Coastal Hazards

Mitigating the Impact of Natural Hazards through Land Use Planning

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http://www.dpac.tas.gov.au/divisions/local_government/osem/mitigating_natural_hazards

Agenda

10am – 11am	The journey thus far
	• Purpose and timelines
	• Framework for the mitigation of natural hazards though land use planning and building control
	• Context
11am – 12.30 pm	Coastal erosion
12.30 pm- 1.30pm	Lunch
1 .30 pm – 3 pm	Coastal inundation

Timelines – coastal hazards

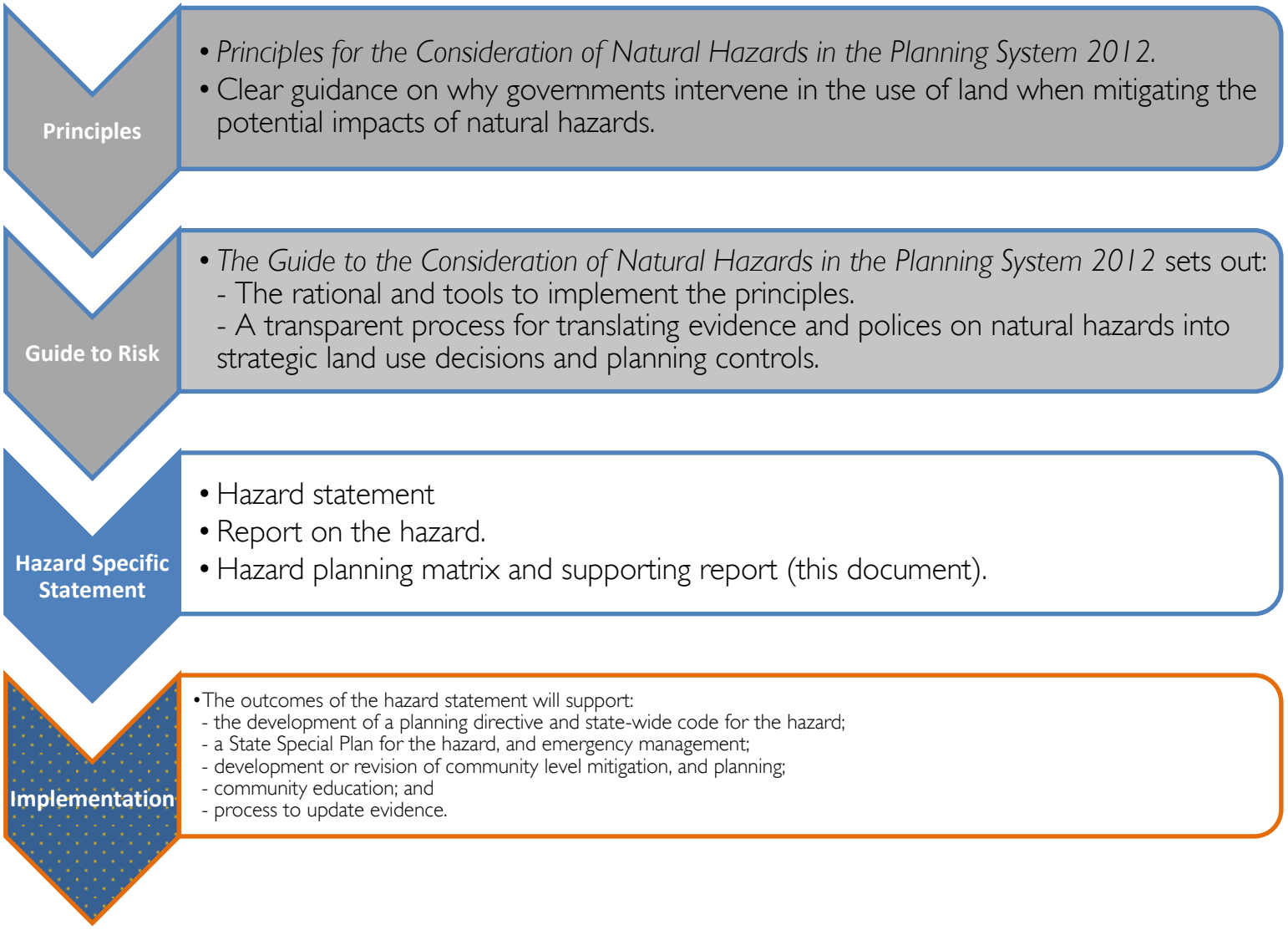
Task	Outcome	Date
Coastal inundation stage 2 - tendering process	*Project awarded to Blue Wren Consulting (UTAS)*	*April 2012*
Coastal erosion tendering process	*Project awarded to Chris Sharples (UTAS)*	*October 2012*
Coastal inundation project completion	*Handover of final report and mapping*	*October 2012*
Information session	*Briefing on the landslide planning matrix.* *Launch of the climate change allowance and the coastal inundation data for Tasmania.*	*October 2012*
Coastal erosion draft report and data	Handover of draft coastal erosion data and mapping	March 2013
Workshop 1	**Agreement on how to develop the hazard planning bands** **Develop the control level statements** **Develop strategic planning level statement**	**March 2013 (deferred from January 2013)**
Review of mapping	Finalise draft hazard bands	March – April 2013
Workshop 2	Draft planning matrix	April - May 2013
Report and mapping preparation	Finalise the draft report and mapping out for consultation	May - June 2013
Review period	Mapping and reports provided to all State and Local Government, Industry Bodies, government authorities for review and comment	August 2013

Purpose

to mitigate the impacts of natural hazards by encouraging responsible land use and development

Principles and methods

Framework for the mitigation of natural hazards in the planning system

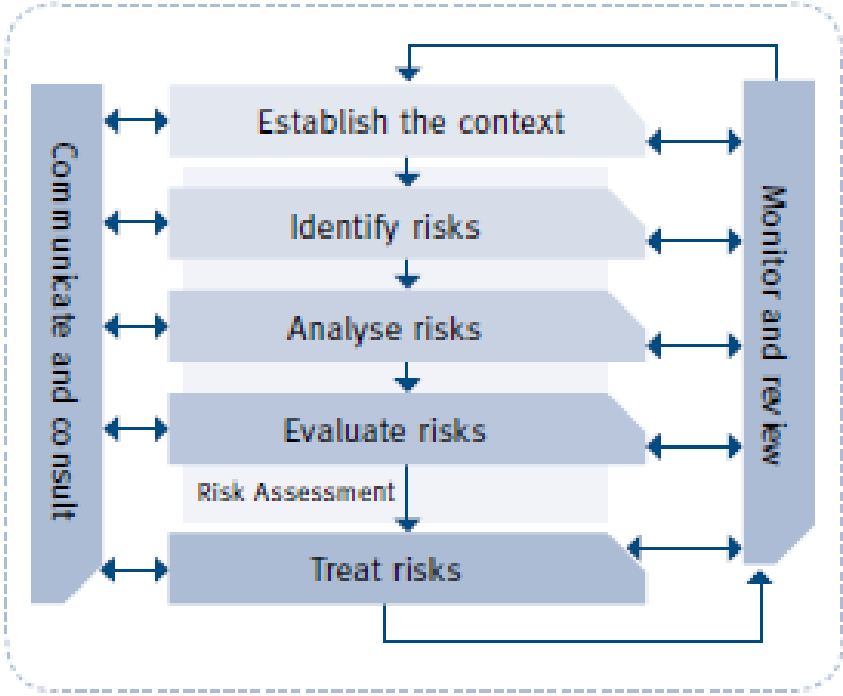


WHY PLAN FOR NATURAL HAZARDS - PRINCIPLES

1. Private risks associated with natural hazards are the responsibility of individuals and business.
2. **Governments should encourage public and private risks to be factored into investment decisions.**
3. Governments can support individuals to understand and manage private risks through the collection of evidence, provision of information, and facilitation of collective action.
4. **Governments should ensure that private investment minimises unacceptable public risk.**
5. Governments should minimise investment, regulation, zoning, or policy that gives rise to unacceptable public or private risks.
6. **Government should have regard to, and support individuals or business to consider how relevant risks may change in to the future, including through climate change.**

Risk based planning - An overview

Regulation of land through land use plans is about **future;** hazard events, land use and development – it does not address our existing exposure to the hazard.



Risk = Likelihood and Consequence

Likelihood = How often do hazard events occur?

(Evidence or Proxy)

Consequence = What will be the impact?

(Evidence or 'Use and development importance by design working life')

Implementing risk based planning?

Do we have enough information to calculate risk for each hazard - summary table of test below

"Risk" Approach	Available information	Examples of outcomes and tasks
Risk assessment	Written definition of the hazard Hazard susceptibility Event magnitude and likelihood Consequence identified for use and developments High level of certainty	Risk based zoning and banding within zones with a banding in a zone guiding different types of use. Risk based consents Use classes for different levels of risk
Precautionary	Written definition of the hazard Hazard susceptibility Lack of information to calculate risk Greater levels of uncertainty	As low as reasonably possible (ALARP) and emergency management Use classes for different levels of risk
Hazard Treatment	Mix of above – based on the best available information	Consultation, public participating in developing policy, conflict resolution, assumptions of likelihood and consequence
Emergency response	Little or no knowledge of the hazard, high levels of uncertainty	Emergency response / recovery / insurance

Guide – The Context:

"a legitimate role of governments is to protect public value by making judgements regarding risk, even in the absence of detailed risk information."

"measures can be developed through active engagement with stakeholders to ensure that they reflect community attitudes towards risk and tolerance to risks" (Pge 4)

Likelihood:

Three approaches to assessing likelihood:

- Modelled Event (eg. flood) – ARI or AEP
  - Trigger event is known and link to hazard is predictable
- Areas of Hazard Susceptibility (eg. landslide) - zones
  - Preconditions for a hazard event are reasonably well known but links between the trigger and event are difficult to generally predict.
- Exposure to a reference event (eg. fire) – dynamically defined hazard areas
  - Used when preconditions for a hazard event are either not known or dynamic.

Consequence:

"policy judgements regarding how to assume consequence for the purposes of assessing the appropriate use of land through the land use planning system".

- May be assumed for low level hazards
- Assessed on a site basis for areas of significant exposure to hazards of high magnitude
- Stepped application of the precautionary principle

Risk Tolerance:

Acceptable risk (or negligible risk), as defined by the Australian Geomechanics Society (AGS), is *...a risk, for the purposes of life or work, society is prepared to accept as it is with no regards to its management. Society does not generally consider expenditure in further reducing such risks justifiable.*

Risk Tolerance:

Intolerable risks are those risks that are considered unreasonable having regard to the likely costs to the public and to the individual. Theoretically, everywhere outside of areas of acceptable risk are areas of intolerable risk.

Risk Tolerance:

Tolerable risk is ...*a risk within a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if possible (AGS: 2007)*

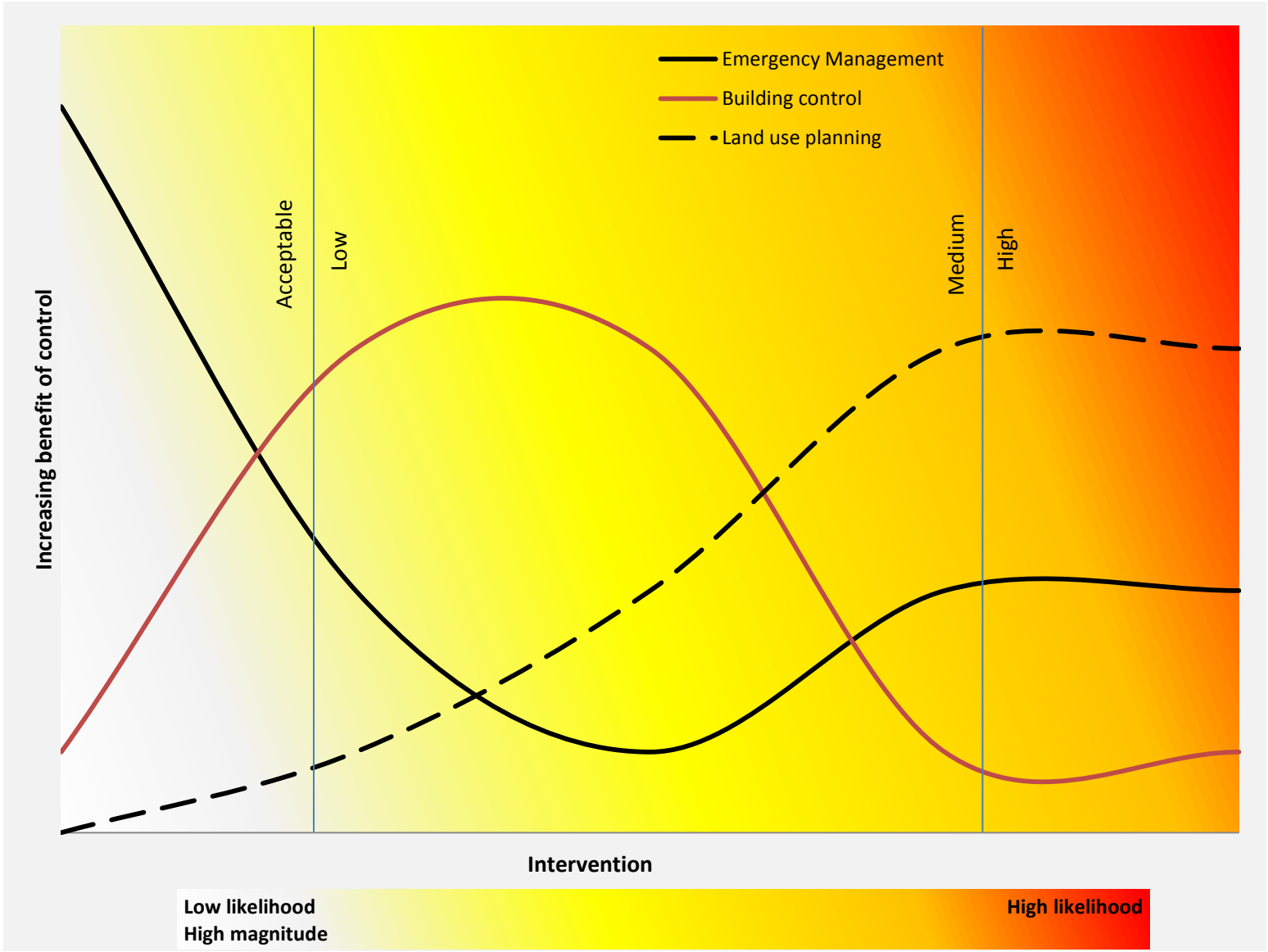
Risk Tolerance: tolerable v intolerable

Defined through engagement with stakeholders.

Can be quantified only in some instances. Policy judgements in others.

Core role of Governments to make these judgements on behalf of the community

Balancing the Private (principle 1) and Public (principle 4) Risk



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Hazard Bands (Likelihood)

Acceptable

- hazard does not apply at all to the area, or with such low frequency as not to be considered as a matter that needs to be addressed.

Low

- frequency is low enough, or the magnitude when it does occur is low enough, that it might be experienced by a significant portion of the community without concern.

Hazard Bands (Likelihood)

Medium

- likelihood is such that when it does occur the impact could be regarded as significant.

High

- frequent or severe in that it creates the conditions not normally considered as being manageable or tolerable without exceptional measures.

Hazard Bands (Likelihood) - Boundaries

- Acceptable to low: point at which risks can no longer be managed solely through non-planning measures.
- Low to medium: point at which development controls (e.g. siting and building controls) are not adequate to mitigate risks.
- Medium to high: point at which it can be presumed that use and development should not be located in the area.

Using Hazard Bands to Guide Use and Development control – hazard

- **Control Level**
  - See example consequence statements, what is the balance between emergency management, land use planning, and building control
- **Strategic Planning Level**
  - Should the area be avoided through settlement planning, zoning or regional strategies
- **Use or Development Controls**
  - Direct guidance for acceptable solutions or performance criteria in a code
  - Life controls on use and developments?

Landslide planning matrix

Process thus far

Regional workshops (April – May 2012)	Launceston, Burnie, and Hobart
	36 participants , plus MRT and DPAC
	Representatives from local government (elected, planners, and emergency management coordinators), state government, and industry
	Minutes released for comment from participants
Follow up workshop (June 2012)	MRT, DPAC, Regional planners, state government, and industry
	14 participants
	Minutes released for comment from participants
Request for comment (August 2012)	Councils, Government Departments, industry bodies
	The method we have used
	Are the landslide controls reasonable?
	Other issues you may see with the approach

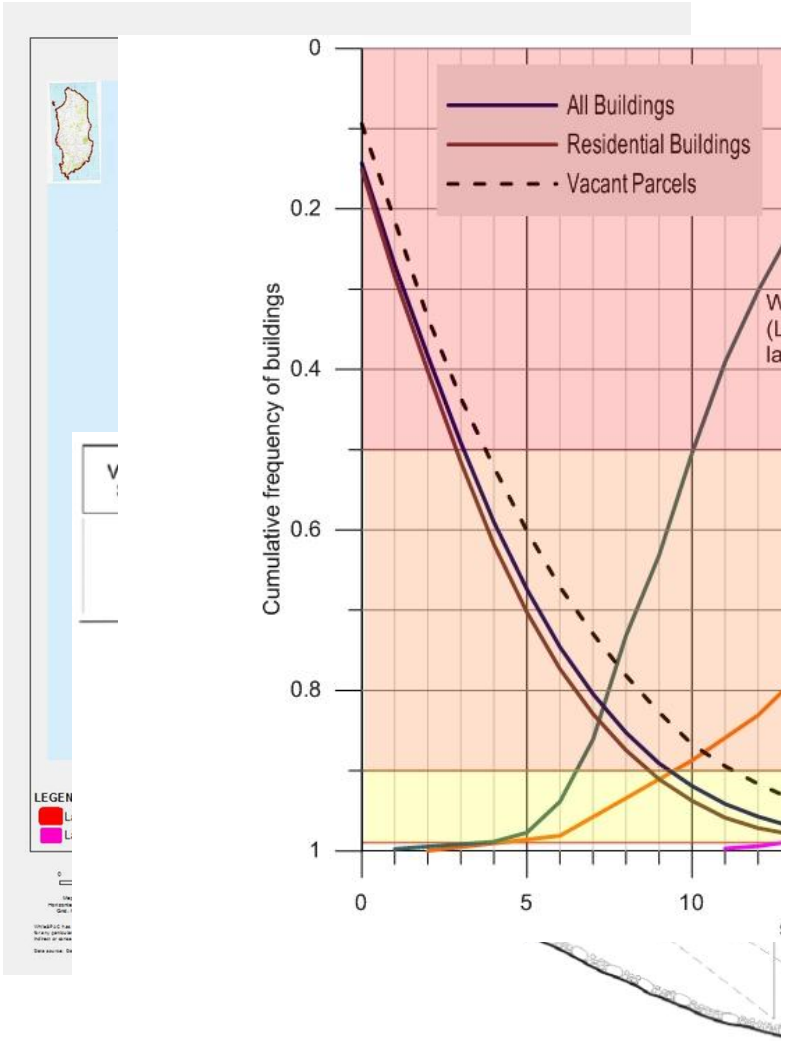
Our current approaches to landslide.

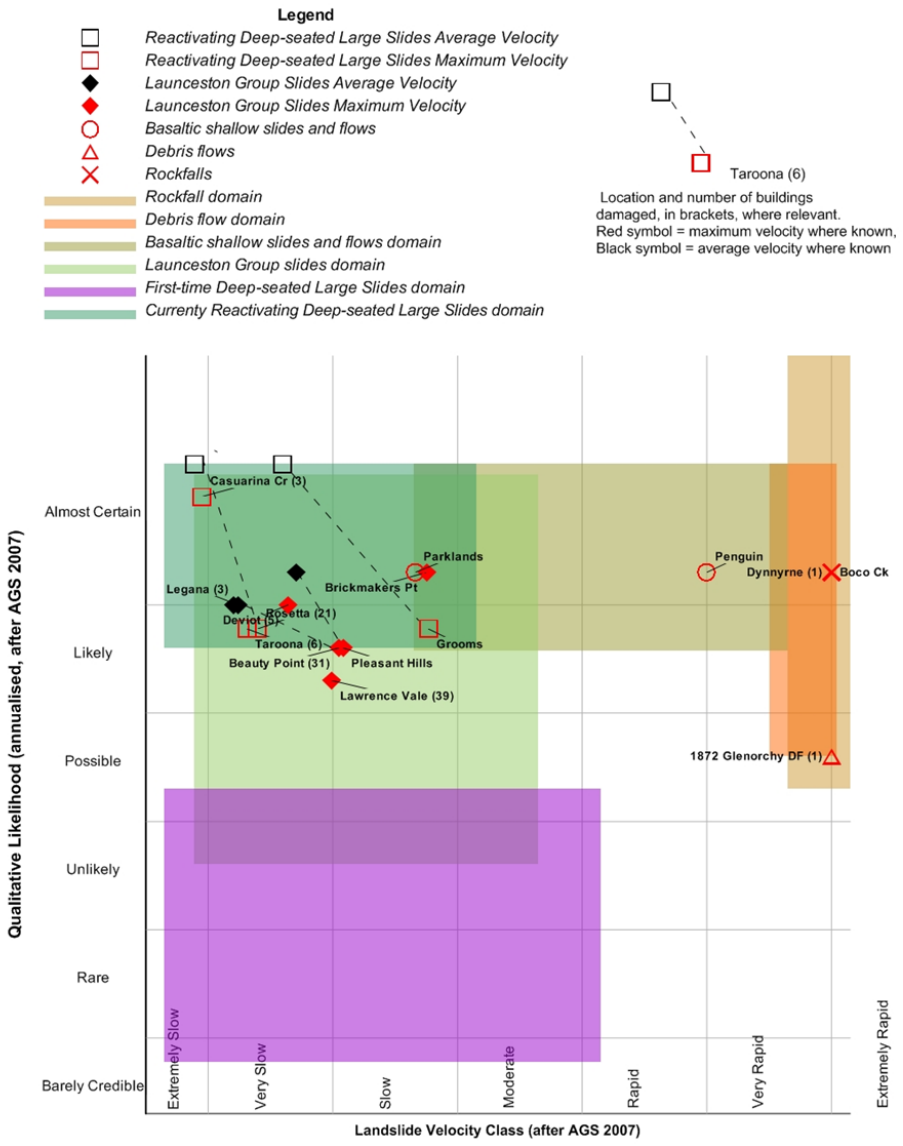
The regional workshops highlighted the following items:

- A lack of guidance from the State Government landslide.
- A highly varied approach to managing landslide hazard between and within councils.
- That existing landslide mapping while useful is difficult to interpret and apply.

3 : Preferred approach to mapping landslide

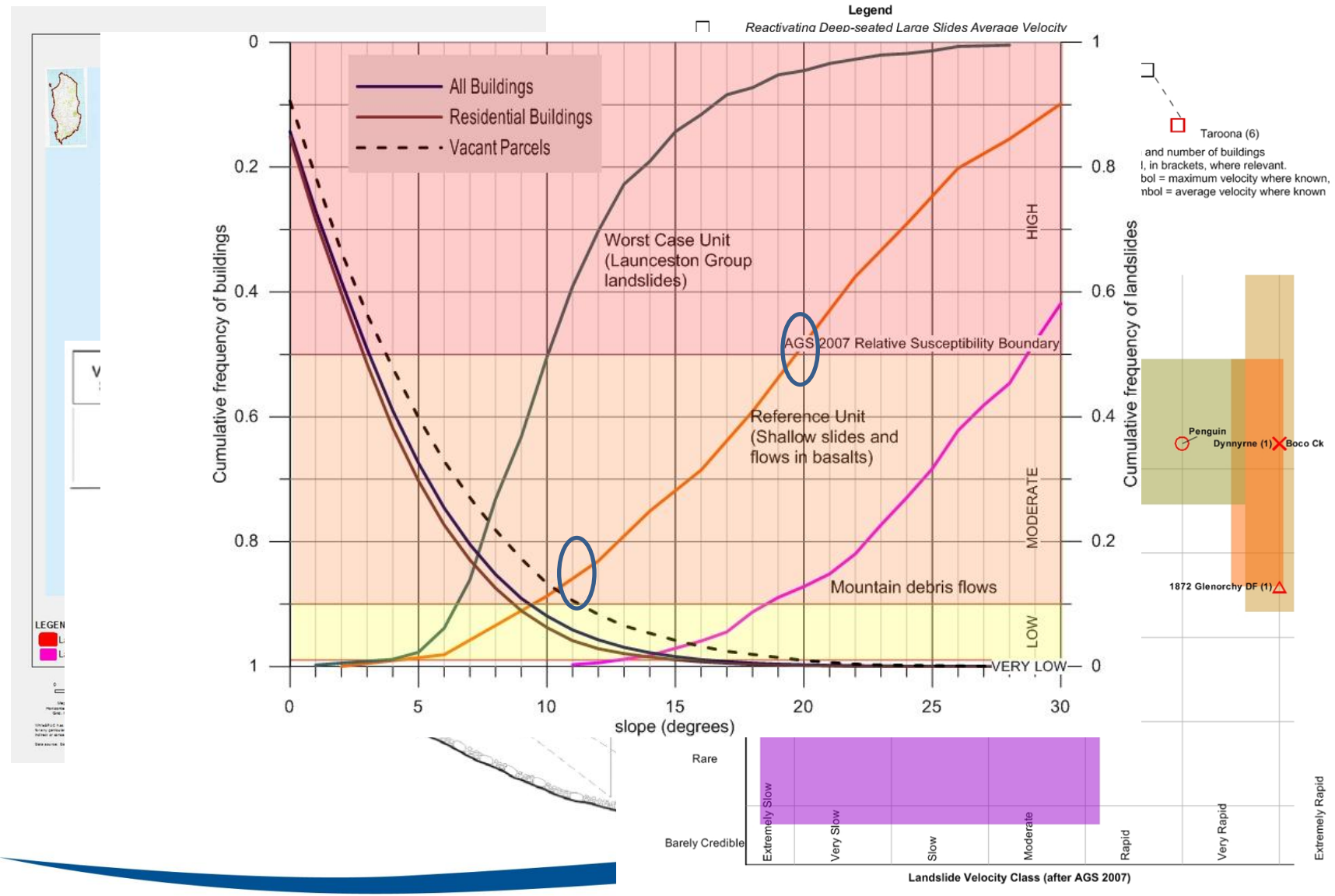
Approach to landslide mapping	Weakness	Strength
Option 1 – Basic (slope) susceptibility	Needs a catch all clauses to developments in non-susceptible areas to be called in for assessment. Too broad in its application. Difficult to set a slope threshold that will capture all know landslip areas and not be too onerous.	Simple and straight forward. The default position. Precautionary, Conservative. Transparent.
Option 2 – Intermediate (slope and geology) susceptibility	Geology mapping is too crude outside of 1:25k geology mapping areas.	Well established in Hobart. Relatively simple and transparent. Allows the likely failure angle for each type of geology to be applied.
Option 3 - Intermediate (slope and geology) susceptibility, Basic (slope) susceptibility, and known landslides	Intermediate susceptibility mapping is only located over a small area of the state. Current system is not well set up to allow updates to the mapping. Intermediate susceptibility mapping is only located the majority of areas in the North West. Boundary of bands will be an issue. It will take up to a year to deliver the final overlay. Perception of inaccurate mapping at the boundaries for basic and intermediate susceptibility mapping.	Based on the advice of MRT. Intermediate susceptibility mapping covers 80% of the populated areas. Users our current knowledge, and AGS standards. Intermediate susceptibility mapping identifies areas with little to no potential exposure to landslide. Increased confidence in the mapping.





Understanding the mapping - Pairwise

Chart of qualitative likelihood vs velocity for major landslide types in Tasmania, with indication of damage to buildings. The x-axis provides a proxy to the probable destructive significance figure of AGS 2007, but suprisingly most of the damage to buildings in Tasmania are in the second lowest category (Very Slow) contrary to the consequence description. The symbols provide our known control on the expected behaviour of each landslide type. Note that much of the damage recorded in the state is associated with reactivations of existing landslides.



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Y is 1000 N is 1 = is 100	Proclaimed "Landslip A areas"	Proclaimed "Landslip B areas"	Statewide slopes (25m DEM and LiDAR) 0-11deg	Statewide slopes (25m DEM and LiDAR) 11-20deg	Statewide slopes (25m DEM and LiDAR) >20deg	Rockfall susceptibility source + runout area 34deg
Proclaimed "Landslip A areas"		X	X	X	X	X
Proclaimed "Landslip B areas"	X		1000	1000	1000	1000
Statewide slopes (25m DEM and LiDAR) 0-11deg	1	X		1000	1000	1000
Statewide slopes (25m DEM and LiDAR) 11-20deg	1	1	X		1	1
Statewide slopes (25m DEM and LiDAR) >20deg	1	1	1000	X		1000
Rockfall susceptibility source + runout area 34deg	1	1	1000	1000	X	
Rockfall susceptibility runout area 30deg	1	1	1000	1	1	X
Shallow slide + flow susceptibility source-high	1	1	1000	1	1	1
Shallow slide + flow susceptibility source-moderate	1	1	1000	1000	100	100
Shallow slide + flow susceptibility source-low	1	1	1000	100	1	100
Debris flow susceptibility Mountain source + runout >30 Q1	1	1	1000	1	1	1
Debris flow susceptibility Mountain runout 30-26 Q2	1	1	1000	1000	1	1000
Debris flow susceptibility Mountain runout 26-22 Q3	1	1	1000	1000	1	1000
Debris flow susceptibility Mountain runout 22 - 12 Q4a	1	1	1000	1000	1	100
Debris flow susceptibility Mountain runout - dam-burst	1	1	1000	1	1	100
Deep-seated slide susceptibility (source-runout-regression)	1	1	1000	1	1	1
Launceston Group slide susceptibility (large and small)	1	1	1000	1000	1	1
Mapped slides - deep-seated/Launc. Gp, recently active	1	1	1000	1000	100	1000
Mapped slides - deep-seated/Launc. Gp, activity unknown	1	1	1000	1000	1000	1000
Mapped slides - other slides/flows, recently active	1	1	1000	1000	1000	1
Mapped slides - other slides/flows, activity unknown	1	1	1000	1000	1	1
Column Totals	19	18	18000	12105	4212	7407

Pairwise assessment – what is the r

Landslide Component	Assessment 1	Assessment 2	Average
Proclaimed "Landslip A areas"	20	119	69.5
Proclaimed "Landslip B areas"	1019	1217	1118
Mapped slides - deep-seated/Launc. Gp, recently active	2018	1316	1667
Mapped slides - other slides/flows, recently active	6113	416	3264.5
Launceston Group slide susceptibility (large and small)	4313	4115	4214
Shallow slide + flow susceptibility source-high	9506	2315	5910.5
Debris flow susceptibility Mountain source + runout >30 Q1	8012	6212	7112
Mapped slides - deep-seated/Launc. Gp, activity unknown	4016	10406	7211
Rockfall susceptibility source + runout area 34deg	8408	6311	7359.5
Remaining areas susceptibility > 20 degrees	4214	10505	7359.5
Debris flow susceptibility Mountain runout 30-26 Q2	9011	7211	8111
Mapped slides - other slides/flows, activity unknown	7112	11504	9308
Shallow slide + flow susceptibility source-moderate	12305	6410	9357.5
Debris flow susceptibility Mountain runout 26-22 Q3	10208	10505	10356.5
Rockfall susceptibility runout area 30deg	13304	10604	11954
Debris flow susceptibility Mountain runout 22 - 12 Q4a	13304	11603	12453.5
Hobart-Glenorchy deep-seated slide susceptibility (Rosetta scenario)	-	13305	13305
Remaining areas susceptibility 11-20deg	13106	14303	13704.5
Shallow slide + flow susceptibility source-low	17003	12503	14753
Debris flow susceptibility Mountain runout - dam-burst	18002	18101	18051.5
North West deep-seated slide susceptibility (source-runout-regression)	19001	19100	19050.5
Remaining areas susceptibility 0-11deg	20000	18200	19100
Very low to no susceptibility	20000	20000	20000

Understanding the mapping - Pairwise

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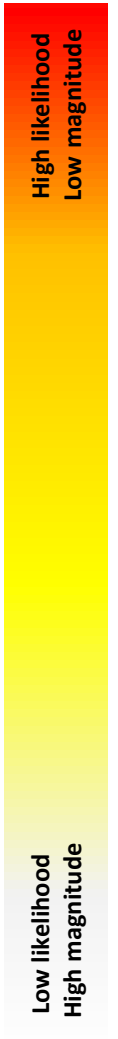
Classifying the features

Landslide Component	Average	Landslide planning band
Proclaimed "Landslip A areas"	69.5	High
Mapped slides - deep-seated/Launc. Gp, recently active	1667	Medium - Active
Mapped slides - other slides/flows, recently active	3264.5	Medium – Active
Proclaimed "Landslip B areas"	1118	Medium
Launceston Group slide susceptibility (large and small)	4214	Medium
Shallow slide + flow susceptibility source-high	5910.5	Medium
Debris flow susceptibility Mountain source + runout >30 Q1	7112	Medium
Mapped slides - deep-seated/Launc. Gp, activity unknown	7211	Medium
Rockfall susceptibility source + runout area 34deg	7359.5	Medium
Remaining areas slopes >20deg	7359.5	Medium
Debris flow susceptibility Mountain runout 30-26 Q2	8111	Medium
Mapped slides - other slides/flows, activity unknown	9308	Low
Shallow slide + flow susceptibility source-moderate	9357.5	Low
Debris flow susceptibility Mountain runout 26-22 Q3	10356.5	Low
Rockfall susceptibility runout area 30deg	11954	Low
Debris flow susceptibility Mountain runout 22 - 12 Q4a	12453.5	Low
Hobart-Glenorchy deep-seated slide susceptibility (Rosetta scenario)	13305	Low
Remaining areas slopes 11-20deg	13704.5	Low
Shallow slide + flow susceptibility source-low	14753	Acceptable
Debris flow susceptibility Mountain runout - dam-burst	18051.5	Acceptable
Deep-seated slide susceptibility (source-runout-regression)	19050.5	Acceptable
Remaining areas slopes 0-11deg	19100	Acceptable
Very low to no susceptibility	20000	Acceptable



What is the consequence?

Paper Size A3

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: MGA55

Landslide_planning_map_20120911

Proposed_Band

Acceptable

Low

Medium

Medium-High

High

Project Name: Landslide planning matrix and map Revision A

Date 15 Nov 2012

Landslide (medium-high band)
Taroona

Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: eGA94

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Proposed_Band

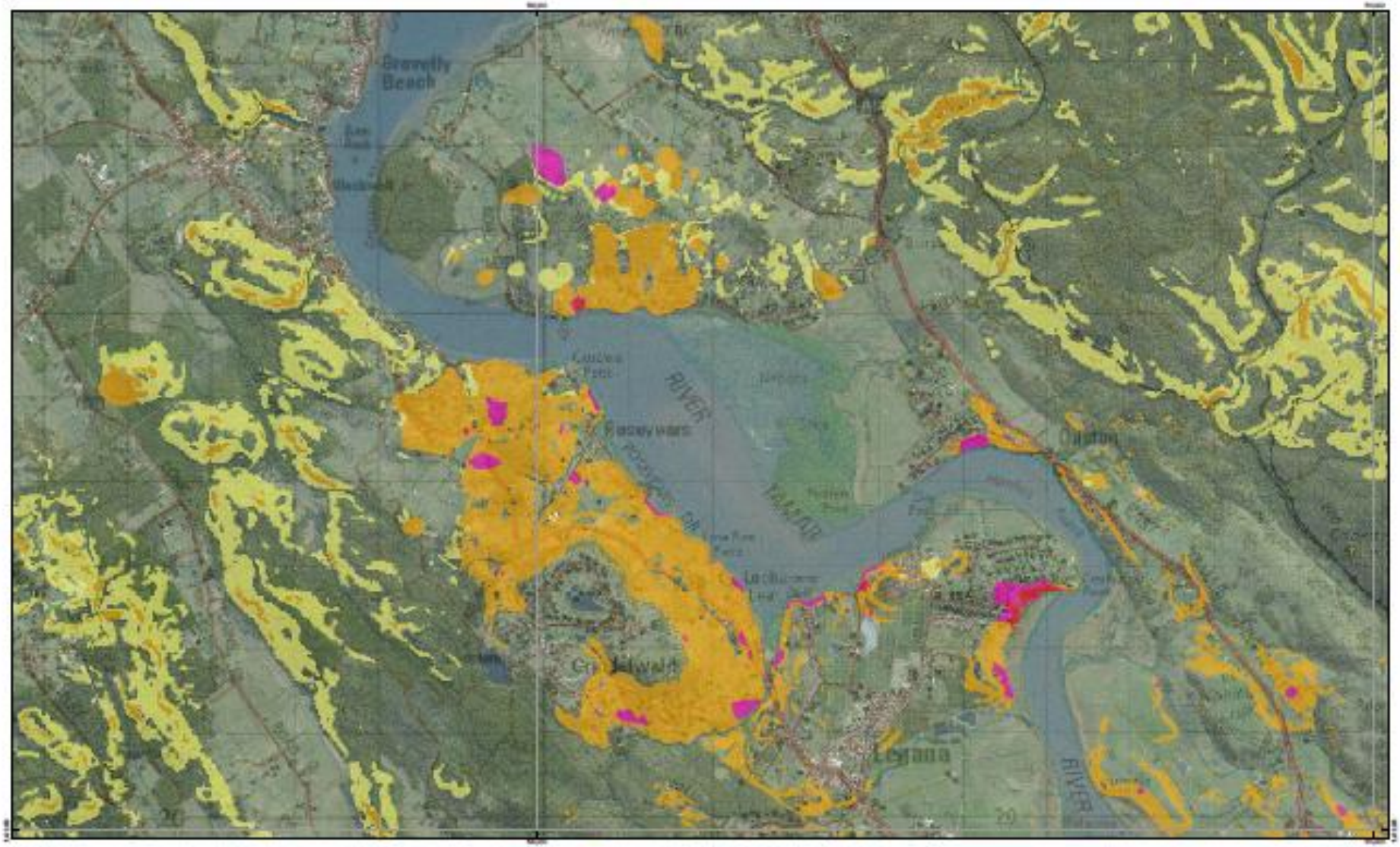
- Acceptable
- Low
- Medium
- Medium-High
- High

Project Name: Landslide planning matrix and map

Revision A

Date 15 Nov 2012

Landslide (medium-high band)
Penguin



Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: mGA56

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Landslide_planning_map_20120911

Proposed_Band

Acceptable

Low

Medium

Medium-High

High

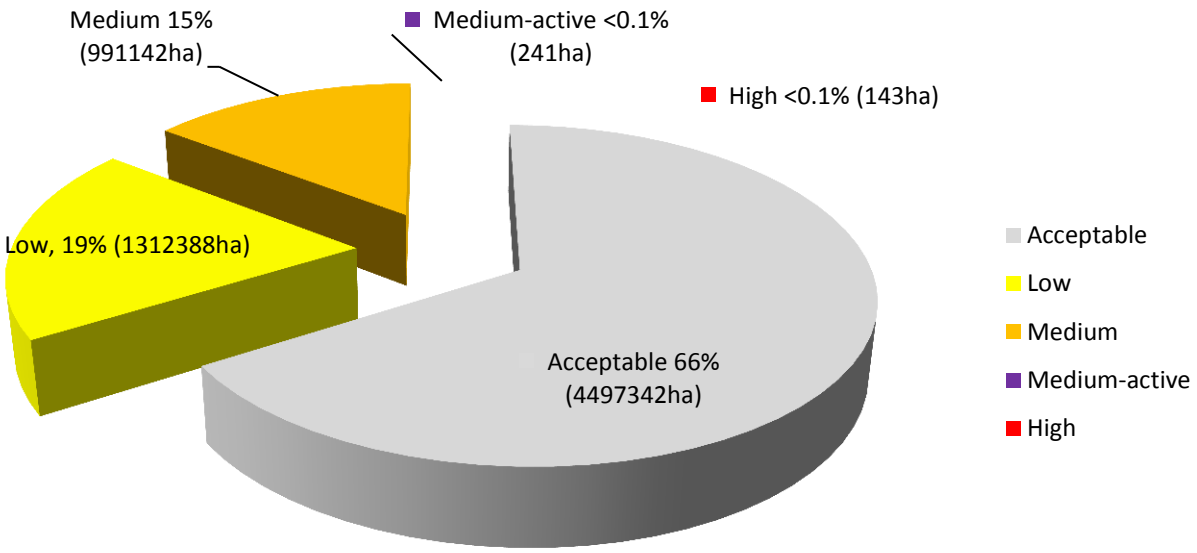
Project Name: Landslide planning matrix and map

Revision A

Date 15 Nov 2012

Landslide (medium-high band)
Legana - Rosevears

Landslide planning bands by area – State



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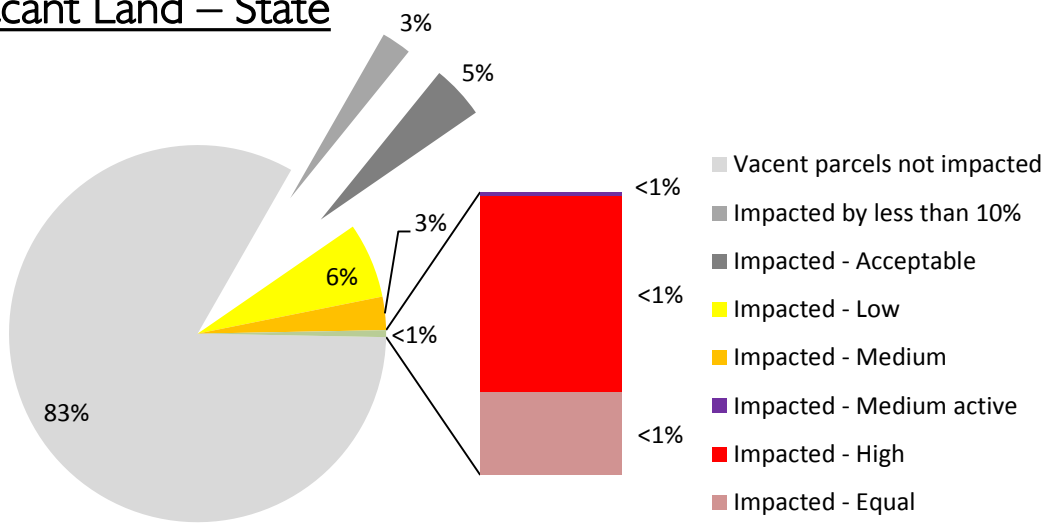
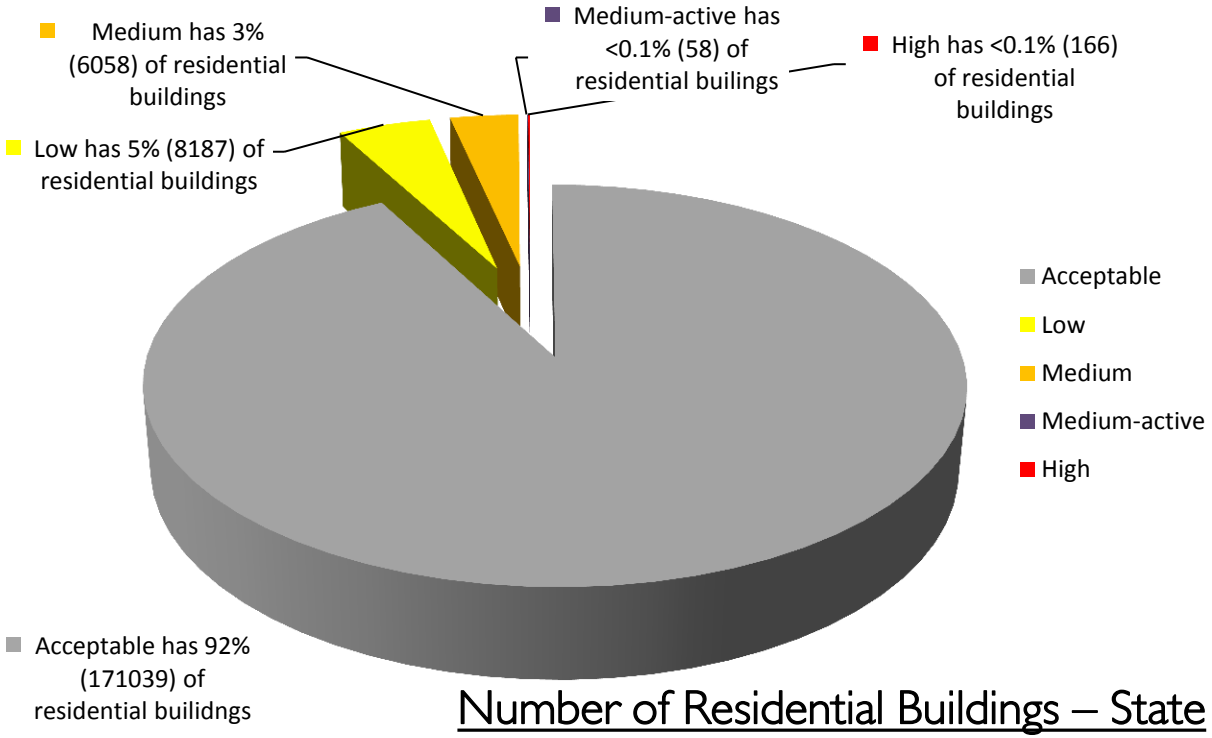
Vacant Land – State





Number of Residential Buildings – State

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Landslide planning matrix

Acceptable Band	White or clear on the landslide hazard map.
Hazard exposure	A landslide is a rare event in this area based on current understanding of the hazard, but it may occur in some exceptional circumstances.
Control Level	Development and use is not subject to landslide controls.
Strategic Planning	No impacts on land use strategies or change to zoning required.
Guidance on Use Standards	No hazard specific controls. No controls are required to bring the use into an acceptable risk level.
Guidance on Development Standards	No hazard specific controls. No controls are required to bring the development into an acceptable risk level.

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Low Band

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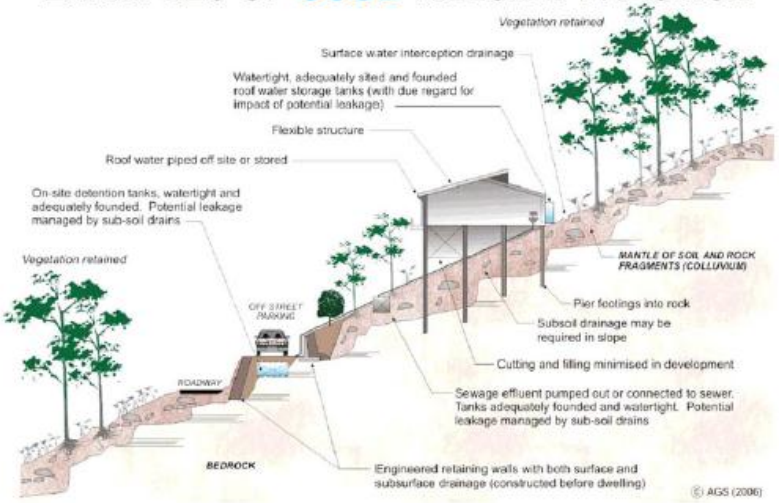
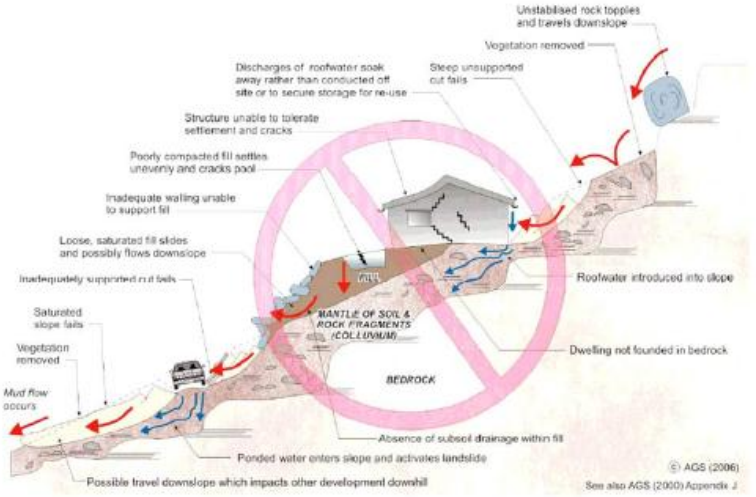
ENGINEERS AUSTRALIA

ISSN 0818-9110

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE



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Medium Band	Orange on the landslide hazard map.
Hazard exposure	The area has known landslide features, or is within an landslide susceptibility zone, or has legislated controls to limit disturbance of adjacent unstable areas.
Control Level	Planning controls are necessary for all use and development to ensure that risks are tolerable (as recommended by AGS 2007a). Any vulnerable or hazardous use will only be allowed in exceptional circumstances.
Strategic Planning	Where there is no compelling reason to include land identified in this band for development, it should be zoned for open space, rural, or environmental purposes. Compelling reasons may include that it is an existing residential area, and further development will be infill. Alternatively, a landslide risk assessment may be required to demonstrate that a proposed zoning is reasonable and avoids areas of high or very high risk.
Guidance on Use Standards	Development in declared Landslip B areas is controlled under Part 10, Division 1 of the *Building Act 2000* and by Part 2, Division 1 of the Building Regulations 2004. **Residential and other use and occasional or temporary use** in existing residential areas are permitted (no permit required), however the rezoning of areas for residential use should only be considered subject to a Landslide Risk Report that avoids high or very high risk areas. **Vulnerable and hazardous use**s are discretionary subject to the completion of a Landslide Risk Report that demonstrates how the risk with be made tolerable. **Post–disaster and catastrophic risk based use** are discouraged ; however, if there is an overriding community benefit or an exceptional circumstance they may be allowed as an exceptional use subject to the completion of Landslide Risk Report that demonstrate how the use will achieve a tolerable risk.
Guidance on Development standards	**Ancillary structures** do not have landslide specific controls **Minor extensions** will be considered a Problem (P) site for landslide under AS2870 unless considered otherwise by a Geotechnical Engineer or a Engineering Geologists. **Infill/ new buildings, habitable buildings and large extensions, and minor utilities** floor area of less than 200 m^2 should be considered a Problem (P) site for landslide under AS2870 unless considered otherwise by a Geotechnical Engineer or an Engineering Geologists. Infill and works with a final floor area over 200m^2 should complete a Landslide Risk Report that shows how the development will achieve a tolerable risk level. **Swimming pools and non-domestic water tanks, major subdivision and major works** are discretionary subject to the completion of a Landslide Risk Report demonstrating how the subdivision will achieve tolerable risk.

Medium Active Band	Violet on the landslide hazard map.
Hazard exposure	The area has known recently active landslide features.
Control Level	Planning controls are necessary for all use and development to ensure that risks are tolerable (ABCB 2006 Landslide Hazards – Handbook for good hillside construction). Any vulnerable and hazardous uses or Post –disaster and catastrophic risk based uses are prohibited.
Strategic Planning	Where there is no compelling reason to include land identified in this band for development, it should be zoned for open space, rural, or environmental purposes. Compelling reason may include it is an existing residential area however a Landslide Risk Report will be required for all use and development except occasional and temporary use or ancillary structures. A Landslide Risk Report should consider the whole landslide and be completed to the satisfaction of the council.
Guidance on Use Standards	Minor uses are permitted. Residential use in existing residential areas are permitted, however the rezoning of areas for residential use should only be considered subject to a Landslide Risk Report that demonstrate how the rezoning will achieve a tolerable risk. Vulnerable and hazardous uses, and Post–disaster and catastrophic risk based use are generally prohibited; however, if there is an overriding community benefit or an exceptional circumstance they may be allowed as an exceptional use subject to the completion of a Landslide Risk Report.
Guidance on Development standards	Extensions, Infill and Works should be subject to Landslide Risk Report that guides the form of the development, and demonstrates how the development meets a tolerable level of. Sub-divisions are subject to the completion of a Landslide Risk Report that demonstrate how the subdivision will achieve a tolerable risk.

High Band	Red on the landslide hazard map.
Hazard exposure	The site is within a declared Landslip A area.
Control Level	All use and development would require significant investigation and an engineered solution to mitigate the natural hazard and enable the development to achieve and maintain a tolerable level of risk, however, the mitigation measures may never achieve comprehensive levels of security and safety.
Strategic Planning	Strategies should discourage all development except vital community infrastructure that cannot be reasonably located elsewhere. Strategies must indicate appropriate zoning and overlays to provide a clear message to the public and the drafters of local government planning schemes to ensure use and development is generally prohibited except under special circumstances.
Guidance on Use Standards	All use may only be undertaken in accordance with controls under Part 10, Division 1 of the *Building Act 2000* and by Part 2, Division 1 of the Building Regulations 2004
Guidance on Development Standards	All development may only be undertaken in accordance with controls under Part 10, Division 1 of the *Building Act 2000* and by Part 2, Division 1 of the Building Regulations 2004