Jack Hodgson Consultants Pty Limited
CONSULTING CIVIL, GEOTECHNICAL AND STRUCTURAL ENGINEERS
ABN 94 053 405 011

VT 25577A
16th July. 2008

The General Manager
Pittwater Council
P O Box 882
MONA VALE NSW 1660

Dear Sir,

62 HERBERT AVENUE, NEWPORT
Order No NOT0092/08 and FINALISATION OF APPROVAL P0523/97

We inspected the residence at the subject address on 9th July. 2008

The two storey brick veneer and timber house and surrounds are in good condition

The approved works have been carried out in accordance with plans submitted to Council

The unauthorised works which include the extension of the ground floor rear verandah and enclosure of the existing lower floor verandah and addition of a small deck on the eastern side of the house on the lower ground floor appear to be well constructed and in accordance with BCA

In our opinion the existing development is structurally adequate

JACK HODGSON CONSULTANTS PTY LIMITED

J D Hodgson M Eng Sc ,
F I E Aust , CP ENG
Civil & Structural Engineer
Nper3, Struct Civil No 149788
Director

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GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO 4 (As per Pittwater Council's Geotechnical Risk Management Policy) – To be submitted with Application for a Building Certificate/Response to an Order

Building Certificate Application/Response to an Order
for _____
Name of Applicant

Address of Site **62 HERBERT AVENUE, NEWPORT**

Order No NOT0092/08

Declaration made by geotechnical engineer in relation to the submission of an application for a Building Certificate/Response to an Order

I BEN WHITE (Insert Name) on behalf of JACK HODGSON CONSULTANTS PTY LTD (Trading or Company Name)

on this the 16/7/08 (Date)

certify that I am a geotechnical engineer as defined by the Geotechnical Risk Management Policy for Pittwater. I am authorised by the above organization/company to issue this document and to certify that the organization/company has a current professional indemnity policy of at least $2million

☒ I have inspected the site and the existing development and am satisfied that both the site and the development achieves at least the 'Tolerable Risk Management' requirement of the Policy. The attached report provides details of the assessment in accordance with Council's Policy. The report also contains recommendations as to any reasonable and practical measures that can be undertaken to remove foreseeable risk. I am aware that Pittwater Council will rely on this certification as the basis for ensuring that the geotechnical risk management aspects of the site and the development have been adequately addressed to achieve at least a 'Tolerable Risk Management' level for the life of the structure taken as 100 years unless otherwise stated and justified in the Report.

or

☐ I have inspected the site of the existing development. The attached report details the remedial actions required to be undertaken prior to me being prepared to certify that the site and the development achieves at least the 'Tolerable Risk Management' criteria required in accordance with the Policy

Geotechnical Report Details

Report Title RISK ANALYSIS & MANAGEMENT FOR BUILDING CERTIFICATE AT **62 HERBERT AVENUE NEWPORT**

Report Date 15/7/08

Author BEN WHITE

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM

Membership No 222757

Company Jack Hodgson Consultants Pty Ltd

Note: If life of structure taken as less than 100 years please indicate _____ years

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RISK ANALYSIS & MANAGEMENT FOR BUILDING CERTIFICATE AT 62 HERBERT AVENUE, NEWPORT

1 INTRODUCTION

1.1 This assessment has been prepared to accompany an application for a building certificate The requirements of the Geotechnical Risk Management Policy for Pittwater, 2007 (Appendix 5 to Pittwater 21) have been met

1.2 The definitions used in this Report are those used in the Geotechnical Risk Management Policy for Pittwater. 2007

1.3 The methods used in this Assessment are based on those described in Landslide Risk Management March 2007, published by the Australian Geomechanics Society and as modified by the Geotechnical Risk Management Policy for Pittwater. 2007

1.4 The experience of Jack Hodgson spans some 50 years in many areas of Australia and in the Pittwater area, particularly in the last 30 years as Principal of Jack Hodgson Consultants Pty Limited

2 EXISTING DEVELOPMENT.

2.1 The site was inspected on the 9th July 2008

2.2 The property is on the low side of the road and has a northerly aspect (Photo 1) The road is supported by a sandstone block retaining wall in good condition (Photo 2) A second block wall is located immediately down slope and the path to the house runs along the trop of this wall (Photo 3) The wall has had some remedial work carried out in the recent past and Gabion Baskets have been installed in front of the wall to support it (Photo 4) The boundary of the road reserve is just below the Gabion Baskets From the toe of this wall the surface slopes down steeply to the house at angles of some 20 degrees where a low cut is supported by a stable stack rock wall (Photo 5) The grade reduces at the house footprint and the surface continues to slope down to the rear boundary at angle of some 10 degrees Some landscaping has been carried out below the house (Photo 6) and a Gabion Basket supports a fill just above the lower boundary (Photo 7 & 8)

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2 3 The two storey brick veneer and timber house is in good condition The supporting brick walls, piers and timber posts show no evidence of ground movement (Photo 9)

3 DESCRIPTION OF SURROUNDING AREA

The council map indicates that the surrounding properties are considered H1 hazard areas Our observations indicate these hazards will not adversely affect the subject property from below or beside The steep slope rises across the site to the road and continues above the site is a potential hazard This hazard is considered in section 8

4 GEOLOGY OF THE SITE

4 1 The site is underlain by interbedded sandstones, siltstones and shales of the Narrabeen Group that outcrop on the high side of the road (Photo 10) The Narrabeen Group Rocks are Late Permian to Middle Triassic in age with the early rocks not outcropping in the area under discussion The materials from which the rocks were formed consist of gravels, coarse to fine sands, silts and clays They were deposited in a riverine type environment with larger floods causing fans of finer materials The direction of deposition changed during the period of formation The lower beds are very variable with the variations decreasing as the junction with the Hawkesbury Sandstones is approached This is marked by the highest of persistent shale beds over thicker sandstone beds which are similar in composition to the Hawkesbury Sandstones

4 2 The slope materials are colluvial at the surface and residual at depth They consist of sandy loam topsoil over sandy clays and clays with rock fragments and some floaters through out the profile The sandy clays and clays merge into the weathered zone of the under lying rocks at depths expected to be in the range 0 6 to 3 0 metres

5 SUBSURFACE INVESTIGATION

The surface features described in this Report are considered to be adequate for the proposed building certificate, therefore no subsurface investigation is required

6 DRAINAGE OF THE SITE

6 1 ON THE SITE

The site is adequately drained with no natural watercourses

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6 2 **SURROUNDING AREA.**

No natural watercourses enter the site from the surrounding area

7 GEOTECHNICAL HAZARDS

7 1 The steep slope that rises to the road across the site is a potential hazard (Photo 1 - 8, **HAZARD ONE)**

7 2 The steep slope that rises above the site is a potential hazard (Photo 10 & 11 **HAZARD TWO)**

8 RISK ASSESSMENT

8 1 **HAZARD ONE Qualitative Risk Assessment on Property** The steep slope from the road down to the house is supported with a series of two sandstone block walls that appear stable The lower wall has recently had Gabion Baskets installed in front of it as part of remedial works to stabilise the wall At the footprint to the house the grade reduces significantly Near the lower boundary a low Gabion basket supports a fill Above the site on the slope shale bedrock outcrops indicating the overlying unconsolidated materials are relatively shallow No evidence of movement related to landslides was observed on the site The likelihood of the slope failing is assessed as 'Rare' ($>10^{-5}$) The consequences to property of such a failure are assessed as 'Medium' (>20%) The risk to property is 'Low'(2×10^{-6})

8 2 **HAZARD ONE Quantitative Risk Assessment on Life**

For loss of life risk can be calculated as follows

$\mathbf{R_{(Loll)} = P_{(H)} \times P_{(SH)} \times P_{(TS)} \times V_{(DT)}}$ (See Appendix for full explanation of terms)

8 2 1 Annual Probability
The steep part of the slope is supported by retaining walls that appear stable and above the site slope shale bedrock outcrops indicating the overlying unconsolidated materials are relatively shallow
$\mathbf{P_{(H)}}$ - 0 00001/annum

8 2 2 Probability of Spatial Impact
The house is located below the steep portion of the slope
$\mathbf{P_{(SH)}} = 0\ 7$

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8 2 3 Possibility of the Location Being Occupied During Failure

The average household is taken to be occupied by 4 people It is estimated that 1 person is in the house for 20 hours a day, 7 days a week It is estimated 3 people are in the house 12hrs a day, 5 days a week

For the person most at risk

$$\frac{20}{24} \times \frac{7}{7} = 0\ 83$$

$P_{(TS)} = 0\ 83$

8.2.4 Probability of Loss of Life on Impact of Failure

Based on the volume of landsliding, its likely velocity when it hits the house, it is estimated that the vulnerability of a person to being killed in the house when a landslide hits is 0 3

$V_{(DT)} = 0\ 3$

8 2 5 Risk Estimation

$R_{(Lol)} = 0\ 00001 \times 0\ 7 \times 0\ 83 \times 0\ 3$
$= 0\ 00000174$

$R_{(Lol)} = 1\ 74 \times 10^{-6}$/annum **NOTE** This level of risk is **'ACCEPTABLE'**

8 3 **HAZARD TWO Qualitative Risk Assessment on Property** The steep slope above the site is separated by the road Shale bedrock outcrops in the cut batter for the road indicating the overlying unconsolidated materials are relatively shallow (Photo 10) The slope is vegetated with a ground cover of exotic weeds and some large gum trees that stand vertical The site is developed and the concrete block retaining wall and house show no evidence of movement as observed from the road (Photo 11) The likelihood of the slope failing and impacting on the property is assessed as Rare ($>10^{-5}$) The consequences to property of such a failure are assessed as 'Medium' (>20%) The risk to property is 'Low'(2×10^{-6})

8 4 **HAZARD ONE Quantitative Risk Assessment on Life**

For loss of life risk can be calculated as follows

$R_{(Lol)} = P_{(H)} \times P_{(SH)} \times P_{(TS)} \times V_{(DT)}$ (See Appendix for full explanation of terms)

8 4 1 Annual Probability

Shale bedrock outcrops indicating the overlying unconsolidated materials are relatively shallow and no signs of movement were observed from the road

$P_{(H)} = 0\ 00001$/annum

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8 4.2 Probability of Spatial Impact
The house is located below the slope
$P_{(SH)} = 0\ 7$

8 4.3 Possibility of the Location Being Occupied During Failure
The average household is taken to be occupied by 4 people It is estimated that 1 person is in the house for 20 hours a day, 7 days a week It is estimated 3 people are in the house 12hrs a day, 5 days a week
For the person most at risk
$\frac{20}{24} x \frac{7}{7} = 0\ 83$
$P_{(TS)} = 0\ 83$

8.4 4 Probability of Loss of Life on Impact of Failure
Based on the volume of landsliding, its likely velocity when it hits the house, it is estimated that the vulnerability of a person to being killed in the house when a landslide hits is 0 5
$V_{(DT)} = 0\ 5$

8 2 5 Risk Estimation

$R_{(Lol)} = 0\ 00001 \times 0\ 7 \times 0\ 83 \times 0\ 5$
$= 0\ 00000291$
$R_{(Lol)} = 2\ 91 \times 10^{-6}$/annum **NOTE** This level of risk is **'ACCEPTABLE'**

9 RISK ASSESSMENT SUMMARY

HAZARDS	Hazard One	Hazard Two
TYPE	The steep slope that rises to the road across the site failing	The steep slope that rises above the site failing and impacting on the property
LIKELIHOOD	'Rare' ($>10^{-5}$)	'Rare' ($>10^{-5}$)
CONSEQUENCES TO PROPERTY	'Medium' (>20%)	'Medium' (>20%)
RISK TO PROPERTY	'Low'(2×10^{-6})	'Low'(2×10^{-6})
RISK TO LIFE	$1\ 74 \times 10^{-6}$/annum	$2\ 91 \times 10^{-6}$/annum
COMMENTS	'Acceptable' level of risk	'Acceptable' level of risk

10 CONCLUSION

The property has an Acceptable Risk Level in accordance with the 2007 Geotechnical Risk Management Policy for Pittwater

JACK HODGSON CONSULTANTS PTY LIMITED

Ben White M.Sc Geol ,
AusIMM , CP GEOL
No. 222757
Engineering Geologist

Photo 1

Photo 2

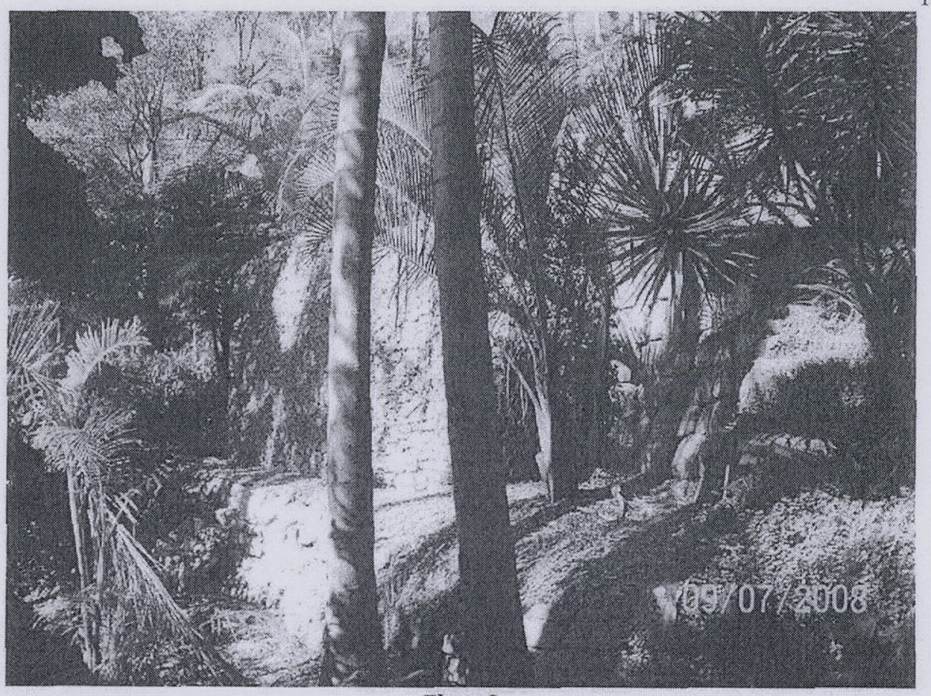

Photo 3

Photo 4

Photo 5

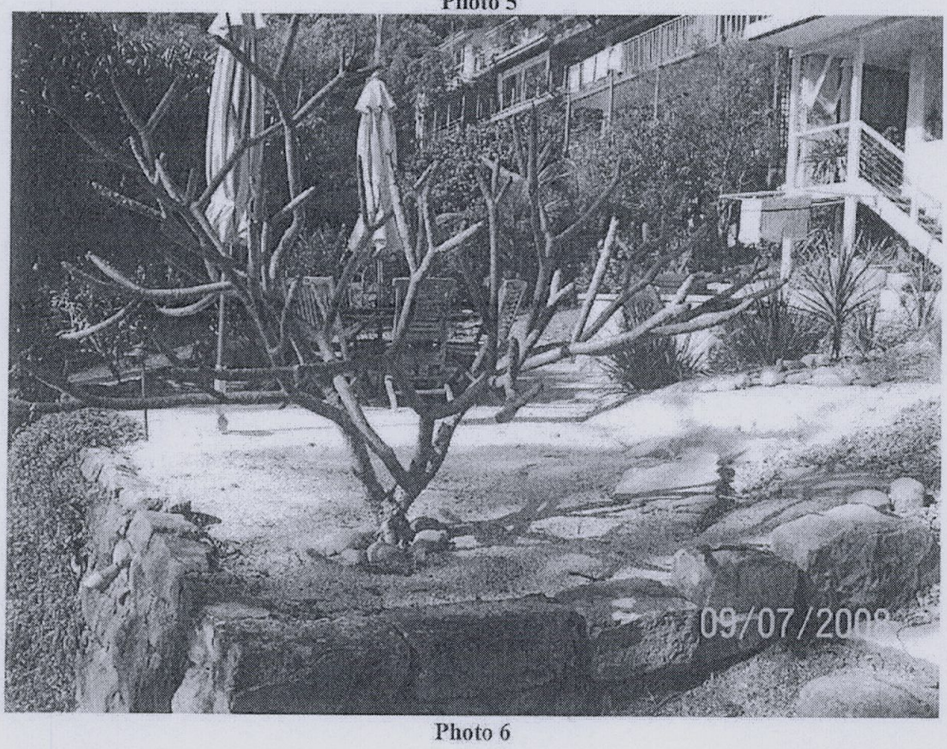

Photo 6

Photo 7

Photo 8

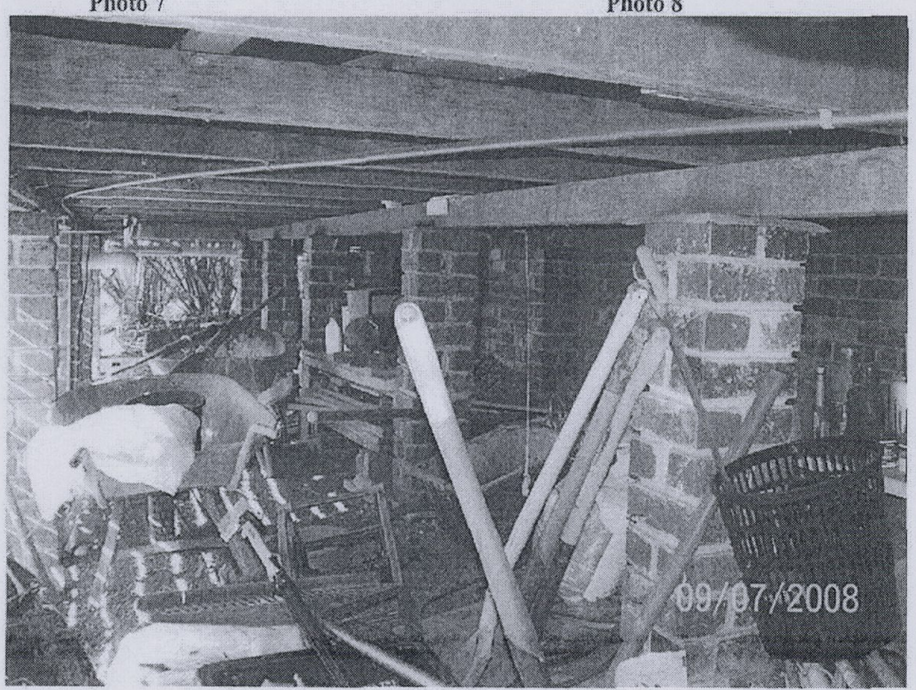

Photo 9

Photo 10

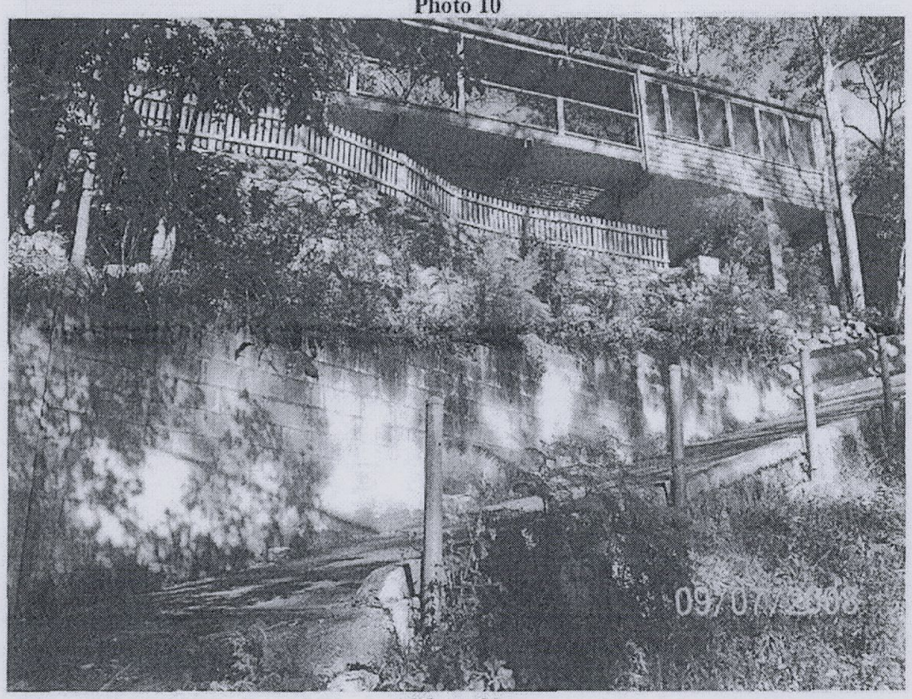

Photo 11

7 RISK ESTIMATION

7.1 QUANTITATIVE RISK ESTIMATION

Quantitative risk estimation involves integration of the frequency analysis and the consequences.

For property, the risk can be calculated from:

$$R_{(Prop)} = P_{(H)} \times P_{(S:H)} \times P_{(T:S)} \times V_{(Prop:S)} \times E \quad (1)$$

Where

$R_{(Prop)}$ is the risk (annual loss of property value).

$P_{(H)}$ is the annual probability of the landslide.

$P_{(S:H)}$ is the probability of spatial impact by the landslide on the property, taking into account the travel distance and travel direction.

$P_{(T:S)}$ is the temporal spatial probability. For houses and other buildings $P_{(T:S)} = 1.0$. For Vehicles and other moving elements at risk $1.0 < P_{(T:S)} > 0$.

$V_{(Prop:S)}$ is the vulnerability of the property to the spatial impact (proportion of property value lost).

E is the element at risk (e.g. the value or net present value of the property).

For loss of life, the individual risk can be calculated from:

$$R_{(LoL)} = P_{(H)} \times P_{(S:H)} \times P_{(T:S)} \times V_{(D:T)} \quad (2)$$

Where

$R_{(LoL)}$ is the risk (annual probability of loss of life (death) of an individual).

$P_{(H)}$ is the annual probability of the landslide.

$P_{(S:H)}$ is the probability of spatial impact of the landslide impacting a building (location) taking into account the travel distance and travel direction given the event.

$P_{(T:S)}$ is the temporal spatial probability (e.g. of the building or location being occupied by the individual) given the spatial impact and allowing for the possibility of evacuation given there is warning of the landslide occurrence.

$V_{(D:T)}$ is the vulnerability of the individual (probability of loss of life of the individual given the impact).

A full risk analysis involves consideration of all landslide hazards for the site (e.g. large, deep seated landsliding, smaller slides, boulder falls, debris flows) and all the elements at risk.