C MULLER CONSULTING PTY LTD
Fire and Environmental Planning

Report on

Bush Fire Threat Analysis

Barrow Island

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Preface

This report has been prepared for the Department of Environment and Conservation (DEC), Pilbara Region.

The analysis has been undertaken using the same methodology as the threat analyses carried out for other areas in Western Australia, including the whole south west.

The analysis is based on data supplied by Chevron Australia Pty Ltd and DEC. The analysis does not include any impacts arising from the proposed Gorgon developments on Barrow Island, as at the time it was undertaken the project had not received approvals.

Contents

Executive Summary

Bush fire threat is the likelihood of a bush fire causing damage, and the consequences should such damage occur. Likelihood is assessed by examining the risk of ignition, the suppression response capability, and the potential fire behaviour. Consequence is assessed by a classification of the values identified.

The risk of ignition is generally low, with few fires in the 34 years of records available.

Rapid response is restricted to the oilfield area and close proximity to roads. It would take many hours to provide additional resources from elsewhere.

Fuel loads are exceptionally high. Should a fire develop under severe fire weather conditions it will be impossible to control, irrespective of the resources available. Whilst the analysis has been undertaken for the 95 percentile weather conditions (i.e. on average one day in 3 weeks would meet or exceed these) the extreme intensities calculated for these conditions indicates that fires would be uncontrollable under far less severe conditions should initial attack during the acceleration phase of a fire fail.

Because of the low risk of ignition and the restricted distribution of the high values identified, the overall threat summary indicates a low threat over most of the island. A high threat is only identified within 50m of high values. This may be misleading because, in the absence of adequate protection around individual assets, should a fire occur anywhere on the island under severe conditions, ALL values downwind will be at risk from this single fire event.

Introduction

Bush Fire Threat Analysis (BFTA) is spatial analysis of the comparative risk of damage resulting from bushfires. It is a strategic risk assessment and does not purport to be a real time fire simulation model. This analysis is based on the standard approach in Western Australia (Muller 1993, 2009) which undertakes analyses for the 95 percentile weather conditions.

A combination of quantitative and qualitative approaches to risk assessment is used, making best use of available data, and supplementing this with expert opinion. Whilst not fully quantitative, the BFTA provides a framework for consistent and repeatable assessment of risk, and a basis for comparing risk in disparate areas.

In accord with the principles of Australian Standard AS/NZS 4360 (1999), risk is defined in terms of the likelihood of occurrence of an event (in this case a bushfire affecting a value), and the subsequent consequences should the event occur.

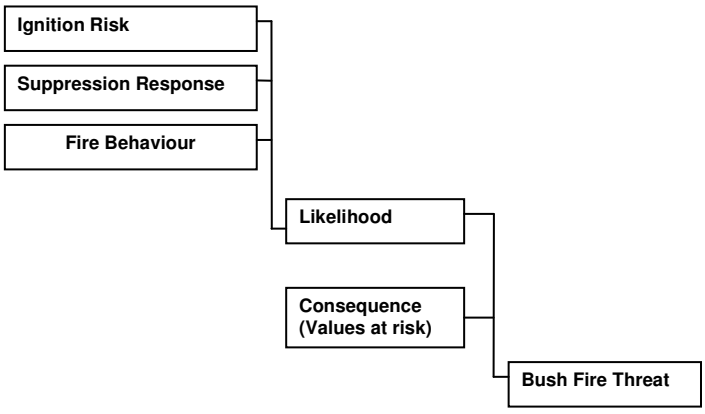
The **Likelihood** of a damaging fire is dependant on:

- The chance of a fire starting (ignition risk).
- The size and intensity of any resulting fire, which in turn is a product of
    - Fire behaviour should there be successful ignition.
    - The likely success of any suppression response.

A weighted combination of these factors is used to derive five likelihood classes.

Consequence arising from a bush fire is measured in terms of the damage or loss incurred. This can include both direct (assets/values destroyed) and indirect (eg major downstream impacts resulting from infrastructure being destroyed). Values (both market and non-market values) are assigned to one of six classes according to the likely consequence if affected by bush fire.

The **Bush Fire Threat** or **Risk** is then determined using a risk assessment matrix, combining the likelihood of damage with the consequence should such damage occur.
All the analysis has been undertaken using the Spatial Analyst extension of ArcGIS. The results are displayed as map layers. The following diagram outlines the hierarchy of the layers that are included with this report:



Likelihood of Bush Fire Damage

Likelihood Layer

Likelihood is a weighted combination of the Ignition Risk, Suppression Response, and Fire Behaviour layers. Each of these factors is separately modelled, and classified into 5 risk classes. These layers are then weighted and combined to provide an estimate of the likelihood of a damaging fire. Ignition Risk and Suppression Response are given equal weighting, and the Fire Behaviour is weighted by a factor of two. Fire behaviour is weighted because, although the risk of ignition may be low in some areas, there is always a residual risk. The size of the fire, and whether it can be controlled, is thus the most important of the risk factors in determining the likelihood of damage.

Ignition Risk Layer

Ignition risk is calculated as the average density of ignitions from available fire report and hot spot data, and combining this with assumed risks related to infrastructure.

The calculated kernel density from fire records has been classified as follows:

Likelihood Class	**Description**
5 Almost Certain	One fire/sq km in 10 years
4 Likely	One fire/sq km in 20 years
3 Possible	One / sq km in 50
2 Unlikely	One / sq km in 100
1 Rare	< 1 / sq km in 100

Few fires have been recorded on Barrow in the last 34 years for which records were provided, and as a consequence the average density (number of fires/sq km/year) is low, particularly outside the main oilfield area. Recorded ignitions have largely resulted from human activity, with no fires recorded as being caused by lightning since 1989.

There is some doubt regarding the accuracy of records. More recent records show significantly more ignitions. It is likely earlier records reflect only significant fire events, not all ignitions, and the ignition density is likely to be underestimated.

The low incidence of recorded fires outside main oilfield the does not mean the risk of damaging fires starting in these areas should be ignored. Although the number of recorded fires results in a low density of ignitions (<1 fire/ha/100years) it should be noted this is based on a relatively short period of records. Lightning has caused fires in this area within the past 20 years, and large fires have occurred. In 1961 90% of the island was burnt.

Existing infrastructure has been assigned to ignition risk classes as follows, based on the classifications used in the State BFTA for equivalent infrastructure (where applicable)

and on discussions with personnel at Barrow Island. A 500m buffer is applied to allow for potential spread before initial attack under 95 percentile conditions.

Feature	Class
Accommodation	4
Circuit Breaker	3
Pole with ground transformer	3
Well supply substation	2
Overhead powerlines	
SWER	3
22KV	3
Electricity 1000v cable	3
Anode wells	2
Cathodic protection 240V cable	2
Barrow Is Wells	2
Separator stn (pumps and motors)	2
Waterflood stns (pumps and motors)	2
Other: Workshops	4
Pwr Stn	4
Compressor stn	2
Generator	3
Bowsers	2
RO Plant	2
Steel Flow Lines (hot work)	3
Road Classes	
Cl1	3
Cl2	3
Cl3	3
Cl4	2
Cl5	2

Future works associated with the Gorgon developments will introduce new ignition risks.

Suppression Response Layer

Travel Time Mapping

Suppression Response is based on resources available, and travel times. The travel time through each cell is calculated according to road class, vegetation type, slope, and barriers such as reservoirs, lakes, and cliffs. Response travel times are then calculated using a least cost distance on a cell by cell basis from the centres where suppression resources are located.

The following speeds have been assigned:

Roads

BARROW ROAD CLASS	KPH
1	60
2	50
3	40
4	30
5	15

Vegetation

VEG_CLASS	VEG_TYPE	KPH
D1	Creek or Seasonal Drainage Lines	3
AP	Air Port	60
L1	Limestone Ridges	2
S2	Clay Pans	10
F2	Flats	3
T1	Tidal	0
L10	Limestone Ridges	2
L5	Limestone Ridges	2
F5	Flats	3
F3	Flats	3
C3	Coastal Complex and Dune System	3
F4	Flats	3
L3	Limestone Ridges	2
L2	Limestone Ridges	2
F6	Flats	3
D2	Creek or Seasonal Drainage Lines	3
L4	Limestone Ridges	2
L7	Limestone Ridges	2
C2	Coastal Complex and Dune System	3
F1	Flats	3
C5	Coastal Complex and Dune System	3
T2	Tidal	0
L8	Limestone Ridges	2
M1	Marine	0
F7	Flats	3
D3	Creek or Seasonal Drainage Lines	3
L6	Limestone Ridges	2
V2	Valley Slopes and Escarpment Slopes	4
V1	Valley Slopes and Escarpment Slopes	4
C4	Coastal Complex and Dune System	3
L9	Limestone Ridges	4
C7	Coastal Complex and Dune System	4
C6	Coastal Complex and Dune System	4
C1	Coastal Complex and Dune System	3
S1	Clay Pans	10
BS	Miscellaneous	8

Pipelines

All pipelines have been considered a barrier to vehicles, even if no longer active.

Slope

The effect of slope is classified as follows:

SLOPE DEGREES	1 IN X	KPH	
0-5		20	
5-10	11.4	10	
10-15	5.7	5	Limit for off road tanker
15-20	3.7	2	
20-25	2.7	1.5	
25-30	2.1	0.5	
30-35	1.7	0.5	
35-40	1.4	0.5	
40-45	1.2	0.25	
45-50	1	0.25	
50-60	0.8	0.1	
60-65	0.7	0.1	
65-90	0.6	0.001	Cliff. Limit of effective travel

Available Suppression Resources

Chevron resources consist of an emergency response team and a heavy duty unit located at base. A light patrol unit "fast attack" is used for other duties, and is not guaranteed to be immediately available. Bristow Helicopters have a light unit at the airstrip, but as this is a requirement for their air operations, it is not available for immediate response.

Emergency response personnel are trained in the use of their fire tender, but have not been trained in fireline construction with hand tools. Fire response is restricted to those areas that can be reached with the monitor or hose lines from the heavy duty. Current policy restricts fire response to the oilfield area only.

Additional water tankers are available to support the heavy duty and light patrol, so turn-around times to replenish water would be short.

There is a grader on the island, but procedures and protocols are needed to enable this to be used without delay if required for fire break construction (i.e. new disturbance) in a fire emergency.

Suppression Response Classification

Suppression Response is normally classified as follows, based on travel time and assuming minimal delay in despatch:

Class 1:	Within 15 minutes
Class 2:	15-30min
Class 3	30-60min
Class 4	1-2 hr
Class 5	>2hr

Whilst the travel times on Barrow have been calculated as outlined above (and are shown as time contours on the Suppression Response layer), all areas outside the 15 minutes response time (i.e. accessible by the fire tender) have been placed in class 5, reflecting the current response capability on Barrow, and that any support resources not already on the island would take more than 2 hrs to respond.

Fire Behaviour

95 Percentile Fire Weather Conditions

For planning purposes the fire threat is normally calculated for the 95 percentile weather conditions during the fire season (restricted burning period). Wind, temperature, relative humidity and rainfall all affect fire behaviour, and it is the combination of these factors that determines the fire danger on any particular day. These factors are integrated in a fire danger index. As different fuels respond at different rates to the weather, a separate index (rate of spread index or ROSI) is calculated for each of the fuels under consideration.

A daily ROSI for each fuel type is calculated. The records are ranked, to determine the 95 percentile conditions. The 95 percentile ROSI is then corrected for fuel factors and slope to calculate the predicted rate of spread and fireline intensity.

Data since 1999 from the Barrow AWS was used to calculate the daily and then 95 percentile grassland FDI and shrubland ROSI. As the Restricted Burning Period in the Shire of Ashburton applies throughout the year, all daily records were used.

Fire Spread Models, Assumptions & Limitations.

The dominant fuel over the majority of the island is Spinifex and the fire spread model of Burrows et al (1999) has been used to calculate the rate of spread (ROS). The shrubland model of Catchpole et al (1999) has been applied to small areas dominated by shrubs.

The inputs into the Spinifex model are wind, fuel, and profile moisture content (PMC). The PMC includes both dead and living components. As there is no model available to calculate the daily PMC from weather data, it is not possible to calculate a daily ROSI for Spinifex. However, as the dead component of the fuel can be expected to respond similar to grass, the grassland FDI has been used as a surrogate to identify the 95 percentile wind conditions. The median wind speed for days within 10% of the 95 percentile grassland ROSI was calculated.

A value of 10% has been assigned for PMC. Outback Ecology have recorded moisture contents below 6% during biomass sampling, so the use of 10% as a 95 percentile value is conservative, and may result in an underestimate of the potential rate of spread. The PMC range for the fires on which the equations were developed was 12 -31%.

Fuel quantity has been estimated from percent cover and height using the relationships developed by Burrows et al (1999). These relationships were developed in the Gibson Desert. The percent cover of Spinifex on Barrow is exceptionally high, and greatly exceeds the experimental bounds. A comparison of the calculated values with fuel

samples collected on Barrow indicated the model under predicts the fuel loads on Barrow. The actual fire spread and intensity is therefore likely to greater than predicted by the models in this fire threat analysis.

Average heights were used for each vegetation association, based on limited measurements and plot data provided by Outback Ecology.

Percent cover values were assigned from a layer prepared by Graeme Behn (DEC) from aerial images supplied by Chevron. Whilst there is generally good correlation between the cover from remote sensing and plot data in Spinifex, some errors are evident (eg the airstrip runway).

Whilst the analysis has been undertaken at a 5m * 5m pixel size, the margin of error in the layers will be greater than this. Differences between the vegetation layer boundaries and the boundaries on the spatially corrected image well in excess of 5m were evident. As the vegetation layer was used to assign fuel classes, the spatial accuracy of the output will be limited to by the accuracy of this layer.

Fire Behaviour Mapping

Rate of spread and fireline intensity are calculated for each cell, and the results classified as below. (Note: this table applies throughout WA, and includes fuel types not found on Barrow).

HEADFIRE BEHAVIOUR CLASSES
5 Indirect attack likely to fail
Intensity > 4000 kW/m and/or ROS > 800 m/hr in forest/woodland
Intensity > 8000 kW/m and/or ROS. 2000 m/hr in shrubland ROS > 10000 m/hr in grassland
4 Direct attack not possible/unlikely to succeed.
Intensity > 2000 kW/m and/or ROS > 400 m/hr in forest/woodland
Intensity > 2000* kW/m and/or ROS > 1000 m/hr in shrubland
Intensity > 5000 kW/m and/or ROS > 6500 m/hr in grassland
3 Direct machine and tanker attack possible
Intensity < 2000 kW/m and/or ROS < 400 m/hr in forest/woodland
Intensity < 2000* kW/m and/or ROS < 1000 m/hr in shrubland
Intensity < 5000 kW/m and/or ROS < 6500 m/hr in grassland
2 Hand tool attack possible
Intensity < 800 kW/m and/or ROS < 140 m/hr) in forest/woodland and shrubland
Intensity < 800 kW/m and/or ROS < 300 m/hr in grassland
1 Readily suppressed.
Intensity < 800 kW/m and/or ROS < 60 m/hr in all fuels

It should be noted that the fire behaviour calculated is the potential headfire rate of spread and intensity for each cell, and as such assumes wind and up-slope are in the same direction. In practice this will not be the case everywhere simultaneously, so the actual overall ROS may be somewhat less. The fire behaviour calculations also assume the fire has reached its pseudo steady state. Whilst this is reached almost instantaneously with a line of fire of around 100m, there will be an acceleration phase when fires start from point ignition during which fire behaviour will be significantly less.

As can be readily seen from the resultant fire behaviour map, under the 95 percentile weather conditions any fire which is not suppressed during its initial acceleration phase will not be able to be controlled whilst such conditions persist. Under these conditions the fire line intensity over much of the island will be more than twice the limits under which effective suppression action can be taken (Fire Line Intensity map). The implications are that:

- conditions need to moderate significantly before control can be achieved
- uncontrollable bush fires can occur under less severe conditions than the 95 percentile conditions.

Consequence

Values vulnerable to damage by bush fires include both market and non-market values. Traditionally these have been difficult to compare, and none of the many methods applied to assign commercial values to non-market benefits have met with universal success. For bush fire threat analysis, no attempt is made to assign market prices to non-market values (although such amounts may be broadly inferred). Instead, values are assigned to one of six broad categories based on the likely consequences if damaged/destroyed by fire.

For the Barrow BFTA, values have been assigned to consequence classes in accordance with the guidelines in Appendix 1, as summarised below. A 50m buffer has been applied to the values. Any fire within 50m poses an immediate threat to the value under 95 percentile conditions.

Where values buffer zones overlap, only the highest value is shown, and used in the subsequent threat assessment.

VALUES (buffered 50m)

Ecologically Significant Species	3
DEFL	As per State classification
Fauna	As per State classification
FlowLines	
Shipping Steel	Non active. No value assigned
Shipping GRE	5
Gathering Steel	2
Gathering GRE	4
GRE Waterflood	2
Branch	
Header	
Well	
Pipelines High Press gas	
Active	3
redundant	
Pipelines Low Press gas	3
Active	
Redundant	
Production Flowlines	
Steel	2
GRE	3
Powerlines	
22KV	4
SWER	3
100V cable	3

Overall Bush Fire Threat

The following matrix is used to assign the risk or Bush Fire Threat on a cell by cell basis.

Consequence Class	6: Catastrophic	5: Major	4: Serious	3: Moderate	2: Minor	1: Low
Likelihood Class						
5 Almost Certain	11	10	9	8	7	6
4 Likely	10	9	8	7	6	5
3 Possible	9	8	7	6	5	4
2 Unlikely	8	7	6	5	4	3
1 Rare	7	6	5	4	3	2

Risk Class (Threat)	
1 Low Risk	
2 Moderate Risk	
3 Significant Risk	
4 High Risk	
5 Very High Risk	

A failing of assigning the threat on a cell by cell basis is that it ignores the potential effects beyond the buffers applied. Where such an analysis is carried out at a regional scale with larger pixel size, this is less critical, but the results must be interpreted with care, particularly where the analysis is carried out at a fine resolution as in this case (5m * 5m pixel). It is thus of the utmost importance to consider the individual layers, as well as the summary map, when interpreting the bush fire threat and making decisions on any action.

Overall, the threat is low to moderate for most of the island in comparison to other areas of Western Australia. This is due to the low risk of ignition, which is based on records since 1964, and the localised nature of the values at risk. The fire record set does not include 1961, when reportedly 90% of the island was burnt.

Most fires can be suppressed irrespective of the weather conditions if sufficient resources are present shortly after ignition, before the fire has developed. In general this would apply to fires where effective suppression can take place within 15 minutes. Resources on the island are not capable of effective fast initial attack for most of the island outside the oilfield area.

The summary map shows the threat is not high except where there are identified higher values; however there is currently no barrier to fires that may start elsewhere. Whilst the chance of a fire starting is low, should initial attack fail and a fire develop to its pseudo steady state under severe fire weather conditions, such a fire on Barrow will not be able to be controlled, irrespective of the available resources. In this situation it is likely the majority of the island (including the oilfield) will be burnt, as occurred in 1961.

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Acknowledgements

Chevron Australia Pty Ltd provided much of the data on which this analysis has been based, facilitated an inspection visit to Barrow, and undertook some fuel sampling.

The Department of Environment and Conservation provided data from the Corporate GIS database.

Graeme Behn (DEC) provided a percent cover layer derived from an image supplied by Chevron.

Outback Ecology provided biomass sampling plot data.

Appendix 1 : Guide to Classifying Values

GUIDE TO CLASSIFYING VALUES FOR BUSH FIRE THREAT ANALYSIS based on likely consequences if burnt				
CONSEQUENCE	**BIODIVERSITY CONSERVATION**	**RECREATION/LANDSCAPE/ENVIRONMENT**	**PRIMARY PRODUCTION**	**COMMUNITY PROTECTION**
6 CATASTROPHIC	**SPECIES EXTINCTION**	**ONE OR MORE FATALITIES**	**DAMAGE > $10,000,000**	**ONE OR MORE FATALITIES PERMANENT TOTAL INCAPACITY EXTENSIVE DAMAGE > $10,000,000**
	Only known occurrence of threatened species or ecological community known to be fire sensitive. Fire will result in extinction.	Areas with high risk of fatalities in event of bushfire.		Settlements, rural residential and special rural subdivisions with native vegetation, poor access, no reticulated water. Does NOT include larger urban areas with maintained gardens, ovals and structures for refuge and therefore a low risk to life.
		Camping areas with high fire season populations, restricted egress, no refuge area. (eg Murray Valley). Does NOT include areas where adequate refuge exists (eg beachside such as Hamelin Bay) or rapid escape/evacuation possible.		Hospitals and schools in bush settings
		Recreation sites with high fire season visitor numbers, dead end access and no refuge.		Public buildings in bush area used daily, access for suppression and evacuation poor.

GUIDE TO CLASSIFYING VALUES FOR BUSH FIRE THREAT ANALYSIS based on likely consequences if burnt				
CONSEQUENCE	**BIODIVERSITY CONSERVATION**	**RECREATION/LANDSCAPE/ENVIRONMENT**	**PRIMARY PRODUCTION**	**COMMUNITY PROTECTION**
5 MAJOR	**LOCAL EXTINCTION. MAJOR REDUCTIONS IN TOTAL POPULATIONS OF VULNERABLE SPECIES OR COMMUNITIES**	**PERMANENT DISABILITY / SERIOUS INJURY.**	**EXTENSIVE DAMAGE $5,000,000 - $10,000,000**	**PERMANENT DISABILITY / SERIOUS INJURY. EXTENSIVE DAMAGE $5,000,000 - $10,000,000**
	Critically endangered species or ecological communities. Risk of local extinction if disturbed.	Major recreation/tourist areas) with good access, but sheer numbers pose a risk to life in event of fire. (eg Tree Top Walk, Boranup and Gloucester National Parks)	Pine plantations >1000ha >8 yrs old	Vulnerable major essential utilities (regional power, water, gas supply) where disruption will result in large downstream losses
	Endangered species identified as fire sensitive	Camping sites on popular long distance walk tracks & mountain bike trails with summer use and risk to life.		Rural/residential and special rural subdivisions, poor access, reticulated, regular fuel modification.
	Only known occurrence of, priority 1 or 2 species.known to be fire sensitive			Public buildings with daily use access good, or weekly use access for suppression and evacuation poor.
	Severely under-represented fire seral stages of communities with vulnerable species.			Built up areas with bush surrounds
	Severely under-represented structural types.			Fire vulnerable railway infrastructure with potential long term disruption (eg wooden bridges).

GUIDE TO CLASSIFYING VALUES FOR BUSH FIRE THREAT ANALYSIS based on likely consequences if burnt				
CONSEQUENCE	**BIODIVERSITY CONSERVATION**	**RECREATION/LANDSCAPE/ENVIRONMENT**	**PRIMARY PRODUCTION**	**COMMUNITY PROTECTION**
				Remote communities/settlements with no fire services, significant infrastructure values.
4 SERIOUS	**LOCAL EXTINCTIONS OF POORLY KNOWN SPECIES** **MAJOR REDUCTION IN LOCAL EXTENT OF VULNERABLE SPECIES OR COMMUNITIES**	**PERMANENT LOSS OF REGISTERED HERITAGE VALUES** **DAMAGE $1,000,000 TO $5,000,000**	**DAMAGE $1,000,000 TO $5,000,000**	**DAMAGE $1000,000 TO $5,000,000** **PERSONAL INJURY (LTA)**
	Endangered species and threatened ecological communities, fire sensitivity unknown..	Fire vulnerable registered heritage sites	Pine plantations >100ha < 1000ha 8-20 yrs old.	Rural residential subdivisions, multiple access, reticulated, fuel modification..
	Vulnerable, P1 & P2 species known to be fire sensitive	Fire vulnerable registered Aboriginal sites	Consolidated Karri regrowth >1000ha, 5-30 yrs old	Public buildings, monthly use access good
	Long established (>15yrs) research/ monitoring plots and scientific reference areas to be kept fire free.	Major infrastructure		Public utilities, pumping stations, etc
	Area significant to the maintenance of overall structural diversity, species richness	Infrastructure posing significant environmental threat (eg bulk chemical storage).		High voltage distribution carriers
	Under-represented structural types eg old growth forest	Bush camping areas, some risk to life.		

GUIDE TO CLASSIFYING VALUES FOR BUSH FIRE THREAT ANALYSIS based on likely consequences if burnt				
CONSEQUENCE	**BIODIVERSITY CONSERVATION**	**RECREATION/LANDSCAPE/ENVIRONMENT**	**PRIMARY PRODUCTION**	**COMMUNITY PROTECTION**
3 MODERATE	**LOSS OF PRIORITY SPECIES** **LOSS OF HABITAT/SPECIES DIVERSITY**	**DAMAGE $100,000 TO $1,000,000**	**DAMAGE $100,000 TO $1,000,000** **LONG LIVED CROPS** **HIGH VALUE ANNUAL CROPS**	**DAMAGE $100,000 TO $1,000,000**
	Vulnerable, P1 & P2 species not known to be fire sensitive	Harnessed catchments with erosion susceptible soils	Small (<100ha) pine and eucalypt plantations	Communications repeaters, masts and towers
		Short term research/monitoring plots to be kept fire free	Other plantation areas (including oil mallee) not included elsewhere.	Scattered houses/buildings
			Orchards, vineyards, olive groves	Fire vulnerable railway infrastructure, short term impact
	Populations of known fire vulnerable priority 3,4 and 5 species and ecological communities	Registered heritage sites, fire vulnerability unknown.	Consolidated Karri regrowth <50 years old	Transmission lines, steel towers (serious damage unlikely, but short term interruption to supply possible)
	Areas of regionally significant species richness, structural diversity		Consolidated Jarrah regrowth 5-20 yo.	
	Regionally under-represented seral stages or structural type		Intensive animal production	
			High value annual crops	
2 MINOR	**LOSS OF LOCALLY SIGNIFICANT SPECIES OR ECOLOGICAL COMMUNITIES**	**$10,000 TO $100,000**	**$10,000 TO $100,000**	**$10,000 TO $100,000**
	Locally significant species, communities	Recreation infrastructure	Developed farmland/pasture	Low voltage distribution carriers

GUIDE TO CLASSIFYING VALUES FOR BUSH FIRE THREAT ANALYSIS based on likely consequences if burnt				
CONSEQUENCE	**BIODIVERSITY CONSERVATION**	**RECREATION/LANDSCAPE/ENVIRONMENT**	**PRIMARY PRODUCTION**	**COMMUNITY PROTECTION**
	Priority 3, 4 & 5 species: fire sensitivity unknown	Day use sites	Apiary sites	
1 INSIGNFICANT	**<**	**< $10,000**	**< $10,000**	**< $10,000**
	Other native vegetation	Minor infrastructure	Other values not listed	

Maps

Ignition Risk
Suppression Response

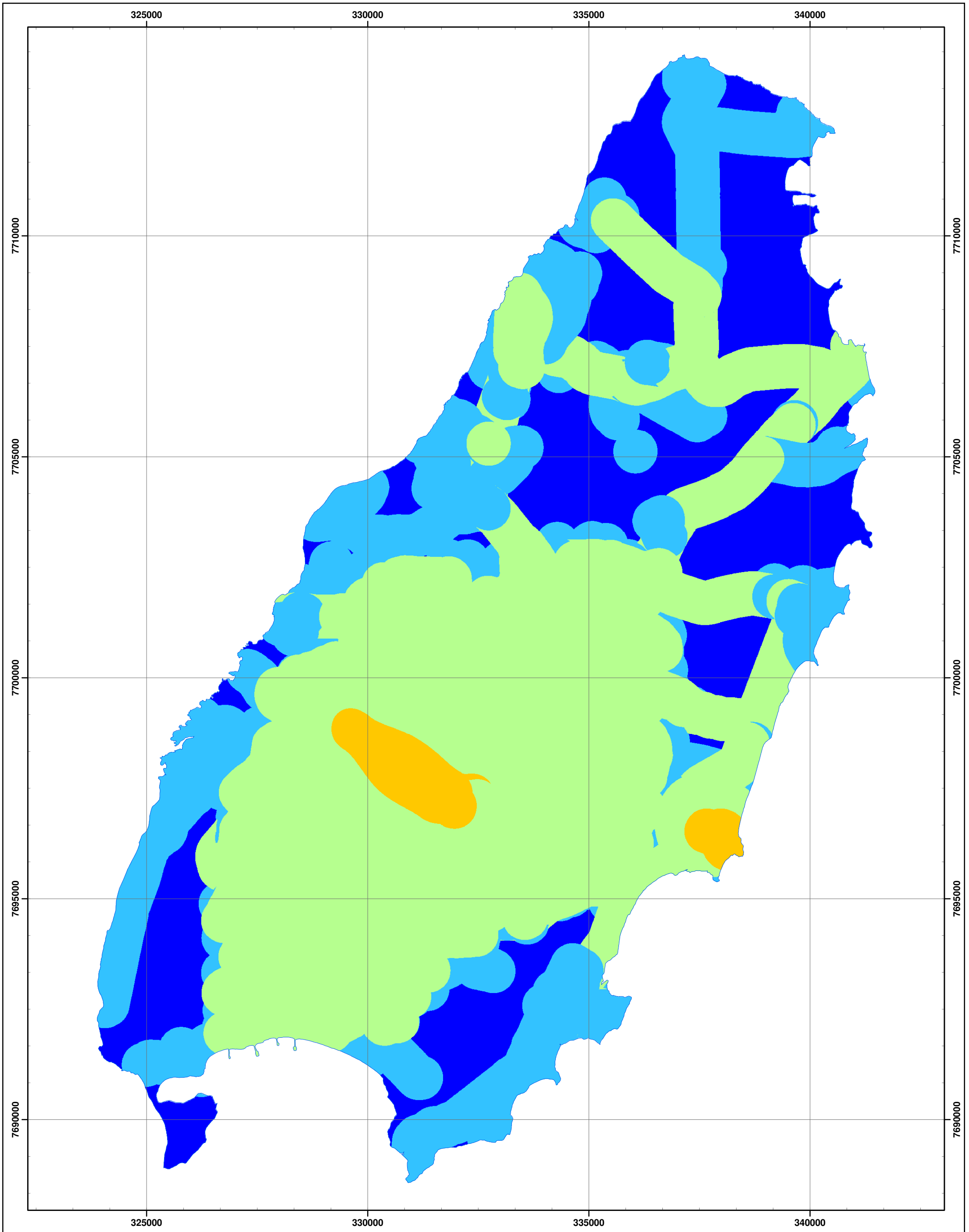
Fire Behaviour

Fireline Intensity

Likelihood

Consequences

Bush Fire Threat



Barrow Bush FireThreat Analysis

Ignition Risk

0 495 990 1,980 2,970
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared
May 2009

ignitionrisk

Risk Class

- **1 Rare (1:100+ yrs)**
- **2 Unlikely (1:50-100 yrs)**
- **3 Possible (1:20-50 yrs)**
- **4 Likely (1:10-20 yrs)**
- **5 Almost certain (1: <10yrs)**

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Based on data supplied by:
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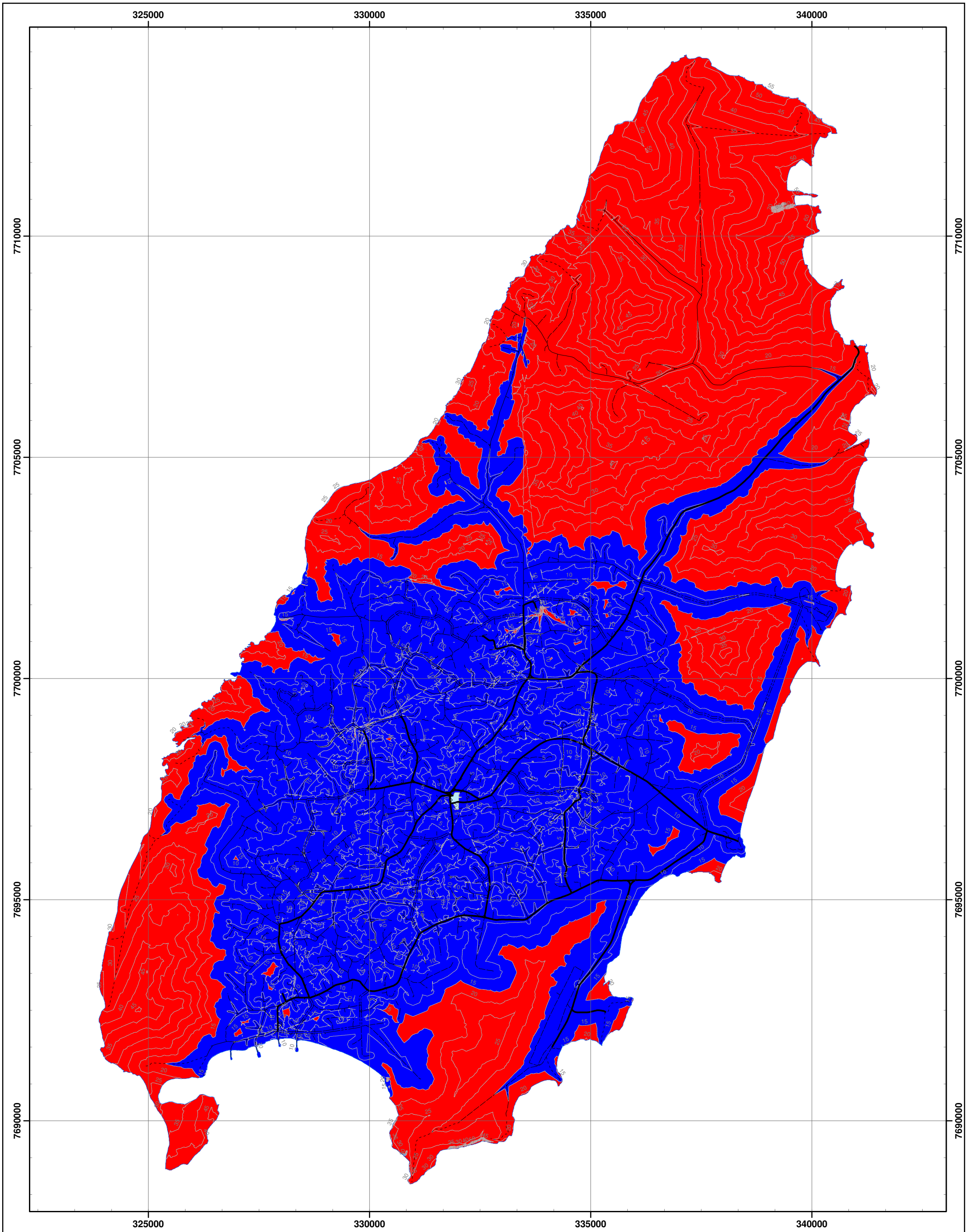

Barrow Bush FireThreat Analysis

Suppression Response

0 500 1,000 2,000 3,000
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared
May 2009

Suppression Response Classes

- Within 15 minutes
- 15 - 30 minutes
- 30 - 60 minutes
- 1 - 2 hrs
- > 2 hrs

Road Class

- 1
- 2
- 3
- 4
- 5
- Base
- 5min contour

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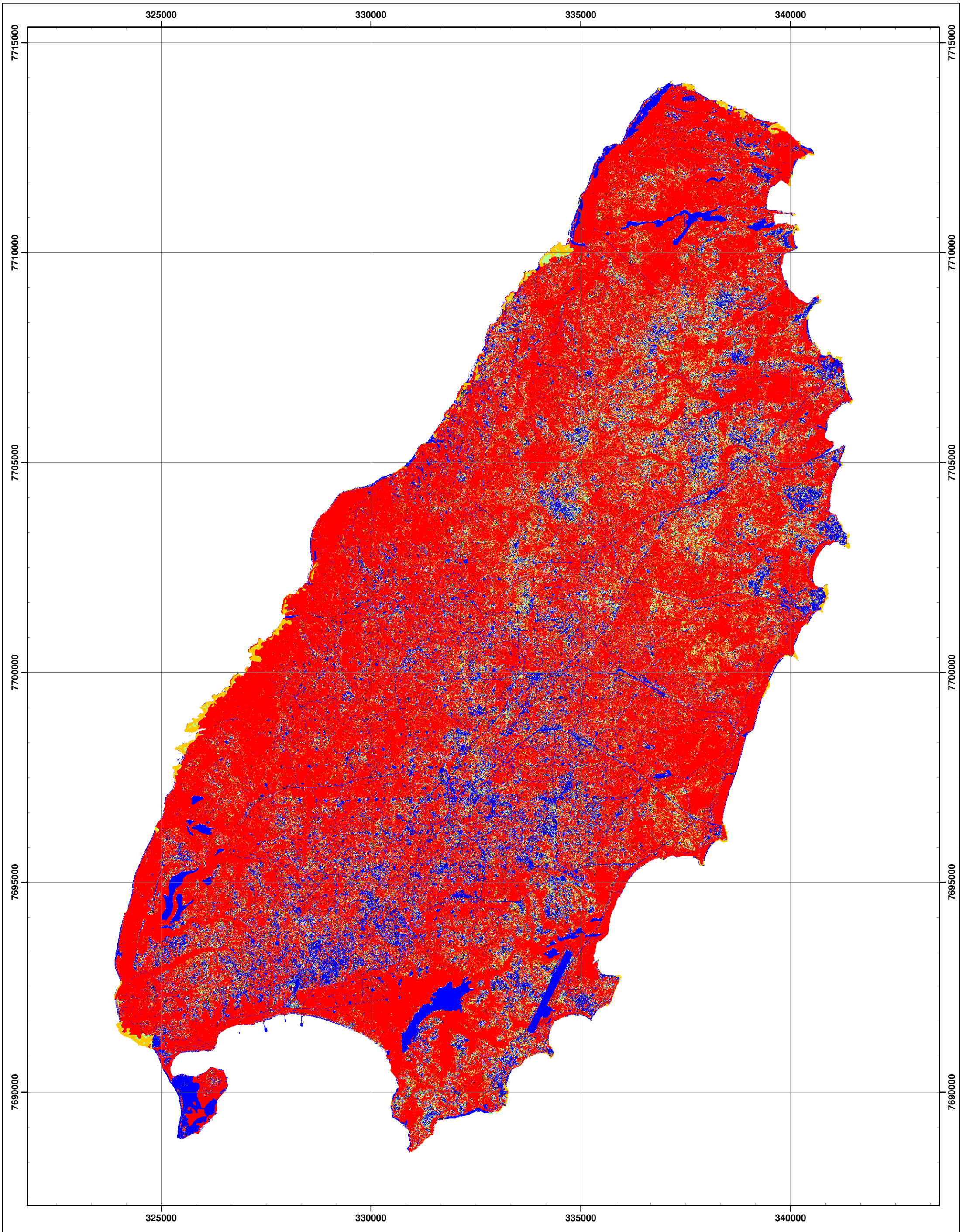

Barrow Bush FireThreat Analysis

Fire Behaviour - Suppression Classes

0 550 1,100 2,200 3,300
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared May 2009

- 1 Readily Suppressed
- 2 Handtool attack feasible
- 3 Direct machine and tanker attack possible
- 4 Direct attack not possible/unlikely to succeed
- 5 Indirect attack unlikely to succeed

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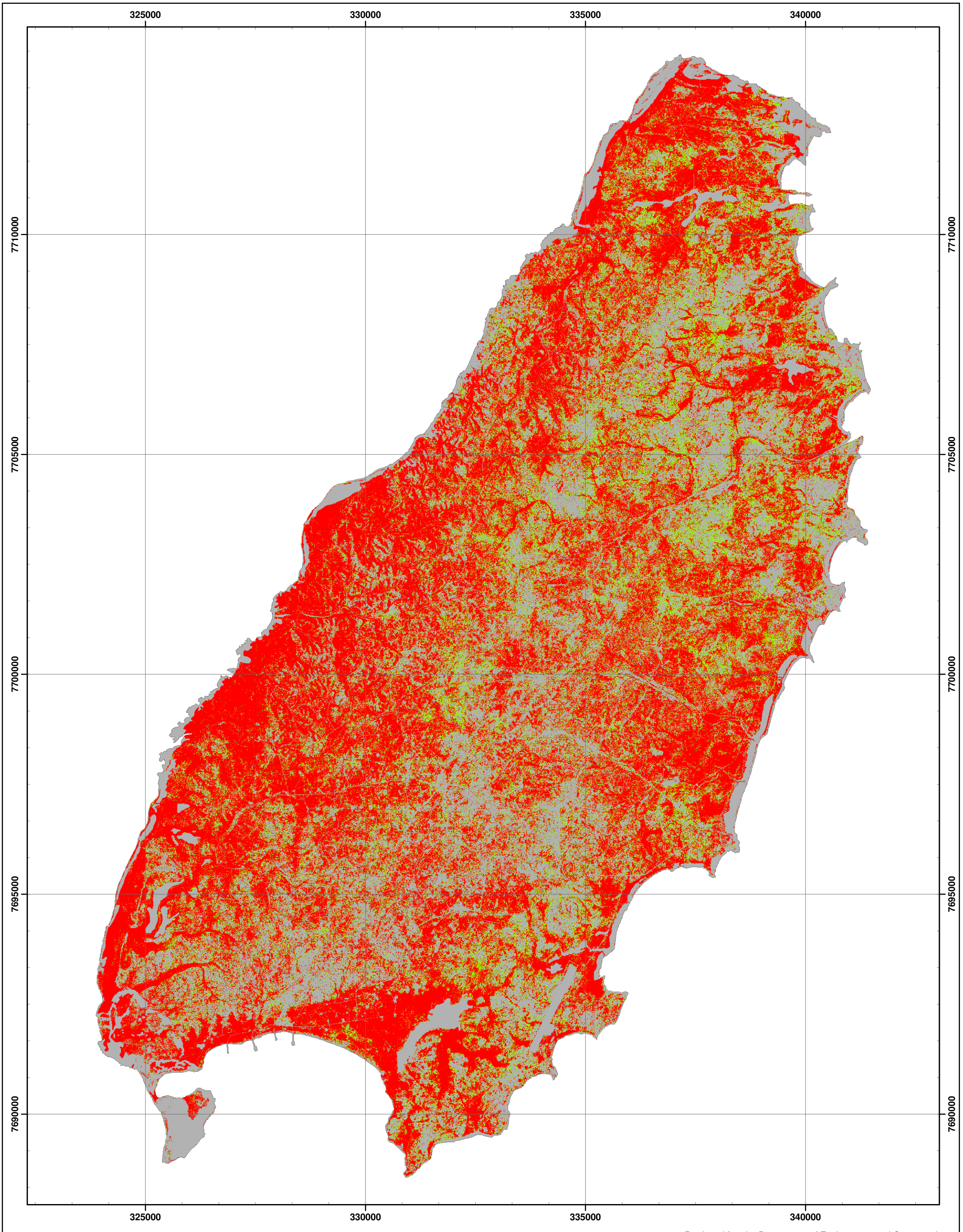

Barrow Bush FireThreat Analysis

Potential Fireline Intensity

0 500 1,000 2,000 3,000
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

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- Less than 8000 kW/m
- 8,000 - 20,000 kW/m
- Greater than 20000 kW/m

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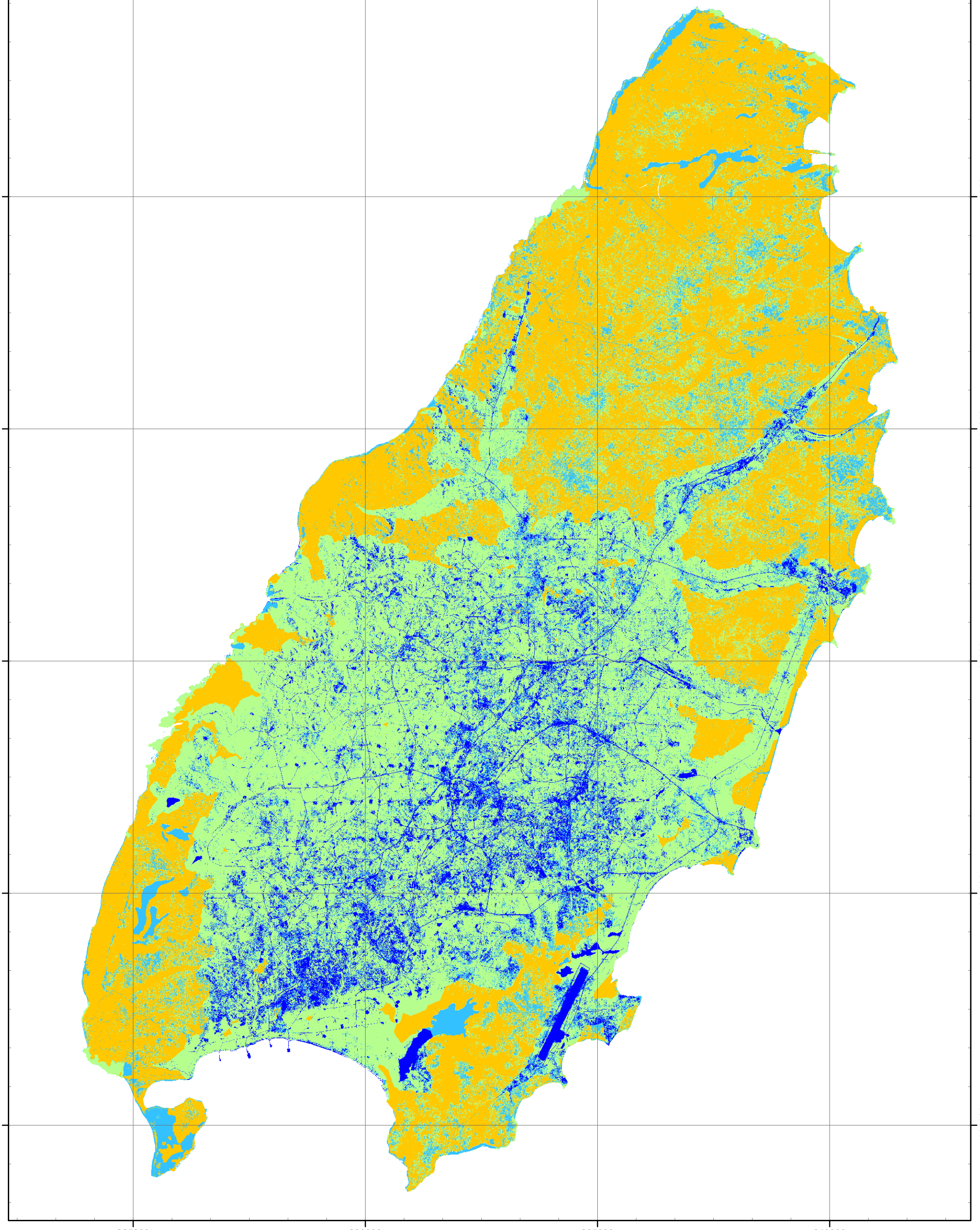
325000 330000 335000 340000

7710000 7705000 7700000 7695000 7690000



Barrow Bush FireThreat Analysis

Likelihood

0 500 1,000 2,000 3,000
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared May 2009

Likelihood of fire impacting identified values

- 1 Rare
- 2 Unlikely
- 3 Possible
- 4 Likely
- 5 Almost Certain

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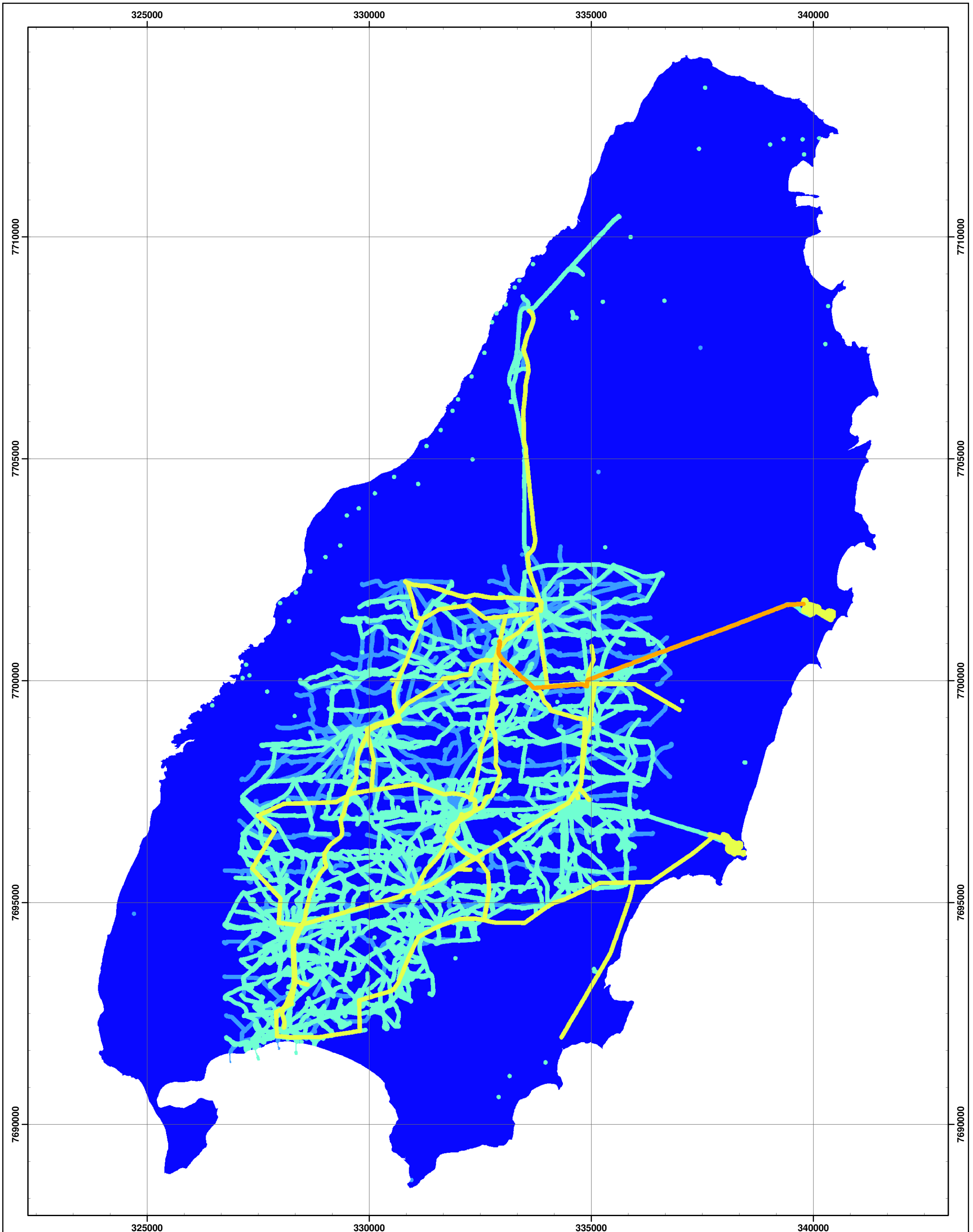

Barrow Bush FireThreat Analysis

Consequence

0 495 990 1,980 2,970
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared
May 2009

Consequence if fire occurs

- 1 Low
- 2 Minor
- 3 Moderate
- 4 Serious
- 5 Major
- 6 Catastrophic

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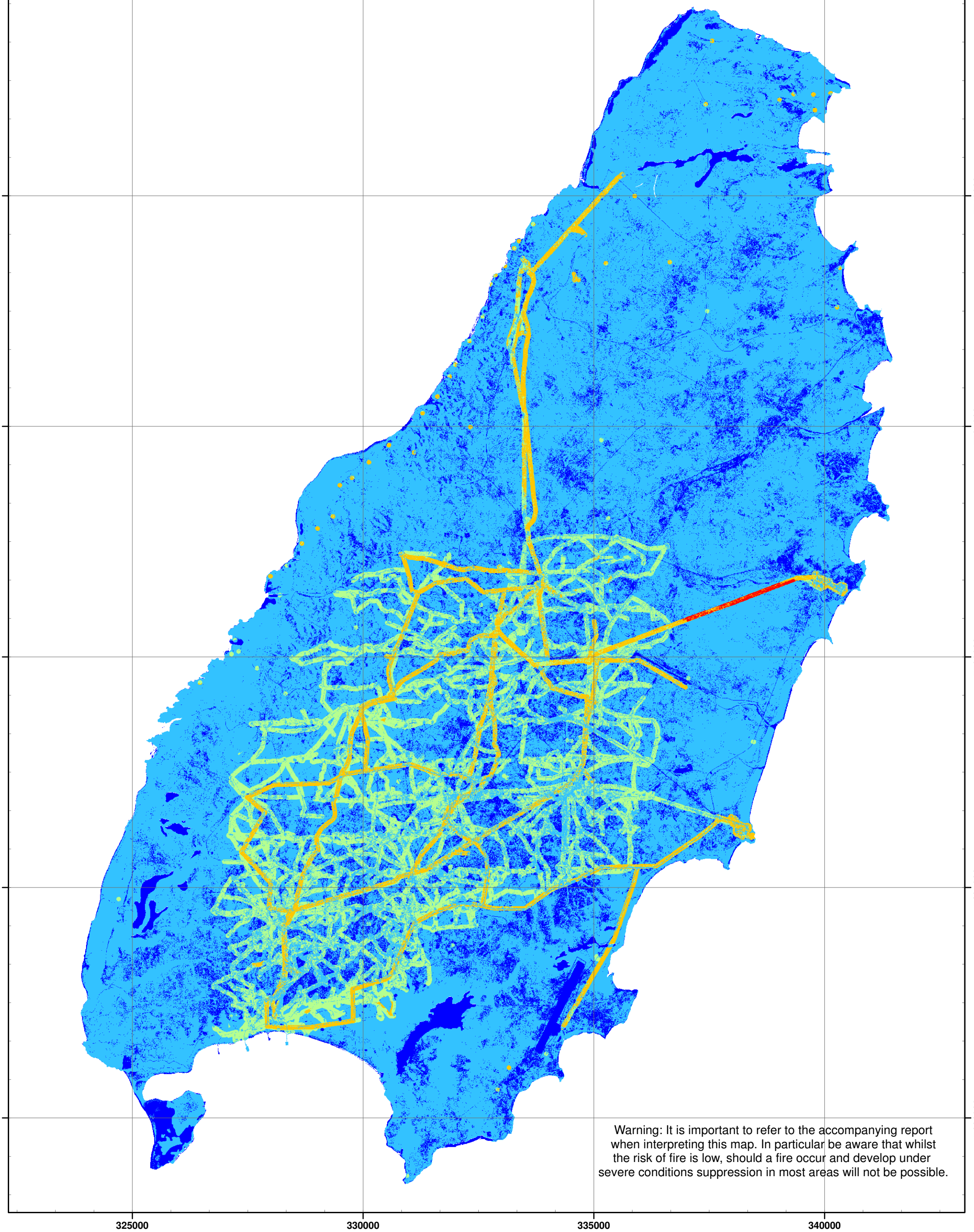
325000 330000 335000 340000

7710000 7705000 7700000 7695000 7690000



Warning: It is important to refer to the accompanying report when interpreting this map. In particular be aware that whilst the risk of fire is low, should a fire occur and develop under severe conditions suppression in most areas will not be possible.

Barrow Bush FireThreat Analysis

Bush Fire Threat

0 500 1,000 2,000 3,000
Meters

Projection: UTM MGA Zone 50
Datum: GDA94

N

Prepared May 2009

Combined Likelihood and Consequence

- 1 Low Risk
- 2 Moderate Risk
- 3 Significant Risk
- 4 High Risk
- 5 Very High Risk

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