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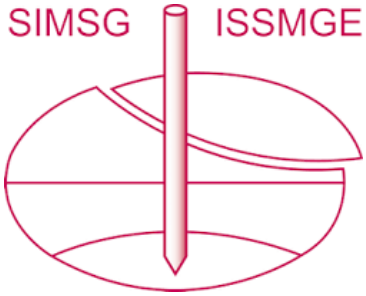

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Reviewing Landslide Hazard Assessment Systems within South East Queensland

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ABSTRACT

The study involved reviewing and evaluation of four Landslide Hazard Assessment Systems being operated by local government authorities within South East Queensland. The four authorities are the City of Gold Coast, Scenic Rim Regional Council, Logan City Council and Redland City Council. These four authorities are all located generally to the south of Brisbane have different landslide hazard assessment systems in place. The overall area covered by these local government areas is over 7000 square kilometres and has a population of over 975,000 people. The areas have variable geology and geomorphology that include significant areas of sloping terrain. The project involved a review and evaluation of the landslide hazard zoning systems, assessment of the existing planning schemes relating to the development on sites potentially susceptible to slope instability and evaluation of each of the systems with respect to the recommended assessment methods outlined in the Australian Geomechanics Society Landslide Risk Management Guidelines 2007.

Keywords: landslide, hazard, susceptibility, assessment, mapping.

1 INTRODUCTION

A review and assessment were undertaken to evaluate the Landslide Hazard Assessment Systems (LHAS) being operated by four local government authorities within South East Queensland. The four authorities are the City of Gold Coast, Scenic Rim Region, Logan City and Redland City. These four authorities all located generally to the south of Brisbane in South East Queensland and have different landslide hazard assessment systems in place.

1.1 Background

Practioners of slope stability assessment in South East Queensland are faced with a number of varying systems being operated by local government authorities. These systems differ significantly in their approach, requirements and compliance with the Australian Geomechanics Society Landslide Risk Management (AGS LRM 2007). The systems are further complicated by the recent amalgamation of most Councils in Queensland which has resulted in the operation of several planning schemes concurrently within many local government areas. This study reviewed the LHAS being operated by the City of Gold Coast, Scenic Rim Region, Logan City and Redland City and suggested improvements to their LHAS. The overall area covered by these local government areas is over 7000 square kilometres with a population of over 975,000 people. The areas have variable geology and geomorphology that include significant amounts of sloping terrain on which a significant number of landslides have been recognised. The location of the four local government areas is shown below in Figure 1.

Figure 1. Queensland Local Government Area Plan

1.2 Current LHAS in Place

The current LHAS systems in place in the four local government authorities examined are outlined below with a summary in Table 1.

1.2.1 City of Gold Coast

Gold Coast City Council (GCCC) has the most mature LHAS which was updated in 2011. A full description of how the system was updated is provided by Kidd (2011). The current system which is at the time of writing in the final stages of implementation relies on Landslide Susceptibility Mapping (LSM) of the entire City to determine whether a particular development or redevelopment site requires a slope stability assessment to be undertaken. If the site is located in a moderate or higher landslide susceptibility area, a slope stability assessment is required to be undertaken to firstly determine whether there is a significant susceptibility to landsliding on the site given the proposed development. This assessment uses a spreadsheet based checklist shown in Kidd (2011), to determine what the susceptibility of the site is. If the susceptibility is moderate or higher a detailed risk assessment is required using the method outlined in the AGS LRM (2007). The results of the risk assessment can then be assessed by the GCCC as to whether the proposed mitigation measures if required, are suitable to reduce the risk to an acceptable level. The system also clearly outlines in the GCCC sloping site development code, the requirements of the person undertaking the slope stability assessment and acceptable solutions regarding the development of sloping sites.

1.2.2 Logan City Council

Currently Logan City Council (LCC) is to date running three planning schemes in parallel from the planning schemes in place over sections of the City gained during the 2008 local government area amalgamation. The former LCC gained sections of the City of Gold Coast and the former Beaudesert Shire during the amalgamation. Within the former LCC section the trigger criteria for sloping site assessment is based on the default 15% slope gradient outlined in the SPP1/03 (2003). In these areas of the former LCC where the land is 15% or steeper a site specific geotechnical analysis is required by

a registered professional engineer, to demonstrate the site is not subject to landslides (LCC 2006). The former portion of the GCCC requires areas zoned as being of moderate or higher risk of instability as described by Sadegh-Vaziri and Taylor (2002), to have a geotechnical site analysis to be undertaken. The geotechnical site analysis must include a stability assessment report, landslide hazard analysis using the Macgregor and Taylor (2001) method and a foundation investigation report by a RPEQ appropriately experienced in slope stability matters. The RPEQ must certify the stability of the property proposed to be developed (GCCC 2003).

The former Beaudesert Shire Council (BSC) section has a LHAS that is based on mapping undertaken by Willmott (1981 &1983) that identifies medium and higher risk landslide hazard areas and combines this with landslide hazard investigation areas for the remainder of the shire where slopes exceed 15% (SPP1/03, 2003). If the proposed development site is located in either of the three aforementioned zones , “a site specific analysis would assist in demonstrating compliance the development constraint code. The report should be prepared by a suitably qualified, registered geotechnical engineer” (BSC 2007).

The entire area of LCC has been subject to a LSM undertaken by SMEC in 2011. This mapping when published by LCC will identify all areas steeper than 15% in the city, known landslides and areas steeper than 12% where landslides have occurred on similar geology down to this slope angle. SMEC (2011) also provided a potential system for a site specific assessment system of sloping land, in the form of a development constraint code similar to that being implemented in the City of the Gold Coast (Kidd 2011). However to date this system has not been adopted by LCC.

1.2.3 Scenic Rim Regional Council

Scenic Rim Regional Council (SRRC) has the least developed LHAS of all the local government areas examined. SRRC is made up of an amalgamation of a reduced section of the former BSC, the majority of the former Boonah Shire Council and a small section of the former Ipswich City Council. Currently the shire is running two planning schemes in parallel from both the aforementioned shires. The former BSC section uses the same assessment described above in section 1.2.2 above (BSC 2007). The Boonah Shire Council section has had no LSM and no system in place for the assessment of landslide hazards (BSC 2006). The former Ipswich City Council section of SRRC is ignored in the current planning system in place. During the 2010 and 2011 wet season many landslides occurred within the former Boonah Shire section of SRRC, particularly in the vicinity of Cunninghams Gap.

1.2.4 Redland City Council

The Redlands City Council (RCC) had no boundary changes during the amalgamations and boundary changes that happened to most Queensland councils in 2008. Consequently RCC is utilising the LSM and LMAS that was produced by SMEC (2005). The system being utilised by RCC (SMEC 2005) is the next most mature LHAS of the four local government areas reviewed. The system in place is based on the SPP1/03 (2003) and AGS Guidelines (2000). The guidelines published by the RCC mention risk assessments and site based assessment of landslide susceptibility, however it doesn’t provide an example of a method to undertake the required assessment. The RCC guidelines (SMEC 2005) have clear guidelines as to the requirements for development in very high and medium Landslide Management Areas (LMA). The requirements are most onerous for very high risk areas but reduce as the risk zoning reduces. The guidelines are inconsistent in the requirements for practioners to have certain qualifications and experience with respect to different zones. Guidelines for Hillside Construction (AGS 2002) are included in the RCC guidelines.

Table 1 Summary of LHAS in Place

Local Government Authority	LSM	Compliance with AGS LRM 2007	LHAS Robustness	Geotechnical Report Requirements and Practioner Qualifications Clarity
GCCC	Multifactor Based	Yes	Clear Two Stage System	Very Clear
LCC	Slope Based	No	Variable System with varying degrees of robustness depending on location in LCC	Variable
SRRC	Incomplete	No	Only part of SRRC covered by a moderately robust system	Not Clear
RCC	Multifactor Based	No	Moderately Robust	Inconsistent

2 CONCLUSION

Currently very different site assessment systems for sloping sites are running within the four local government areas examined during the study. Only one of the systems in place complies with the current national guidelines for assessment of landslides outlined in sections B and C of the AGS LRM (2007), by ensuring slope stability assessments are undertaken on potentially hazardous sites utilising the practice note guidelines in section C after reference to the LSM available, that complies with section B. The LSM present in the four LGA's have varying degrees of robustness and coverage across their local government areas. The requirements for undertaking slope stability assessments also vary, in terms of qualifications and experience of personnel to undertake them and the required outputs in terms of reporting and certification. It is very difficult for local practioners of slope stability assessments to operate in this very contradictory environment with systems varying across and within local government areas. As the systems vary significantly in their robustness, coverage and compliance with best practice, they also vary in the degree to which they protect the public and properties from landsliding. With the differing systems in place the local government authorities of the areas examined are exposed to varying levels of risk of legal claims resulting from development on sloping sites.

3 RECOMMENDATIONS

3.1 Gold Coast City Council

It is recommended that the system outlined in Kidd (2011) be fully implemented as is understood to be occurring at the time of writing.

3.2 Logan City Council

It is recommended that LCC publish the mapping recently undertaken by SMEC (2011) and implement the draft development code (SMEC 2011) or a similar system to assess the sloping sites within the City that is not overtly onerous to potential developers, that complies with Sections B and C of the AGS LRM (2007). The Code should outline how to assess the sites landslide susceptibility and where there is a moderate or higher susceptibility of landsliding occurring ensure a detailed risk assessment is undertaken and clearly state the required level of experience and qualifications of practioners as well as report requirements. Implementation of these measures will bring the entire LCC in line with the AGS LRM (2007) guidelines sections B and C.

3.3 Scenic Rim Regional Council

It is recommended that a LSM be undertaken across the entire Scenic Rim Region and a Region wide sloping sites assessment system be implemented similar to that being implemented on the Gold Coast (Kidd 2011). The current complete lack of a system in a large portion of the Region provides no systematic means of assessing and managing development of sloping sites in this portion of SRRC. Both the current LSM available in part of the Region which is based on a very inaccurate terrain model, and the remainder of the Region which is unzoned, expose the developers, property owners, local government authority and their rate payers to potential large costs of remediation and legal proceedings from issues with respect to landsliding occurring on sites within the Scenic Rim Regional Council area.

3.4 Redland City Council

It is recommended that RCC update their development assessment system to incorporate a two stage assessment system similar to that being implemented within GCCC (Kidd 2011). Implementation of this system would bring the system up to date to comply with the AGS LRM (2007) and would also remove current inconsistencies in the qualifications required of persons assessing sloping sites, as well as the methods dealing with site specific susceptibility and risk assessment.

3.5 Overall

It is recommended that across the entire region examined within this study, a common form of LSM and sloping site specific assessment system be adopted. The LSM mapping system should include a landslide inventory and have the capability for constant updating as site specific assessments and modifications to sites are undertaken. This regional system could be managed either by a designated consultant or a University, with contributions made by each of the local government authorities funded by a levy on development to pay for the process. By having a consistent and robust system in place it would be anticipated that less issues with development of sloping sites would occur into the future, within the region.

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