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Our ref: 754-NTLGE220504-AQ.Rev1

Crescent Newcastle Pty Ltd
C/- Stronach Property
Suite C502, Lee Harbour, 19 Honeysuckle Drive
Newcastle NSW 2300

Attention: Mark Purdy

Dear Mark,

Proposed multi-storey and multi building development
11-17 Mosbri Crescent The Hill
Discussion on risk of Gaseous Emissions from Drilling

1. Introduction

Crescent Newcastle Pty Ltd (Crescent) are proposing a multi-storey and multi-building development at 11-17 Mosbri Crescent Cooks Hill. Coffey Services Australia (Coffey) have been assisting with the development approval process.

Concerns have been raised by objectors regarding gas escaping from mine voids.

This letter presents Coffey's review of this risk in accordance with EPA Guideline: Assessment and management of hazardous ground gases 2019 (NSW EPA, 2019).

2. Site Conditions

The site is undermined in two coal seam, the Borehole Seam at a depth 90m to 100m and the Yard Seam at a depth of 41m to 45m. Coal Seams were also previously encountered at depths of 17m to 26m, the Dudley Seam at 27m to 31m and the two foot seam at 52m to 56m. For further information on the ground conditions refer to Coffey report 754-NTLGE220504-AH.Rev3 dated 14 January 2019.

Ground water inflows were generally recorded at 11.9m and 13.7m in two boreholes previously drilled onsite.

3. Discussion

With reference to the EPA Guideline: Assessment and management of hazardous ground gases 2019 (NSW EPA, 2019), the abandoned mine workings and coal measure strata form a potential source of coal seam gas.

Using the risk assessment framework (Section 4 (NSW EPA, 2019)) Coffey has carried out a Level 1 qualitative risk assessment based on the geological ground model and an assessment of probability and consequence.

The two mined coal seams occur at depth (at least 40m) and each seam is now below the depth of groundwater, meaning previously mined workings are now flooded. The main mechanism for gas migration to the site surface would likely be advection due to changes in pressure gradients with dissolved phase movements in groundwater considered a minor mechanism for this site.

Based on the ground model and likely migration mechanisms, the likelihood of release of gas impacting during drilling (explosion) or at the surface is considered to be low. The consequence of gas from the coal seams is considered to be minor. As such, with reference to Figure 1, the risk is very low.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Figure 1: Qualitative Risk Assessment Matrix Reproduced EPA Guideline.

In accordance with Section 4.3.3 sites with a very low risk generally require no further assessment. As a precaution and for worker health and safety some initial monitoring for gases is recommended during the drilling phase to verify the Level 1 risk assessment findings.

4. Conclusions

Based on the EPA guideline (NSW EPA, 2019) the risk of gases being released in sufficient quantities to be of risk, is very low. This very low risk should be verified with the use of gas monitoring during drilling.

Guidance on the uses and limitations of this report is presented in the attached sheet, *'Important Information about your Coffey Report'*, which should be read in conjunction with this report.

If you have any questions regarding this report or should you require further assistance on this project, please contact the undersigned.

Regards,

Simon Baker
Senior Geotechnical Engineer

References

NSW EPA. (2019). *Assessment and Management of hazardous ground gases.* NSW Environment Protection Authority.

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.