Southern Tasmania Regional Land Use Strategy

Background Report No.6: Land Hazards

March 2011

This document is detailed supporting information for the Regional Land Use Strategy for Southern Tasmania.

Please visit www.stca.tas.gov.au or telephone the Southern Tasmanian Councils Authority on
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Acknowledgements

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1. Introduction

1.1 What is a Hazard?

Natural hazards are essentially meteorological and/or geological phenomena that have the potential to create emergency or disaster situations for communities and the environment. The consequences of natural disasters cost governments, individuals and the community in terms of personal tragedy, financial and economic loss, environmental damage, loss of social amenity and damage to or loss of infrastructure. Losses and costs may be magnified if these events repeatedly affect the same areas (Emergency Management Australia 2002: 3)

Many hazards are naturally occurring events, and may only be described as hazards due to their potential impact on life or property. For example, flooding of a remote and unsettled area may not be considered a hazard as there may not be any potential for harm to life or property.

Conversely, if that area contained settlements or infrastructure that may be potentially harmed, the same event is likely to be considered a hazard.

1.2 Planning Approach

While the circumstances that give rise to extreme natural phenomena are often beyond human control, there are ways that communities can plan and behave to prevent or mitigate the consequences of extreme events.

Contemporary approaches to emergency management in Australia consider measures to reduce the impact of natural disasters in terms of prevention and mitigation of, preparation for, response to and recovery from natural disasters. A comprehensive approach to emergency management incorporates all of these elements; however it is clear that prevention of impacts to life and property by natural hazards reduces the demands on government, community and individuals. Land use planning, which takes into account natural hazards and risks, has been identified as the single most important mitigation measure in preventing future disaster losses in areas of new development (Council of Australian Governments 2002: 17).

Effective land use planning is therefore a critical component of any strategy to reduce exposure to natural disasters in the medium to long term. The obligations under the planning system to work towards the objective of sustainable development, which includes securing '…a pleasant, efficient and safe working, living and recreational environment for all Tasmanians and visitors to Tasmania' is the statutory expression of the ideal that settlement strategies and planning controls promote development that does not give rise to unacceptable risks to life or property.

Promoting sustainable development requires that development and use decisions:

- Are informed by the best available information on natural hazards;
- Adequately assess the risk from natural hazards; and

- Avoid those areas where natural hazards present an unreasonable[1] risk to life and/of property.

In order to support these objectives the planning system needs to:

- Guide, over time, the removal or modification of structures that are in areas of significant risk;
- Avoid development or use in areas of unacceptable risk; and
- Ensure development and use in areas of moderate risk incorporates appropriate features having regard to that risk.

The challenge, however, is to ensure that both state and local government maintain a sound understanding of natural hazards, the level of risk they present and what is meant by 'unacceptable risk'. There is a wide range of stakeholders involved in developing appropriate approaches to managing the impacts of natural hazards and risk, particularly in terms of the various responsibilities of State Agencies. Individually the responsibility for and management of hazards through emergency response is well understood and practiced with in the emergency management structures as outlined in the Tasmanian Emergency Management Plan 2009. In contrast to this the planning response is ad-hoc and poorly articulated between levels of government, with evidence, understanding of risk, policy and decision making being applied differently by all agencies, the result is to potentially increasing the individual, community or governments exposure to hazards and inhibiting the ability of the community to adapt to hazards as the hazard changes.

As part of the response the Office of Security and Emergency Management under the Department of Premier and Cabinet is undertaking a project to develop a common framework (figure 1) that bring together a common use of evidence, risk decision making and policy to natural hazards. The primary objective of the framework is to improve the clarity and consistency of advice and, where appropriate support to local and state government regarding the mitigating of the impacts of natural hazards in the planning system. One of the outcomes of the project will be to provide a single point of reference for individual hazards (flood, fire, landslip, coastal erosion, coastal inundation) on the standardisation, collection and consolidation of information currently available on each of the hazards in Tasmania.

The Regional Land Use Framework is a clear opportunity to provide a more coordinated approach to the consideration of natural hazards. It adopts a regional perspective (reflecting the nature of complex and interlinked natural systems that operate at a regional or catchment level), strikes an appropriate balanced between State level planning, which cannot reflect local circumstances, and local planning, which cannot deal with issues that extend beyond the boundaries of local planning authorities. Specifically the Regional Land Use Framework can identify the overarching principles as well as take measures to avoid areas with unacceptable risk through its settlement strategies.

[1] Understanding the tolerance of the community to the potential risk of loss of life and property is a key element for responding to natural hazards and risks through the planning system. Risk thresholds are used to gauge the level at which a risk is considered acceptable or 'tolerable'. They can evolve through international custom or best practice, such as the adoption of the 1% chance of flood. Risk is not static and there is a need to constantly review accepted thresholds in light of changing conditions and evidence. At present, there is no coordinated approach to setting appropriate risk threshold for the various natural hazards across planning schemes in Tasmania. Planning Authorities at present determine appropriate threshold independent of each other based on a combination of factors including historical use, national and international custom and practice, and local considerations.

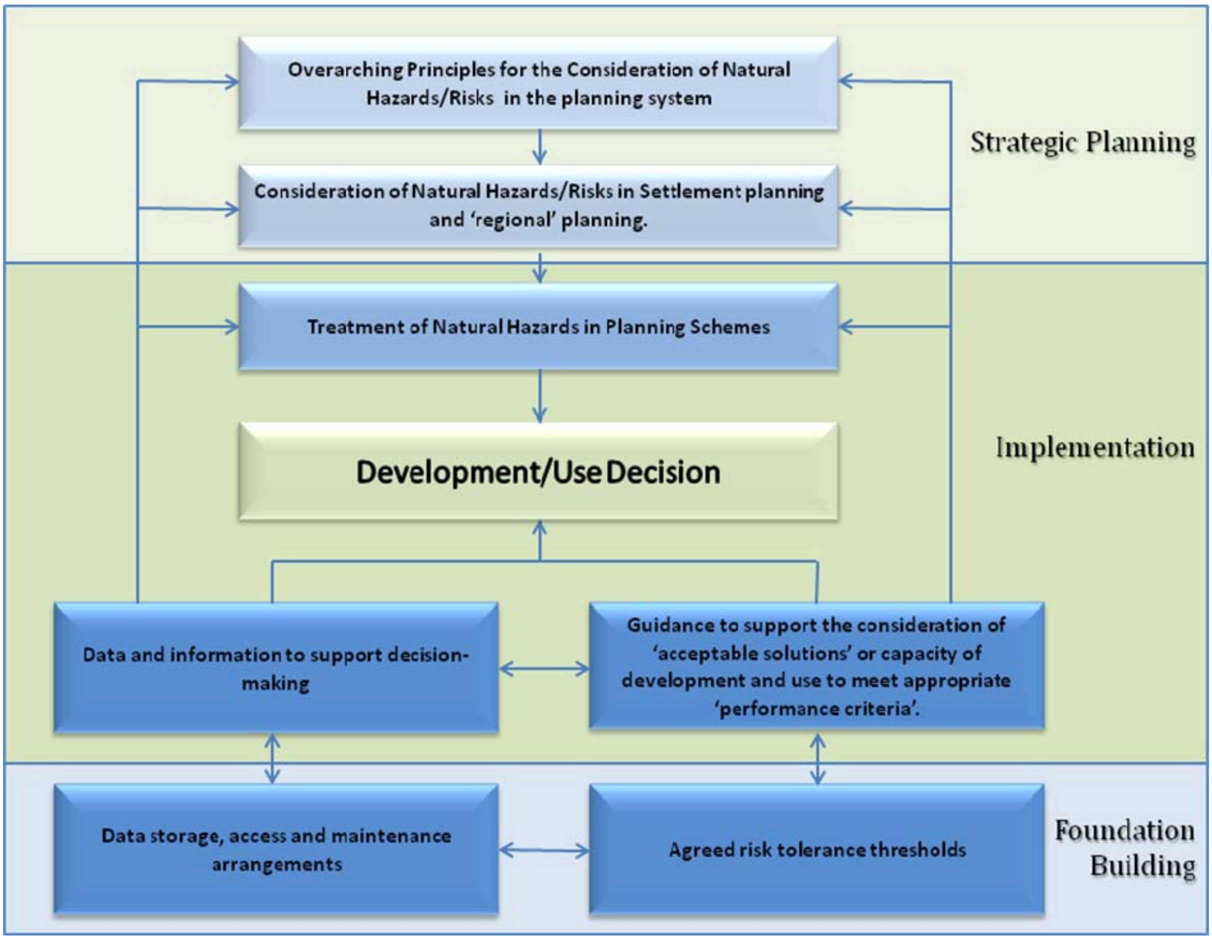

Figure 1: Conceptual Framework for Consideration of Natural Hazards in the Planning System

2. Sea Level Rise and Storm Surge

2.1 Overview

Australia's climate is clearly changing and increasing temperatures, sea level rise, changing rainfall patterns and more frequent and intense extreme climatic events are likely. Many Australian sectors and systems are highly vulnerable to climate change, including the functions and responsibilities of local governments. The State of the Environment Report for Tasmania (Tasmanian Planning Commission 2004) identifies the likely hazards arising from climate change in the Tasmanian context. These include higher sea levels, more frequent and more severe storm events and low-pressure systems, changes in short term climate cycles and an increased number of high rainfall events.

At a more detailed level, the CSIRO, University of Tasmania and Tasmanian Partnership have completed specific climate change modelling for Tasmania for Advanced Computing (TPAC) for Hydro Tasmania. This modelling has assisted in overcoming some of the uncertainty associated with applying the larger scale global modelling prepared by the Intergovernmental Panel on Climate Change (IPCC), to the Tasmanian circumstance. In summary the model scenario prepared for Hydro Tasmania predicts:

- Annual rainfall to increase in the SW of the State by about 10% by 2040, while in the NE it is projected to become drier by 10% to 20%;
- On a seasonal basis, there will be increased winter and early spring rainfall in all catchments;
- Only a very small trend in increased annual maximum temperatures for the SW, however a greater rise on the east coast, with a project maximum temperature increase on the east coast by 0.7°C by 2040;
- All areas expected to see a rise in annual minimum temperatures implying a warming projection of 0.5 C by 2040, with the maximum values occurring in the Derwent Valley;
- Annual evaporation rates are projected to increase except in the west coast and adjacent highland areas. In the midlands and east coast predications are in the order of 10% over 35 years; and
- Only slight increases in wind speeds, although changes in seasonal occurrence with increases in winter/early spring and early summer and the projected westerly component.

In terms of sea level rise, the IPCC has estimated a global rise in sea level between 0.09 and 0.88 m by 2100 relative to 1990 (or 0.8 to 8.0 mm per year, predominantly arising from the expansion of oceans as they warm (although contributions from melting of ice sheets and glaciers are also expected). These predictions clearly encompass a significant variation, with local sea level rise influenced by coastal subsidence or uplift.

More localised sea level rise predictions based upon Hobart data across the last 25 years indicates a trend of increasing sea level averaging 1.41 mm/yr (slightly higher than the mean overall trend across Australia of 0.7 mm).

The threat from sea level rise is not however just from the rising water levels. As sea levels rise, materials on sandy shorelines are eroded away, with shorelines retreating. CSIRO research has indicated that coastlines will retreat horizontally 50 to 100 times the vertical sea level rise. This prediction has been reflected in more specific local studies relevant to Southern Tasmania.

Preliminary mapping of the potential hazard zones relating to sea level rise impact was undertaken by Sharples (2004) in '*Indicative Mapping of Tasmanian Coastal Vulnerability to Climate Change and Sea Level Rise: Explanatory Report*'. This report provided a 'first pass' identification of the areas of Tasmanian coastline most likely to experience coastal flooding, both at present and predicated sea levels. In general this report indicated that sandy shorelines are more likely to recede and therefore pose the greatest hazard. Sharples (2004) does, however, indicate that the extent of coastal recession, at any given site, will be dependent upon:

- The actual degree of sea level rise and the nature of climate change;
- The actual storm patterns and exposure at each site;
- Seabed and shoreline topography at each site;
- Height and mass of dunes; and
- Existing coastal protection structures.

More recently, the Clarence City Council in association with the Australian Department of Climate Change and the State Emergency Service undertook a pilot study on the impact of climate change on Clarence coastal areas (SGS Economics & Planning and Water Research Laboratory, University of New South Wales). This study provided an integrated assessment of climate change risks on coastal areas within Clarence, specifically examining existing community attitudes and an assessment of 18 localities within Clarence City and the possible adaptive management options to the hazard presented. While many of the investigations and recommendations in this study are specific to Clarence, and therefore more detailed than the regional planning level, there are some general themes that are relevant to the broader Southern Tasmania region.

The community's knowledge and concern regarding climate change is rather vague. Many members of the Tasmanian community are aware of climate change, but are not aware of how it could impact upon their lifestyles. For instance, many community members living in coastal areas are prepared to continue living there, given the immediate and real lifestyle benefits of living close to the coast, against the likely timeframes in seeing the real impacts of climate change.

Despite this attitude, the community was strongly supportive of continued research in the field to devise possible management and adaptation measures; to reduce greenhouse gas emissions, protect shorelines, introduce planning controls to minimise flood risk for new developments and limit development in high risk areas.

The *Climate Futures for Tasmania* project will also have relevance to land use planning responses on climate change. This project builds upon the earlier work by CSIRO, University of Tasmania and Tasmanian Partnership for Hydro Tasmania as discussed above. Delivered by a consortium of research providers and research users such as the Antarctic Climate & Ecosystems CRC, CSIRO, TPAC, Tasmanian Institute of Agricultural Research, Australian Bureau of Meteorology and Hydro Tasmania. Overall project management responsibilities are vested in the ACE CRC & the State Government. The data generated under this project will better represent Tasmania's geography and its effect on the local climate. The project will also provide an accessible basis for subsequent climate change research, by archiving fine-scale climate model outputs for the entire state of Tasmania (www.acecrc.org.au, accessed 5 December 2009)

The key output of this project to date, has been the LiDAR dataset. This dataset has new high resolution digital elevation information that covers priority areas of coastline, up to 10 metres above sea level at 250mm intervals. Topographic maps of the more populated areas of the Tasmanian coast have been generated, including many areas within Southern Tasmania. The value of this data is that it can be used to identify and assess areas that may be affected by, or vulnerable to, sea level rise, sea inundation and storm or tidal surges in a more accurate and finer grained scale than previously possible (Antarctic Climate & Ecosystem CRC 2008). The LiDAR data was used in the Clarence City Council's pilot study to identify the areas most at risk.

This data has also been used in the Tasmanian Shoreline Vulnerability Mapping Project which has been jointly funded by the three regional planning projects and the Tasmanian Planning Commission. This project aims to provide an initial level of assessment of the impacts of sea level rise and inundation with basic modelling provided for different heights of sea level rise. The modelling gives a first indication of the areas which are vulnerable to sea level rise and should be recognised within planning schemes and zoned accordingly.

2.2 Planning Implications

The adoption of known and agreed climate change indicators such as sea level rise and storm surge events will have profound land use implications for adaptation and mitigation measures in the future to deal with the increasing threat of climatic change. Municipalities that are likely to be affected by climate change (coastal municipalities) will require strong policy approaches to determine what areas need to be protected from climate change events and how areas most likely to be affected can adapt to climate change events. Further consideration must be given to how future developments can use mitigation measures to reduce the immediate impacts of climate change (Aurecon 2009).

At the regional level, consideration of future storm surge events and sea level risks will be critical in determining the settlement strategies under the Regional Land Use Framework. The Tasmanian Shoreline Vulnerability Mapping Project will assist in providing the first cut of this data which will enable vulnerable communities to be recognised early on and further research to be undertaken where necessary. Bearing in mind the precautionary principle, whilst this data still requires a level of ground truthing and further work, some recognition of areas likely to be impacted through zoning and/or Codes is appropriate.

Beyond the consideration of climate change hazards in growth management, there are a number of other land use planning responses that will be required, particularly in terms of existing urban areas:

- Specific uses and developments should be located in areas well away from areas at high risk (i.e. dwellings, community facilities that would be used as emergency shelters, critical infrastructure, schools).
- Planning control measures such as building setbacks, minimum floor levels, appropriate engineering assessments, appropriate construction techniques (i.e. piled buildings, flood resistant materials).

Setting standards for new development within planning schemes will not address the risk for existing property. Government and Councils will need to consider a number of managed/adaptive measures as risk increases. For example, in terms of erosion, technically feasible options include hard protection (i.e. seawalls) and soft protection (i.e. sand nourishment, revegetation). Emergency planning is also a further option for existing development in risk areas. While emergency planning will not protect property and assets, it will ensure that risk to human life is minimised. Emergency planning type measures are however outside the scope of strategic land use planning.

At a broader level there needs to be some understanding of the general community's acceptance of risk, and where there are areas that will be back zoned or require compulsory acquisition, compared to areas where engineering solutions may be acceptable. Whilst this is a question for the general community to debate and resolve, it has significant impacts and ramifications on zonings, codes, application of standards and requires further attention in the immediate future.

3. Bushfire

3.1 Overview

The physical and environmental setting of Southern Tasmania makes the area particularly susceptible to bushfires. Generally high rainfall and a predominance of eucalypt vegetation types, accompanied by dry summers, prevailing strong northerly winds and thunderstorms provides the ideal environment for bushfire ignition. Further, the steep topography of the landscape compounds the intensity and ferocity of bushfires. The higher rainfalls in certain areas and the fertility of the soil contribute heavier concentrations of ground fuels than in other parts of Australia. When the right conditions prevail, fires can become uncontrollable and large conflagrations occur (McNiece, 2006).

While bushfires are an inherent part of the Australian environment and have a fundamental and irreplaceable role in sustaining ecosystems and ecological processes, they can also pose a significant hazard to life and property.

Most houses are destroyed by ignition from embers that enter the house through gaps in the house construction (e.g. between the wall cladding, eaves and roof, subfloor vents or between the roof sheeting and ridge/valley capping) or through windows that are broken by radiant heat or airborne debris. Other causes include the ignition of external timbers, combustion of adjacent sources of fuel and house to house spread.

Those houses that abut standing vegetation are at greatest risk from bushfires, and studies suggest that up to 70% of burnt houses are within 50m of a vegetation boundary. However 80% of burnt houses are 80m or less, and 95% are 180m or less. Only 5% of burnt houses are at a distance greater than 180m from vegetation (Ahern and Chladil 1999).

A building’s proximity to bushland has been identified as a key determinant of bushfire risk. The 100m distance from standing vegetation is often adopted as a threshold to define land susceptible to bushfire hazard as buildings within 100m have been shown to be at particular risk of ember attack (Standards Australia 2005: 13)

Bushland abuts a considerable portion of the urban fringe of Greater Hobart. Because of the physical proximity of bushland, bushfire can threaten houses several ‘rows’ back from standing vegetation. In many locations across Greater Hobart, the first ‘row’ back (i.e. those houses closest to the bushfire hazard) provide the separation to larger urban areas, as cleared buffer distances between the urban fringe and surrounding bushland is not a likely occurrence across Greater Hobart.

In addition, as a result of an increasing ‘tree change’ trend, there has been an influx of new residents into rural areas. Often located within or adjacent to standing vegetation, many lots have little bushfire protection, are difficult to access and do not have adequate water supplies for fire suppression.

Bushfires pose a direct hazard to the safety of occupants and fire fighters, either during fire fighting operations and /or evacuations

Bushfires in Southern Tasmania

Tasmania has faced a series of devastating fires from early settlement in 1803. The new settlers were not used to the summer conditions which caused fire to spread quickly. As early as 1854 a Bush Fires Act aimed 'to guard against damage by fire in certain months of the year', by preventing fires being lit and escaping on to another person's property. In 1897–98 an area almost the same as the 1967 fires was burnt when the 'Black Friday' fire spread rapidly through the south, destroying farms and forests. It covered the area from the lower Midlands and the Channel District to Port Arthur, the Derwent and Huon Valleys, as far as Esperance and Cygnet. The fire in late December 1933 to January 1934 threatened the whole of the Derwent Valley and 300 volunteers were rushed to fight it.

The worst bushfire disaster in Tasmania occurred on 7 February 1967, an event which became known as the *Black Tuesday* bushfires. They were the most deadly bushfires that Tasmania has ever experienced, leaving 62 people dead, 900 injured and over seven thousand homeless.

The late winter and early spring of 1966 had been wet over southeastern Tasmania, giving a large amount of growth by November. However, in November, Tasmania began its driest eight-month period since 1885, and by the end of January 1967 the dryness had dried off the luxuriant growth provided by the early spring rains in the area. Though January was a cool month, hot weather began early in February, so that in the days leading up to 7 February 1967, several bushfires were burning uncontrolled in the areas concerned. Some of these fires had been deliberately lit for burning off despite the extremely dry conditions at the time. Reports into the causes of the fire stated that only 22 of the 110 fires were started accidentally.

Shortly before midday on the 7th, a combination of extremely high temperatures, (the maximum was 39 °C), very low humidity and very strong winds from the northwest led to disaster.

125 separate fire fronts burnt through some 2,640 square kilometres (652,360 acres)(264,000 ha) of land in Southern Tasmania within the space of five hours. Fires raged from near Hamilton and Bothwell to the D'Entrecasteaux Channel as well as Snug. There was extensive damage to agricultural property near the channel, the Derwent Valley and the Huon Valley. Fires also destroyed forest, public infrastructure and properties around Mount Wellington and many small towns along the Derwent estuary and east of Hobart. The worst of the fires was the Hobart Fire, which encroached upon the city of Hobart. In total, the fires claimed 62 lives in a single day. Property loss was also extensive with 1293 homes, and over 1700 other buildings destroyed. The fires destroyed 80 bridges, 4800 sections of power lines, 1500 motor vehicles and over 100 other structures. It was estimated that at least 62,000 livestock were destroyed. The total damage amounted to $45 million in 1967.

(Sources: McNeice, & Whittaker)

3.2 Legislative & Governance Context

Several years ago, the Tasmanian Fire Service produced the *Guidelines for Development in Bushfire Prone Areas of Tasmania*. The objective of these guidelines is:

> *To minimise loss of life and property from bushfires by making living and working places defendable from bushfires.*

The guidelines identify a number of measures that can be applied to mitigate bushfire risk. These fall under different aspects of development:

1. Defendable space from bushfires – produced by separation of the building from the bushfire hazard and reduction of nearby fuel.
2. Roads – planning for network connectivity and the design and construction of roads and fire trails for emergency use and site access.
3. Water supplies – provision of adequate and accessible water supplied for effective fire fighting.
4. Buildings – siting, design and construction to maximise safety.

Much of the content concerning the creation of defendable space requires vegetation modification and management. Defendable space comprises the Building Protection Zone (BPZ) and Fuel Modified Buffer Zone (FMBZ). These zones are described below:

Building Protection Zone	Include non-flammable areas such as paths, driveways and short cropped lawns. Locate dams, orchards, vegetable gardens and effluent disposal areas on the fire prone side of the building. Using radiation shields and windbreaks such as stone fences and hedgerows avoiding highly flammable plants. Removing fire hazards such as wood piles, rubbish heaps and stored fuels. Replacing highly flammable plants with low flammability species such as dogwood, white flat iris, native frangipani. Ensuring there is horizontal separation between tree crowns as well as vertical separation between ground litter and the canopy by pruning low branches. Maintaining the area in minimum fuel conditions whereby fine fuels are minimised to the extent that the passage of fire will be restricted.
Fuel Modified Buffer Zone	Retaining established trees to trap embers and reduce wind speeds. Selectively removing small trees and scrubs to create dumps (rather than a continuous wall) separated by open areas. Removing the fuel between the ground and the bottom of the tree canopy or to height of at least 2 metres (pruning lower branches and scrubs). There is not need to remove most trees as they are beneficial in trapping embers and reducing wind speeds and will not be involved in a bushfire once the fuels below (understorey) have been modified.

Figure 50 is a nominal site plan illustrating the position of a BPZ and FMBZ in relation to a dwelling:

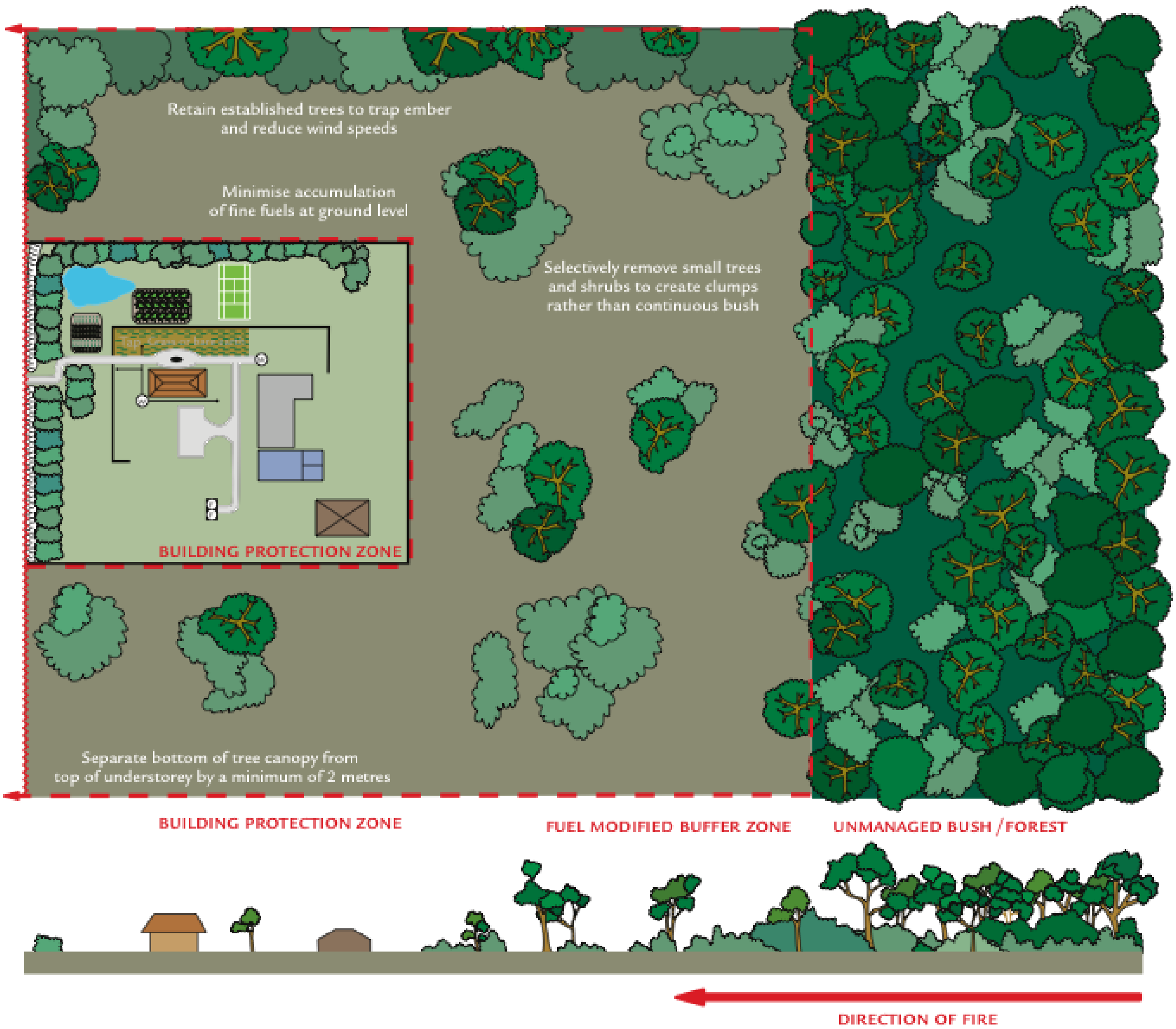

Figure 2: Site plan illustrating the Building Protection and Fuel Modified Zones *(Source: TFS)*

Many existing planning schemes within the region embrace the guidelines within their provisions and as a result there are residential areas across Southern Tasmania that do have a degree of protection from bushfires. In addition, some Planning Authorities have also utilised the construction standards under *Australian Standard 3959 – Construction of buildings in bushfire prone areas* (AS 3959) to permit dwellings in areas where sufficient buffer distances cannot be achieved.

AS 3959 details a range of building construction methods that provide guidance on construction standards for buildings in bushfire prone areas and is focused on standards that effectively 'harden' or protect a building from ember attack, radiant heat and in extreme cases, direct flame contact. These construction standards address particular weaknesses in building design that are known to increase a building's susceptibility to bushfire attack. Adoption of AS 3959 standards, when used in conjunction with other actions such as those outlined in the TFS guidelines, mean a building is safer and easier to defend.

While some Planning Authorities have utilised the standards in an informal way, as no bushfire prone areas as defined under the Building Code of Australia (BCA) have been declared in Tasmania (unlike other States) the adherence to AS 3959 is not mandatory.

In light of the recent Victorian bushfires, On 15 March 2009 the Premier of Tasmania announced that he had requested that the Department of Premier and Cabinet provide advice on a package of measures to ensure that the construction of houses in Tasmania was appropriate having regard to the risk from bushfires. The three main reforms that were to be considered were:

- An appropriate definition of 'bushfire prone areas' or a process for defining 'bushfire prone areas' for the purposes of applying relevant parts of AS3959-1999 *Australian Standard for the Construction of Buildings in Bushfire Prone Areas* or subsequent versions of the Standard in Tasmania through the *Building Act 2000;*
- An appropriate draft Standard Bushfire Schedule that can be referred to the Tasmanian Planning Commission for consideration as a new Planning Directive; and
- Advice on strategies to ensure that Development applications for building in "bushfire prone areas" can be considered and approved within a reasonable period.

The draft report has been released for consideration and comments by peak organisations and Councils. Once finalised, the draft Standard Bushfire Schedule, including definition of 'bushfire prone areas' will be forwarded to the Tasmanian Planning Commission for further consideration through a statutory process that includes public consultation. The current Royal Commission into the Victorian bushfires is also likely to produce outcomes that will be adaptable and relevant to the Tasmanian context.

3.3 Planning Implications

The planning system seeks to encourage sustainable development and the planning process obliges Council planning decisions to provide a safe living and working environment (Tasmania Fire Service 2005). Planning schemes can be used to implement controls to reduce and/or avoid risks associated with land use in areas susceptible to bushfire risk, through requirements such as minimum lot sizes, buffer distances involving fuel modification and the design and location of dwellings. A standard approach to these statutory mechanisms is being addressed by the current review being undertaken by the Department of Premier and Cabinet (standard schedule).

Above and beyond development control of areas already subdivided for residential purposes is the need to ensure that undeveloped areas identified for residential purposes are as far as practicable not bushfire prone. Recognising the physical extent of bushland adjacent to our urban area, it is however acknowledged that avoiding locating residential development in bushfire prone areas is a difficult task. Therefore the first priority should be ensuring that future residential areas that are bushfire prone can be appropriately managed. For example land that contains significant flora or habitat for threatened fauna should be avoided because of the inherent conflict between clearance required to minimise bushfire risk and the retention of natural values.

These measures must, however, be complemented by ongoing efforts to assist everyone already living or owning residentially zoned property in bushfire prone areas to understand the risks inherent in the environment within which they live and to take action to manage those risks. This is particularly important as there are existing subdivisions and residential areas where land clearance is difficult to achieve because of natural values (i.e. Tolpuddle Estate near Richmond).

Ultimately, good planning and development will include a series of measures for minimising the bushfire threat and reducing the physical and emotional costs that bushfires can create. Bushfire prone areas should be defined and a range of planning responses provided which can be used to increase the chances of survival of buildings and occupants.

4. Land Instability

4.1 Overview

Land instability refers to a range of hazards that affect the stability of land. Landslides are the most common form of land instability, however debris flows and rock falls are known to occur. Physical and chemical weathering processes create an overall weakening of surface rock, which makes it more susceptible to the pull of gravity. There are many forms of mass movement including soil creep, earthflow, slumps, landslips, landslides and rock avalanches. Although relatively infrequent in Tasmania, large mass movement events are dramatic, resulting in permanent loss of houses, roads and agricultural land. All mass movement occurs on slopes under the influence of gravitational stress. The greater the slope angle the more susceptible the surface material is to mass wasting processes. Clays, shales and mudstones are highly susceptible to hydration. Every human disturbance of a slope such as highway road cut, surface mining, and housing development can all hasten mass wasting. The newly destabilised and over steepened surfaces are thrust into a search for a new equilibrium.

Large tracts of land throughout Tasmania are subject to slope instability and about 60 houses have been destroyed by landslides since the 1950s. Fortunately no loss of life has occurred in this time but such events are highly traumatic to those directly affected and the financial cost to individuals and the State runs into many millions of dollars. In 1872, however one person was killed in a major debris flow event in the Humphrey's Rivulet catchment in Glenorchy. Caused by an intense rainfall event, a slurry of boulders, rocks, timber and other debris raced down the catchment at an estimated speed of 40 kph.

Another major landslip event in Southern Tasmania occurred at Hone Road in Rosetta, which is now a declared landslip area. Areas such as this, have been mapped by Mineral Resources Tasmania (MRT) as declared Landslip A or B areas. These Maps of Tasmania, are used for identifying areas susceptible to debris flow, rock flows and deep-seated landslip hazard. The two areas A and B, are described as:

Land Slip A – as a location where significant landslide damage has occurred in the past, and/or the area with the greatest likelihood of future movement where no more building is allowed.

Land Slip B – are areas where strict development controls, are a form of buffer zone to the A area. The purpose of which is to recognise that inappropriate activities in the B area could destabilise the A area, and parts of the B area could also be susceptible to movement.

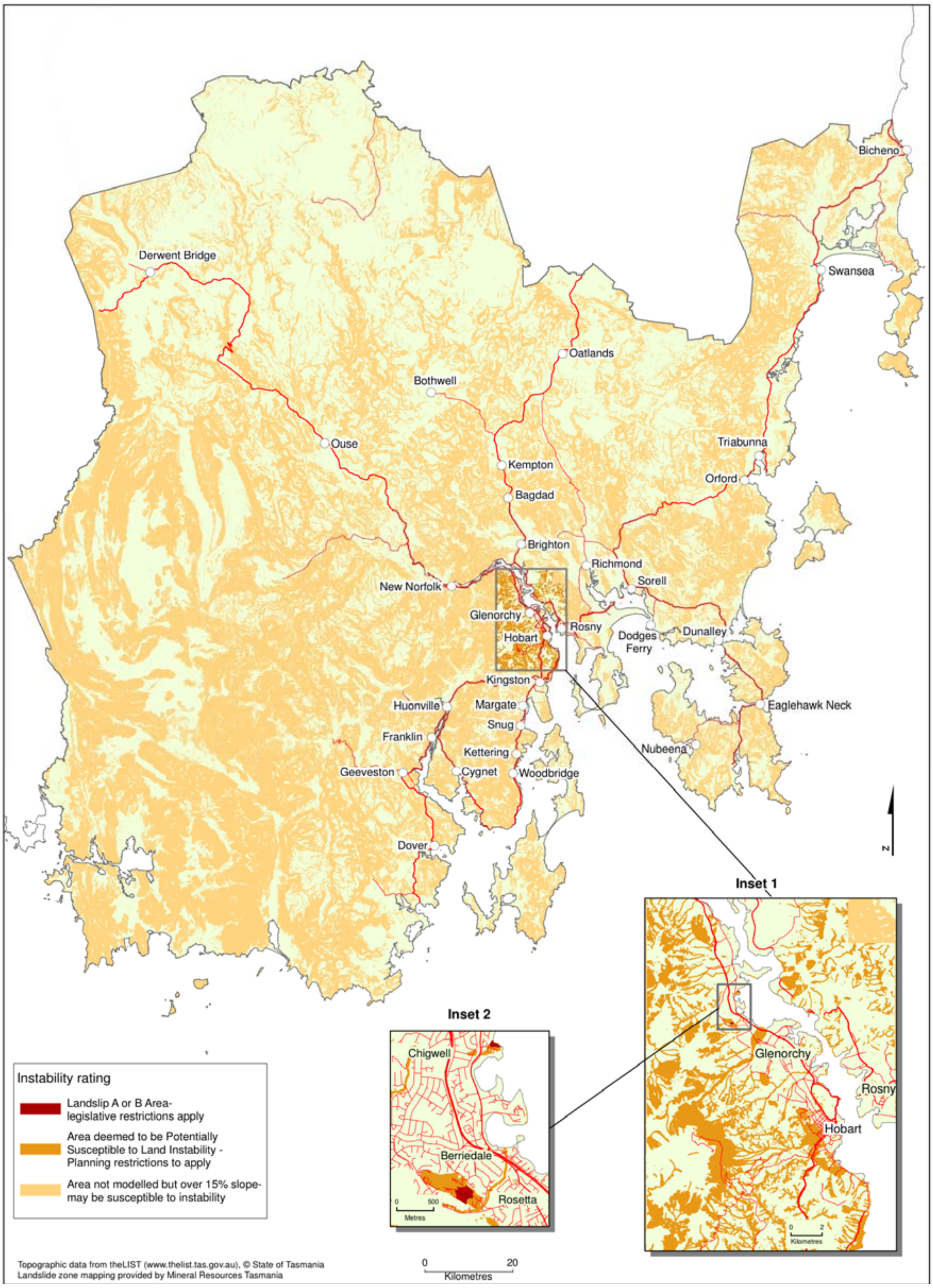

Figure 3: Land Instability Rating for Southern Tasmania (map available separately)

4.2 Legislative & Governance Context

Part 9A of the *Mineral Resource Development Act 1995* deals with the declaration of A and B Landslip Areas. The Minister may on the recommendation of the Director of Mines, declare an area to be an A Landslip Area or a B Landslip Area if satisfied that it is subject to earth movement because of inherent instability. An A Landslip Area is more unstable than a B Landslip Area.

The process calls for the relevant Council and affected owners to be formally notified and given the opportunity to lodge an objection.

Building in declared landslip areas is covered by Part 10, Division 1 of the *Building Act 2000* and Part 2, Division 1 of the *Building Regulations 2004*. The *Building Act 2000* prevails over local planning schemes. These regulations outline special requirements for building in landslip areas additional to the normal approval processes.

Outside of declared landslip areas, it is generally the responsibility of the Planning and Building Authorities to ensure that buildings are appropriately constructed in accordance with the underlying land instability risk. Within Southern Tasmania, some existing planning schemes already require assessment of land instability and where development is proposed on land where the slope potentially exceeds the threshold for the underlying geology, land instability assessments are required as part of the development application.

4.3 Planning Implications

Planners can use the MRT maps to avoid unstable areas when assessing new developments and subdivisions . The maps are intended to give general guidance on landslide susceptibility in the areas covered and consequently will be important tools in the establishment of the settlement strategies under the Regional Land Use Framework. The maps are not intended to be used for making development decisions on a block-by-block basis in the absence of a suitable geotechnical report.

Planning should focus on preventing inappropriate development through assessment criteria determined by the Regulators, in locations that may increase the risk to life or unacceptable risk to property. Community infrastructure also needs to be located and designed to function effectively during and immediately following rapid onset landslips and debris flow events. Residential dwellings, schools and critical infrastructure should be located to minimise social and community impacts from landslip or debris flow events. Further, use and development must maintain the safety of people and property.

There are a number of tools available for use when development is to occur within an area susceptible to landslip events. Mineral Resources Tasmania has released Urban Landslide Maps of Tasmania which are used for identification of areas susceptible to landslip hazard. A number of best practice guidelines, such as the Australian Geomechanics Society Landslide Risk Management Guidelines 2007, have been developed across Australia that must be adopted to manage landslide risk for landslide prone areas.

5. Flooding

5.1 Overview

A flood is defined as a high water level that overflows the natural or artificial levees along any portion of a watercourse. Both floods, and the flood plains that they might occupy, are rated statistically for the expected time intervals between floods.

Flooding is recognised as the most costly form of natural disaster in Australia. This is not necessarily due to the frequency of floods, but due to the fact that many towns and cities are located on floodplains; for reasons relating to water supply, transportation, advantageous points for water crossings, access to productive soils and recreation purposes (ARMCANZ 2000:1).

On average, floods cost the Australian community over $300 million a year. From 1967 to 1999 flooding accounted for 29% of total natural disasters in Australia. Floods can cause damage to properties and can affect personal safety, business activity, financial security and general health and well being (Bureau of Transport and Regional Economics 2002: 1)

The Southern region has a long history of flood events, with certain areas subject to regular inundation. Areas subject to hydrological hazard generally comprise the riparian zone that encompasses the active creek bed and immediate flood zone and recharge basins. Flash flooding can occur, particularly where natural watercourses are utilised for stormwater purposes in urban areas.

Under various funding programs, the Department of Primary Industries, Parks, Water & Environment has guided the development of Floodplain Maps and Flood Data Books in Tasmania. Floodplain maps are detailed maps of areas that have been inundated with flood waters. Floodplain maps are usually restricted to urban areas where significant historic information is available, and where the economic cost of flooding is high. Flood Data Books are a compilation of information on past flooding, mainly in rural areas, including photographs, maps of flood extent, flood profiles and a tabulation of heights reached by historic floods.

For the following watercourse floodplains within the region, the designated flood level is the level which has a 1% probability of being exceeded in any year (i.e. the 1:100 annual exceedance probability flood level). Most of these areas are covered by Floodplain Maps or Flood Data Books:

- Derwent River through New Norfolk;
- Huon River at Huonville and Mountain River;
- Jordan River below Pontville;
- Bagdad Rivulet; and
- Coal River at Richmond.

Flooding, particularly flash flooding also occurs on numerous other watercourses across the region. Whilst many of these are within rural areas and therefore create few hazards, in urban areas flooding on smaller watercourses is also important to consider. The landform of Greater Hobart, particularly those on the western shore) involves urban development extending from the foothills of surrounding mountains and hills through to Derwent River foreshore. A number of rivulets originate in the slopes above the settled areas. Many of these are prone to flooding, particularly as they are utilised as outlets for stormwater collected across the impervious surfaces of urban areas.

Given the steep topography of the catchments for many of these rivulets, floods are usually akin to 'flash floods'. The steep topography means floodwaters arrive quickly after heavy or prolonged rainfall, peak, and then also fall rapidly.

5.2 Planning Implications

Effective floodplain management is necessary to reduce economic losses and minimise the potential loss of life from flooding. In 2000, the Agriculture and Resource Management Council of Australia and New Zealand published *Floodplain Management in Australia - Best Practice Principles and Guidelines*. This document states that the principal aim of floodplain management "is to reduce the effect of flooding and flood liability on individual owners and occupiers of flood-prone property, and to reduce private and public losses resulting from floods" (DPIPWE). The Guidelines promote an integrated approach to floodplain management based upon a consideration of the total catchment, the integration of roles and responsibilities, the integration of floodplain management plans with flood emergency plans and the integration of stormwater and mainstream flood behaviour. Total catchment considerations are necessary to avoid moving flood effects from one point to another via inappropriately designed flood amelioration measures. For example, the construction of levees or structures may reduce the flooding on one parcel of land, but increase flooding on upstream or downstream properties.

Possible land use planning responses to flooding (Bureau of Transport and Regional Economics 2002) include:

- Restricting development to areas outside the floodplain (e.g. by prohibiting development in areas prone to frequent flooding).
- Controlling the mix of land uses to allow only 'flood compatible' activities in areas prone to less frequent flooding.
- Stipulating a minimum floor level usually 1% Annual Exceedence Probability (previously referred to a 1 in 100 year Average Recurrence Interval). This measure however only protects up to the design level and if a higher flood level event occurs (i.e. 1 in 500 year even), damage is likely.

Non structural measures such as land use planning and building controls were considered by the Bureau of Transport and Regional Economics (2002), as a more cost effective form of flooding response, with the costs being relatively low and potential benefits considerable, albeit such as response is limited to new development rather than existing development.

It is however difficult to impose a 'one size fits all' solution to flooding hazard. Rivers are natural landscape elements which are subject to aggradation (build up of material) and scouring (removal of material). Aggradation and scouring can lead to significantly different flood heights for the same flow. Dense willow growth, for example, in the river channel can lead to significant changes in flooded area. For example, at points along the Meander River in Northern Tasmania, floods of the same flow have been found to be 1 - 1 1/2 m higher when dense willow growth is present.

Each waterway has its own hydrological characteristics, each flood plain its own morphology, each flood its own duration and intensity and each locality is own social, economic and political attributes (Bureau of Transport and Regional Economics 2002: 16). As a response local based land use planning responses are therefore as important as regional land use planning responses.

6. Acid Sulphate Soils

6.1 Overview

Acid water and heavy metal pollution, caused by the disturbance of acid sulphate soils, is a major environmental issue for the management of coastal regions around Tasmania. Acid sulphate soil is the name given to soil and sediment containing oxidisable, or already oxidised sulfides (Charman & Murphy 2000: 249).

A Natural Heritage Trust funded report has confirmed the presence of acid sulphate soils in Tasmania, and has identified that acid is being released from some sites which host acid sulphate soils (Resource Planning and Development Commission 2004). The disturbance and exposure of acid sulphate soils from below the water table by earth moving practices and fluctuations in groundwater levels can result in the oxidation of pyrite, which in turn, produces sulphuric acid (Charman & Murphy 2000). Implications relate to the direct impact of acid on the receiving environment and the indirect impact of acid in mobilising toxic metals.

Elevated levels of mobilised trace heavy metals in soil and water can be toxic to aquatic life if released into the drainage system during high flow events or a rise in the groundwater table. Land areas impacted by exposed acid sulphate soils have poor fertility, high vegetation dieback and are prone to surface scalding and erosion.

Within Southern Tasmania the known extent of acid sulphate soils is minimal. The distribution of potentially acidic soils along coastal areas in southeast Tasmania is limited to small patches in low-lying flats in the Bicheno, Swansea and Dodges Ferry areas. The National Land and Water Resource Audit Atlas maps indicate that the region's agricultural topsoils have low (acidic) pH and are therefore a lower risk for acid sulphate compared to soils in the other regions.

All States and Territories across Australia have adopted a national policy framework (The National Strategy for the Management of Coastal Acid Sulphate Soils) that establishes the following key principles for management:

- Identify and define where acid soils occur,
- Avoid acid soil disturbance,
- Mitigate impacts when acid soil disturbance is unavoidable, and
- Rehabilitate disturbed areas.

The State Policy on Water Quality Management 1997 also identifies the need to assess the potential risk arising from the presence of acid sulphate soils. The Department of Primary Industries, Parks, Water and Environment in conjunction with the regional NRM bodies, as part of the Tasmanian Acid Sulphate Soils Information Project (TASSI), released guidelines for the management of Acid Sulphate Soils in early 2010

6.2 Planning Implications

While not as prevalent a risk in other regions, the disturbance of acid sulphate soils is a land hazard that needs to be managed within the region. The key planning implication in terms of managing this risk is managing the disturbance of ground and soils within areas shown as having potential to contain acid sulphate soils (see Figure 4 below).

To avoid disturbing potential acid sulphate soils is clearly the first option, as it carries the least environmental risk and is usually the cheapest option. However as evident from the spatial information and mapping developed through the TASSI, there are many locations where these soils exists within or in close proximity to existing urban and town development, particularly given the prevalence in coastal areas.

In addition, it is recognised that particular developments in areas of high probability of acid sulphate soils have elevated risks because of their inherent development characteristics. These uses include extractive industries, golf courses, marinas, canal estates and developments requiring below ground floor areas.

While desirable, in view of the many other considerations affecting land use planning decisions, it may not always be possible to avoid the risk. In this instance management and mitigation through specific assessment provisions (building into planning schemes) is the next desirable option.

The 'Tasmanian Acid Sulphate Soil Management Guidelines' provides a best practice approach and assessment to managing the disturbance of potential acid sulphate soils over a 7 step process:

Step 1

If the proposed project is in the coastal zone and is at or below 20 metres AHD, or will disturb soil or nearby groundwater hydrology at or below 20m AHD, proceed to Step 2 (if not, no further consideration of ASS is required). If the proposal is in an inland area but within or adjacent to a deflation basin (topographic depression scoured by wind), wetland area or an area of known acid mine discharge, or if indicators of acid conditions are identified, proceed to Step 2.

Step 2

If the project will excavate 100m3 of soil or sediment, or will involve the dumping or filling of land with more than 500m3 of soil to a depth of greater than 0.5m then proceed to step 3, otherwise no further consideration of ASS is required.

Step 3

Existing mapping information should be checked. Maps identifying the predicted distribution of coastal areas affected by ASS are available at www.thelist.tas.gov.au and on the ASRIS website (http://www.asris.csiro.au/index_ie.html). If the project falls within an area identified as being at risk proceed to step 4, if not no further action is required.[2]

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[2] Although the map is based on best available information, it is important to be aware of possible limitations of this dataset. The local scale variation in Tasmanian landscapes can result in small pockets of ASS outside the zones indicated on the map. Similarly, within the zones indicated, ASS may not be uniformly distributed. It is intended that proper application of these Guidelines will improve the capacity of soil scientists, environmental scientists, planners, engineers and landholders to carry out an initial risk assessment for ASS if suggested by indicators or local topography and determine the need for further testing.

Step 4

Conduct a desktop risk assessment. All disturbances to the groundwater hydrology or surface drainage patterns in coastal areas below 20 metres AHD should be investigated, designed and managed to avoid potential adverse effects on the natural and built environment (including infrastructure) and human health from ASS. This recommendation also applies to the investigation of subsoil or sediments below 20 metres AHD where the natural ground level of the land exceeds 20 metres AHD (figure 2). In some situations, ASS may also occur at elevations greater than 20 metres AHD (i.e. inland areas), and these guidelines also apply to the management of those soils where they are identified.

Step 5

Develop a soil profile. If it is determined, from mapping or site assessment, that the probability of ASS occurrence is likely, on site investigations will be required to determine where, and at what depth and concentration, the ASS may occur. The first step in this process is to develop a soil profile of the site, with detailed information on elevations, soil types and depths. Only some soil types are likely to contain ASS, and it will only be necessary to conduct further sampling if the proposed project is likely to disturb significant amounts of ASS (as per step 2). If disturbance is likely, consideration should be given to redesigning the project so that the ASS materials can be avoided. If this is not possible, a management plan should be developed to minimise environmental harm from the project and justification provided as to why the ASS cannot be avoided. If disturbance is unavoidable proceed to step 6.

Step 6

Conduct field tests and laboratory analyses. Sampling and testing of the soil types likely to contain ASS should be done by a qualified and experienced soils professional in accordance with the Guidelines (see Appendix B). Once the location, depth and concentration of any ASS present on the site have been determined, options to manage the risk can be considered (step 7).

Step 7

Develop an ASS Management Plan. The remainder of these Guidelines outlines the principles and management strategies to be used in developing a management plan to minimise and/or neutralise any impacts from the disturbance of ASS.

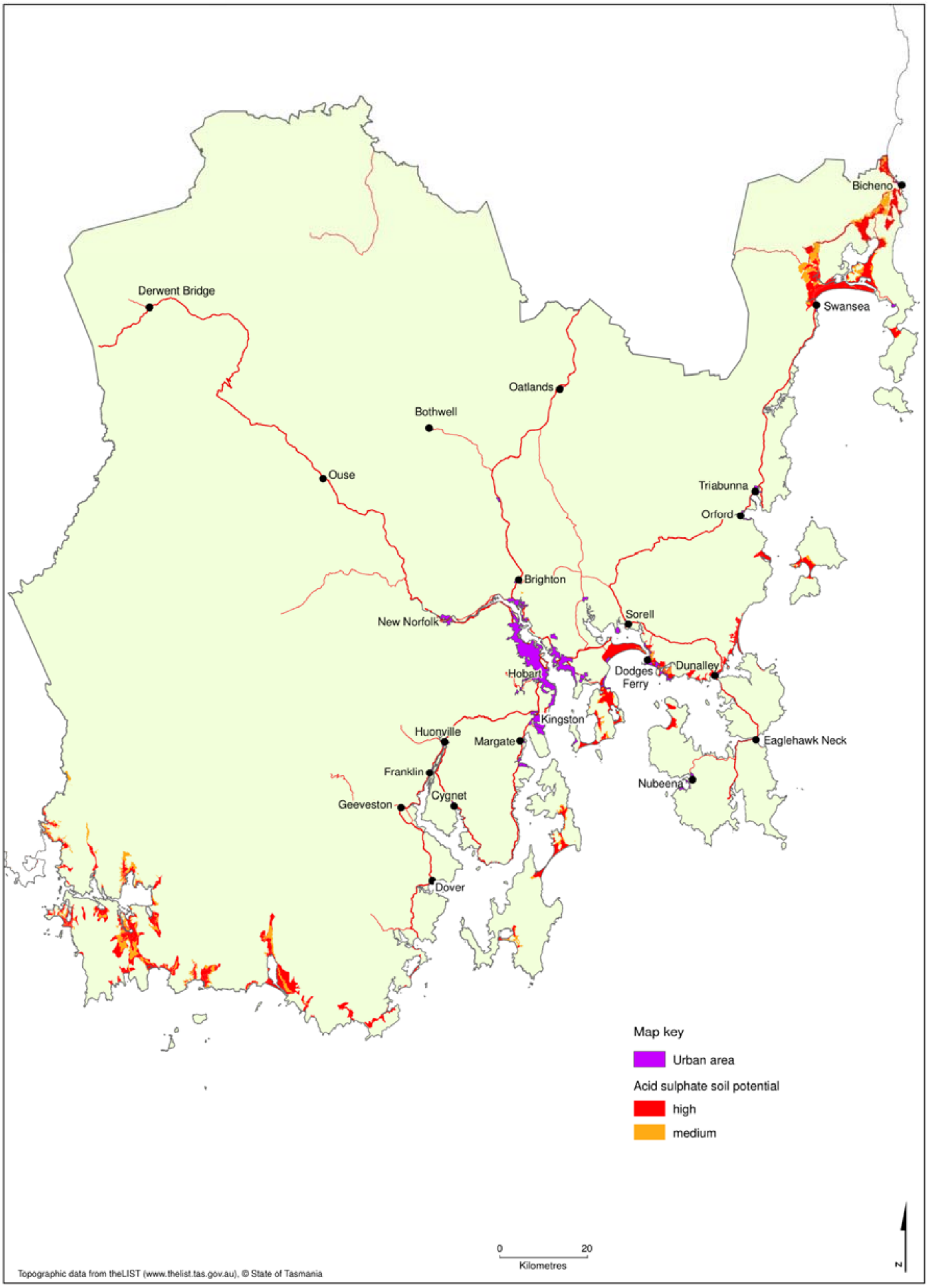

Figure 4: Potential for Acid Sulphate Soils in Southern Tasmania (map available separately)

7. Dispersive Soils

7.1 Overview

Dispersive soils (otherwise known as sodic soils or sodosols) are fine grained soils with a higher content of dissolved pore-water sodium than ordinary soils. When a sodic soil comes into contact with non-saline water, water molecules are drawn in between the clay platelets causing the clay to swell to such an extent that clay platelets are separated from the aggregate, which is known as dispersion. As a result these soils rapidly erode, forming tunnels and deep gullies, which can cause severe damage to infrastructure and buildings. Consequently erosion arising from dispersive soils is a much greater risk in urban areas as compared to other forms of erosion, which as discussed below, are more problematic in agricultural areas.

Dispersive soils cannot be differentiated from other soils through normal soil testing processes. It is known however that in Tasmania dispersive soils are generally associated with soils derived from Triassic sandstone or Permian mudstone and the general extent of dispersive soils in Tasmania is known, although not specifically mapped. Within Southern Tasmania dispersive soils occur in all Municipal Areas. Tunnel erosion has been observed at numerous locations around Cygnet, North Bruny Island, Bridgewater, New Norfolk, Tea Tree, the Tasman Peninsula and Collinsvale (NRM South 2005).

In almost all cases, tunnel erosion results from some form of disturbance, which allows rainwater to come into direct contact with dispersive soils. Activities that increase the risk of exposing dispersive subsoils to rainfall include removal of topsoil, subsoil excavations, supply of services by trenches, construction of roads and culverts in dispersive soils and dam construction. Changes to hydrology such as culverts, runoff from hardened areas and ponding of rainfall may also increase the risk of tunnel erosion.

7.2 Planning Implications

Given the difficulty in repairing tunnel erosion, management effort should be focused on prevention of tunnel formation through increased understanding and awareness of the issues associated with construction and development on dispersive soils. The risk of initiating tunnel erosion during construction or development of land containing dispersive soils can be minimised by identification and avoidance of disturbance to areas of dispersive soils, reducing the ponding of water, keeping dispersive soils buried under topsoil and maintenance of vegetation cover.

DPIPWE has released a guidelines document for *Dispersive Soils and their Management Guidelines for Landholders, Planners and Engineers* which can assist with soil and water management on development and construction sites. Soil and Water Management on Building and Construction Sites Fact Sheets have also been released by the Derwent Estuary Program in conjunction with NRM South to provide further guidance for developers.

Avoidance of development on dispersive soils is unrealistic given their extent within the region.

8. Erosion

8.1 Overview

Other soil related hazards include, the many different types of wind and water erosion, which potentially occur whenever surface soil is exposed to winds and rain. Sheet, rill, gully and stream bank erosion are the most active forms of water erosion. Sheet erosion occurs when water breaks down exposed finer topsoil particles, causing it to slide away and create the subsequent, and most widely recognised, rill and gully type erosion. Whilst stream bank erosion occurs on the edge of water channels, when water flow causes the banks to erode, or when there is a rapid loss of flow that causes the bank to break and slump.

While soil erosion is a natural process in the landscape, accelerated erosion occurs as a result of human intervention in natural systems. The potential for wind or water erosion exists for most soils in the region under extremely wet or windy conditions and/or under management practices that increase the risk of erosion, such as excessive working of the soil or removal of surface cover. The longer the period of time that soil is in a loose state without surface cover, the greater the risk of erosion (NRM South 2005). Dryland grazing areas are prone to moderate sheet, gully and tunnel erosion, particularly on dry north-facing slopes or sodic duplex soils. There has been a recent increase in the number of farmers protecting vulnerable north-facing slopes, but severe erosion can still be found in some areas of the Southern Midlands and Derwent Valley. The Central Plateau has some of the worst soil erosion in the State as a result of past over-grazing and the impacts of rabbits. Alpine areas are particularly susceptible to sheet erosion because of very high rainfall, low temperatures and the impacts of heavy snow and frost cover over long periods.

There is no formal legislation in Tasmania covering soil conservation, as adopted in mainland states (e.g. the South Australian *Soil Conservation and Land Care Act 1989*). However, soil conservation is implemented indirectly through various legislative and non-regulatory measures.

The Department of Primary Industries, Parks, Water & Environment, along with extensive farmer and community group consultation, have released soil management guidelines for Tasmanian farmers which is a non-regulatory document outlining general management recommendations for conservation of Tasmanian agricultural soils. Several community groups have developed soil management plans for specific areas and catchments within the region.

Existing resource management and catchment management plans highlight local threats to the soil resource in an anecdotal manner but provide little objective assessment of severity, extent or cost of the problem. Forestry Tasmania has initiated a methodology to identify the susceptibility of specific soil types to erosion and the appropriate management requirements needed. Soil surveys are routinely undertaken prior to developing forestry plantations in order to identify that the site is capable of supporting such land use. No such methodology exists for agricultural soils.

8.2 Planning Implications

Soil erosion is a natural process in the landscape. Accelerated erosion occurs as a result of human intervention in natural systems, often through vegetation clearance or soil cultivation. The texture contrast soils and deep sands that are extensive throughout the region are particularly susceptible to erosion by wind and water.

Because of the underlying risk, that most soils are susceptible to erosion, land use planning responses to soil erosion hazards should generally be focused on mitigation during and post construction/development.

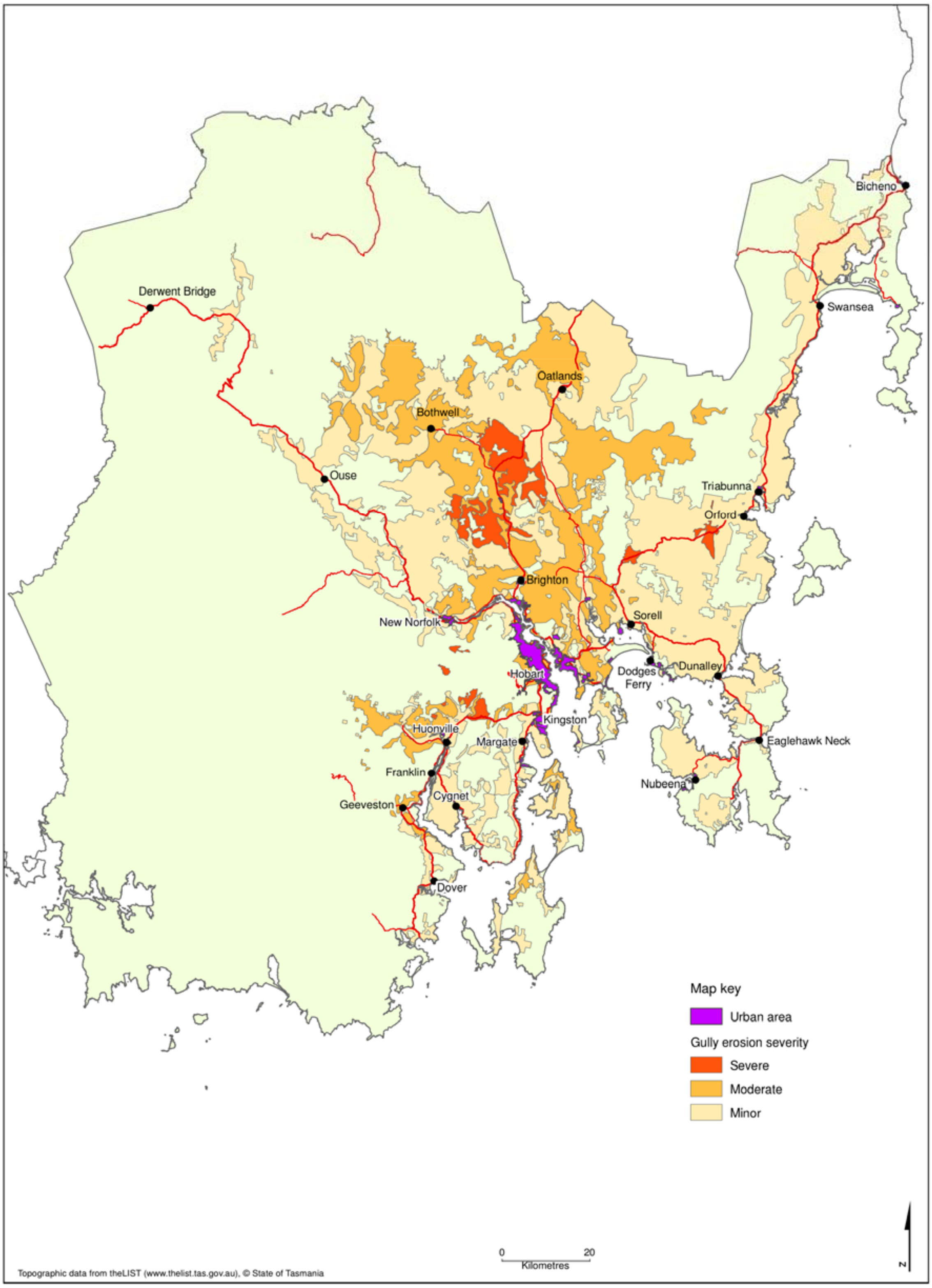

Figure 5: Gully Erosion Potential in Southern Tasmania (map available separately)

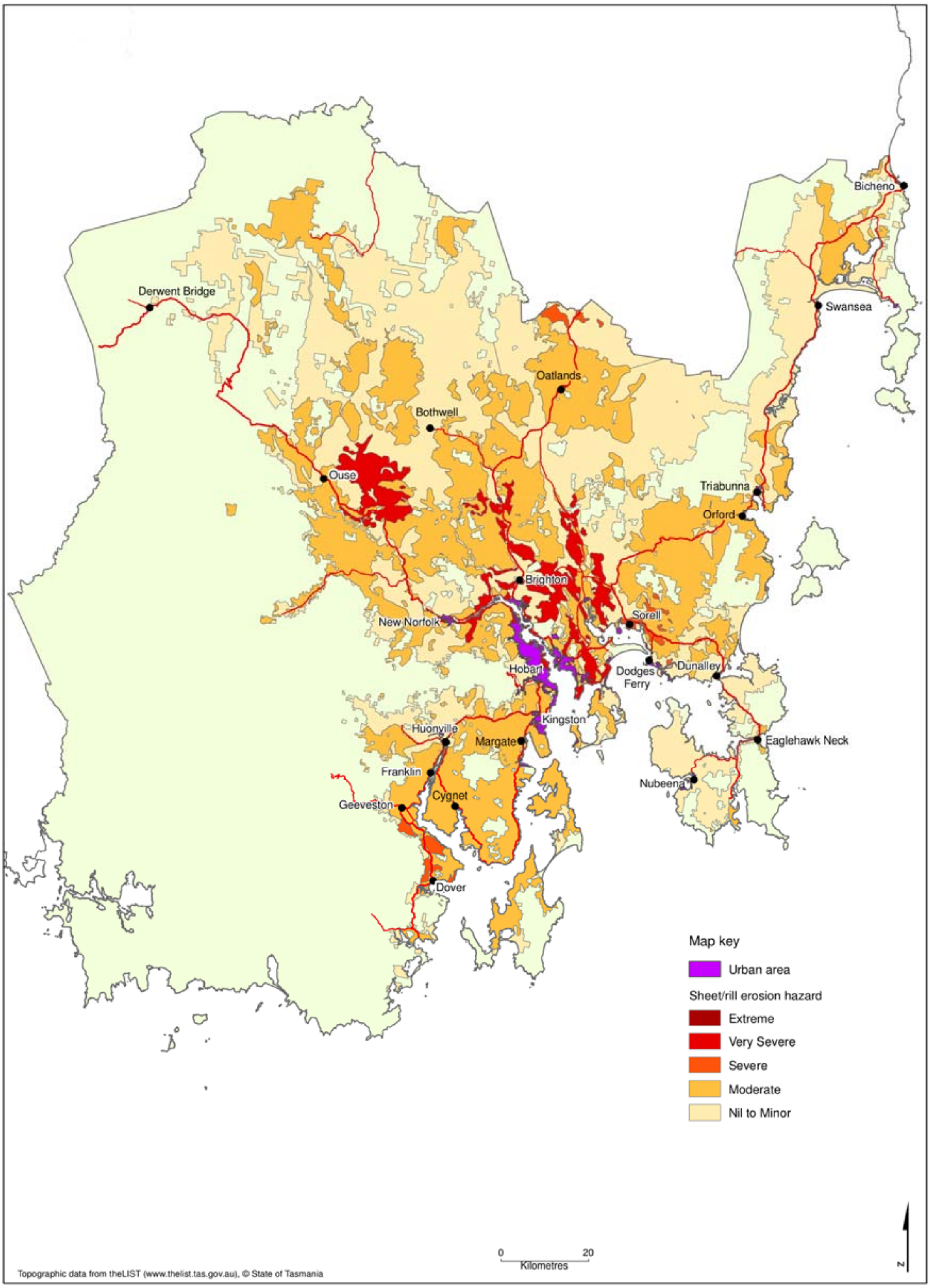

Figure 6: Sheet/Rill Erosion Potential in Southern Tasmania (map available separately)

9. Contaminated Land

9.1 Background

Contaminated land is defined as an area of land (including water in, on or under land) that is a 'contaminated site' if the following are invoked:

- The land contains a pollutant in a concentration above naturally occurring levels, which is, or is likely to be causing serious or material environmental harm or environmental nuisance; or
- The land contains a pollutant in a concentration above naturally occurring levels, which is likely to cause serious or material environmental harm or environmental nuisance in the future if not managed appropriately.

Contaminated land can result from current or historic land use activities at a site, such as refuse disposal, petroleum storage, timber treatment plants, heavy industry and gas works. The potential for damage to ecosystems or to human health can be significant, and the financial costs of cleaning up a site can be high. At present use and development of, or adjacent to, potentially contaminated land must not proceed unless an assessment has been carried out to determine any risk to human health or the environment in accordance with the *National Environmental Protection Measure 1999*. Experience has shown that some industrial activities have a higher probability of contaminating a site, including activities such as oil production and storage, and chemical manufacturing and formulation. Any commercial, mining, industrial or agricultural site has the potential to be contaminated, however some activities intrinsically give rise to contamination more frequently than others.

The issue of contaminated land was highlighted at Lutana in Hobart, where soil had been contaminated by particles of cadmium, lead and zinc blown from the nearby zinc refinery (Resource Planning and Development Commission 2004). The number of suspected, but not confirmed, contaminated sites in Tasmania is unknown. As an indication of the potential scale of the problem in 1995, there were about 1600 underground storage tanks containing either petrol, distillate or aviation fuel in Tasmania (Resource Planning and Development Commission 2004). Most of these tanks are at petrol stations. In conjunction with the numerous types of other activities that can potentially contaminate a site, the total number of potentially contaminated sites in Tasmania (i.e. suspected but not confirmed to be contaminated) is in the order of many hundreds.

9.2 Legislative & Governance Context

In Tasmania, the management of contaminated sites is shared by the Environment Division of the Department of Primary Industries, Parks, Water and Environment and local Councils. Under this framework, the Contaminated Sites Unit (CSU) of the Environment Division regulates contaminated sites that pose a significant risk of harm to human health and/or the environment under the *Environmental Management and Pollution Control Act 1994*. Other contaminated sites that do not pose a significant risk of harm to human health or the environment, and therefore are suitable for the current or approved use, are managed by local councils through the planning process. For guidance in relation to best practice management of land and groundwater contamination, the Contaminated Sites Unit refers to the National Environment Protection (Assessment of Site Contamination) Measure, 1999 (NEPM). Under Section 12A of the Tasmanian *State Policies and Projects Act 1993*, the NEPM has been adopted as state policy.

9.3 Planning Implications

Guidelines and potential development control provisions are being prepared by the Contaminated Sites Unit in regard to how specific applications for use and development on potentially contaminated sites are dealt with. The Regional Land Use Framework will need to incorporate the broader principles and policies underlying these guidelines and provisions.

Above and beyond this, settlement planning will need to consider the suitability of areas proposed for new residential growth in terms of broader scale land contamination, for example, the conversion of underutilised industrial land to residential purposes.

10. Salinity

10.1 Background

NRM South defines salinity as "…the accumulation of excessive salts in land and water at sufficient levels to have an impact on human and natural assets." There are two types of salinisation: natural and secondary. Natural salinity occurs in closed drainage basins where salt is retained and accumulated for long periods, compared to open drainage basins, where salt is rapidly returned to the sea. Naturally occurring salinity is evident in some areas within Southern Midlands. Secondary salinisation occurs as a result of human intervention in natural processes and it is this, which is of primary relevance to the Regional Land Use Framework.

High soil salinity has a number of consequences that are of concern in a land and water management context:

- The adverse effects of salt on plant growth;
- The effect on water quality, whether surface water or ground water, particularly if it is needed for domestic or industrial uses, for stock water, or if it flows into major watercourses or storage bodies;
- The adverse affects on fresh-water dependent ecosystems as a result of degradation in water quality;
- Low vegetation cover can expose areas to high erosion rates;
- The saturation of soils with solutions high in sodium can result in the development of sodic soils, as the sodium cations replace calcium and magnesium ions on the clays; and
- High saline soils have the potential to mobilise heavy metals and other potentially toxic substances in soils (Charman and Murphy 2000: 240).

Increases in salinity in soils can only occur if a saline groundwater system receives extra water, a salt store is mobilised, or a new source of salt is adding salt to the soil or water. Where there is a salt store or saline groundwater, any process which increases the availability of water in the soil can increase the leakage of water to groundwater, and flush salt out into surface waters or soil systems (NRM South, 2005).

There are approximately 10,700 ha of land affected by systems known to contain salinity within Southern Tasmania, which is equivalent to 1.8% of the agricultural land in the region. The percentage of salt-affected land is much higher in cleared agricultural land than in areas with native vegetation. Areas known to be affected by salinity are the Derwent Catchment, upstream of Hobart, and the Coal River Valley. The area of salt affected land in the region is expected to increase by 1.5% per annum. This has implications for the future water supply in Hobart and the surrounding areas. Processes occurring within the region attributing to further increases in salinity include tree decline, the collection and concentration of saline water in farm dams and the dispersal of this water and the proposed significant increase in wastewater for irrigation (NRM South 2005).

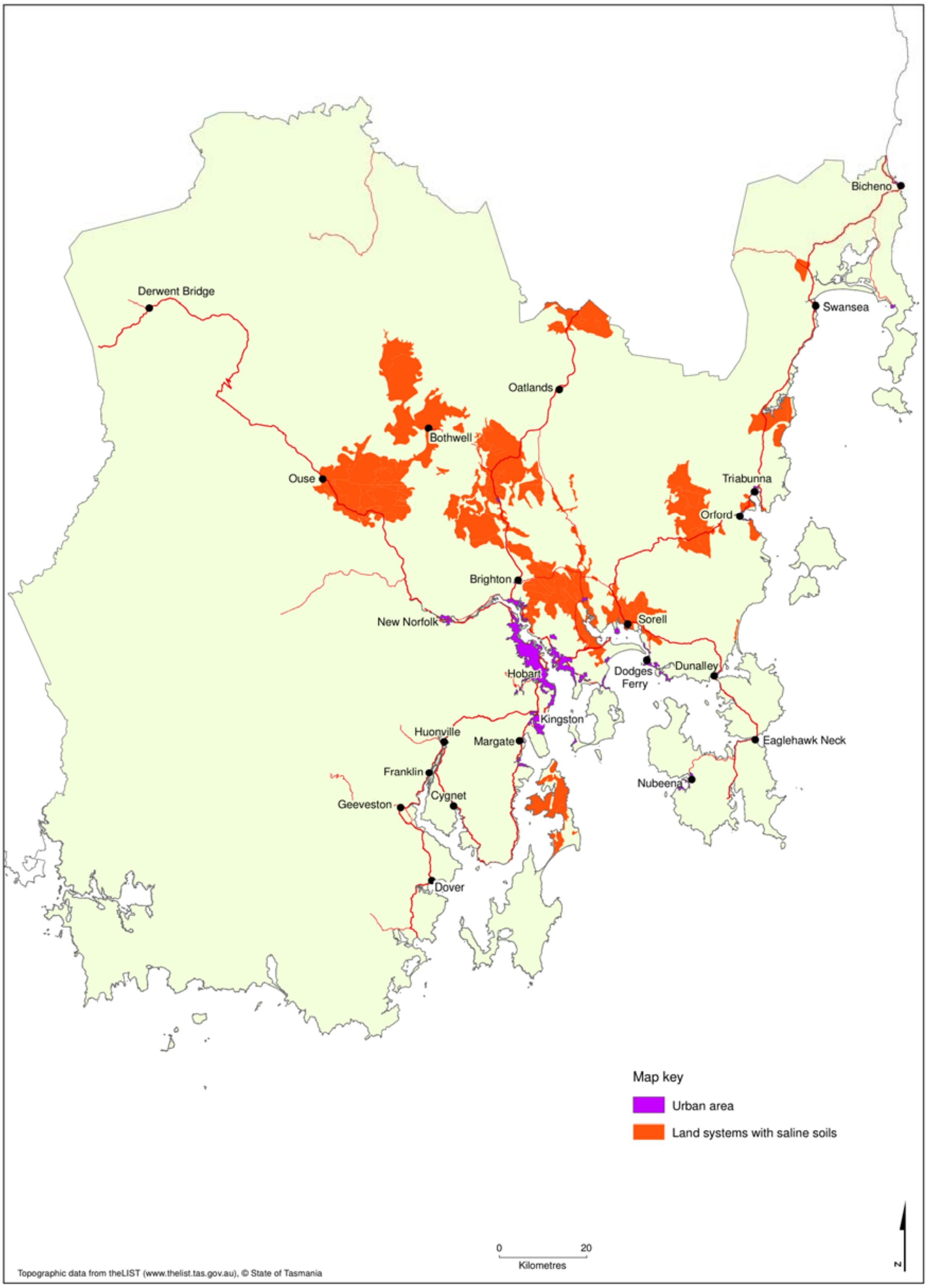

Figure 7: Land Systems with Saline Soils in Southern Tasmania (map available separately)

10.2 Planning Implications

There are a number of key land use and management factors which are generally seen as the cause of the development of secondary salinisation:

- In dryland areas the change from native tree vegetation to grazing land after clearing;
- The clearance of native vegetation on elevated recharge areas resulting in increased groundwater flow to lower elevated areas, causing a rise in water table;
- Arable land use, particularly that involving cultivated fallows where, for most of the season, the land lacks an actively growing and transpiring crop to take up rainfall, resulting in a rise in the water table;
- Irrigation of soils, particularly dryland soils. The amount of irrigation is critical, as irrigation can raise the level of saline water tables and recycle fresh water that is already saline.
- In urban areas salinity can occur when deep rooted native vegetation is cleared and replaced with shallow rooted garden plants and lawns, creating an inbalance in the water cycle by allowing larger amounts of water to escape into the underlying groundwater.

Planning therefore needs to take into account the risk of salinity with clearance of native vegetation, particularly where it is proposed on a large scale and on elevated recharge areas (for example urban salinity in Greater Hobart has been largely minimised by the retention of native vegetation on the hill tops). In addition the planning of irrigation infrastructure and the associated management required of irrigation water users should take into account the risk as well. It is acknowledged that at present such management of the risk is already undertaken by land owners utilising irrigation for agricultural production.

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The Southern Tasmania Regional Planning Project
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the 12 Southern Councils and the Sullivans Cove Waterfront Authority