TAYLOR MINING SERVICES PTY LTD
ABN: 55 242 784 379

1041 Redbank Plains Road
New Chum Qld 4303

PO Box 4065
RACEVIEW Q4305

Phone: (07) 3816 2311
FAX: (07) 3816 2377
Mobile: 0418 741 915
Email: hugh-taylor@bigpond.com

22 March 2021

ICC Ref: - 15443
Our Ref: - I2.20_MPReview_V3_20210322

Ipswich City Council
PO Box 191
Ipswich QLD 4305

Attention: - ShyanneWard / David Fermer

RE: ICC Mining Peer Review & Suitability Assessment Report

1.0 Introduction: -

This Mining Peer Review has been prepared by Taylor Mining Services Pty Ltd in accordance with Council's advices dated 18 November 2020 and their Purchase Order No. 205765 dated 2 December 2020.

The purpose of the Mining Peer Review is to provide an assessment of the draft mining policy framework, code and associated mapping for the New Ipswich Planning Scheme including a Suitability Statement and recommendations to improve alignment and compliance.

Our Associates, Moreton Geotechnical Services Pty Ltd, have assisted us with this review. Together Taylor Mining Services and Moreton Geotechnical Services have in excess of 70 years' experience in the Ipswich and surrounding region Coal Mining activities. Individually and together we are well suited and qualified to provide Council with the information and advice required as part of this Mining Peer Review.

Plans and Annexures with this Review include: -

- Plan 1 - Revised OV3 Plan in .PDF format.
- Plan 2 - Comparison Plan in PDF format
- Mapinfo GIS Format data consistent with Councils GIS system.
- Table 1 - Code of Symbols and Specifications
- Table 2 – Number of Mine Tunnels and Shafts
- Annexure 1 - Report and Report Plans requested under part 4 of Council's Scope - Associated Mapping Extent for 5 specified sites.

The Revised OV3 Plan is a .PDF format plan and the Mapinfo GIS data includes the Documented underground mine working outlines, the inferred Undocumented underground mine working areas, the Documented Open Cut mine areas, Potential Influence Zone, the

Disturbed Surfaces from mining activity areas, Mine Tunnels, Mine Shafts and Geological Survey Qld (GSQ) Coal Exploration Boreholes.

The Mapinfo GIS Format data contains Shape File data consistent with the Council GIS System format. This data set does not identify or show any amendments or changes to the old OV3 Constraint Layer system. The data set is set up to fully replace the old OV3 Data set so that no confusion or errors should be encountered in adopting the revised OV3 Constraint Layer System.
Table 1 sets out the Code of Symbols used in the Plans and MapInfo data
Table 2 sets out the number of Mine Tunnels and Mine Shafts with a breakdown of these items between the Rosewood Field and the Ipswich Field.

The Comparison Plan is a .PDF format plan that shows the comparison between the extent of the old OV3 mining constraint overlay to this now Revised OV3 overlay. The 2 different colours in the plan identify the areas that have been removed from the old mining constraint layers and the areas that were not but are now included in the mining constraint overlays.

The Code of Symbols and Mine Feature Specifications Table shows the symbols used in the New OV3 Mining Constraints Plan and explains the Specifications used to identify the generalised status of each item.

1.1 Ipswich Coal Mining Background: -

Coal Mining in the Ipswich City Council local government area ceased in December 2019 with the closure of New Hope Group's "Jeebropilly Open Cut Coal Mine". The New Hope company commenced in the suburb of Walloon, Ipswich in the 1940's, expanded to the Swanbank area in the 1950's, developed mines in Indonesia, Central Queensland, the Hunter Valley of NSW and in South East Queensland at Acland and of course Jeebropilly. Today they are one of the major mining companies in Australia.

Coal mining in the Ipswich Area is reported to have commenced with Mr Williams "Pioneer Mine" at Redbank in the early 1840's. From this humble beginning Ipswich grew and maintained its place as the major coal production region in Queensland up to the 1960's. From this time large open cut and longwall underground coal mines commenced in the Central Queensland area and soon replaced Ipswich as the major producer.

Despite the large production of the Central Queensland mines the Ipswich Mines continued to produce good quantities of high-grade coal. Coal that was well sought after for its high energy and low impurities. Up to the mid 1960's almost all of the Ipswich coal was produced by underground mines.

In the late 1960's some open cut mining started to develop and 2 events in the early 1970's caused open cut mining to expand significantly. In 1972 there was the Box Flat Disaster and in 1974 there was the Australia Day Floods. The Box Flat mines were the major producer of coal for the Swanbank Power Station. Five underground mines were flooded in the 1974 Floods and only 1 of those ever reopened.
The immediate requirement to continue the supply of coal for Swanbank Power Station was mostly achieved by the local companies through open cut mining activities. From this time on open cut mining became a common and regular part of coal mining in the Ipswich region.

During these years, the Region also saw the development of several underground mines. Some of these became large ventures and worked extensive areas, by Ipswich Region standards. Some were much smaller ventures, and some were so small that they can best be described as prospecting tunnels and shafts.

During the Mining period the region has seen up to 315 underground mines commence and up to 83 Open Cut Mines. Due to these developments the Ipswich region grew and prospered. The Industry was a major employer and provided employment, accommodation, regional development, and community development for the Ipswich Region.
Through this development the coal mining industry provided Ipswich with a Legacy. A Legacy that is real, a Legacy that needs to be acknowledged, understood, and managed.

1.2 Mining Overlay System - Background: -

Any proposed development within the Ipswich City area needs to be aware of and take recognition of the implications and constraints the past mining activities can place upon certain development.

It should also be noted that under earlier Planning Acts that Development, for residential, commercial, or industrial type use, was designated as a "Use of Land". Similarly, Mining was designated as a "Use of Land". Understandably the two Uses were usually incompatible and separated until the cessation of one of the uses.

Being aware of this Legacy and the potential constraints Ipswich City Council commenced, in 1972, a Pilot Study on the Potential for Mine Subsidence within the Region. Coffey & Hollingsworth, a consulting Geotechnical and Engineering firm from Brisbane were commissioned to provide the Pilot Study.
The Pilot Study soon highlighted the need for further work and a full Mine Subsidence Study and Report was completed by the end of 1973. This Study became the main reference material that potential development within the region needed to recognise and refer to as part of their development applications.

This study, having been produced in the early 1970's covered the then local government area for Ipswich. It did not include the local government area of Moreton Shire and other immediate surrounds. With the realignment of Local Government boundaries in 1995, Moreton Shire was mostly included into the Ipswich City Council Shire. Therefore, additional areas to the Coffey & Hollingsworth Study area were needed. Also, about this time, we believe Council were having concerns regarding development regulations being accepted or recognised by applicants. We believe that Council was finding it difficult to enforce the requirement for a Mining and Geotechnical Study in relation to a development application.

The 2002 to 2004 development of Mining Constraint layers under the Ipswich Town Planning Scheme was a significant step forward to implementing mining and Geotechnical reports as a mandatory part of development applications, if the development fell within a Mining Constraint Layer or zone. The development and outcome of this system provided direction to the construction and development of responsible applications.

In early 2000's Ipswich City Council saw and understood the need for mining constraint principles and implementation into development activities within the Ipswich City Council boundaries. Most importantly it had been found necessary for the safety and well-being of all parties concerned and connected with the development of land and properties that past mining constraints must be understood. It was also found necessary for any proposed development to be conditioned to accept, control, or remediate any potential constraint issues or matters to gain Council approval.
By 2004 Moreton Geotechnical, assisted by Taylor Mining, prepared for Council the first set of plans in the development of the Ipswich City Council Mining Constraint Layer system. The plans were digitised and made available for Council, Developers, and the General Public via the Council's Property Development section, PD Online, on the Council's website. The system has been an especially useful component in reducing risk associated with development within the constrained areas by past coal mining activities.

Over the past 16 years Moreton Geotechnical and Taylor Mining have carried out periodic updates to the information contained within the Council mining constraint, OV3, layer system.

Despite these periodic updates it had become obvious that the existing system still had numerous inaccuracies and errors and that a complete review would be the best outcome for inclusion into the New Town Plan.

It had also become obvious that computer technology and digital data quality and availability had significantly improved and advanced over the time that the Mining Constraint Layer System has been operating.

This Mining Peer Review has been developed and structured to review the old Mining Constraint Layer System, known as the OV3 Layer in the Council Property Development Online, PD Online Web Site, and update the system with the current understanding for the mining constraint layer information. This includes providing specifications for the content of the Items and layers as well as standardised minimal proforma to be included into any development application.
The outcome of this proforma is aimed to assist both the developer and Council in understanding any potential risks and administering and implementing any requirements to safeguard the proposed development.

1.3 Mining Terminology: -

For clarification in this report, it is necessary for there to be an explanation of the terminology used in the mining industry and in this report: -

Tunnel: - a tunnel refers to the entry into an underground mine from the surface. Tunnels are usually a decline structure that can be located and driven within the coal seam itself or through the overlying stone measures that lay above the coal seam. Either way tunnels can vary in grade depending on the mining situation and or the prevailing geology. They are often referred to as the Man & Supply Tunnel or Access Tunnel, the Belt Tunnel, or the Ventilation Tunnel. Some early Tunnels were also driven for exploration purposes and these are often referred to as Trial Tunnels.

Shaft: - a shaft is usually a vertical feature used to access a coal seam. Most vertical shafts were sunk as square or rectangular in cross section, however, some were sunk as round or circular in cross section. Small and square type shafts, often 1.2m to 1.5m square, were generally driven as a Prospecting Shaft or an Air Shaft for ventilating the mine workings. Larger rectangular shafts were developed as Production Shafts, often 2m by 4.5m, and these would usually have a Poppet Head or Gantry established over them with a large winder or winch nearby to raise and lower the shaft cages to transport men, materials, and coal skips into and out of the mine. Round shafts were sometimes used as production shafts but mostly they were developed as Air Shafts or Ventilation Shafts.

In some areas Decline Shafts were used and these were generally driven at considerably steep angles i.e. greater than 45 degrees. These were mainly for creating ventilation airways either between levels within the mine or from the mine workings to the mine surface.

Another form of Shaft used within the mining industry was known as a Staple Shaft. A Staple Shaft was usually a vertical feature and used for ventilation or airway or for access between various levels within the mine. As a Staple Shaft they did not connect to the surface. These

were usually short shafts and if used as an access shaft a ladder was the usual method of access.

Underground Mine Workings: - There are a few different methods of **u**nderground mine workings used in the Ipswich coal mining region. Some of the main methods used included Welsh Bord, Bord and Pillar, Short Wall, and Long Wall. By far the most common method used was the Bord and Pillar method. This method uses a combination of mine roadways, which are often called "Bords" and these roadways or Bords form the mine pillars. Hence the name "Bord and Pillar"

Mine Roadways: - Underground mine roadways can also be referred to as Bords. Certain underground mine roadways have a dedicated purpose and are often referred to as the Man & Supply Road or Travelling Road, Belt Road, and even the Return Road. The Return Road being the underground roadway used to draw air from the mine to the ventilation fan and the surface.

Mine Pillars: - Mine pillars are the solid blocks of coal left between the mine roadways or Bords. The mine pillars form the support mechanism that the mine leaves to maintain the integrity of the overlying strata, or in other words to keep the roof of the mine up. The mine pillars usually represent between 50% and 70% of the coal seam upon first working the mine resource.

Pillar Extracted Areas: - Pillar extracted areas are parts of the mine where the mine pillars are attempted to be fully or partially removed to win the coal contained in them. Once removed the roof falls and a controlled subsidence should occur.
Mine Pillar extracted areas were identified in the original OV3 Constraint Layer system. This feature has not been displayed in the overlays to date and we see no real need to do so for the future. Features such as this should form part of any Mining Geotechnical study undertaken for a development site, where applicable.

Floor or Roof Stripping: - Floor and roof stripping was a method used to extract coal where a thick coal seam was being worked. With this method the roadways are mined at a manageable height, usually up to 3m high, and then depending on the part of the seam being mined initially additional coal is often mined from the floor or roof.

Potential Influence Zone: - The Potential Influence Zone consists of the depth of cover to the mine workings and a Angle of draw determined by a number of varying factors. The angle of draw is the angle off the vertical, outwards from the edge of mining. This determines the extent of potential subsidence effects and the influence zones beyond the edge of the mining. For the Ipswich Rosewood Area and this Report an angle of 26.5 Degrees has, in general, been used.
Potential influence zones are further described in Annexure 1 of this Report.

Documented Mining: - The term **refers to** available Mine Plans of the mine workings.
Justification for Documented Mining Areas can best be described as areas defined by mine plans held by the Department of Natural Resources and Mines Queensland. In some cases it has been found that the department records are not complete and additional records, when found, have been used in this report.

Undocumented Mining: - The term refers to areas where past mining is considered to have been carried out but there are no available mine plans of the mine workings. Plans of these mines may have been lost over time or never lodged with any authorities or never produced. Evidence of mining in these areas is sometimes found from notes on adjoining mine plans and surface features such as tunnels and shafts. Evidence of some of these undocumented mine areas have been determined due to earlier coal exploration drilling or more recent drilling caused by potential development or other incidents like subsidence occurrences,

In defining the areas within this report, we have, where possible relied on all the above-mentioned parameters including any geological knowledge and evidence for geological faults or intrusions that could have prevented the extent of underground mining.

The Justification for the Undocumented Mining Areas can best be described as areas where no mine plans are available and have been defined by references on adjoining mine plans, evidence of tunnels and shafts, drilling records, geological reports and geological features. The true extent of mining in these areas will only be discovered by future Detailed Studies, when necessary or required.

Disturbed Surfaces: - The coal mining industry can and has caused various types of surface disturbance as part of the mining activity.
From underground mining there is usually an inferior part of the coal that is mined and brought to the surface. This inferior part is rejected when examined or washed on the surface. This washing or separating process usually results in waste or Reject low quality coal referred to as Reject Coal Stone that is stockpiled in areas on the surface around the mine area.
Reject coal stone stockpiles have, in many instances caught fire by spontaneous combustion or through bushfire. These are often referred to as a "**heating"**. Once started these fires can burn or smoulder, often referred to as a heating, for several years slowly burning through the stockpile. When burning or smouldering they do produce sulphur and tar smelling odours and can contain carbon monoxide gases. Such gases dissipate very quickly when they reach the surface atmosphere and do not usually present any serious health concerns. Temperatures within a heating can however range up to 600 Degrees Celsius or more in parts. These areas if shallow can be quite dangerous, especially if uninformed access is allowed. The burnt coal stone forms a fawn to white coloured material and is then commonly referred to as "Chitters"

Shallow underground mine workings fire or heating: - Shallow underground mine workings can also ignite through Spontaneous Combustion and smoulder away for many years. Areas where this occurs will also cause surface cracking and deformation and should be recorded in the disturbed surfaces areas.

Overburden Spoil Dumps: - Another form of disturbed surface has been caused by the out of pit stockpiling of overburden from open cut mining. Due to the nature and size of some open cut activities large stockpiles of unconsolidated soils have been created. Sometimes they cover large areas on non-mined land and often cover parts of backfilled open cut mines. These areas often represent large areas of unconsolidated fill and can be a concern to development if not understood and investigated.
Backfilled Open Cut Voids: - Unconsolidated Overburden Spoil deposited as backfill into open cut mine voids are also regarded as part of Disturbed Surfaces.

Mine Site Pithead Areas: - Other disturbed surface areas can be found where mine site operations occurred. These can be from building areas to simple storage, stockpiling or vehicle parking areas etc.

Sudden Collapse Subsidence: - Sudden Collapse Sinkholes cause deformation of the surface and are often referred to as "Sinkholes" or "Potholes". These areas usually form due to some form of mining collapse and can cause serious concern to property and lives. These areas should also be included in disturbed surfaces, where known.

2.0 Draft Mining Policy Framework

2.1 Weaknesses & areas of Non-Compliance

The Draft Mining Policy Strategic Framework currently used by Council was designed to set out a basis for ensuring appropriate and responsible development within the past coal mining areas and settings under the Ipswich Town Planning Scheme.

The Policy and Strategic Framework can be described as a form of Risk Management. It should always be remembered that there will always be some risk when development is proposed within these areas and settings. Mining Reports and Geotechnical Reports for proposed development within these settings should contain specific requirements and information along with recommendations to reduce risk to an acceptable level or as low as practically possible.

Some of the Risks associated with this process include: -

- Available data

- Reliability of that Data
- Accuracy of the Data
- Interpretation of Data
- Identifying any Risk or Potential Risk

The Policy and Strategic Framework needs to identify and protect State and National interests. This includes Land Use Planning that integrates and protects Local, State and National interests and resources. Such Interests and Resources are important elements that represent good community expectation and facilitates the delivery of economic development, the creation of jobs and sustainable resilient environments.
The Vision statement of the Draft Strategic Policy and Framework mentions the need to conserve valuable features such as places and areas of historic and heritage significance. There are few remnant historic mining sites remaining within the Ipswich local government area and we would recommend that these be identified and considered for their significance. Where possible these should be considered in future planning and development so that sites of significance can be preserved and potentially conserved.

The development of land without taking due consideration of the natural resources of the region will lead to sterilisation of part of some resources and potentially all other resources should, due to the size of the remaining resource be so small that it is rendered not viable and not economically viable.

The regions natural resources have been laid out by nature and exist where they are. The mining or extraction of such natural resources therefore must occur where the resource exists. Proposed Development is man-made development and usually located subject to land ownership. Proposed Development should be located subject to good strategic planning taking into consideration the location, potential extraction methods and value of the resources to the State and the Community.

The policy to consider coal mining and gas extraction as incompatible within the Ipswich Region fails to protect these important natural resources and fails to represent a good cross section of the community. Such resources can provide economic development, the creation of jobs and sustainable resilient environments. Proper management of such activities could see these natural resources utilised for the benefit of the community and region. As such they should not be labelled as incompatible or not supported as part of the future Town Plan.

3.0 Draft Mining Code

The Draft Ipswich planning scheme and code recognises development constraints from underground, and open cut mining and quarrying operations. These human activities need to

be recognised as they provide hazards and constraints under the planning scheme. The scheme deals with these constraints by using land use designations that have been developed to consider the risks and impacts associated with the constraints.
Whilst these risks and constraints may be able to be dealt with within the development project, the land use designations should not be too restrictive to not allow the developer to provide potentially acceptable solutions for the constraint and the development.

Underground mining and Open Cut mining have occurred extensively, in parts, within the Ipswich local government area. A substantial part of the mined area has been documented through the preparation and lodgement of Mine Plans with the Queensland Department of Mines. Unfortunately, some mine plans have been lost over time and others potentially were never documented or lodged.
The revised OV3 Mining Constraints plan has been designed to include the documented and potential undocumented mining areas, where known.

Under the scheme the impacts and risk from mining are to be effectively managed to avoid unacceptable risk or reduce any risk to as low as practically possible.
Any residual risk must be considered to decide whether the proposed development is acceptable. The development applicant may provide a reasonable engineering solution to a constraint, and this will need to be assessed by Council before any approval could be issued.

The potential influence and risk to development from underground and open cut mining is well documented and understood by qualified mining and geotechnical engineers. It is widely recognised and understood that should any mining feature fail, the extent of the surface subsidence or disturbance area will extend for a distance beyond the vertical extent of the feature. This is known as the Potential Influence Zone and for this report we have used a standard and widely accepted Angle of Influence or “Draw”, 26.5 Degrees from the vertical. The width of the Potential Influence Zone is calculated in reference to the depth of the mine feature or workings. The Revised OV3 Constraint layer Zone of Influence has been developed using the 26.5 Degree Angle of Influence or “Draw” and using a calculated or approximated mine depth value, where possible. The Potential Influence Zone is shown in reference to the documented mining, the undocumented mining, the open cut mining, and tunnels and shafts.

The previous OV3 Layer was developed using a generic Potential Influence Zone and had only generalised reference to the depth of the underground mining or feature.
The revised OV3 mapping and layer system in this study provides a more reliable alignment for all users. The revised system also provides a more responsible system and approach that will improve the understanding by users of the system and as such has the potential to reduce any Corporate Risk.

4.0 OV3 Mapping Review

The Revised OV3 mapping has been developed in PDF format and Mapinfo GIS format suitable to Council's GIS System.
The Code of Symbols and specifications for the revised OV3 mapping is shown in **Table 1**
The revised code now has up to 8 different layers compared to the previous system with 5 layers.
The mapping review has extended to reviewing and checking the extent of the documented mine plans and preparing a more definitive outline.
An approximate outline has been adopted for the undocumented mining areas.
A review of the mine tunnels and shafts was compiled and compared with the previous OV3 layer system. This revealed a 70% increase in the number of tunnels and shafts. **See Table 2**
An improvement into the Revised OV3 data was the establishment of a standardised system for the size and positioning of the Tunnel Icons. A scaled approach was adopted for the tunnels and shafts with the size difference depending on the reliability of the location and source from which the location has been derived. A located and surveyed tunnel icon is shown considerably smaller than a Tunnel located off a Mine Plan and larger again if located off a Geological Plan.

Similarly, the size of icons for mine shafts has been scaled in a similar format as for the mine tunnels.

This version of the Revised OV3 data includes the approximate location of Geological Survey Queensland (GSQ) coal exploration boreholes. These deep boreholes are worthwhile checking to see if they have been decommissioned properly before any fresh development is carried out on the site. If uncapped these boreholes could be coal seam gas vents.
Recent inspections of some of these boreholes have revealed them to be in varying states of abandonment. Some appear to have been properly decommissioned and sealed and others appear to have been left with virtually no decommissioning efforts at all. Some have been found to be still open to considerable depths and some open almost from the surface. The potential for these features to create a risk to future development should not be underestimated and our experience to date has shown that these are worthwhile locating, checking, and ensuring that a suitable plug or decommissioning works are undertaken. It has also been our recommendation that when fresh subdivision is planned that these boreholes be placed outside any new freehold lots. The plug and any capping works should be survey located and completed to be at least 2m below any final surface levels. This is to prevent any future infrastructure from disturbing the capping etc.

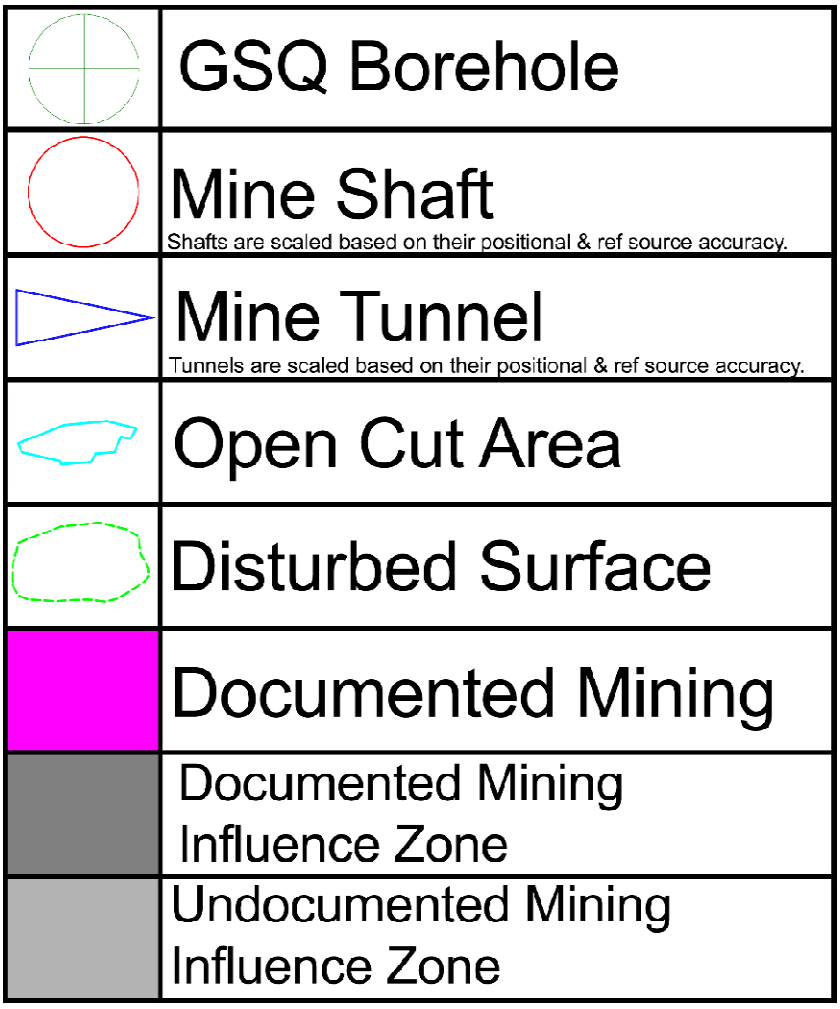


Table 2	Shafts			Tunnels		
	Rosewood	Ipswich	Total	Rosewood	Ipswich	Total
Old OV3	69	303	372	113	393	506
Revised OV3	175	605	780	133	574	707
Change	106	302	408	20	181	201

5.0 Suitability Statement

The Draft Mining Policy Framework, Codes and Associated mapping are discussed in parts 2, 3, 4, and 5 of this report.
The overlay plans prepared and included in this report have been prepared to

- identify areas of risk to development.
- allow constructive planning to be undertaken as part of the New Town Plan
- Provide an initial awareness of any risk element to a potential developer or development.
- Provide Council with the basic information to set Codes and requirements for compliance.

The main elements of this Revised OV3 constraint overlay Code include:

- Documented Underground Mine workings
- Undocumented Underground Mine workings
- Open Cut mined areas.
- Disturbed Surfaces from mining activities
- Mine Tunnels
- Mine Shafts
- Potential Influence Zones
- GSQ Boreholes

These elements are the main Risk components that need to be considered in any Mining Geotechnical reporting as part of development applications.

5.1 In preparing any Mining Geotechnical reports the research and investigations should consider the following matters.

- Available data
- Reliability of that Data
- Accuracy of the Data
- Interpretation of Data
- Identifying any Risk or Potential Risk
- Provide recommendations on how to minimise any risk or potential risk
- Providing geotechnical information on their findings including Potential Tilt and Strain parameters

This information should conform with engineering requirements and specifications that assist with engineering design. This includes the type and standard of construction necessary for any developments in those settings.

5.2 Purpose and Content of Desktop Mining Geotechnical Reports are to accompany Development Applications in relation to the Mining Constraint Layer System. This can lead to More Detailed Studies, Remediation, and Certification prior to Council Approval.

Desktop mining studies have been required by Council as part of development applications within mining constrained areas for many years. These reports are required, in the first instance, for many applications and form the framework and initial understanding of the potential and realistic site constraints for both the developer and council.

The **Purpose** of the Mining Geotechnical Desktop Report is to identify any Risk to the development or construction from any mining or mining related items, features, or zones.

The **Content** and framework of a Mining Geotechnical Desktop Report should include: -

- An Introduction part - Setting out details of the Application and the Site.
- Factual information and evidence part - This part is to include information that should be discoverable or available to the developer or their consultants.
- Interpretation part - This part is to provide the engineering assessment and potential constraint parameters for the site.
- Summary or Concluding part – to summarise the factual and interpretive information into a constraints plan and draw conclusions.
- Recommendation's part - to minimise any Risk. This may require more Detailed Studies where additional evidence and information is required to understand the full extent of the risk.

More Detailed Studies, Remediation, and Certification

- Remediation part - remediation works may be proposed as part of the recommendations and would usually follow More Detailed Studies or Reports
- Certification Part - Any recommendation and or remediation works should be signed off by qualified professional practitioners.

The **Introduction** part should: -

- identify the applicants and or their consultants.
- clearly identify the development or construction project.
- clearly identify the proposed development site.

The **Factual Information and Evidence** part should include **Plans:** -

- a Site plan that shows the current applicant lot or number of lots boundaries and description along with adjoining properties and features such as roads creeks and rivers etc.
- A topographical plan showing the general elevation of the site and the site in relation to surrounding properties or features.

- A geology Plan showing the prevailing bedrock geology of the site and surrounds. The plan could display known geological formations and fault lines etc.
- A mine plan, if available, that clearly shows the proposed development site superimposed on the mine plan. Where more than one plan of mine workings exists, the proposed site should be superimposed on each plan and be included as separate plans in the report.
- A plan showing the location of any GSQ coal exploration boreholes, if these are not already shown on the mine plans.
- A Constraint Plan that summarises the amount and extent of any mine workings, features, or zones into as many defined areas as necessary to fully summarise and define the amount and type of mining that constrains the site.
- A Development Plan that should show the proposed development or construction work locations in relation to the defined areas on the Constraint Plan.
- A written part of the Factual Information should mention and describe the factual information with reference to the plans specified above.

The **Factual information and Evidence** should also include a **written part**: -

- The presence of any tunnel or shaft entries within or close by to the site that could constrain the proposed development.
- The presence of any underground mine workings within or close by to the site that could constrain the proposed development.
- The presence of any open cut mining within or close by to the site that could constrain the proposed development.
- Any information or knowledge of past subsidence or mine related problems on or nearby to the site.
- Any knowledge or information of past coal stone deposited on the site and any knowledge or information of past or present coal stone heatings on the site.
- Any GSQ coal exploration boreholes located on the site.

The **Interpretation Part** should include: -

- The location of the proposed development or construction in relation to the defined constraint matters. This could be in relation to actual mining or mining influence items, features, or zones.
- Actual Mining could include items or features like tunnels, shafts, subsidence, or settlement holes from underground or open cut mining.
- Mining Influence Zones could include the potential influence from the same items of tunnels, shafts, subsidence, or settlement holes from underground or open cut mining.

- The interpretation of Mine Pillar stability, if applicable.
- Any potential regional subsidence prediction should the mine pillar stability interpretation indicate potential failure of the mine pillars.
- A prediction of potential tilt and strain parameters for the site.
- Any potential for sudden collapse type subsidence (often referred to as 'Sinkhole' or 'Pothole' type subsidence).
- Comment on any subsidence that may have already occurred and that could still occur.
- Comment on the effects any faulting in the area may impact or constrain the site.
- Potential constraints from past coal stone deposits or past or present coal stone heating.

The **Summary or Concluding Part** should include: -

- compilation of the factual and interpretive information and evidence into a responsible written summary with reference to constraint issues discovered as part of the report and be specific for the site.

The **Recommendations Part** should include: -
A written description of recommendations on how to minimise any Risk. Such recommendations could allow the proposed development or construction to be made safe and approved without further studies.
The recommendations could be designed towards remediation of the constraint or limiting the constraint so that the development or construction can proceed either in total or in a restricted or limited form. The recommendations should focus on the identified constraints or potential unknowns of the site and matters.
The recommendations, depending on its findings, may make recommendations based on the available information and interpretations that could lead to development approval without further detailed studies.
This could include: -

- Types of development construction such as unrestricted, waffle raft or Stump type for development in the undermined or influence zones
- Optimum positioning of development construction away from mine constraint areas, if possible.
- The ability to relevel stump type buildings or residences or portal frames with flexible cladding in industrial buildings.
- The ability to relevel or maintain concrete slabs in sheds or industrial site applications.
- Inground services designed with flexibility to cope with potential predicted movement, should it occur.

More Detailed Studies could be necessary, and be recommended, where additional evidence and information is required to understand the full extent of the risk. Should remediation works be considered as suitable to reduce or eliminate Risk for the particular development or construction such works should be described in a More Detailed Report for reviewed by Council for comments prior to any works being undertaken. Council does not need to and should not approve any such works.

The **Remediation Part**: -
Such additional investigations and Remediation works might include: -

- excavator work to investigate items like mine Tunnels, mine Shafts and even sudden collapse type subsidence events (often referred to as "sinkholes").
- Drilling boreholes to determine items like bedrock geology, depth to the coal seam or mine workings, thickness of the coal seam and height of mine workings or voids.
- Aerial Photogrammetry studies
- Geophysical / Seismic Studies
- Settlement Studies undertaken by experienced personnel in settlement analysis to predict potential long term settlement characteristics from underground mining, open and backfilled voids from open cut mines, and mine overburden spoil piles.
- Various methods of sealing tunnels, capping shafts, capping coal stone areas, extinguishing coal stone heatings and even mine filling in some cases.

Depending on the type of development or construction the findings and the ability to remediate the site may or may not achieve the required level of safety to allow approval. There is usually an outcome for the use of constrained land, but this depends on the residual risk to the particular type of development or construction. Sometimes an alternative use may be the eventual outcome.
Any remediation proposals and works should be provided by and supervised by suitably qualified professional practitioners.

The Certification Part: -
Any recommendation and or remediation works undertaken should be signed off by suitably qualified professional practitioners.

5.3 Suitably Qualified Practitioners: -

A proposal for development application or construction should be managed by suitably qualified practitioners and may consist of 4 parts.

- Part 1 - Assessment of the Site with Recommendations
- Part 2 - Assessment of any proposed Remediation Works.
- Part 3 - Supervising any Remediation Works.
- Part 4 - Certification of any Remediation Works.

Part 1 - Assessment of the Site with Recommendations could be assessed by a person with some mining experience or background and qualification in mining. This could be mining engineer or mining personnel with some technical qualifications i.e. Engineering, Mining Geologist, Mine Surveyor, an RPEQ or someone working with or under an RPEQ.

Part 2 - Assessment of any Proposed Remediation Works could be provided by a person with some mining experience or background and qualification in mining. This could be mining engineer or mining personnel with some technical qualifications i.e. Engineering, Mining Geologist, Mine Surveyor, an RPEQ or someone working with or under an RPEQ.

Part 3 - Supervising any Remediation Works could be provided by a person with some mining experience or background and qualification in mining. This could be mining engineer or mining personnel with some technical qualifications i.e. Engineering, Mining Geologist, Mine Surveyor, an RPEQ or someone working with or under an RPEQ.

Part 4 - Certification of any Remediation Works should be signed off by a person with mining engineering or technical mining qualifications working with or under an RPEQ. i.e. either joint certification or by an RPEQ only.

It is preferable that the relevant person or company with continuity of knowledge carry out each of the progressive phases described above.

Ref: - Moreton Geotechnical Services Presentation to Ipswich City Council Planners and Engineers 17 August 2020.

5.4 Mining Policy Framework: -
The mining policy framework, code and associated mapping is designed to advise development applicants of the specific outcomes Council is seeking in reaching compliance with the Planning Codes.

Whilst we are not qualified to advise on Town Planning or Legal issues, and we were not approved to provide any external opinions as part of this Report, however, we believe that the mining policy framework, code, and associated mapping meets the current legislative requirements. It forms the basis in assuring appropriate development occurs and is maintained.

We are not aware of any critical legislative conflict at present.

Development applicants for the Ipswich Region have been dealing with the mining constraint overlays for some time now and due to the legislative requirements of ensuring appropriate development we believe that the mining constraint overlays are achieving such compliance.

The now Revised OV3 Mining Constraint Overlay defines the current general understanding of the coal mining constraint risks for the Ipswich Region. Applicants need to be mindful that what is displayed is just the basic information and indicates the type and elements of the investigation works required to achieve compliance and potential approval.

Recommended Improvements to the associated mapping would be the ability to indicate where features like mine workings, tunnels, and shafts etc have been located, have a surveyed position, whether they have been removed or whether any remediation works have been carried out to them. To date many development applications and mine site rehabilitation activities, within the region, has taken place with the outcome that some of these features have been located, surveyed, and even removed or partly remediated.

Some features have even been removed by development works and earthworks or past open cut mining. An improvement to the system would be to be able to identify if a feature has better location coordinates and whether any rehabilitation work has been undertaken.
For this, Council would need to create a database of the items shown in the Revised OV3 Constraint Layer system and keep a record of any reports, works or remediation activities associated with them. Then at regular intervals, of say 12months, the records could be reviewed, and the database updated. This information should not be made available on a public website but available to the landowners and their approved agents, especially if further development works are proposed.

We believe that any potential for Corporate risk will only apply should the data or the OV3 Constraint layer information contain inaccurate or misleading information. The information provided in this Peer Mining Review is based on the Mine Plan records held by the

Queensland Department of Mines and the mining records from the Geological Survey Queensland, both State government Departments. This base is then extensively supported by the database mining records of Taylor Mining Services and the investigation and drilling records of Moreton Geotechnical Services. The indicated records where we believe there has been undocumented mining is backed up by reliable records that indicate that past mining has occurred.

Provided that the public information being made available via the council is kept at this generalised level we believe that the Corporate Risk to Council from the use of these records and Constraint layers is extremely low. It is up to the development applicants to ascertain what detailed information is required to bring about the specific and acceptable outcome. It also needs to be understood that the information provided has been compiled to the best of our knowledge at the time of writing. New information and knowledge do come to hand from time to time and often when site specific geotechnical investigations become available. It should be understood that the information may not be exact and that some errors, omissions, or fresh information may vary the existing data. Periodic updates and reviews are always essential with matters of this nature.

The Revised OV3 Constraint code and elements conform and align well under the Draft Strategic Framework. It would be difficult to see this constraint layer system be functional as a traditional Zone under the planning scheme. The mining constraint layer extents vary significantly over small and large areas of the Region. As such we would not recommend that the Constraint layer system be considered for change to a tradition Zone arrangement. A traditional Zone arrangement could be suitable should areas be able to be set aside for mining or extractive industries like the Key Resources areas.

The previous OV3 Constraint Layer system contained inconsistencies such as the size and shape of the Tunnel icons, size of Shaft icons, the extent of mining outlines and potential influence zones. There appeared to be little to no standard for determining the size and shape of the tunnel icons, which at this time were entered into the database by Council. Similarly, the size of the shaft icons appeared to be inconsistent. The generalised mining outlines had some errors and in turn this gave the potential influence zone some errors.
In the Revised OV3 Layer scheme we have set out a standard for the size and positioning of the tunnel icons and shafts.

The Tunnel icons are based on a tunnel that has been located and a survey coordinate determined for it. The size of the icon is then scaled up in size depending on the quality of the source from which the tunnel location has been determined.
Similarly, the Shaft icons are based on the same methodology.

The mining outlines were revised using documented mine plans and the Potential Influence Zones were determined using depth values applied to them, where possible.

The undocumented mine outlines were determined by our experience and from what mining records we could discover about the mines. A depth of mining was also determined for these areas.

The potential influence zones were derived from the depth values determined for the extent of the documented and undocumented mining areas.

The geographical referencing of old mine plans to today's DCDB Cadastre can have its limitations. The outlines provided in the Revised OV3 Layer scheme relies on the available and reliability of the available mine plan. This data is considered as the best possible outcome, however, it should also be recognised that not all mine plans are considered accurate or up to final extension of the mine workings.
Therefore, as a safeguard an additional potential influence zone has been used in areas where we have limited confidence in the mine plan or uncertain depth information.

5.5 Comparison review: -

The only similar mining constraint scheme considered worthwhile as a comparison to the Ipswich OV3 layer constraint scheme is the one in place and operational in Newcastle NSW. The Newcastle City Central Area (NCCA) Mine Subsidence Guidelines and Maps were developed to aid the community to understand the type and extent of mine workings in and around the Newcastle City Central Area. They were also developed to assist the community to gain a general understanding of the type of conditions that Subsidence Advisory may impose in relation to any proposed subdivision or surface development within this area.
The Newcastle city area is severely constrained by early undocumented underground coal mining. The development proposals and requirements in this area is predominately for high value and high-density building development. Subsidence Advisory NSW is a State Authority funded by the NSW coal mining industry. Under this scheme any damage to buildings, infrastructure or developments within those zones can be financially looked after by Subsidence Advisory, provided they comply with and meet specific conditions.

Safety is the highest priority for both Newcastle and Ipswich regarding potential subsidence issues and areas. Under the Subsidence Advisory system should a subsidence safety or serviceability issue occur then Subsidence Advisory coordinate an immediate response to ensure the affected area is made safe.
The Queensland Government through the Department of Mines has an Abandoned Mines Land organisation. Unfortunately, the Queensland organisation usually only get involved with a subsidence event if the event is located on State or Local Government property. This is little to no comfort for the safety of members of the Ipswich Community should a subsidence event occur on private land and an event that they have no control or involvement in. The State Government have been known to become involved if there has been damage to improvements on the property, but this is not always the case.

Subsidence Advisory NSW also regulate development within the nominated subsidence regions. These regulations are in addition to any other local government or development approval process.
As Queensland does not have such a system the regulation and responsibility fall back on the local government of Ipswich, to administer.

The Newcastle city area needed to develop more stringent codes and arrangements due to the type of development required for their area. Their system looks more into permanent type remediation works such as mine filling works, where particular developments are proposed. The scheme for the Newcastle city area is more prescriptive than the revised Ipswich OV3 Layer system but the Newcastle scheme deals only with the heavily commercialised area of Newcastle City. To provide the level of guidance and potential remediation requirements under the Newcastle scheme detailed studies would have been undertaken by Subsidence Advisory.
The level of information and Guidance by Subsidence Advisory for areas outside the Newcastle city area is considerably less descriptive and informative than the Ipswich OV3 Constraint Layer system.

The Subsidence Advisory information for the Newcastle city area scheme is particularly good as it has been studied and designed specifically for the limited area, density of development and location of Newcastle City. The Subsidence Advisory information for the Mine Subsidence Development areas, outside the Newcastle City area, are considerably less descriptive and less informative than the Ipswich OV3 Constraint Layer system.

The Ipswich OV3 Constraint Layer system is designed specifically for the constraints faced in the Ipswich Region. The Ipswich OV3 system is an excellent system as it has the flexibility for developers to study the constraint and propose a remediation program that could meets the required outcome for Council and the proposed development.

In summary the Newcastle City plan has gone into quite prescriptive remediation concepts and proposals even before any development has been proposed. This plan has been developed at a cost to the local and State Governments albeit through Subsidence Advisory NSW.
The same arrangements are considered not applicable or warranted to the Ipswich Region. The Ipswich scheme whilst alerting landowners and developers to the mining constraints, the OV3 Constraint Layer system allows development sites to be investigated at the time of any proposed development. This allows remediation work proposals to be investigated and designed with the best engineering methods available at that time. It will prevent any time or investigation costs being spent on areas where development works may be unknown, where development works are only considerations or where development works are considered long-term future programs.

As such we believe that, whilst there is no State Government process or involvement, the Ipswich OV3 Mining Constraint Overlay scheme is Best Practice and a scheme best suited to the Ipswich Region's Planning and Development requirements.

Ref. NSW Planning Portal / e-Planning Spatial Views / Subsidence Advisory and relevant layers.

5.6 Comparison Plan - Plan 2

As part of this Mining Peer Review, we have assessed the information contained on numerous mine plans and the extensive information in the databases of Taylor Mining Services and Moreton Geotechnical Services.
The review has also addressed the items raised in the Scope of Works by Council and revealed the presence of 201 tunnels and 408 shafts that were not previously shown on the OV3 Constraint Layer system. The system now shows 780 Shafts and 707 tunnels with a total of 1,487 Tunnels and Shafts for the Region.
The Comparison plan has shown that up to 1,100ha of property could be released from the Mining Constraint overlays and 350ha will be included in the OV3 mining overlays. a net balance of 750ha released from the mining constraint layer system.

6.0 Recommendations

This Mining Peer Review and Suitability Report has looked at the matters and issues associated with the OV3 Constraint Overlay scheme.
From the Review it is obvious that Council has a considerable task in managing and regulating development in the mining constrained areas.

Our report has assessed and highlighted several issues that need to be considered as part of this process. We have also made some recommendations for amendments and potential improvements with the system and compared the scheme with other similar scheme's within Australia.

In Part 2 of our report, we have recommended that historic Mine Sites and features should be identified, assessed and where possible conserved or preserved.

In Part 5 we have recommended the GSQ deep coal seam exploration boreholes be located and made sure the holes are effectively plugged and sealed when being part of any redevelopment of an area.

In Part 6 we have recommended that a database of the mine features identified within the Ipswich Region be compiled so that any tracking of location coordinates and remediation works can be readily identified.
For example, areas like the Ipswich Motorway Upgrade in 2010 to 2013 where considerable areas of underground mine workings were mine filled with stabilising grout to prevent any

future mine subsidence. Also, the remediation works carried out by the Dept of Natural Resources and Mines (DNRM) in the back yard of a house in Coal Street Basin Pocket. Here the original backfill in an old mine shaft slumped and the matter received national and international media coverage. How are these item tracked for future reference should further development be applied for ??

Also, in Part 6 we have not recommended that the OV3 Layer system be considered as a future or more traditional Zone. We would only support such a proposal should the State Government become involved and assist with the administration and management of the scheme i.e. similar to the current referral system but taking more ownership and responsibility of the scheme.

Mine Pillar extracted areas, as discussed in part 1.3 recommends that areas such as this should be identified and form part of any mining geotechnical reporting for a proposed development, where identified. Additional areas where underground collapse has occurred should also be noted and considered under the reporting.

A particular recommendation as part of this review would be to recommend that should Council not have a qualified engineering section that looks after mining related issues, (such as subsidence events, locating mine tunnels and shafts and assessing development applications relating to such matters within the mining constrained areas), then it would be worthwhile considering engaging a 3rd Party Reviewer. Such person would need to be suitably qualified in mining engineering and be the holder of or work under a Registered Practising Engineer Queensland (RPEQ).
A reviewer could advise Council on issues of a more complex or simple issues within or about a particular project.

7.0 Limitations

The work in this report was produced for the Ipswich City Council on the basis of information available at the time of writing. The content of the report will not contain sufficient information for other parties and purposes.

While care has been taken in producing the report, it needs to be noted that there will always be some risk associated with developing in mining constraint settings.

The plans and the data included in these files must be taken as approximate but are considered the most up to date and appropriate at the time of preparation. Due to the extensive history of coal mining in this region it should be expected that additional information will from time to time be located and become available.
Comments and recommendations put forward in this report are aimed at minimising any risk.

Our companies accept no responsibility for any works which do not comply with the comments and recommendations in these reports.



Hugh Taylor
Taylor Mining Services Pty Ltd.