



Development Application – Merit Assessment Policy

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1. Introduction

1.1 Subsidence Advisory NSW

Subsidence Advisory NSW (SA NSW) is a NSW Government agency responsible for administering the *Coal Mine Subsidence Compensation Act 2017* (the Act). SA NSW has three primary functions:

1. To manage claims for compensation where surface developments are damaged by mine subsidence following extraction of coal or shale in NSW.
2. To regulate surface development within mine subsidence districts (districts) to minimise liabilities arising from mine subsidence.
3. To manage risk associated with mine subsidence including public awareness of mine subsidence.

1.2 Regulation of surface development

Districts are proclaimed in areas where there is potential for mine subsidence to impact surface development. This may be a result of potential ground instability in previously mined areas or ground movement due to planned future mining activity.

SA NSW has set surface development guidelines (guidelines) which specify the type of construction permitted on each property in districts. SA NSW has assigned one of eight guidelines to each property located in a district. The type of guideline that is applied depends on subsidence hazards at the property. Each guideline includes restrictions on building footprints, height, foundation type, superstructure material and occupation density.

Applications that comply with certain guidelines can be assessed by an Accredited Certifier, including councils, and do not require SA NSW approval. Table 1 summarises each development guideline and the relevant certifying authority for compliant applications. All applications for proposed development on a property that does not comply with the property's guideline must be considered by SA NSW on merit.

Applicants can find out the guideline assigned to a property through the NSW Planning Portal at www.planningportal.nsw.gov.au/find-a-property.

Table 1 - Summary of SA NSW's development guidelines

SA NSW surface development guideline	Brief description*	Assessment authority
Guideline 1. Non-active mine workings at risk of pothole subsidence	Single storey brick veneer or two storey clad frame on engineer designed footings to span a 5m pothole	SA NSW
Guideline 2. Non-active mine workings possible subsidence risk	Single or two storey brick veneer on AS 2870 footings/slabs. Maximum length of 24m and maximum footprint of 400m ² .	Councils and certifying authorities*
Guideline 3. Non-active mine workings remote subsidence risk	Up to four storey residential structures in accordance with all standards and codes.	Councils and certifying authorities*
Guideline 4. Active mining areas - high predicted subsidence impact	Single storey clad frame on strip footings or waffle slab to minimum H2 AS2870 site classification. Maximum length 18m and maximum footprint of 250m ² .	SA NSW
Guideline 5. Active mining areas – moderate predicted subsidence impact	Single or two-storey clad frame or brick veneer on footings/slabs to minimum H2 AS 2870 site classification. Maximum length of 24m and maximum footprint of 400m ² .	Councils and certifying authorities*
Guideline 6. Active mining areas – minimal predicted subsidence impact	Single or two-storey clad frame or brick veneer on AS 2870 slabs/footings Maximum length of 30m and maximum footprint of 500m ² .	Councils and certifying authorities*
Guideline 7. On Application	The complexity of the geotechnical environment or lack of information regarding subsidence risk requires that all surface development be assessed by SA NSW	SA NSW
Guideline 8. No Restrictions	SA NSW has assessed, based on available records the subsidence hazard to be negligible	Councils and certifying authorities*

*A full copy of each SA NSW surface development guideline is available at www.subsidenceadvisory.nsw.gov.au/development-guidelines.

** Councils and Certifying Authorities, can approve compliant applications on properties assigned these guidelines. All applications that do not comply with the guideline assigned to the property must be assessed by SA NSW on merit.

2. Policy Statement

This policy provides a framework for the assessment and determination of development applications within districts that do not comply with the SA NSW development guideline assigned to the property.

2.1 Objectives

The key objectives of the policy are to:

- ensure compliance with all relevant statutory requirements
- ensure public safety
- establish a comprehensive, transparent and consistent process for assessing development applications that do not comply with SA NSW's development guidelines
- clearly define roles and responsibilities
- provide guidance on the type of conditions that SA NSW may impose as part of a conditional approval of a development application prior to construction in order to gain final approval following construction
- establish a consultation process
- establish a dispute resolution process
- prevent unnecessary delays in SA NSW's assessment of development applications.

2.2 Scope

This policy applies to all officers, consultants, contractors and outsourced service providers performing work for SA NSW. It also applies to all SA NSW activities that involve assessment of applications for proposed surface development that do not comply with SA NSW's guidelines and the preparation of associated guidelines and procedures.

2.3 Ethical Conduct

All activities must be conducted in an ethical and transparent manner and comply with the values, principles and articles in the Code of Conduct.

Staff will ensure they are not, or are not perceived to be, in a conflict of interest with any stakeholders. Those staff who have, or may be perceived to have, a perceived conflict of interest in the outcome of a development application or related decision should disclose

any perceived conflict to their manager and discuss whether they should exclude themselves from any role in the consideration of the application.

2.4 Roles and Responsibilities

Each of the following has specific assigned responsibilities under this policy:

- Chief Executive Officer (CEO)
- Technical Manager
- Senior Risk Engineer & Senior Advisor Residential Subsidence Regulation
- SA NSW officers

2.4.1 Chief Executive Officer

The CEO is responsible for:

- establishing a policy for the assessment of development proposals within a district
- ensuring the delegations set out in the Instrument of Delegation are appropriate to the development assessment process
- reviewing any determination of an application that is subject to an appeal by a stakeholder.

2.4.2 Technical Manager

The Technical Manager is responsible for:

- ensuring that their staff, including consultants, contractors and outsourced service providers, comply with this policy and associated procedures
- reviewing and updating this policy and the associated procedures and guidelines
- approving or refusing applications for proposed development of land in line with SA NSW's Instrument of Delegations.

2.4.3 Senior Risk Engineer & Senior Advisor, Residential Subsidence Regulation

The Senior Risk Engineer and Senior Advisor, Residential Subsidence Regulation are responsible for:

- complying with this policy, the associated procedure and Instrument of Delegations.

2.4.4 SA NSW officers

SA NSW officers undertaking the assessment of Integrated Development referrals and applications are responsible for:

- complying with this policy, the associated procedure and Instrument of Delegations.
- referring any suggestions for improvement or queries to their respective Manager.

3. Development applications

This policy applies to the assessment and determination of development applications:

- made under section 22 of the Act
- referred to SA NSW as integrated development under section 91A of the *Environmental Planning and Assessment Act 1979*.

3.1 Application lodgement

Applications for development within a district may be submitted directly through SA NSW's online portal at www.subsidenceadvisory.nsw.gov.au or as an Integrated Development application through the relevant local council.

Applications should include detailed plans of the proposed structure, including the location and details of articulation / control joints in brickwork to confirm compliance with the requirements of the Building Code of Australia.

3.1.1 Referral of Integrated Development

Integrated Development is development that requires consent under the *Environmental Planning and Assessment Act 1979* and one or more approvals under other Acts.

Integrated Development is referred to SA NSW by a local council. Referrals may occur through SA NSW's portal.

Integrated Development is referred when an applicant has indicated on a development application (DA) form submitted to council that the DA is to be assessed as Integrated Development.

3.2 Application process

After receiving a development application, SA NSW will:

- register the application and determine whether it requires assessment on merit.

Note applicants may refer to the NSW Planning Portal to find out the surface development guideline applied to a property in order to determine whether the proposed application complies with the guideline or will require a merit assessment.

- undertake a preliminary review and if necessary either (1) request more information from the applicant or (2) consult the relevant coal mine operator or the Division of Resources and Geoscience (DRG).

- Refer to Attachment A for an overview of the merit assessment process based on building type, and whether the application is inside a current mining title. If additional information is required, SA NSW will notify the applicant within **14 calendar days** of receipt of the application.
- make a determination based on its records and any other available information.
- issue written notification advising the applicant of the outcome of the application.

SA NSW is to provide the applicant with a determination within **40 calendar days** of receipt of the application, excluding any time lost due to requests for additional information or consultation with external parties.

3.3 Advisory services

SA NSW offers expert advice on matters relating to mine subsidence or proposed development of land that may be subject to mine subsidence, whether or not the land is within a district.

Any interested party, including councils, can approach SA NSW for advice on mine subsidence matters, including requests for comment on development proposals that are not Integrated Development.

4. Assessment process

4.1 Assessment overview

SA NSW's assessment process aims to generate appropriate controls to eliminate or reduce risks associated with mine subsidence in districts.

As part of the assessment process for development applications that do not comply with SA NSW's guidelines, SA NSW will consider the:

- likelihood that mine subsidence events will occur
- consequence of mine subsidence events on surface infrastructure and public safety
- reliability of information used to determine the above, including mine plans, assumed pillar and extraction dimensions, and assumptions regarding geotechnical modelling
- risks arising from the proposed engineering controls.

The assessment process will vary depending on the type, size, potential repair cost of the proposed development, and whether it is in an area affected by operational, historical or future mining (refer to **Attachment A**).

The guideline assigned to a property includes information about whether the property is located in an operational (active) or non-active mining area. Applicants can find out the SA NSW guideline assigned to a property through the NSW Planning Portal. A full copy of all SA NSW development guidelines is available at www.subsidenceadvisory.nsw.gov.au/development-guidelines.

4.2 Applications within a current mining title

4.2.1 Assessing mine subsidence risks within current mining titles

In assessing risks associated with mine subsidence for development applications within a current mining title, SA NSW will consider the available information at the time including:

- the current development approval or mining lease to extract coal under the site
- any plans to extract coal under the site, including the likely timeframe and predicted ground surface subsidence impact
- the potential consequences of predicted subsidence on proposed development and the appropriate engineering controls required to mitigate against subsidence damage.

SA NSW will request information from the relevant mine operator or the Division of Resources & Geoscience within **5 calendar days** of receipt of the application. If no response is received from the mine operator within **14 calendar days**, SA NSW may make its own reasonable determination on the development application based on available information.

SA NSW does not require geotechnical desktop assessments to support development applications in operational or future mining areas. However, SA NSW may require a geotechnical investigation or desktop study to support large infrastructure projects or developments in active mining areas as part of its conditions of approval.

4.2.2 Consultation with the title holder

SA NSW is to consult the relevant title holder during the assessment of development applications within a current mining title.

SA NSW is to consider the title holders advice when making a determination. The title holder will be notified of any determination of a development application in a current mining title that varies from the relevant advice. On request, SA NSW shall provide the title holder with an explanation for the decision.

There may be situations where a mine operator objects to a proposed development in a current mining title. In these situations, SA NSW may request the mine operator and applicant to reach a co-existence agreement before making a determination.

4.2.3 Co-existence agreements

Co-existence agreements between the mine operator and applicant may include a subsidence liability and cost prediction assessment based on the likely mining plans and development of land.

There may be some instances, such as in areas where there is a high degree of certainty for coal extraction within a well constrained timeframe, where it is more appropriate for co-existence agreements to require mining to precede development.

4.2.4 Request for further information to facilitate assessment

SA NSW is able to encourage discussions on co-existence agreements between applicants, mine operators and the Department of Planning including the Division of Resources and Geoscience as necessary.

4.2.5 Previous mine workings within a current mining title

In areas where there are previous mine workings in a current mining title, SA NSW will also assess the mine subsidence risk in accordance with section 4.3 of this policy in addition to section 4.2 of this policy.

4.2.6 Areas of potential future mining

SA NSW may consult the Division of Resources and Energy (DRG) on applications for B3 category structures as identified in **Table 2**.

SA NSW is to provide DRG with at least **14 calendar days** to provide advice on the application. SA NSW will consider DRG's advice when making a determination on such applications. If DRG does not provide a response within the specified timeframe, SA NSW may make its own assessment and determination.

4.3 Mine workings outside a current mining title

Some districts cover mine workings outside a current mining title, these include known or suspected historical underground mine workings, shafts and tunnel entries.

4.3.1 Assessing mine subsidence outside a current mining title

In assessing the risk associated with mine subsidence for development applications near mine workings outside a current mining title, SA NSW will consider the:

- nature of the proposed surface development
- type and condition of the mine workings beneath the site
- depth of the mine workings beneath the site
- history of subsidence at the site
- estimated likelihood of subsidence occurring in the future
- geotechnical characteristics of the site
- potential consequences of subsidence
- reliability of the information available to assess the above.

4.3.2 Requests for further information to facilitate assessment

SA NSW may require additional information to facilitate assessment of an application, including geotechnical studies or investigations into potential subsidence risk. SA NSW's standards for geotechnical analysis and reporting for mine subsidence are outlined at **Attachment B**.

Applicants planning to build in areas where there are mine workings outside a current mining title are encouraged to contact SA NSW in the preliminary stages to ascertain

whether geotechnical studies will be required. SA NSW's building type classifications and requirements for geotechnical desktop studies are outlined at **Table 2**.

SA NSW is to notify applicants when further information is required to progress the assessment of a development application within **14 calendar days** of receipt. In instances where geotechnical investigations are deemed necessary, SA NSW is to outline the necessary scope and objectives of the investigations.

In instances where SA NSW has requested further information from the applicant, the development application will be placed on hold until the information has been received. If SA NSW has not received a response from the applicant within **two months** of the request, SA NSW is to issue a reminder email to the applicant. If no response is received within **one month** of the reminder, SA NSW may close the application and notify the applicant by email. The applicant can re-submit the application at any time.

Refer to **Attachment C** for guidance on how SA NSW assesses subsidence risk and the type of engineering controls that may be applied based on geotechnical uncertainty, the estimated level of subsidence risk and the type of proposed surface development.

4.3.3 Geotechnical investigations

The types of geotechnical investigations SA NSW may require to facilitate assessment of a development application include, but are not limited to:

- desktop studies of mining history, geological/geotechnical conditions, subsidence history
- ground surface observation and geotechnical mapping
- subsurface investigation
- stability and subsidence analysis
- risk assessment and development of risk mitigation measures.

The extent of investigations required will depend on anticipated subsidence hazards as well as the nature of the proposed development. In areas with minimal well-defined subsidence hazards, SA NSW may deem a simple desktop study to be sufficient. Development applications in areas with a history of subsidence and complex ground conditions are more likely to require extensive desktop studies followed by further mapping, subsurface investigation, analysis, assessment and reporting.

The selection of investigation techniques and the evaluation of pillar stability and subsidence impact should be made by competent professionals. SA NSW's minimum requirements for geotechnical reports accompanying development applications are outlined at **Attachment B**.

All geotechnical studies and investigations must be undertaken by suitably qualified and experienced geotechnical, mining or engineering geology professionals. SA NSW can provide details of suitably qualified professionals upon request.

A list of key technical papers that SA NSW recognises as providing acceptable methodologies for estimating subsidence risk are set out at **Attachment D**. SA NSW may also accept other technical papers on request.

Table 2 – SA NSW classification of building type used to indicate requirement for desktop geotechnical study

Building Structure Description		
SA NSW category	General Classification of Building type	SA NSW requirement for Geotechnical Assessment
B1	<ul style="list-style-type: none"> up to and including 3 storeys (including rooftop access) < 50m maximum plan footprint dimension no basement no load bearing masonry construction up to and equal to \$3 M construction cost 	<p>Desktop assessment not required with submission.</p> <p><i>SA NSW may request further geotechnical work following submission if site undermined by historical workings.</i></p>
B2	<ul style="list-style-type: none"> up to and including 4 Storeys (including basements and rooftop access); or Between \$3 M to \$5 M construction cost; or > 50m in maximum plan footprint dimension 	<p>Desktop assessment not required with submission.</p> <p><i>SA NSW may request further geotechnical work following submission if site undermined by historical workings.</i></p>
B3	<ul style="list-style-type: none"> greater than 4 storeys (including basements and rooftop access) or > 100m maximum plan footprint dimension Greater than \$5 M construction cost; or Use - Hospital Wards, Operating theaters, critical public infrastructure Public Buildings with high trafficability (i.e. school halls etc.) 	<p>Desktop assessment required with submission if site undermined by historical workings.</p> <p><i>SA NSW may request further geotechnical work following submission if site undermined by historical workings.</i></p>

5. Determinations and Approvals

Certifying Authorities, including local councils, can approve some applications that comply with development guidelines that SA NSW has assigned to a property. Details of surface development guidelines that do not require SA NSW approval is available at **Table 1**. All applications that do not comply with a property's development guideline are to be considered by SA NSW on merit.

5.1 Section 22 Approval

For all applications lodged directly to SA NSW by the applicant, approval is granted by SA NSW under Section 22 (3) of the Act. Copies of this approval can be used to accompany a Development Application with the relevant local council.

5.2 General Terms of Approval

For development applications lodged through council as an 'integrated development', council is to lodge the application with SA NSW on behalf of the applicant under Section 91 of the *Environmental Planning and Assessment Act 1979* in order to obtain General Terms of Approval (GTAs).

SA NSW is to issue GTAs within **21 calendar days** of receiving the development application from council. If an integrated referral cannot be returned within **21 calendar days**, SA NSW is to notify council of the delay within the **21 calendar day** timeframe.

In instances where SA NSW requires further information to assess a development application referred through council, SA NSW is to request the additional information from council within **21 calendar days** of receiving the application.

SA NSW is to specify whether approval or conditional approval has been granted under section 22 of the Act when issuing GTAs. In instances where SA NSW grants conditional approval, the applicant is required to meet any applicable conditions before building works can be carried out.

In the event that SA NSW does not grant approval, council is required to refuse the application.

5.3 Refusals

SA NSW may refuse a development application where mine subsidence risks are considered too high. Examples of development applications that SA NSW may refuse include:

- Development applications that SA NSW has determined present an unacceptable financial or safety risk and the potential subsidence impact cannot be effectively mitigated through engineering design.
- Areas where the subsidence hazard has been assessed by SA NSW to present a credible and unacceptable public safety risk and an effective mitigation strategy is not feasible.

In such cases, SA NSW officers are available to meet with the applicant to attempt to find a mutually agreeable solution. If the applicant is not satisfied with the proposed pathway forward, they may request a meeting with the CEO or dispute the determination in accordance with Section 6 of this policy.

6. Reviews and Dispute resolution

SA NSW offers applicants the option to formally request a review if they are not satisfied with the determination of a development application. The CEO is to be notified of all requests for review and make the final determination on the outcome of reviews.

Prior to initiating the formal review process, SA NSW may suggest meeting with the applicant to attempt to reach a mutually agreeable solution.

6.1 Review process

To initiate a review, applicants are to submit a written request to SA NSW for a review of a determination on a development application. The submission needs to outline the reasons for the request including justifying why there should be a review and what the applicant considers would be a reasonable determination. If applicable, details of the applicant's preferred review type should be included.

SA NSW is to acknowledge requests for reviews within **7 calendar days** and advise the applicant of timing and next steps, depending on the review type, within **14 calendar days**.

The findings and recommendations from external reviews are to be provided to the CEO for consideration. The CEO is to make the final determination on the outcome of the review. Once finalised, SA NSW is to advise the applicant of the outcome of the review with an explanation for the determination. SA NSW is to finalise reviews within **40 calendar days** of the request.

6.1.1 Reviews of applications with mine workings outside a current mining title

Applicants disputing SA NSW's determination of applications within historical (non-active) mine areas have the option for an internal review by a different SA NSW officer or a review by an external consultant. The CEO may use these subsequent reports to inform the final decision.

6.1.2 Reviews of applications within a current mining title

Applicants disputing SA NSW's determination of an application within a current mining title have the option for an internal review by an SA NSW Risk Engineer who was not involved in the original determination.

Note: There is no option for external reviews of applications within a current mining title as subsidence impacts in these locations have generally been previously agreed upon by coal mine operators and the Division of Resources & Geoscience.

6.2 Review of determination

6.2.1 Internal reviews

SA NSW offers applicants the option of an internal review of a determination on a development application at no cost. Internal reviews are carried out by a SA NSW Risk Engineer with no involvement in the original determination.

6.2.2 External reviews

External reviews of development applications in areas with existing mine workings outside a current mining title are to be carried out by an independent consultant with extensive experience in mine subsidence studies and acceptable to SA NSW. SA NSW will use the report to reconsider the determination.

If the review results in SA NSW's original determination on the application being overturned, SA NSW may re-imbursement the applicant for the cost of the review.

7. Key Performance Indicators

Key Performance Indicators are an important part of the strategic planning process and play a role in the measurement of SA NSW's progress towards achieving its planned goals. The following table lists the key performance indicators.

- If the application is made under section 22 of the Act, SA NSW will advise the applicant if additional information is required to progress their application within **14 calendar days** of receipt.
- If the application is made as an integrated development under section 91 of the *Environmental Planning and Assessment Act 1979*, SA NSW will advise council if it requires additional information to progress the application within **21 calendar days** of receipt unless additional information is requested by SA NSW in order to progress the application.
- All merit based approvals under section 22 of the Act will be determined within **40 calendar days** of receipt unless additional information is requested by SA NSW to progress the application.
- 90% of integrated development applications made under section 91 of the *Environmental Planning and Assessment Act 1979* will be determined within **21 calendar days** of receipt unless additional information is requested by SA NSW in order to progress the application.
- 10% of integrated development applications made under section 91 of the *Environmental Planning and Assessment Act 1979* will be determined within **40 calendar days**. SA NSW will notify council that additional time is required within **21 calendar days**.

***Note:** assessment durations exclude “stop the clock” periods where SA NSW is waiting for additional information from the applicant or a third party to enable an assessment.

8. Related Policies and Documents

Issuer	Reference	Document Name
NSW Government	No 23	<i>Coal Mine Subsidence Compensation Act 2017</i>
NSW Government		<i>Coal Mine Subsidence Compensation Regulation 2017</i>
NSW Government	No 203	<i>Environmental Planning and Assessment Act 1979</i>
NSW Government		<i>Environmental Planning and Assessment Regulation 2000</i>
NSW Government		<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
NSW Government	No 17	<i>State Records Act 1998</i> (regarding the creation, management and protection of records and public access to those records)
NSW Government	No 52	<i>Government Information (Public Access) Act 2009</i> (regarding public access arrangements to agency information)
NSW Government	No 133	<i>Privacy and Personal Information Protection Act 1998</i> (regarding the collection and protection of personal information)
NSW Government	No 35	<i>Independent Commission Against Corruption Act 1988</i> (regarding reporting of any matter suspected on reasonable grounds to involve corrupt conduct)
NSW Government	October 2015	NSW Integrated Mining Policy - <i>Indicative Secretary's Environmental Assessment Requirements for State Significant Development - Mining</i> (Hotlink)
NSW Public Service Commission	Direction No 1 of 2015	The Code of Ethics and Conduct for NSW government sector employees
Department of Finance, Services and Innovation	Hotlink	Code of Ethics and Conduct

9. Document Control

9.1 Document Approval

Name & Position	Signature	Date
Kieran Black Technical Manager		25 May 2018
Brendan Killen A/Chief Executive Officer		25 May 2018

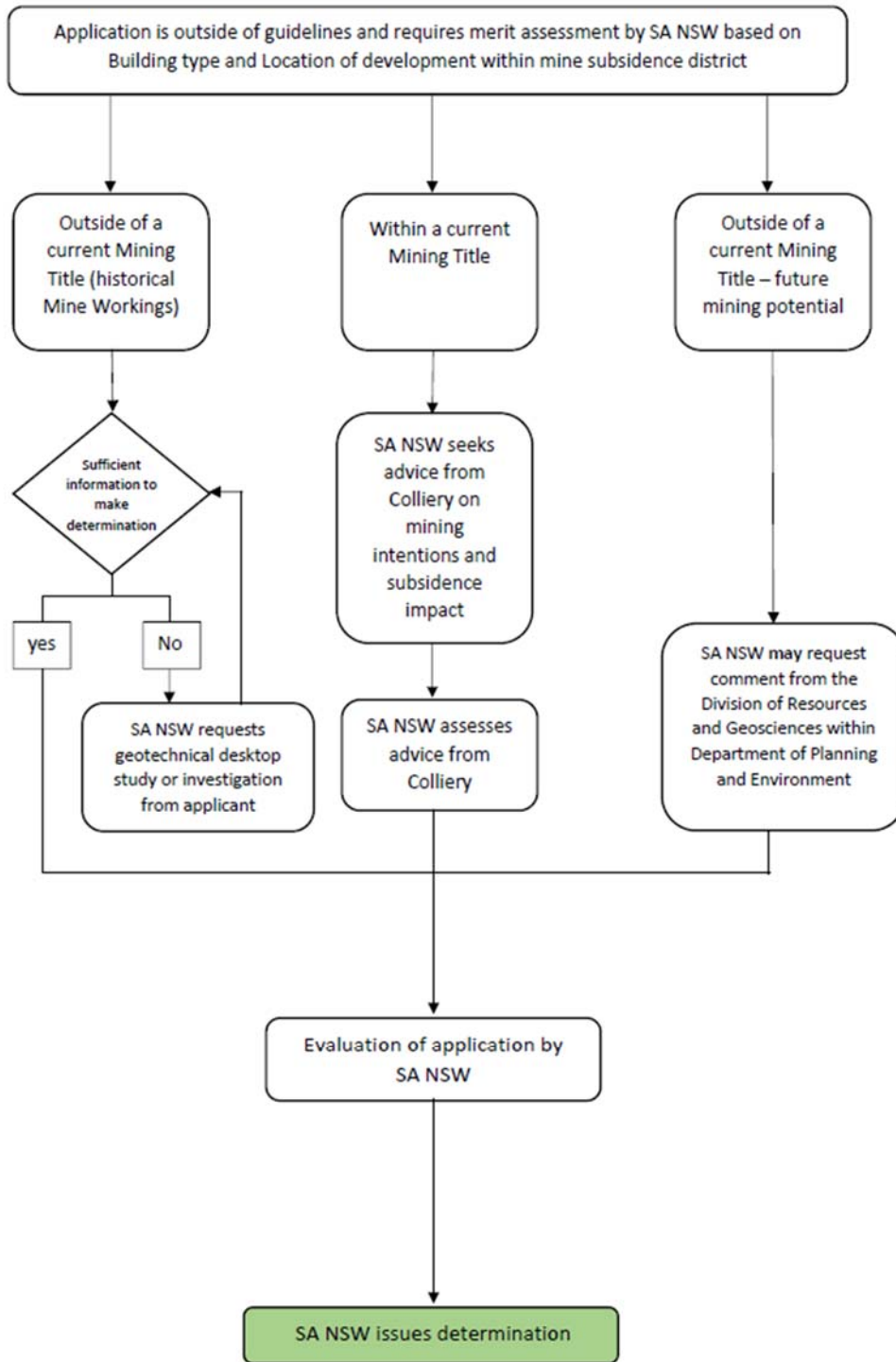
9.2 Document Version Control

Version	Status	Date	Prepared By	Comments
1.0	Draft	23 March 2018	Kieran Black	

9.3 Review Date

The attachments to this policy will be reviewed and updated as required. A formal review will be undertaken every two years. Feedback from applicants and other stakeholders will be considered during the review process.

Attachment A: Merit based development application assessment flowchart



Attachment B: SA NSW's minimum requirements for geotechnical reports

Geotechnical desktop study or geotechnical investigation reports provided to SA NSW as part of a development application should clearly address the following.

The likelihood of mine subsidence affecting the site. An assessment of this should be clearly stated in the report. Include if applicable an assessment of:

- Pillar failure – (The UNSW pillar strength formula should not be used without providing a thorough assessment of the inputs used and the level of confidence in them. The formulae should not be used on selected isolated pillars, but rather averaged over an entire panel. An assessment should then be made if the panel is susceptible to a pillar run. Clear recommendations should be made on what further work the applicant could undertake to reduce the uncertainty.)
- Surface pothole formation.
- Migration of overlying soil into subsidence cracks or mine voids.
- Poorly or un-remediated mine openings such as drifts and shafts.
- Residual subsidence due to ongoing goaf consolidation and settlement of the overburden (superincumbent strata).
- The potential for variability in any assumptions used in the assessment (as described above) including:
 - Parametric Analysis: Identify the primary variables and provide their adopted values and expected variability.
 - Sensitivity Analysis: Assessment of how outcomes or risks are affected by variations in input values for a parameter.
 - Sources of information and their reliability, including discussion of perceived gaps in information with specific reference to a geotechnical model as defined in Australian Standard AS 1726-2017 Geotechnical site investigations.
- Recommendation on whether further geotechnical studies or investigations should occur in order to make a more accurate assessment.

The consequence of subsidence. Including, if applicable, predictions of:

- Surface deformations including;

- Vertical subsidence (mm)
 - Horizontal displacement both tensile and compressive (mm/m)
 - Tilt (mm/m)
 - Radius of curvature (km)
- Anticipated nature and extent of damage to the proposed development

Additionally, SA NSW may request that the applicant provide;

- An estimate of repair costs (including cost of re-housing of inhabitants during repair) of proposed development should a subsidence event occur
- An assessment of whether a credible safety risk exists should a subsidence event occur. This should include both structural failure and formation of subsidence features.

Recommendation on appropriate engineering controls (if applicable). All engineering controls should be accompanied by clear justification as to how and why the adopted methods are appropriate. The likelihood and consequence of a subsidence event with the controls in place should be assessed.

- Each report should, if applicable, include the following in assessing subsidence risk:
 - Seams worked (single or multi-seam, seam thickness and structure)
 - The class of mine workings (i.e. Historical, Operational or Future)
 - The characteristics of mine workings (e.g. depth, extraction height, percentage of extraction, geotechnical conditions).
 - Mine workings type, age and level of confidence in accuracy (bord and pillar, pillar extraction, longwall/miniwall, mining height, 1st workings, 2nd workings)
 - Regional geology (Stratigraphy/dip/faults/dykes)
 - Overburden properties (soil cover, rock strength, discontinuities, moisture sensitivity, water table, potential for time dependent strength and stiffness changes (i.e. creep)
 - Mine workings roof, seam and floor properties (as per overburden properties plus peak and residual strength and stiffness of coal pillars, strain hardening goaf)
 - Propensity for pillar geometry change (rib spall, roof collapse)
 - Standing pillars factor of safety (FoS), goaf, bearing capacity of roof and floor, pothole development potential

- Justification for adopted parameters
- Mine subsidence parameters for systematic behavior (vertical subsidence, horizontal strain, tilt, curvature).
- Likelihood and allowance for non-systematic mine subsidence behavior (e.g. dependent on geological structure: faults, dykes, slip planes and / or topography, cuttings).
- **Clear recommendations** – The geotechnical consultant should clearly put forward their conclusions and recommendations and avoid the use of ambiguous language.

Attachment C: Procedure used by SA NSW Risk Engineers to assess surface development on merit

The purpose of this procedure is to:

1. provide a consistent approach when assessing development applications
2. provide guidance on the type of engineering mitigation measures and geotechnical reporting that may be required to facilitate assessment of a development application.

SA NSW will apply different conditions of approval based on building category. SA NSW classification of building category is described in Table C1.

Table C1 – Classification of Building type

SA NSW category	General Classification of Building type
B1	<ul style="list-style-type: none"> • up to and including 3 storeys (including rooftop access) • < 50m maximum plan footprint dimension • no basement • no load bearing masonry construction • up to and equal to \$3 M construction cost
B2	<ul style="list-style-type: none"> • up to and including 4 storeys (including basements and rooftop access); or • Between \$3 M to \$5 M construction cost; or • > 50m in maximum plan footprint dimension
B3	<ul style="list-style-type: none"> • greater than 4 storeys (including basements and rooftop access) or • > 100m maximum plan footprint dimension • Greater than \$5 M construction cost; or • Use - Hospital Wards, Operating theaters, critical public infrastructure Public Buildings with high trafficability (ie school halls)

Trough Subsidence Risk

SA NSW will apply our conditions of approval based on;

- the assessed level of geotechnical uncertainty (uncertainty factor),
- the assessed stability of remnant coal pillars based on estimated factors of safety and slenderness of remnant coal pillars, and
- the type of structure (building category).

It should be noted that this is intended as a guide, and the conditions of approval may vary in areas that have a high level of geotechnical complexity. SA NSW will provide justification on request should the applicant dispute the outcome.

The uncertainty factor is used by SA NSW to determine the levels of conservatism and allowed assumptions required when assessing the likelihood of a trough subsidence event.

The level of geotechnical uncertainty is categorised as low, medium or high based on the level of confidence and understanding of the;

- Geological environment (R1)
- Level of geotechnical investigation (R2)
- Type of coal mine plans and records (R3)
- Method used to assess stability and impact (R4).

The weighting applied to each factor is outlined below;

- R1 = 2
- R2 = 2
- R3 = 3
- R4 = 3

Refer to **Table C2** to determine the uncertainty value (U) that should be applied for each of the above. The uncertainty value (U) that can be applied to each of the above are as follows;

- Low uncertainty = 1
- Moderate uncertainty = 2
- High uncertainty = 3

Once these have been determined, the Uncertainty Factor can be determined by applying the following formulae;

$$\text{Uncertainty Factor (UF)} = (R1 \times U) + (R2 \times U) + (R3 \times U) + (R4 \times U) - 10$$

Table C2 – Factors used to determine the Uncertainty factor

	(Low Uncertainty)	Medium Uncertainty	High Uncertainty (U)
	U value = 1	U value = 2	U value = 3
Geological Environment (R1) value =2	<ul style="list-style-type: none"> A review of available mine plans and records indicate that faults, dykes or other adverse geological structures are likely not present. (i.e. should be regular layout - no evidence of limiting intersection spans, no significant patterns of truncated or miss-aligned roadways) If borehole information is available, a review of geotechnical and geophysical logs indicate no anomalous geological structures or stratigraphy being present. Records indicate seam dip is less than 10 degrees 	<ul style="list-style-type: none"> A review of available mine plans and records, indicate that Faults dykes or other geological structures may be present. (i.e. evidence of limiting intersection spans, no significant patterns of truncated or miss-aligned roadways) If borehole information is available, a review of geotechnical and geophysical logs indicate an anomalous high density of joints and/or small faults (i.e. less than 200mm throw) Records indicate seam is dipping at between 10 and 20 degrees 	<ul style="list-style-type: none"> An analysis of record tracings, indicates faults / dykes are present. Structures are either clearly marked on plan or immediately obvious from analysis of mine plan layout. If borehole information is available, an analysis of core samples and geophysical logs indicates an anomalous high density and orientation of faults / dykes or other rock types that may contribute to magnitude of subsidence impact. Borehole information indicates potential for soft floor or roof conditions resulting in foundation or roof punching failure. Records indicate seam is dipping at greater than 20 degrees
Level of geotechnical Investigation (R2) Value =2	<ul style="list-style-type: none"> Geotechnical investigation sufficient to adequately assess; - depth of workings, - geo reference mine plans - void heights and widths - pillar plan dimension under site - material properties and slaking potential of overburden and roof and floor - state of workings (failed or standing) <p>Note: this will likely require a minimum of two fully cored and geotechnically logged boreholes</p>	<ul style="list-style-type: none"> Geotechnical investigation sufficient to confirm; - mine void dimensions - depth to seam - state of workings (failed or standing) roof and floor properties. <p>Note: this will require a minimum of one borehole</p>	<ul style="list-style-type: none"> No site specific borehole data, or inferences made from boreholes located more than 50m from site

	(Low Uncertainty)	Medium Uncertainty	High Uncertainty (U)
	U value = 1	U value = 2	U value = 3
Coal Mine Plans and Records (R3) Value = 3	<ul style="list-style-type: none"> Mechanised mining showing 1st workings only Mine workings record tracing based on post mining survey results with regular layout Sufficient post mining geotechnical boreholes in area to confirm record tracings accuracy Mine workings show previously extracted longwall panels Multi-seam mining is a minimum of 100m between seams 	<ul style="list-style-type: none"> Hand worked mines (welsh bords) with regular layout and sufficient borehole data to confirm dimensional accuracy. Mechanised workings showing partial or full pillar extraction <p>Mechanised workings showing single gate road mini-wall panels.</p>	<ul style="list-style-type: none"> Irregular mechanised or hand worked mining
Method used to assess stability and impact (R4) Value = 3	<ul style="list-style-type: none"> Method used to assess stability of pillars and subsidence impact has been validated by use of another method – i.e. numerical modelling validated by empirical method OR peer review by relevant professional accepted by SA NSW Pillar stability calculations are based on the average pillar FoS for panel. Other potential pillar loading scenarios considered if applicable. All variables and assumptions used in estimating both pillar stability and subsidence impact clearly outlined - in the absence of borehole data, credible worst-case assumptions have been made (ie assume 0.5m off plan dimensions, full seam extraction + 0.5m to allow for roof fall). Pillar stability and subsidence impact assessment capable of being replicated from data published in report 	<ul style="list-style-type: none"> single method used to assess stability of pillars and subsidence impact (note that in assessing pillar stability the average panel FoS should be used rather than assessment on isolated pillars) Other potential pillar loading scenarios considered if applicable. All variables and assumptions used in estimating both pillar stability and subsidence impact clearly outlined 	<ul style="list-style-type: none"> No geotechnical report or analysis Geotechnical analysis does not meet specified criteria Internal estimation of subsidence risk based on available records carried out by SA NSW Risk Engineers.

The application of these can be divided up into low, medium and high uncertainty based on the following values;

- Low uncertainty - ≤ 5
- Moderate uncertainty > 5 and ≤ 10

- High uncertainty >10

Refer to **Table C1** in order to determine the building type.

Apply the Building Type classification (B1, B2 or B3) in conjunction with the uncertainty **C3** for a guide as to the conditions of approval and design requirements based on building category, the uncertainty factor and calculated FoS and slenderness ratio (W/h) of the remnant coal pillars.

Sinkhole (pothole) Risk

The attached table (**Table C2**) provides a broad outline on the conditions that SA NSW may apply for areas that have been identified as having a sinkhole (or pothole) risk.

This is based on (1) cover depth, (2) borehole information, (3) the nature of the workings and (4) seam dip and (5) previous history of pothole formation.

The assessment of pothole risk outlined below is intended as a guide. The proponent may engage a geotechnical consultant to provide a more detailed analysis of the risk of sinkhole (pothole) formation for a particular site. However, it should be noted that if a credible pothole risk is identified, SA NSW will generally require that the risk of sinkhole formation be effectively eliminated as far as is practicable.

Refer to **Table C4** for a guide as to the type of conditions that SA NSW may apply based SA NSW classification of building category and sinkhole risk.

Internal refit

If a proposal is for an internal re-fit of an existing building, and the existing building will remain structurally unaltered, SA NSW will not require any design mitigation measures unless (1) site is subject to medium or high sinkhole risk and (2) existing structure is inadequate to cater for the assessed maximum pothole diameter and (3) cost of refit is greater than \$3 M (\$3,000,000.00).

Attachment C - Table C3. SA NSW Estimated Conditions of Approval for Trough Subsidence Risk

SA NSW category (refer to table C1)	Uncertainty Factor	General Summary of likely approval conditions for sites where the pillar FoS (and W/h ratio's) greater than nominated values				General Summary of likely approval conditions for sites where the pillar FoS less than nominated values	
		FoS	W/h Ratio	Allowed assumptions for assessment of pillar stability	General Summary of approval conditions	Summary of design requirements	General summary of likely approval conditions (these may vary in accordance with the geotechnical environment and subsidence risk)
B1	Low uncertainty (≤ 5)	>1.6	>2	Unless informed by borehole data; 1) Pillars are full seam height 2) Plan pillar dimensions are as shown on record tracings.	(1) Submit Site Classification report (to AS2870 standard) to SA NSW for our records (2) Following construction, provide sign-off from qualified engineer that improvements have been constructed in accordance with plans and foundations have been constructed accordance with AS2870. Note: Nominal subsidence parameters up to 2mm/m +/- horizontal strain, 2mm/m tilt and 7km radius of curvature may be applied by Risk Engineer dependant upon type of structure	If the estimated subsidence impact is less than or equal to; (1) 3mm/m horizontal strain (+/-), (2) 4mm/m Tilt and (3) 5km radius of curvature. Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable". If estimated subsidence impact is greater than above, then structure must both satisfy the above and in addition remain structurally safe to occupants taking into account additional estimated subsidence impact.	(1) Submit plans prior to construction with a letter from a qualified structural engineer that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable". The subsidence impact parameters should be clearly stated. (2) If the parameters exceed +/- 3mm/m horizontal strain, 4mm/m Tilt and 5km radius of curvature, then signoff from a structural engineer that the point (1) above is met and (2) that structure will remain structurally safe given the estimated additional subsidence impact. (3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.
	Moderate uncertainty (> 5 to ≤ 10)	>1.8	>2				
	High uncertainty (> 10)	>2.1	>4				
B2	Low uncertainty (≤ 5)	>1.8	>2	Unless informed by an adequate level of borehole data; 1) Pillars are full seam height 2) take 0.5m off pillar dimensions as shown on available mine plan records to allow for error	(1) Submit Site Classification report (to AS2870 standard) to SA NSW for our records (2) If not already submitted, a geotechnical desktop study or investigation for SA NSW acceptance confirming that the pillars under the site meet the nominated pillar Factors of Safety for the appropriate uncertainty factor.	If the estimated subsidence impact is less than or equal to; (1) 5 mm/m horizontal strain (+/-), (2) 7 mm/m Tilt and (3) 2 km radius of curvature. Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable". If estimated subsidence impact is greater than above, structure must remain safe to occupants taking into account additional estimated subsidence impact.	(1) Submit plans prior to construction with a letter from a qualified structural engineer that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable". The subsidence impact parameters should be clearly stated. (2) If the parameters are within +/- 5mm/m horizontal strain, 7mm/m Tilt and 2km radius of curvature, then signoff from a structural engineer that the structure will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 up to and including the above. In addition, the structure must be designed to remain safe under absolute worst-case subsidence impact.
	Moderate uncertainty (> 5 to ≤ 10)	>2.1	>3	3) Absolute worst-case subsidence impact parameters should be determined regardless of apparent pillar stability (this assumes that all pillars with W/H ratios of less than 8 fail)	(3) Provide signoff by a Structural Engineer experienced in mine subsidence design that the proposed improvement will remain structurally sound and safe in the event that it is subject to absolute worst case subsidence impact. (4) Following construction, provide sign-off from a suitably qualified engineer that improvements have been constructed in accordance with plans and foundations have been constructed in accordance with AS2870.	Note: potential exists for refusal or requirement to grout if the risk of pillar failure and subsidence impact has been assessed by Risk Engineers as being unacceptable.	(3) Submit a "Subsidence Impact Statement" prior to commencement of detailed design for acceptance by SANSW, which shall identify the: a. Mine subsidence parameters used for the design. b. Main building elements and materials. c. Risk of damage due to mine subsidence d. Design measures proposed to control the risks. e. Comment on the likely building damage in the event of mine subsidence and sensitivity of the design to greater levels of mine subsidence.
	High uncertainty (> 10)	>2.1	>5		Note: Nominal subsidence parameters up to 2mm/m +/- horizontal strain, 2mm/m tilt and 7km radius of curvature may be applied by Risk Engineer dependant upon type of structure		(4) Submit detailed design drawings prior to the commencement construction with design measures proposed to control the mine subsidence risk clearly highlighted. (5) Following construction, sign-off from a suitably qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.
B3	Low uncertainty (≤ 5)	2.1	>2	Unless informed by borehole data; 1) Assumed pillar height should take into account potential for roof failure 2) take 0.5m off pillar dimensions as shown on record tracings to allow for error 3) Potential for pillar foundation failure should be considered 4) Absolute worst case subsidence impact parameters should be determined regardless of apparent pillar stability (this assumes that all pillars with W/H ratios of less than 8 fail)	(1) Provide a peer review of the initial geotechnical report by a consultant acceptable to SA NSW with confirmation and signoff that the pillars are long-term stable. (2) Provide signoff by a Structural Engineer experienced in mine subsidence design that the proposed improvement will remain structurally sound and safe in the event that it is subject to absolute worst case subsidence impact (ie that all pillars with W/H ratios of less than 8 fail). (3) A number of permanent survey marks to AHD will be required so that building movement can be monitored should mine subsidence occur. survey marks need to be initially surveyed and all details are to be forwarded to Subsidence Advisory NSW. (4) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans and in accordance with all relevant building codes and standards.	Structure must be designed to be "safe, serviceable and readily repairable" under the predicted subsidence impact parameters. If estimated subsidence impact greater than specified, subsidence impact must be either eliminated or mitigated by a suitable means such as the emplacement of grout into the mine workings, or another suitable engineered mitigation measure put forward for SA NSW acceptance.	(1) Submit plans prior to construction with a letter from a qualified structural engineer that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'very slight' in accordance with AS2870 (Damage Classification), and readily repairable". The subsidence impact parameters should be clearly stated. (2) Either (a) submit a proposal to remove the risk of mine subsidence by a suitable means, such as grouting or (b) demonstrate that the improvement can be designed to remain "safe, serviceable and any damage from mine subsidence shall be limited to 'very slight' damage in accordance with AS2870 (Damage Classification), and readily repairable". If grouting option chosen, submit for acceptance by Subsidence Advisory NSW prior to commencing work: a. Grout Design, including grout locations (dimensioned in plan and elevation), and design parameters for any residual mine subsidence. b. Grout Implementation Plan; including a site plan (showing property boundaries within 200m of the site), grout locations (dimensioned in plan and elevation), proposed bore locations, and grout designers endorsement. c. Grout Verification Plan; showing the location of verification holes and the grout designer's endorsement. Any assumptions applied to the numerical modelling shall be subject to verification (using empirical or analytical methods) and a sensitivity analysis. Arrange for an independent peer review of the grouting design and implementation plan by a suitably qualified engineer acceptable to the Subsidence Advisory NSW. On completion of grouting submit a Grout Verification Output Report endorsed by the grout designer and site verification engineers for compliance with the accepted Grouting Plan. (3) Submit an "Engineering Impact Statement" prior to commencement of detailed design for acceptance by SANSW, which shall identify the: a. Mine subsidence parameters used for the design. b. Main building elements and materials. c. Risk of damage due to mine subsidence d. Design measures proposed to control the risks. e. Comment on the likely building damage in the event of mine subsidence and sensitivity of the design to greater levels of mine subsidence.
	Moderate uncertainty (> 5 to ≤ 10)	2.1	>4				(4) Submit detailed design drawings prior to commencement construction with the design measures proposed to control the mine subsidence risk clearly highlighted and the design subsidence parameters clearly marked on the plan. (5) A number of permanent survey marks to AHD will be required so that building movement can be monitored should mine subsidence occur. survey marks need to be initially surveyed and all details are to be forwarded to Subsidence Advisory NSW.
	High uncertainty (> 10)	High uncertainty not acceptable for B3 type surface developments					(6) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.

Attachment C - Table C4. Estimated Sinkhole conditions of approval based on Building type and Subsidence Risk

SA NSW category	Pothole Risk	Summary of design requirements*	General summary of likely approval conditions*
B1	<p>Low Risk</p> <ul style="list-style-type: none"> Cover depth is less than 10 times the seam thickness, however on-site borehole evidence has been provided that workings have completely failed and risk is limited to piping of soil into pre-existing tension cracks and consolidation of goaf. SA NSW risk engineers have assessed the risk of pothole formation as being low 	<p>Additions (i.e. deck, additional storey, garage with slab): No additional design requirements</p> <p>Granny Flats (<60m² internal floor area): No additional design requirements if constructed with lightweight materials. No cavity brick, brick veneer or other masonry allowed without being required to be designed for the parameters outlined below.</p> <p>For single residential dwellings in the absence of geotechnical advice accepted by SA NSW risk engineers. Waffle-pod slabs or slab on ground permitted. Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" given following subsidence parameters;</p> <p>(1) 3mm/m horizontal strain (+/-), (2) 7mm/m Tilt and (3) 2km radius of curvature.</p>	<p>(1) Submit plans prior to construction with a letter from a qualified structural engineer that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" given the following subsidence parameters; (+/-) 3mm/m horizontal strain, 7mm/m Tilt and 2km radius of curvature.</p> <p>(2) Submit Site Classification report (to AS2870 standard) to SA NSW for our records</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.</p>
	<p>Moderate Risk</p> <ul style="list-style-type: none"> Borehole confirmation that cover depth is 5 to 10 times the Seam Thickness No previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Records indicate the seam dip is less than 10 deg SA NSW risk engineers have assessed the risk of pothole formation as being moderate 	<p>Additions (i.e. deck, additional storey, uninhabitable garage with slab): No additional design requirements</p> <p>Granny flats (<60m² internal floor area) and single dwellings: Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" should a pothole with maximum diameter of 5m open up at any point underneath.</p> <p>Dual Occupancy or units: Removal of risk of mine subsidence by a suitable means such as grouting under building footprint</p> <p>commercial premises: Removal of risk of mine subsidence by a suitable means such as grouting under building footprint</p>	<p>(1) Submit plans prior to construction with a letter from a qualified structural engineer that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" given that a 5m pothole could open up at any point underneath the proposed structure.</p> <p>(2) Submit Site Classification report (to AS2870 standard) to SA NSW for our records</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.</p>
	<p>High Risk</p> <ul style="list-style-type: none"> No borehole confirmation of cover depth and available records indicate cover depth is less than or equal to 10 x the Seam Thickness Borehole confirmation of cover depth is less than or equal to 5 x the Seam Thickness, or less than 10m Records indicate the seam dip is greater than 10 deg Previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Geotechnical environment allows for accelerated weathering and degradation of both pillars and overburden. SA NSW risk engineers have assessed the risk of pothole formation as being high 	<p>Additions (i.e. deck, garage with slab on ground, retaining walls over 1m etc): Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" should a pothole with maximum diameter of 5m open up at any point underneath. Additional Storeys not allowed without removal of risk by suitable means such as grouting.</p> <p>Single Dwelling: Removal of the risk by a suitable means such as grouting under building footprint</p> <p>Dual Occupancy or units: Removal of risk of mine subsidence by a suitable means such as grouting under entire lot</p> <p>commercial premises: Removal of risk of mine subsidence by a suitable means such as grouting under entire lot</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Submit Site Classification report (to AS2870 standard) to SA NSW for our records</p> <p>(4) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>
B2	<p>Low Risk</p> <ul style="list-style-type: none"> Cover depth is less than 10 times the seam thickness, however on-site borehole evidence has been provided that workings have completely failed and risk is limited to piping of soil into pre-existing tension cracks and consolidation of goaf. SA NSW risk engineers have assessed the risk of pothole formation as being low 	<p>Structure must be designed to be "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" given subsidence parameters provided by Geotechnical Engineer in report accepted by SA NSW.</p>	<p>(1) Submit a geotechnical report prior to construction that provides residual subsidence design parameters for SA SW acceptance.</p> <p>(2) Submit Signoff from a qualified structural engineer that improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" given the subsidence parameters accepted by SA NSW.</p> <p>(3) Submit an "Engineering Impact Statement" prior to commencement of detailed design for acceptance by SANSW, which shall identify the:</p> <p>a. Mine subsidence parameters used for the design. b. Main building elements and materials. c. Risk of damage due to mine subsidence d. Design measures proposed to control the risks. e. Comment on the likely building damage in the event of mine subsidence and sensitivity of the design to greater levels of mine subsidence.</p> <p>(4) Submit detailed design drawings prior to commencement construction with design measures proposed to control the mine subsidence risk clearly highlighted.</p> <p>(5) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant codes and standards.</p>
	<p>Moderate Risk</p> <ul style="list-style-type: none"> Borehole confirmation that cover depth is 5 to 10 times the Seam Thickness No previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Records indicate the seam dip is less than 10 deg SA NSW risk engineers have assessed the risk of pothole formation as being moderate 	<p>Residential Development (single residence, townhouses, units, dual occupancy): Removal of risk of mine subsidence by a suitable means such as grouting under building footprint.</p> <p>commercial premises: Removal of risk of mine subsidence by a suitable means such as grouting under all trafficable areas of property.</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>
	<p>High Risk</p> <ul style="list-style-type: none"> No borehole confirmation of cover depth and available records indicate cover depth is less than or equal to 10 x the Seam Thickness Borehole confirmation of cover depth is less than or equal to 5 x the Seam Thickness, or less than 10m Records indicate the seam dip is greater than 10 deg Previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Geotechnical environment allows for accelerated weathering and degradation of both pillars and overburden. SA NSW risk engineers have assessed the risk of pothole formation as being high 	<p>Residential Development (single residence, townhouses, units, dual occupancy): Removal of risk of mine subsidence by a suitable means such as grouting under entire lot.</p> <p>commercial premises: Removal of risk of mine subsidence by a suitable means such as grouting under all trafficable areas of property</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>
B3	<p>Low Risk</p> <ul style="list-style-type: none"> Cover depth is less than 10 times the seam thickness, however on-site borehole evidence has been provided that workings have completely failed and risk is limited to piping of soil into pre-existing tension cracks and consolidation of goaf. SA NSW risk engineers have assessed the risk of pothole formation as being low 	<p>Residential and commercial development (single residence, townhouses, units, dual occupancy): Removal of risk of mine subsidence by a suitable means such as grouting under building footprint.</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>
	<p>Moderate Risk</p> <ul style="list-style-type: none"> Borehole confirmation that cover depth is 5 to 10 times the Seam Thickness No previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Records indicate the seam dip is less than 10 deg SA NSW risk engineers have assessed the risk of pothole formation as being moderate 	<p>Residential and commercial development (single residence, townhouses, units, dual occupancy): Removal of risk of mine subsidence by a suitable means such as grouting under all trafficable areas of property.</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>
	<p>High Risk</p> <ul style="list-style-type: none"> No borehole confirmation of cover depth and available records indicate cover depth is less than or equal to 10 x the Seam Thickness Borehole confirmation of cover depth is less than or equal to 5 x the Seam Thickness, or less than 10m Records indicate the seam dip is greater than 10 deg Previous history of pothole formation on current block or neighbouring blocks with similar cover depths. Geotechnical environment allows for accelerated weathering and degradation of both pillars and overburden. SA NSW risk engineers have assessed the risk of pothole formation as being high 	<p>Residential and commercial development (single residence, townhouses, units, dual occupancy): Removal of risk of mine subsidence by a suitable means such as grouting under all trafficable areas of property.</p>	<p>(1) Submit a plan for acceptance by SA NSW prior to construction to remove the risk by the emplacement of grout into any mine voids.</p> <p>(2) Submit a grout verification report following grouting works for SA NSW acceptance that the risk of pothole formation on the site has been effectively eliminated such that the improvement will remain "safe, serviceable and any damage from mine subsidence shall be limited to 'slight' in accordance with AS2870 (Damage Classification), and readily repairable" if constructed in accordance with all relevant building codes and standards.</p> <p>(3) Following construction, sign-off from qualified engineer that improvements have been constructed in accordance with plans submitted to SA NSW and in accordance with all relevant and applicable building codes and standards.</p>

Attachment D: List of methods and papers recognised for assessing likelihood and consequence of mine subsidence

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