area of land required increases) and \$3,283.60 per annum for the 16,418 square metres under road. The court relied upon the evidence given as to the value of the land per hectare and assigned a rent value using a percentage. This general approach coincides with valuation tradition in applying piecemeal approaches based upon a rate per square metre or hectare to the land occupied (see for example *Kater v. The Electricity Transmission Authority of New South Wales NSWLEC 1993, 18*). However, the approach stops at the assessment of the value of the land occupied, and makes no allowance for severance losses.

In an attempt to rectify the perceived shortcomings of compensation the 2012, report of the New South Wales Legislative Council General Purpose Standing Committee No. 5 recommends (at 22):

That the NSW Government ensure that the template access agreement for exploration and production take a default position whereby the landholder be compensated in the sum of \$5,000 per well head per annum (pp 150).

The problem is that this approach is focussed on the work and (as in the "industry common practice" approaches mentioned above) overlooks the potential for injury to the rest of the property.

The affect on the value of remaining land

Schemes that use attributes of the work for the assessment of compensation have been the subject of criticism (see for example, Maloney 1971, 374). The problem with this approach is that (in concentrating on the work) it ignores the affect on the whole property. It is unlikely a prudent vendor (or lessor) of part of property would consider disposing without considering all inconveniences and costs involved (including loss in value of remaining land). Hyam cites the following quotation from *Minister for Works v Antonio* [1966] SASR 54 (a case relating to partial taking for a sewage treatment plant).

It is reasonable to suppose that if a man were to sell part only of his land in a free market, he would protect himself by fixing an appropriate price to compensate himself for any diminution in value which might result to the land he retains as a result of activities to be carried out on the land which he sells (Hyam, 446).

The potential for diminution referred to can be found in the items of severance and injurious affection.

Severance and compensation for CSG occupation

In addition to losing the use of land under roads and in wellhead enclosures, landholders incur a loss due to severance. The term severance relates to the loss in value to the residual land caused by the taking of part (Collier, 1955, 251). Severance can arise in two ways, and this is illustrated by Hyam (1995) who referred to the judgment in *Suntown Pty Ltd v Gold Coast City Council* (1979) 6 QLCR 196 the Queensland Land Appeal Court:

The severance may be by way of a division of the retained land into two parts, for example, by way of a resumption for an intersecting road. It may also occur where a part only of the claimant's land is taken leaving a compact parcel. Severance damage is depreciation in the value of the retained land resulting from its division into two or more parts, or its reduction in area and consequent loss of value for some current or higher (potential) use." (Hyam, 238).

Brown 2009, 166, reinforces this understanding of the operation of the term severance.

Figure 3 Wellhead and access roads at Menangle c 2007
(road curves east to northeast to serve additional well)



Source: Google Earth Image, Sinclair Knight Mertz 2012. 34° 7.413' S 150° 43.0662'E.

There are degrees of severance. Roads and gas lines that travel across paddocks may have a greater impact on value than those that follow fence lines. Wherever CSG infrastructure is placed, it imposes upon the landholder's rights to the surface, and this imposition needs to be compensated. However, the degree of the affect of the work will vary from property to property and from project to project.

The occupation of part of property raises a number of issues. The wellhead is fenced off and a hardstand area is laid around it. Where a number of wells are established, properties are punctuated by wellheads, and this can be disruptive. Roads (see figures 2 &3) must be established in order to gain access to individual wells, and it is may be necessary to provide electricity. Gas lines may be buried along roads. The following quote demonstrates the apprehension felt by some landholders.

... It is not just that well; it is the access roads, the pipelines, possibly some overhead powerlines and some compressor stations. .. Australian Senate Management of the Murray-Darling Basin System Tuesday, 19 July 2011, Dalby, 9.

CSG infrastructure can cause considerable disruption to farm operations and the general enjoyment of private property.

The problem of injurious affection

Injurious affection arises from the use of, and the activities upon the land taken (see Hyam 2009, 445, Collier, 1955,251, Brown 2009, 165, 166).

The well site comprises the wellhead pipe and associated plant. The plant observed in Menangle (see Figure 4) resembles a small electricity sub-station (alternatively, a small sewage or water pumping station) and is out of character with rural landscapes. The technology is evolving, and well designs will probably change over time. The appearance and layout of wells will affect property according to placement in the terrain. Put simply, prominent and ugly works would be expected to have a greater negative effect than well-designed works that are hidden by natural features.

Figure 4 Wellhead site and infrastructure in Camden area

	
File Photograph HLA Environmental Services <i>Expansion of Stage 2 of the Camden Gas Project Menangle Park Project Area Environmental Assessment . Vol 1 4.6 2007.</i>	Wellhead in south western Sydney. File photograph AGL c 2011.

The gas retrieval process obviously incurs some risks, and wellhead sites may carry signs warning of the danger of “explosive vapours” and prohibiting “unauthorised entry”. Accordingly, it is likely the property market would take a negative view of the presence of wellhead sites and this is evidenced in the Queensland gas case of *Sullivan v Oil Company of Australia and Santos* (in Scarr 2004).

In making its award in *Sullivan v Oil Company of Australia and Santos*, the court followed the tradition established in ordinary compulsory acquisition matters and awarded compensation for injurious affection. Unfortunately, the Queensland law (like that in New South Wales) contained no clear provision for the injurious affection award of \$95,760. Oil Company of Australia and Santos appealed the initial judgment successfully and had the award for compensation for injurious affection overturned (Scarr, op cit).

It is possible that, in the case of coal seam gas occupation, injurious affect is multi-faceted. While land is occupied by well sites (complete with warning signs about explosive vapours), the hypothetically prudent purchaser would find the presence of mining infrastructure off putting. In ordinary compulsory acquisition, landholders would be compensated for this.

Additionally, there is a possibility that (even after the wells have been abandoned and capped) ongoing stigma will attach to the land. The importance of this factor in property markets was recognised by Chan (2001, 127) who pointed out that stigma arises because of perceptions in the marketplace as to environmental risks. Based on potential contamination and damage to aquifers and possible contamination of sites, there appears ample opportunity for the development of market based stigma for properties occupied by CSG

infrastructure. The existence of stigma is something that would also be considered in ordinary land acquisition compensation.

Disturbance

Section 69 (2)A of the Act provides *An access arrangement must (if the landholder so requests) specify that the holder of the prospecting title is required to pay the reasonable legal costs of the landholder in obtaining initial advice about the making of the arrangement.* However, in addition to legal fees, it is possible that landholders would need to obtain accounting and valuation advice in carrying out their negotiations with petroleum producers. Additionally, Sections 109 (1)a and 109 (1)e provide for “disturbance” items comprised in damage to property and stock during operations.

The right to additional assessment

Section 111 of The Act provides for reassessment of compensation where *further loss has been caused to the land to which the assessment relates, or to other land, being loss arising from any one or more of the causes mentioned in section 109 (1).* At the date of this study, it is not clear if the provisions of Section 111 would operate to allow additional claims for alteration in the value of affected properties due to events such as rezoning.

DOES COMPENSATION MATCH THE INJURY?

In order to test the adequacy of the NSW Petroleum (Onshore) Act 1991 in respect of compensation, a literature analysis (including court cases, federal and state inquiries and submissions) was undertaken and used in conjunction with field investigations to determine how land is affected. Table 1 uses the heads of compensation derived from valuation theory to categorise the effects discerned.

Table 1. Compensation heads and effects of occupation.

Compensation Head	Effects for CSG Projects Studied.	NSW Petroleum (Onshore) Act 1991
Market Value	Wellheads and roads are placed under hardstand and are unavailable for farming for the term of the occupation.	Market value is implied by Section 109 1 (b), however, not specified directly. The Halfpenny judgement compensated for land occupied through an annual payment.
Special Value	Special value can exist in a wide range of circumstances.	The Petroleum legislation does not address the topic of Special Value.
Severance	Property is punctuated by wellhead sites and roads impose on paddocks. The <i>Halfpenny case</i> raised issues of severance (deep raking page 9, and construction of roads at page 11). Air photos evidence severance (see figures 2 and 3). However, the degree of severance will fluctuate according to property characteristics and those of CSG works.	Severance is identified by Section 109 1 (c), however, no definition of severance is included in Act. Severance was not included in the Halfpenny judgement (possibly due to absence of direct evidence being tendered).
Injurious Affection	The use of affected land for gas extraction and plant maintenance is potentially a major issue (see points raised in Sullivan & Oil Company of Australia case and nature of plant and its impact). Figure 4 portrays CSG plant.	Although mentioned by Section 107, injurious affection is not included in the list of compensable matters in Section 109.
Disturbance	Items such as damage to trees and stock are covered. At the date of this paper, legal fees (but not valuation fees) are recoverable. There is no provision for business disturbance.	Section 109 does not nominate disturbance, however, “disturbance like” items including damage to crops and loss of stock are nominated. Disturbance of business goodwill is not specifically nominated by the Act.

Severance is specifically nominated as a compensable item by the legislation (and was allowed in Moolarben Coal Mines Pty Ltd, Sojitz Moolarben Resources Pty Ltd, Kores Australian Coal Pty Ltd v Ulan Coal, Mining Warden, 2008,25). However, given the apparent reliance on the “common practice” of compensating based on a rate per well and area of roads and hardstand, it is possible that a claim under this head could meet with resistance. Accordingly, claims for severance will need to make a compelling argument as to the existence of severance and its magnitude.

Both the field observations and literature indicate that injurious affection is potentially a crucial head of compensation. However, it is not included in the list of compensable items under section 109 of the act (although it is mention in section 107). Scarr (2004, 571) commented on the issue of injurious affection and the Petroleum (Onshore) Act 1991and commented *This perhaps indicates that in the scheme of this particular legislation, injurious affection has a limited meaning or effect.*

The ability to claim for injurious affection for CSG sites in NSW is dubious. Perhaps it could be claimed under Section 109 (1) f (f) *by damage consequential on any matter referred to in paragraphs (a)–(e).* However, this may lead to legal argument (as in the Sullivan case cited by Scarr op cit), and the outcome associated with such a claim is the subject of uncertainty. Importantly, matters that would otherwise be claimed as injurious affect cannot be simply lumped in with a severance claim because of the way in which severance is understood by the general law associated with partial taking.

CONCLUSIONS

The Petroleum (Onshore) Act 1991 creates a form of (compulsory) property occupation that is of uncertain term and where the compensation provisions are blandly specified. In 1999, 349, White proposed *Compensation constitutes the recompense that society dictates must be made by a miner to a landholder for the unwanted intrusion of the miner onto the land of the landholder.* He pointed out that compensation should be sufficient to allow landholders to continue operations (or to move) *without financial loss and with some compensation for disturbance.* In commenting on the compensation provisions of mining law generally in NSW, White (1999, 330) considered that (in comparison to other states) NSW had the narrowest concept of compensable loss. Clearly, there are challenges for legislators in NSW.

As CSG exploration moves into closely settled areas such as the Hunter and Northern Rivers in NSW, there is potential for significant issues arising from severance and injurious affection. Additionally, the Petroleum (Onshore) Act 19991 does not recognise the concept of special value. The provisions of the Act in respect of going concerns such as vineyards and accommodation property (which may raise questions concerning disturbance of business goodwill and special value) are untested at the date of this paper. A great deal of research remains to be done in the area of compensation for coal seam gas occupation. Further research into the affect of access arrangements and CSG infrastructure is needed. In NSW, this will necessarily be of a qualitative nature pending the expansion of CSG well fields and the transaction of properties affected by CSG. However, it is possible that Queensland (which has a longer established CSG industry) may yield sufficient sales data for a quantitative assessment of the affect of CSG plant on property values.

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