PROGRAM D

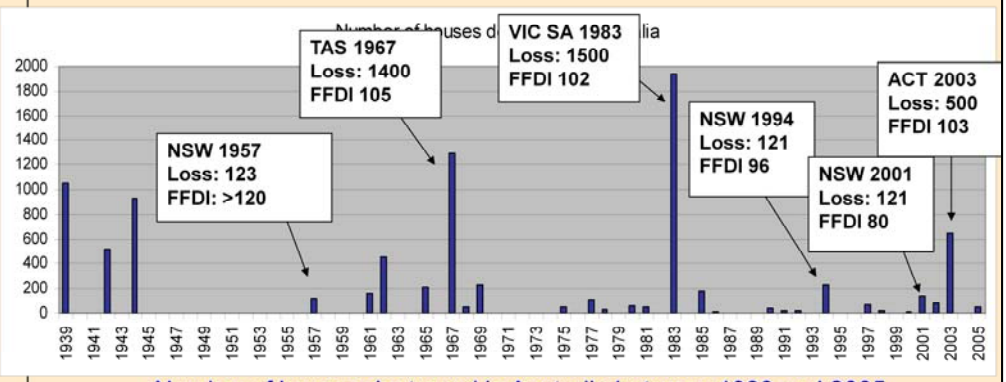
Asset protection, fire weather and risk

Justin Leonard
Sustainable Ecosystems, CSIRO, Victoria

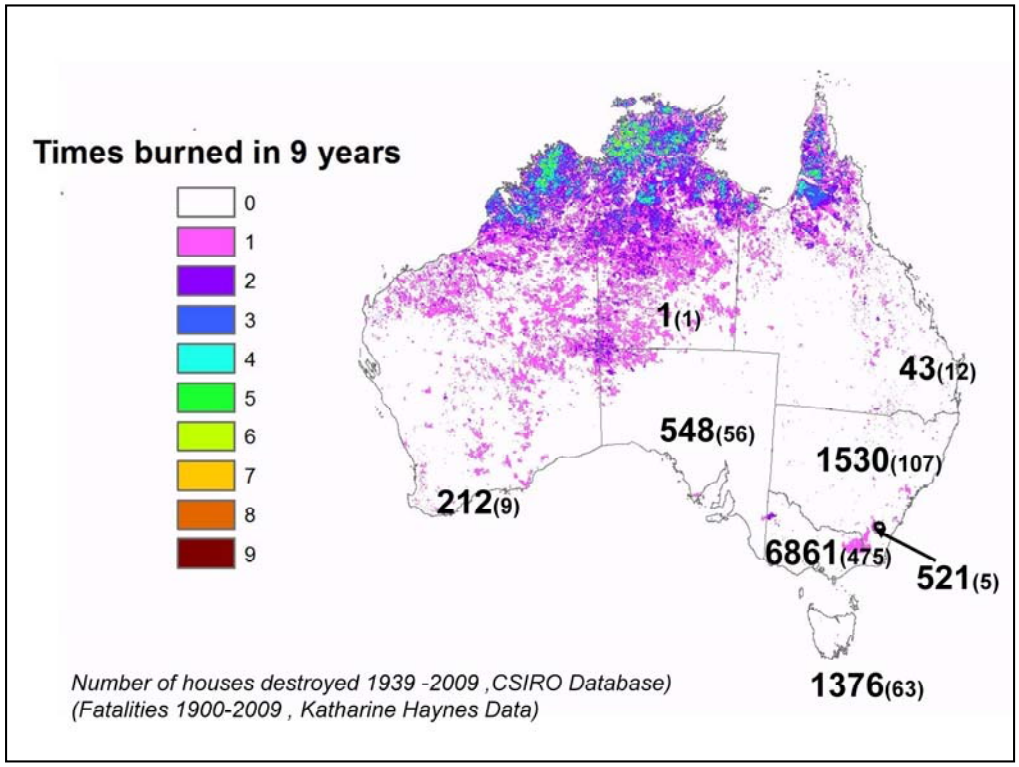
bushfire CRC

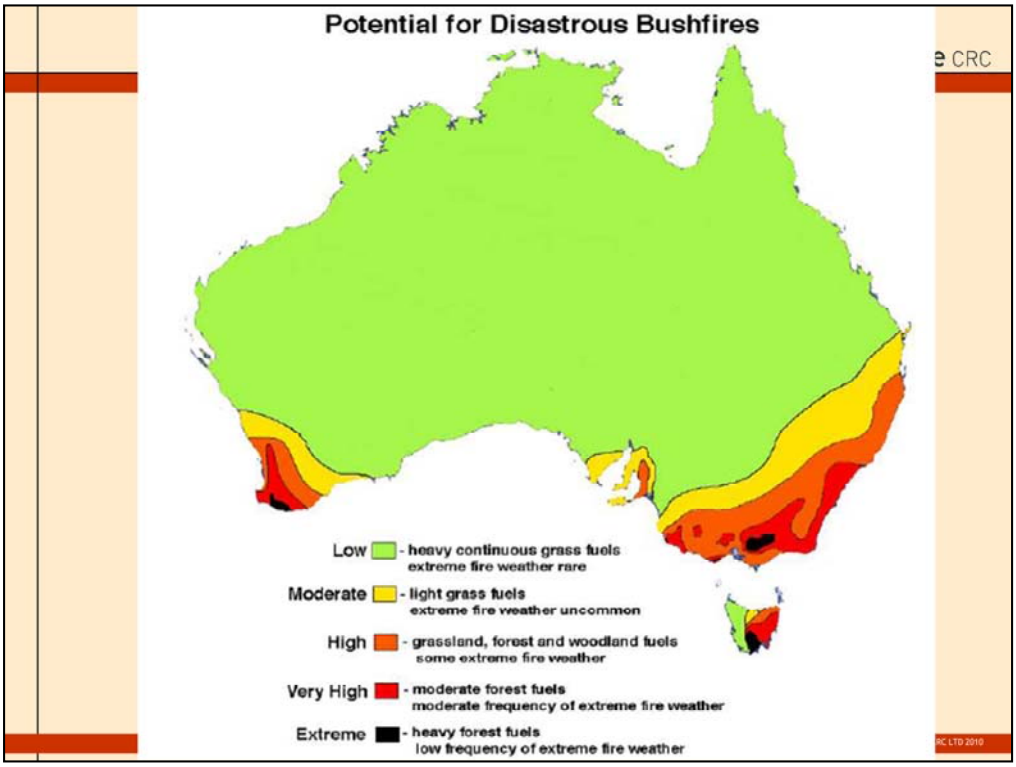
PROGRAM D People and property safety

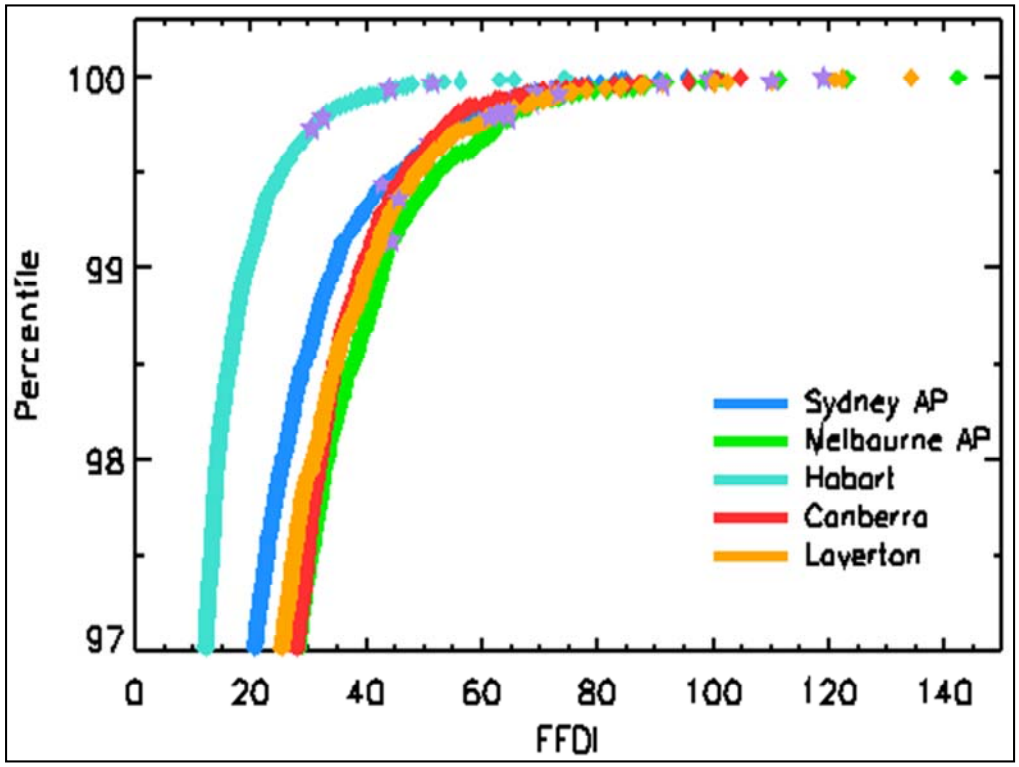
Major bushfire events in Australia that have caused house loss

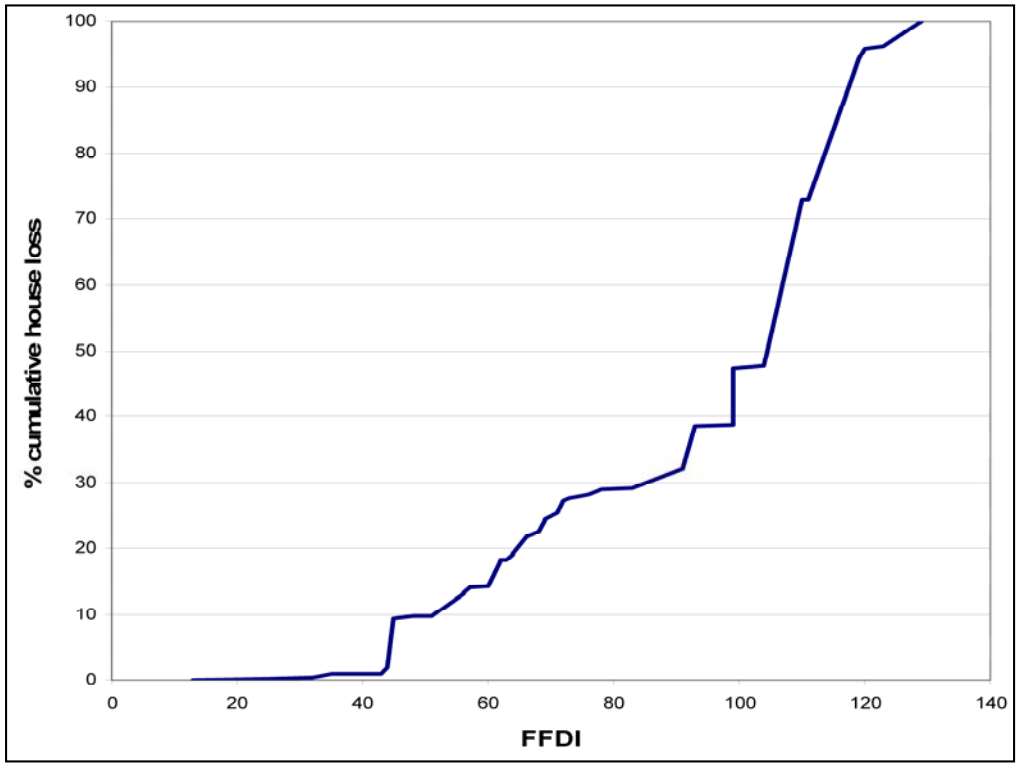


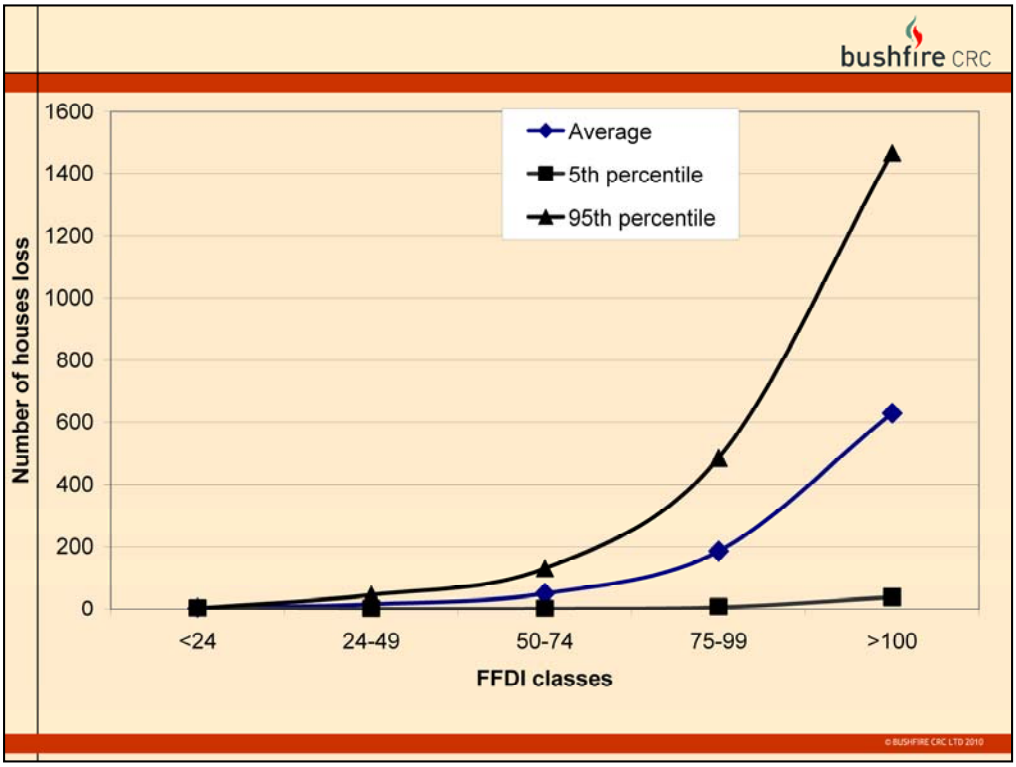
Number of houses destroyed in Australia between 1939 and 2005


Times burned in 9 years
0
1
2
3
4
5
6
7
8
9
1(1)
43(12)
548(56)
1530(107)
212(9)
6861(475)
521(5)
1376(63)
Number of houses destroyed 1939 -2009 ,CSIRO Database)
(Fatalities 1900-2009 , Katharine Haynes Data)


Potential for Disastrous Bushfires
e CRC
Low - heavy continuous grass fuels
extreme fire weather rare
Moderate - light grass fuels
extreme fire weather uncommon
High - grassland, forest and woodland fuels
some extreme fire weather
Very High - moderate forest fuels
moderate frequency of extreme fire weather
Extreme - heavy forest fuels
low frequency of extreme fire weather
RC LTD 2010


100
99
98
97
Percentile
0
20
40
60
80
100
120
140
FFDI
Sydney AP
Melbourne AP
Hobart
Canberra
Laverton


% cumulative house loss
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
FFDI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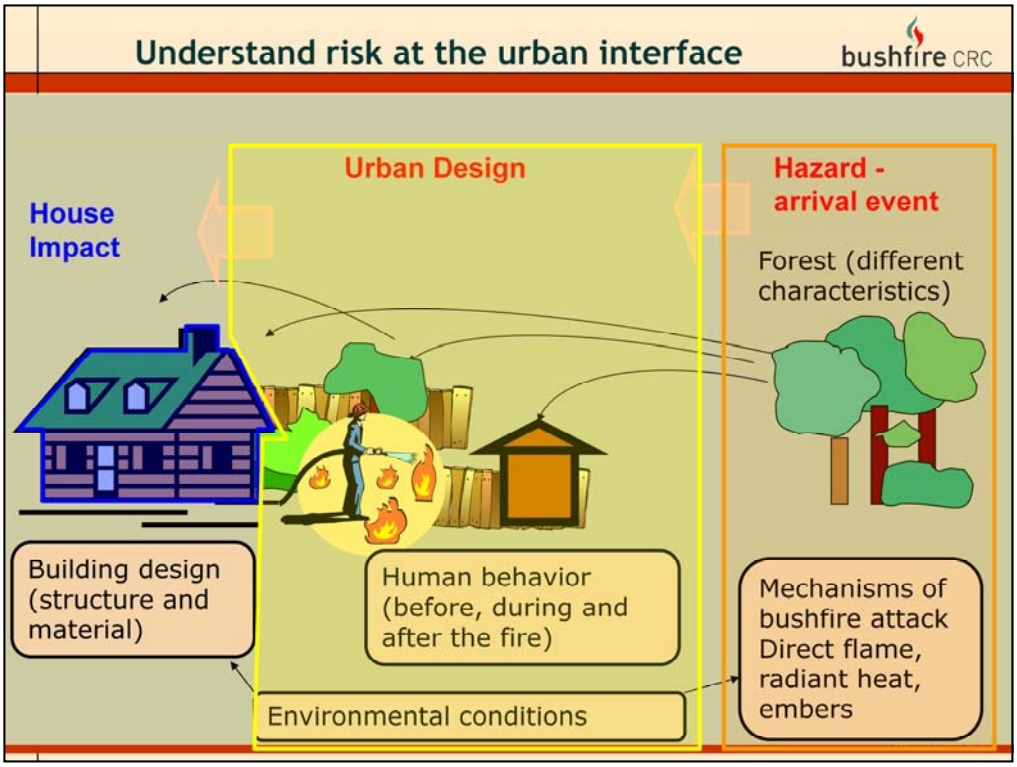
Number of houses loss
1600
1400
1200
1000
800
600
400
200
0
Average
5th percentile
95th percentile
<24
24-49
50-74
75-99
>100
FFDI classes
© BUSHFIRE CRC LTD 2010


Understand risk at the urban interface
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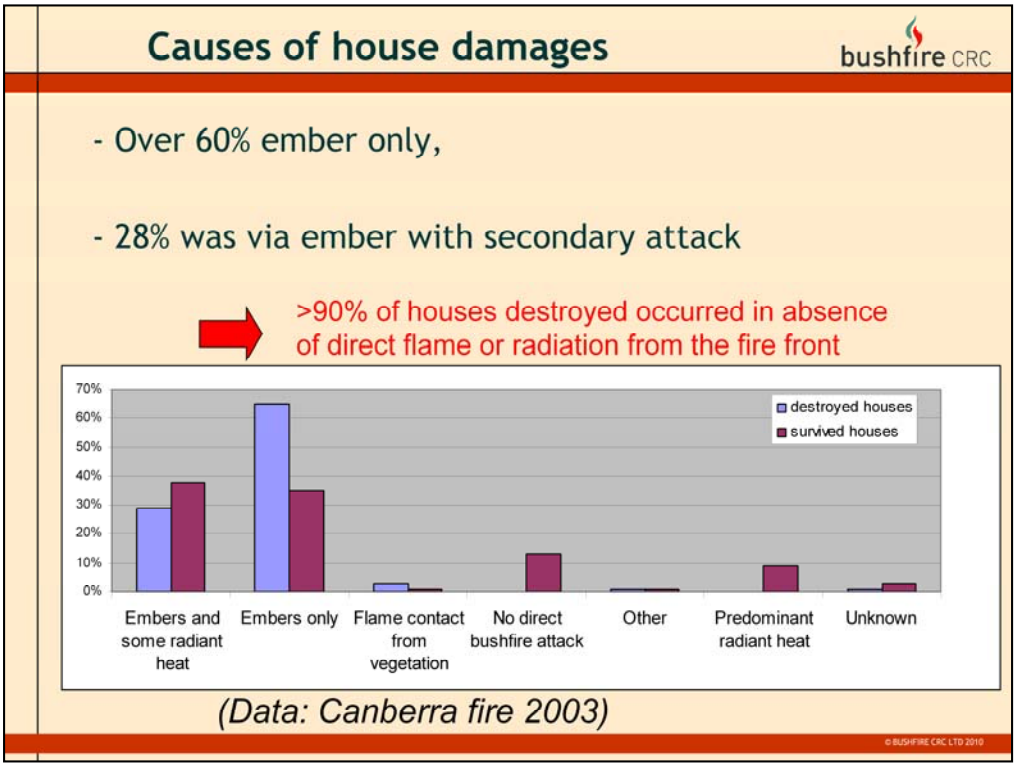
House Impact
Urban Design
Hazard - arrival event
Forest (different characteristics)
Building design (structure and material)
Human behavior (before, during and after the fire)
Environmental conditions
Mechanisms of bushfire attack Direct flame, radiant heat, embers



Bushfire impact on the urban interface over the past seven decades has taught us many lessons

The general principles of how bushfires impact on the urban interface are now well established

However we still lack the formal quantification of the most critical aspects of urban interface risk prediction

The recent ACT bushfires stand as a reminder that previous urban impacts events do not represent the worst case scenarios for many aspects of the fire event.

Specific urban edge example

Stage two - fire spread due to urban elements

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Quantifying house to house spread

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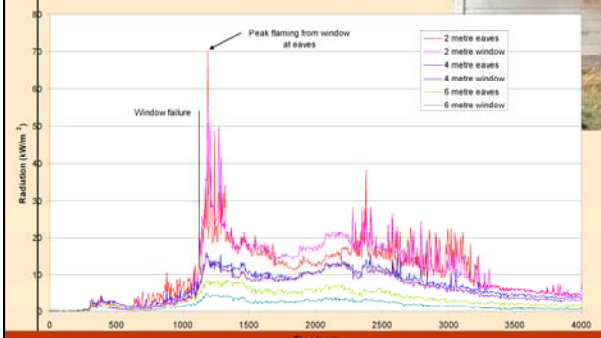
Radiation emitted from house

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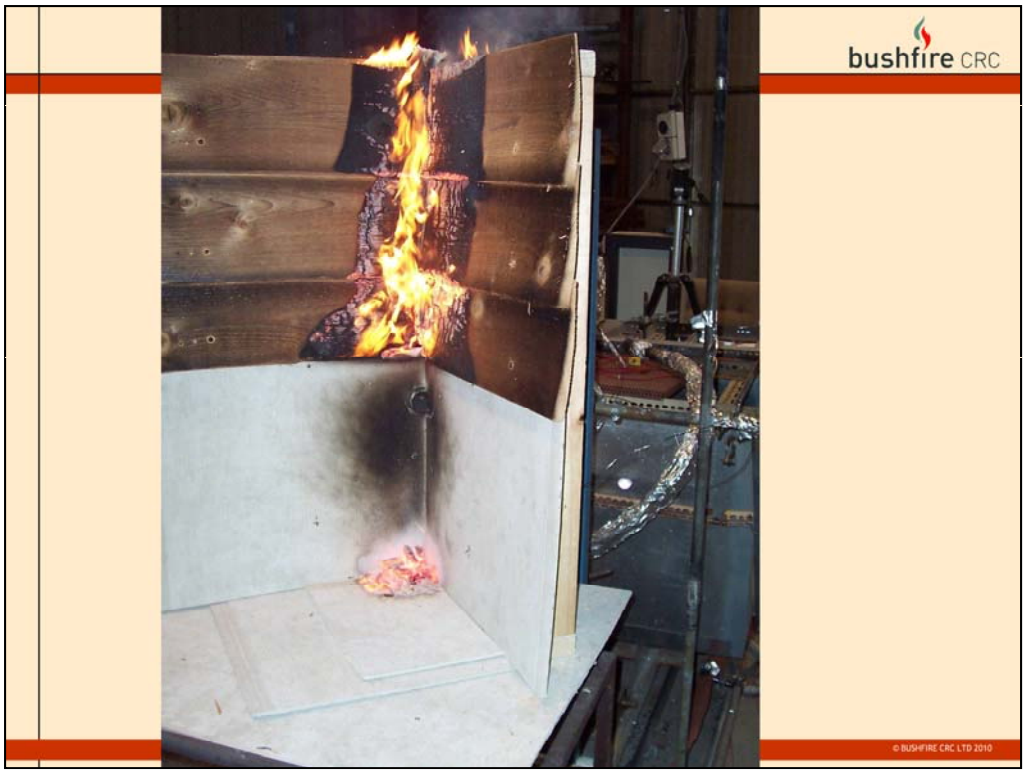
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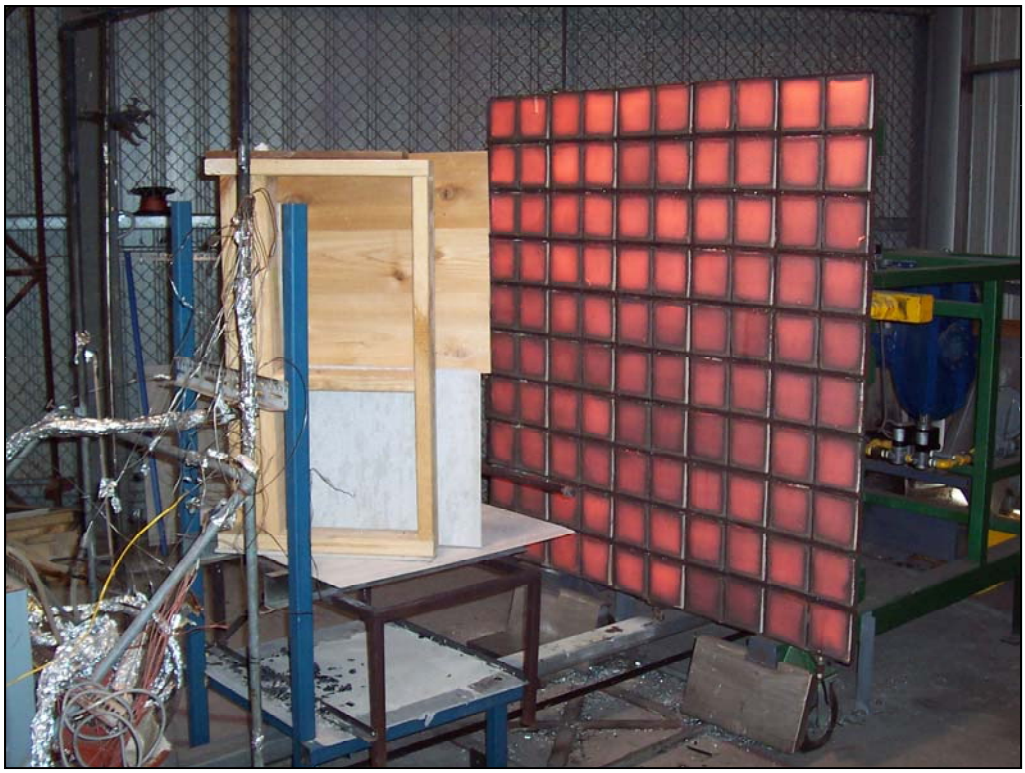

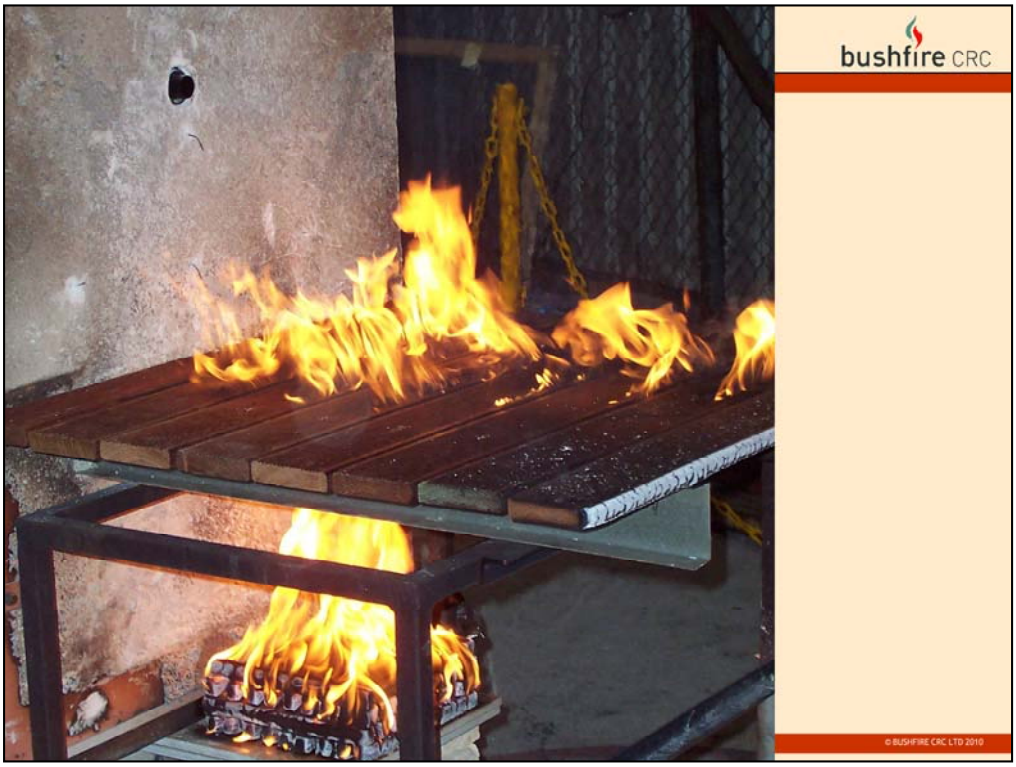
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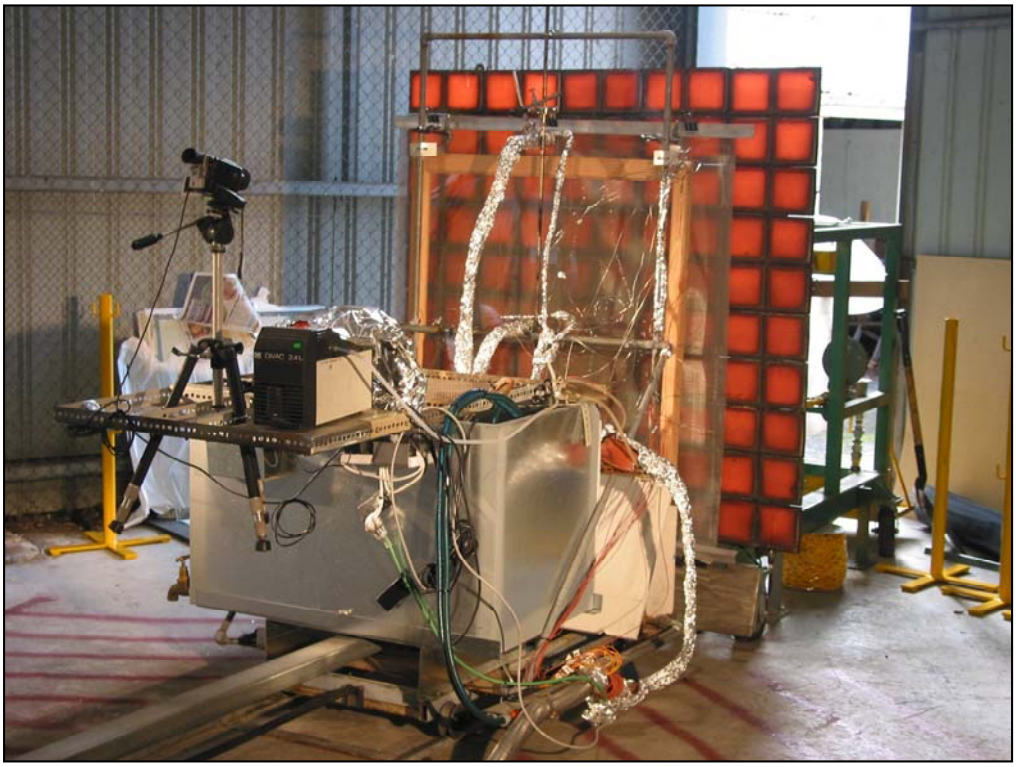
D1c Glazing performance in bushfires

First recorded bushfire event



About the research conduct on material performance in house we have Assessed glazing system design.

Plain, toughened and laminated glass have been tested with various aluminum and timber frame. The results provide the necessary information to assist occupant to make appropriate cost effective solution (that's mean different solution of glazing for different level of bushfire exposure).

Other work in progress deal with effective timber deck design solutions to minimise ignition by embers attack. And Assessing the viability of using external water spray systems as a risk minimisation strategy for buildings

In the future we will assess the performance of roof system and study the behaviour of domestic gas bottle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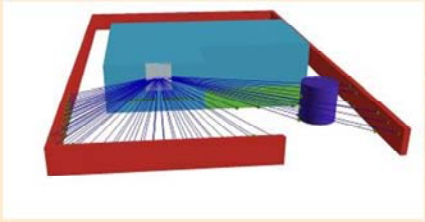
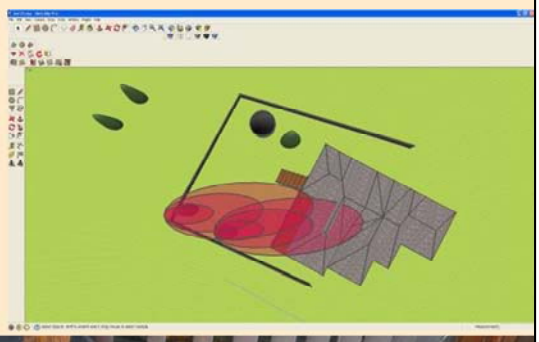
Urban interface Vulnerability Modeling

1. **Embers entry thru gaps**
   a) Ember attack: density and duration (type material, wind , distance)
   b) Ember entry function gaps, material and type of object
2. **Radiant heat exposure on window**
   a) Radiant heat attack: view factor, distance, temperature,…
   b) Critical level cause failure



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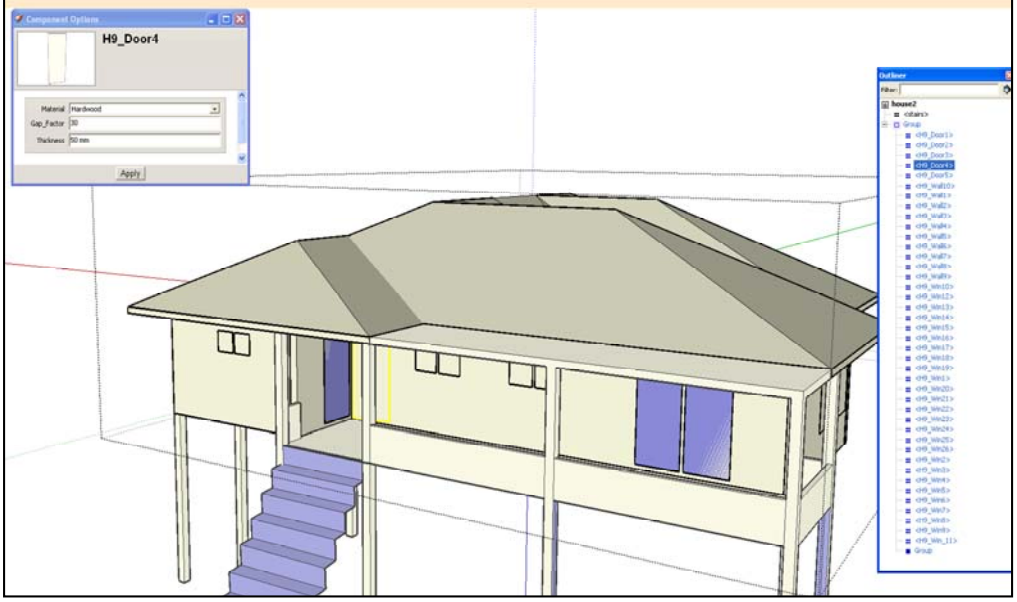
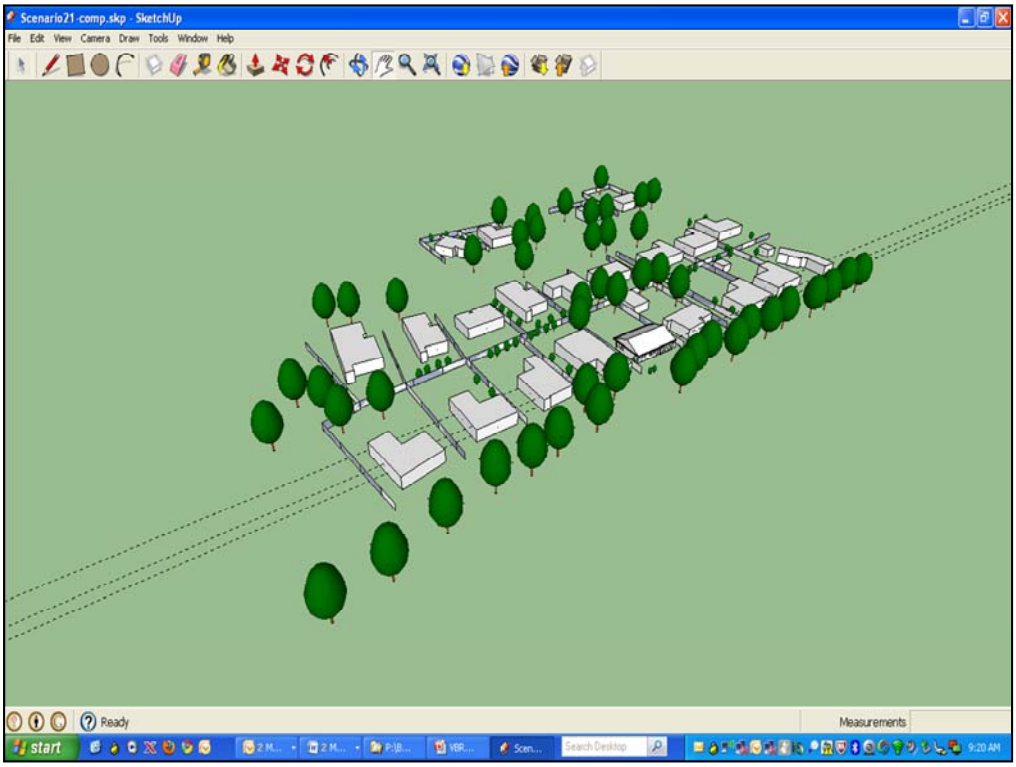
Designing urban environment in Google SketchUp

Defining objects

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Ready
Measurements
start
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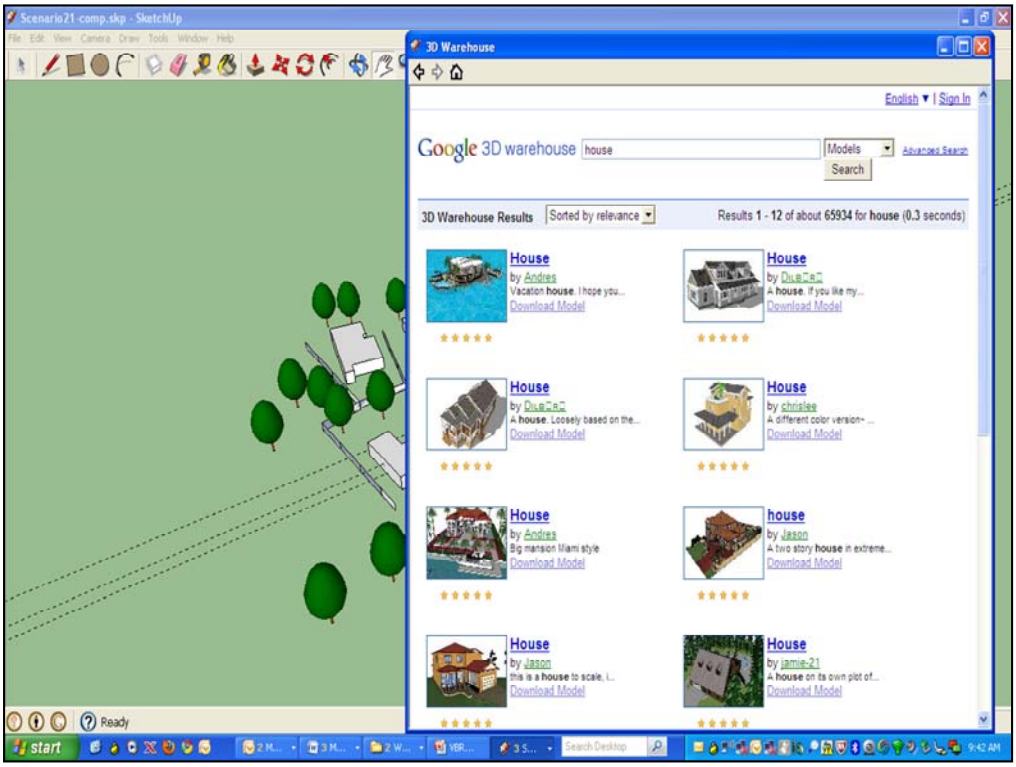
Scenario21-comp.skp - SketchUp
3D Warehouse
English ▼ | Sign In
Google 3D warehouse
house
Models
Search
Advanced Search
3D Warehouse Results
Sorted by relevance
Results 1 - 12 of about 65934 for house (0.3 seconds)
House
by Andres
Vacation house. I hope you...
Download Model
House
A house. If you like my...
Download Model
House
A house. Loosely based on the...
Download Model
House
by chrislee
A different color version- ...
Download Model
House
by Andres
Big mansion Miami style
Download Model
house
by Jason
A two story house in extreme...
Download Model
House
by Jason
this is a house to scale, i...
Download Model
House
by jamie-21
A house on its own plot of...
Download Model
Ready
start
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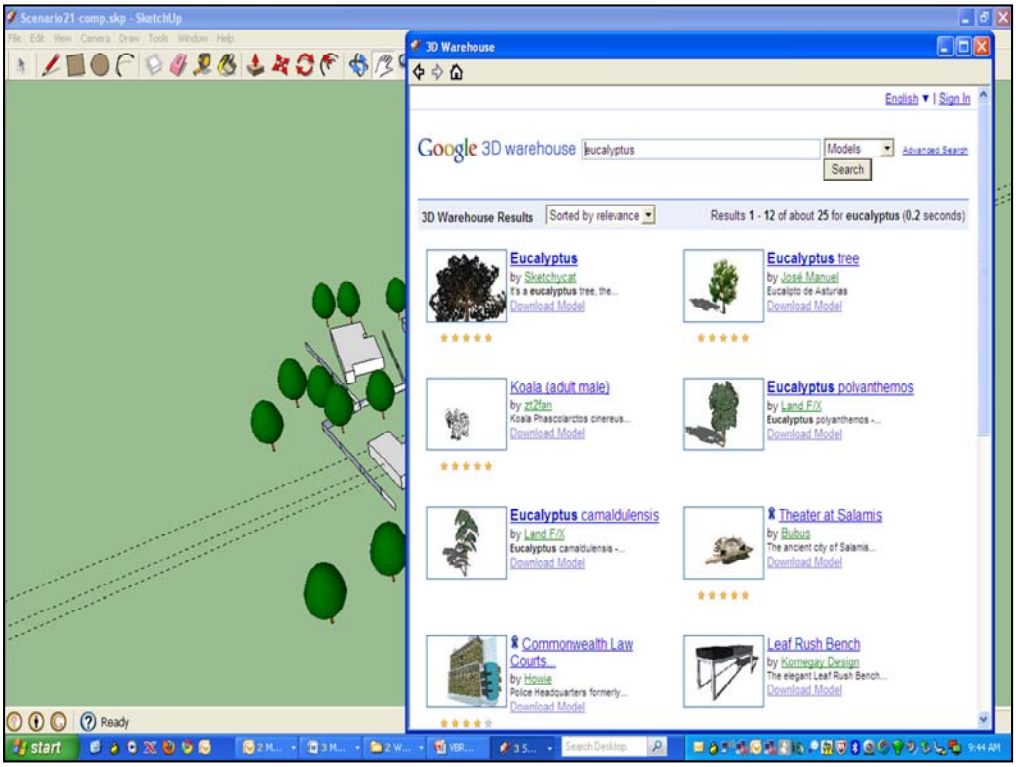
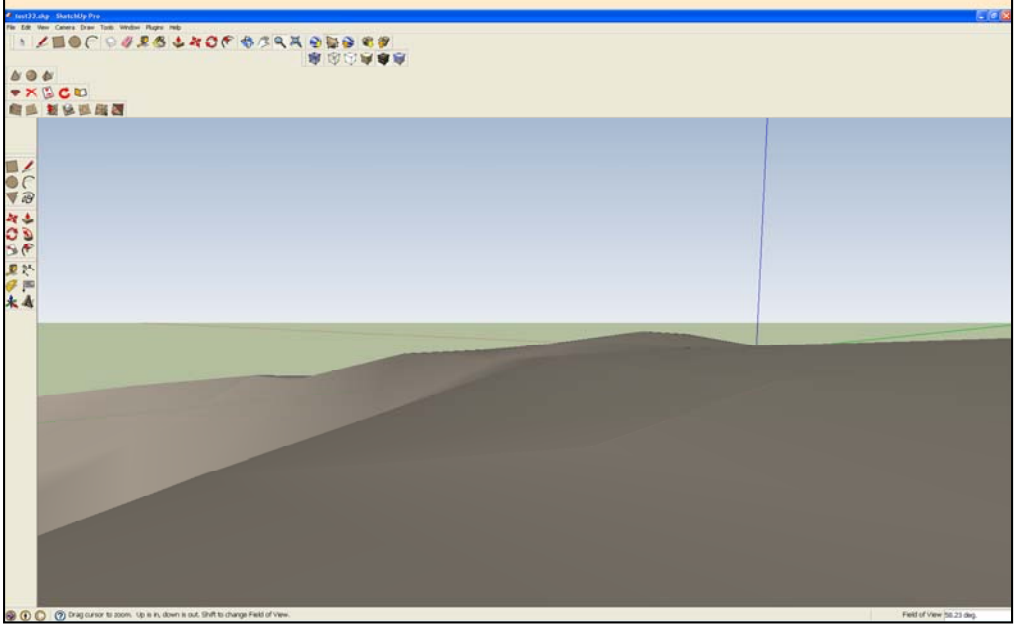

Scenario21-comp.skp - SketchUp
3D Warehouse
English ▼ | Sign In
Google 3D warehouse
eucalyptus
Models
Search
Advanced Search
3D Warehouse Results
Sorted by relevance
Results 1 - 12 of about 25 for eucalyptus (0.2 seconds)
Eucalyptus
by Sketchycat
It's a eucalyptus tree, the...
Download Model
Eucalyptus tree
by José Manuel
Eucalipto de Asturias
Download Model
Koala (adult male)
by zt2fan
Koala Phascolarctos cinereus...
Download Model
Eucalyptus polyanthemos
by Land F/X
Eucalyptus polyanthemos -...
Download Model
Eucalyptus camaldulensis
by Land F/X
Eucalyptus camaldulensis -...
Download Model
Theater at Salamis
by Bubus
The ancient city of Salamis...
Download Model
Commonwealth Law Courts...
by Howie
Police Headquarters formerly...
Download Model
Leaf Rush Bench
by Kornegay Design
The elegant Leaf Rush Bench...
Download Model
Ready
start
9:44 AM

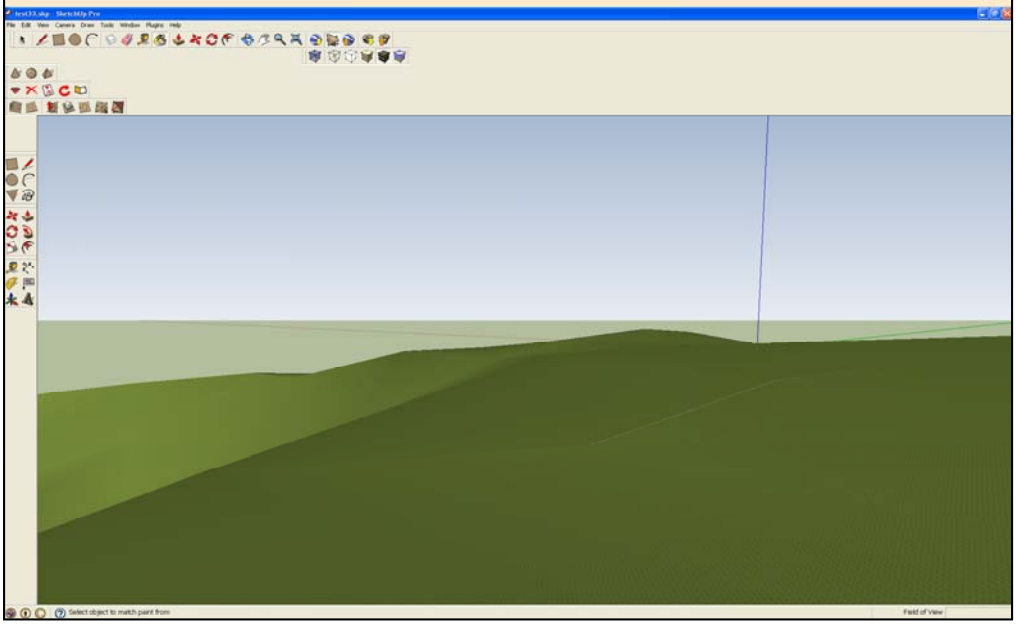
Designing urban environment - setting scenario

Terrain from Google earth



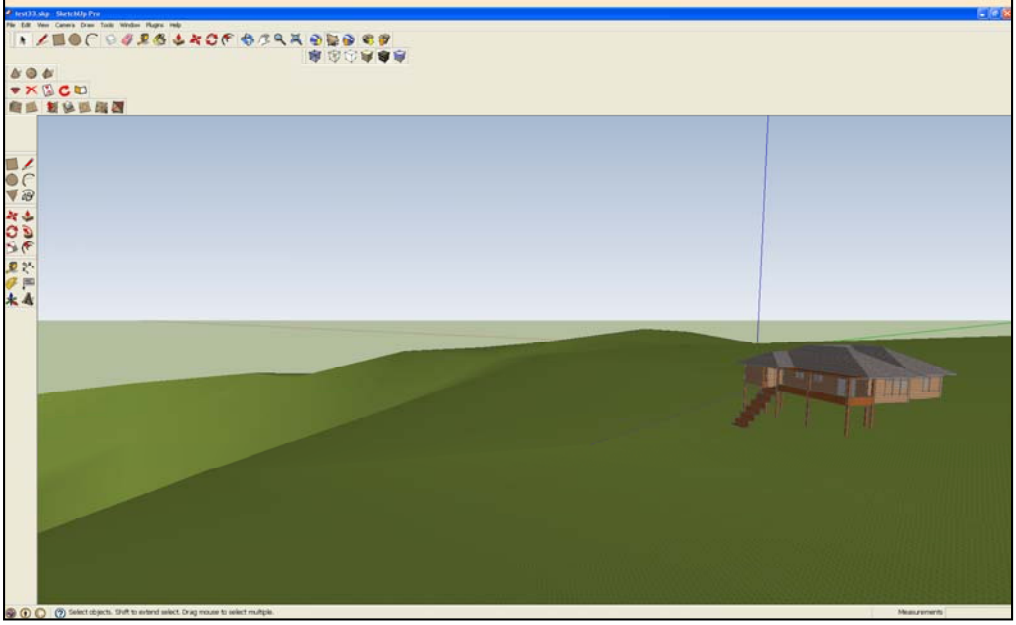
Designing urban environment - setting scenario

Ground cover



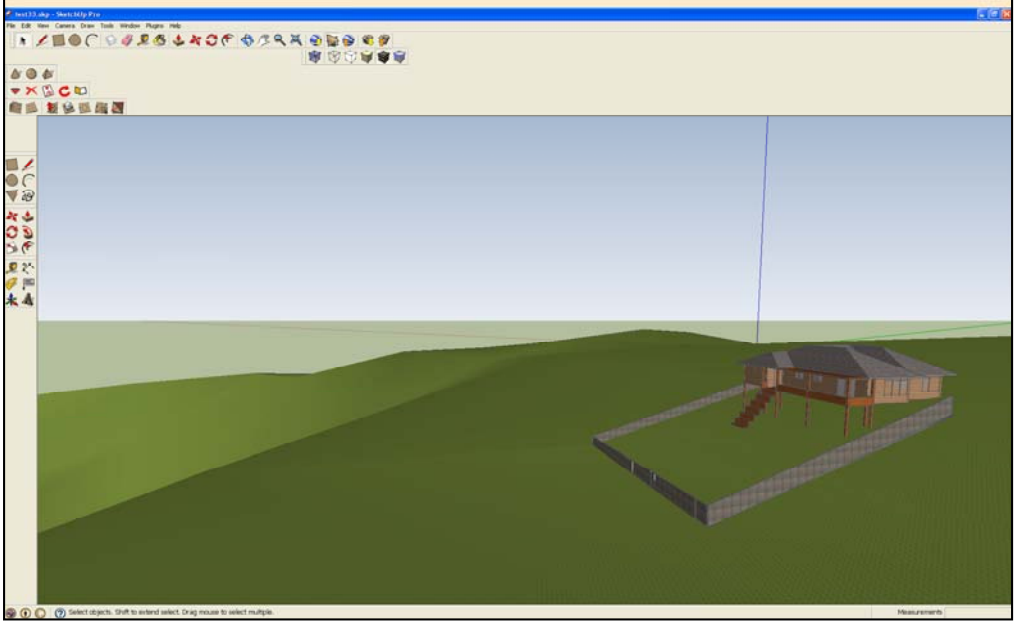
Designing urban environment - setting scenario

House from library (built from components)



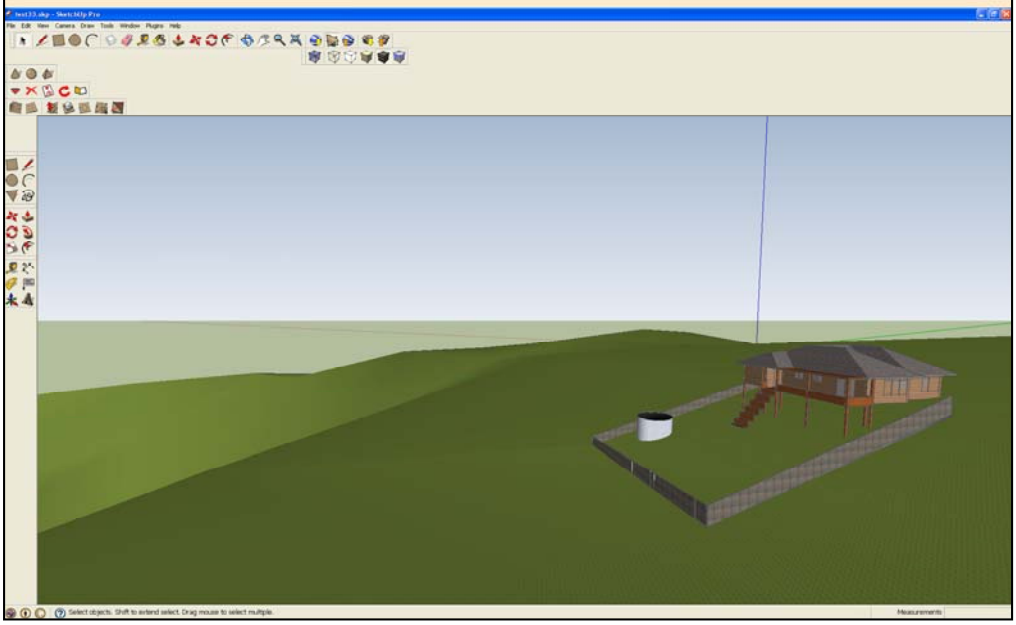
Designing urban environment - setting scenario

Surrounding object - Fence



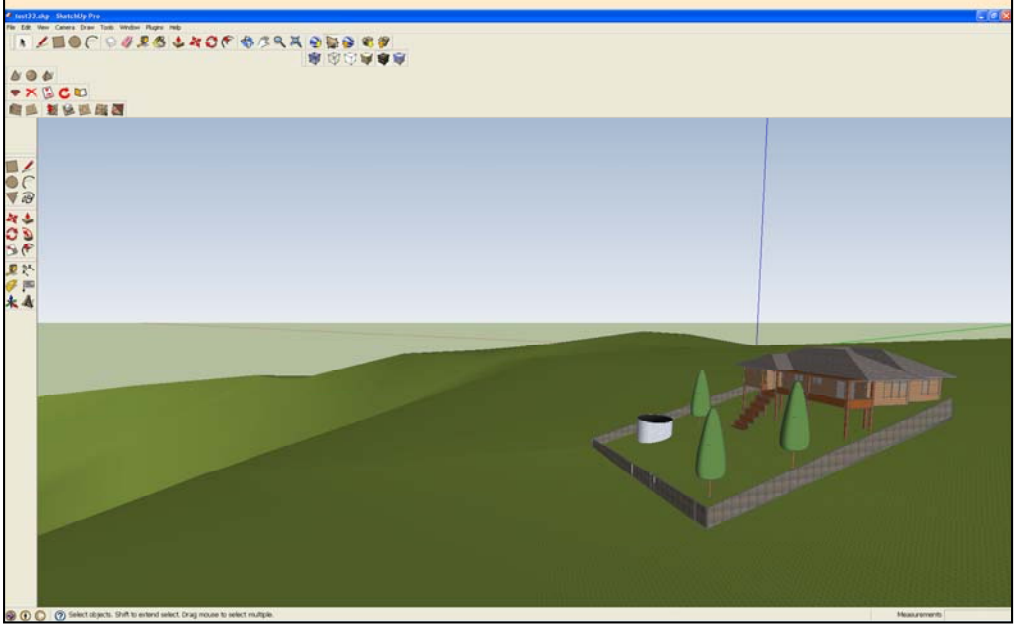
Designing urban environment - setting scenario

Surrounding object – Water tank



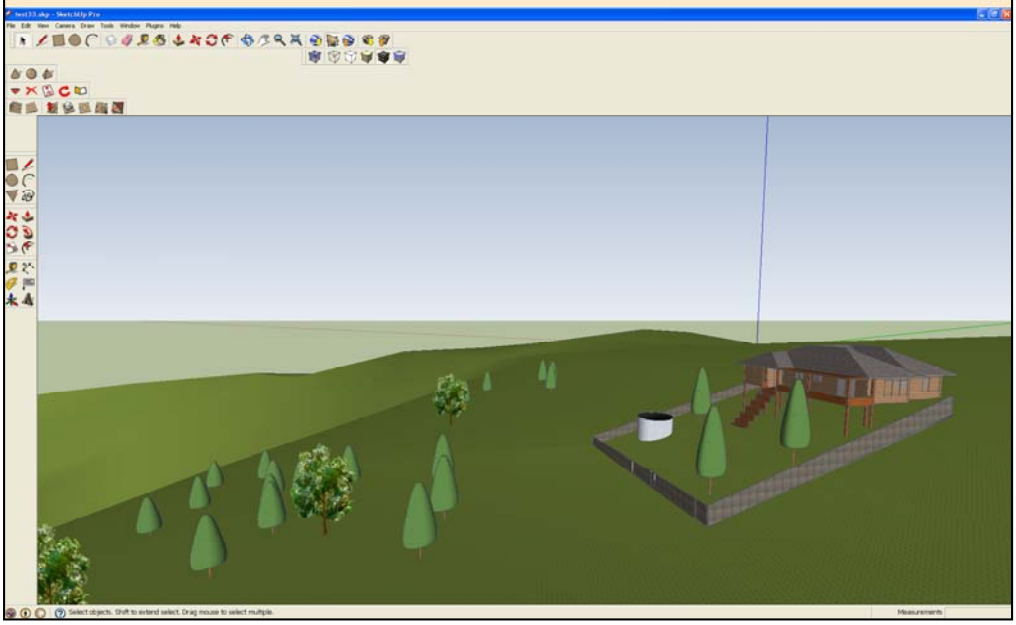
Designing urban environment - setting scenario

Surrounding object – Garden vegetation



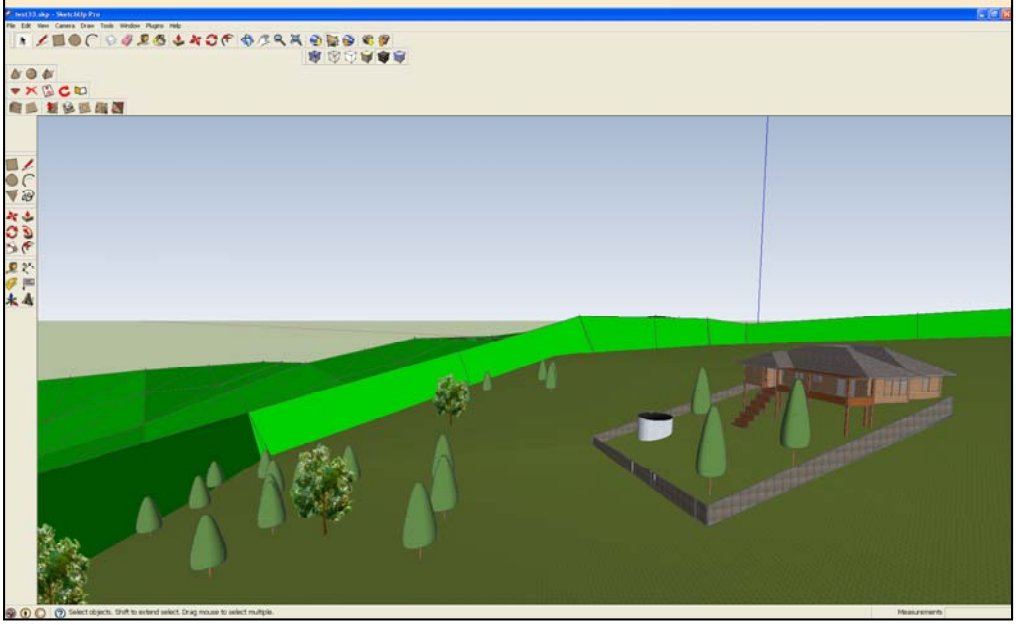
Designing urban environment - setting scenario

Surrounding object – Tree



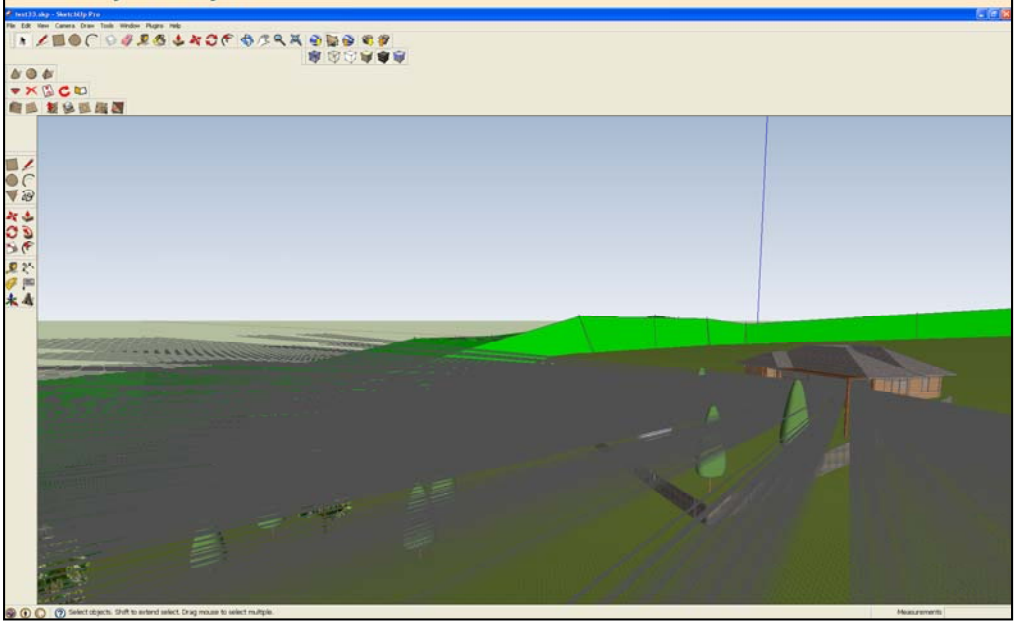
Designing urban environment - setting scenario

Forest



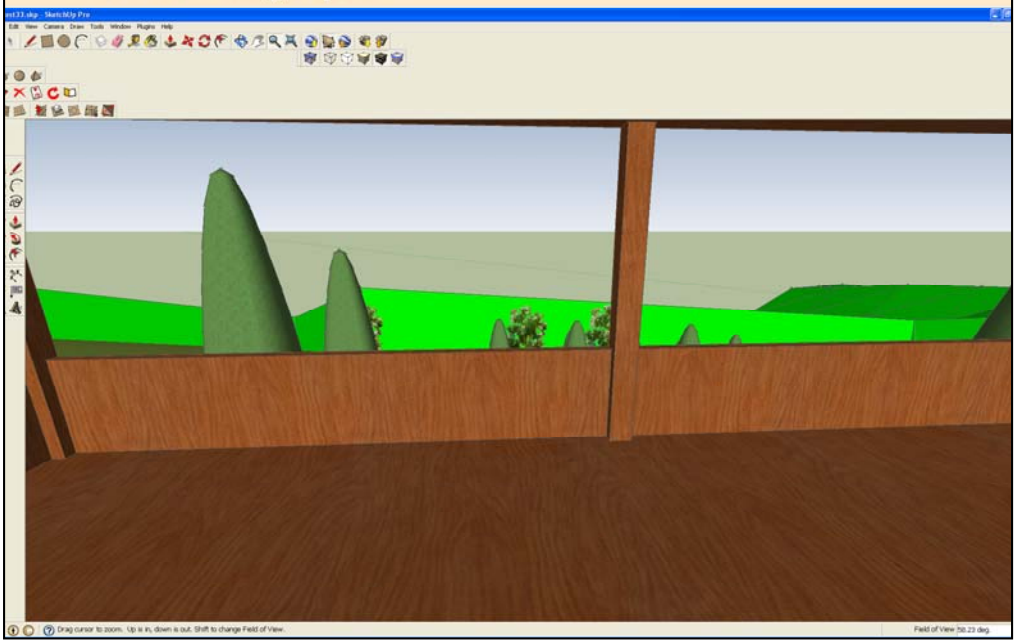
Vulnerability analysis - defining exposure - Radiant heat

Ray Analysis



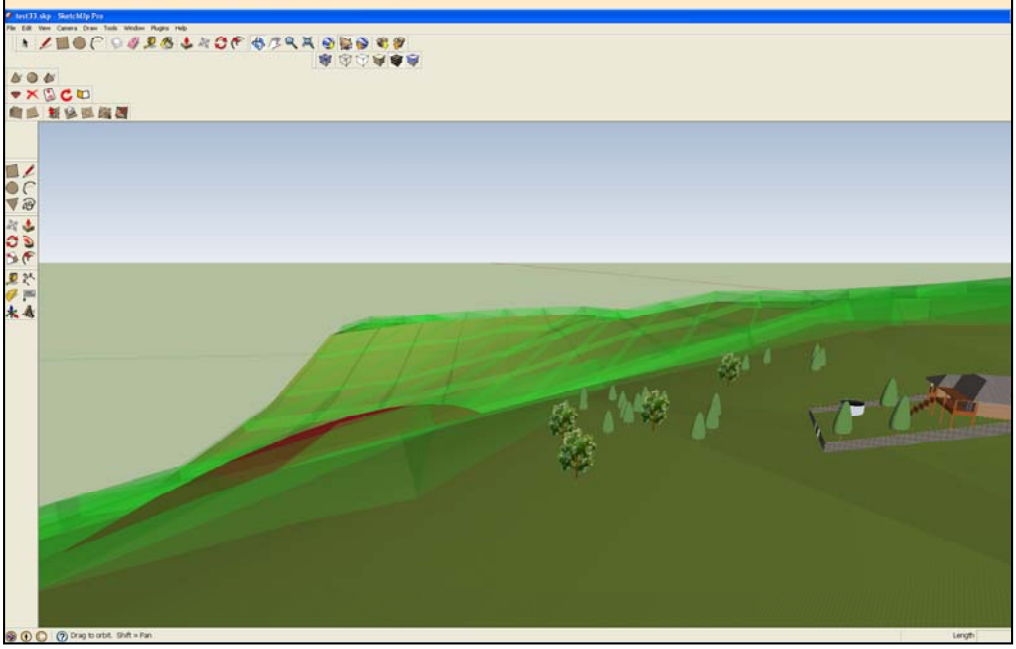
Vulnerability analysis - defining exposure - Radiant heat

View from target point



Vulnerability analysis - defining exposure - Radiant heat

Fire front 200m away

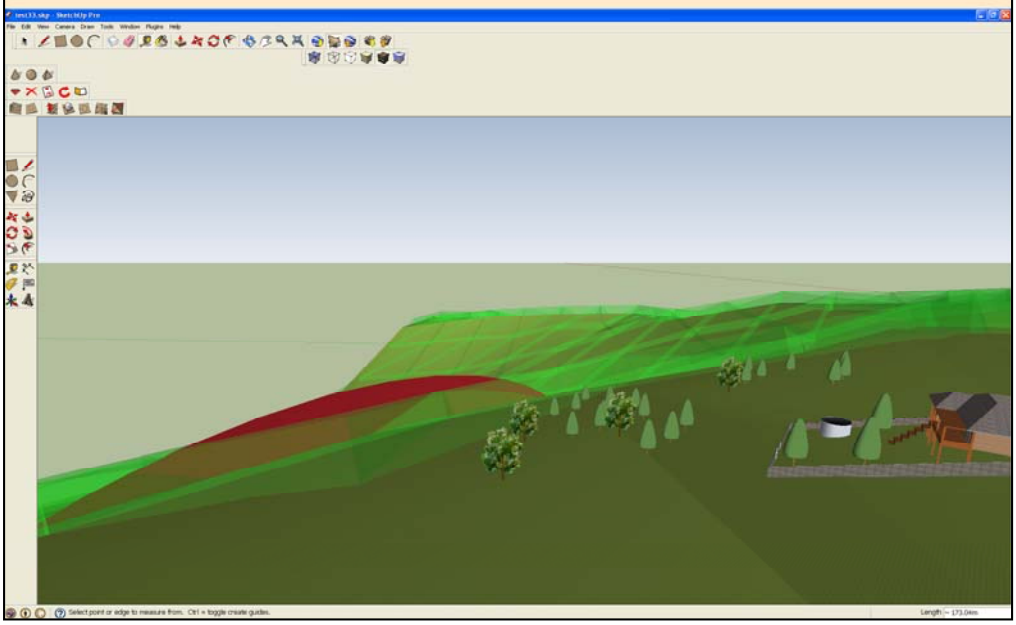


Vulnerability analysis - defining exposure - Radiant heat

Fire front

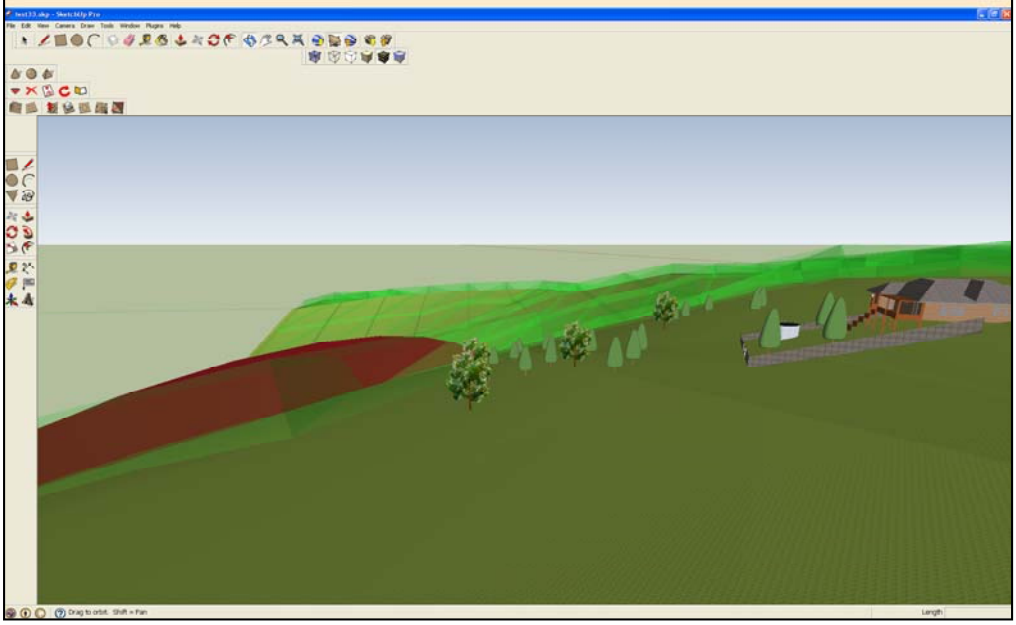
Vulnerability analysis - defining exposure - Radiant heat

Fire front 160m from house

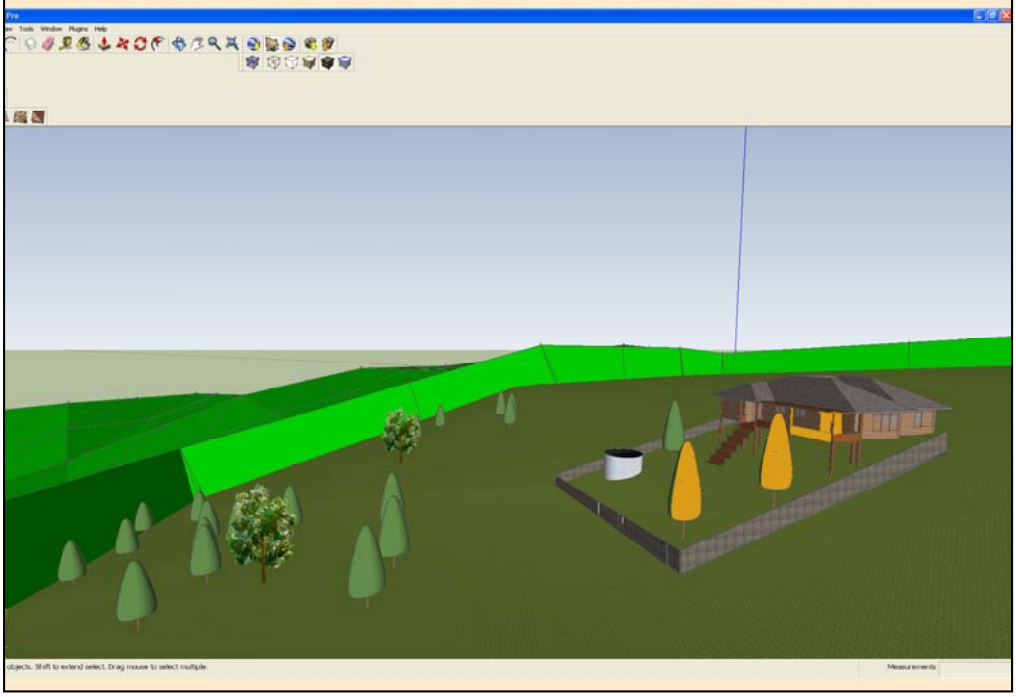


Vulnerability analysis - defining exposure - Radiant heat

Fire front 130m from house



Vulnerability analysis - Run time application



Thank you

Contact:
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Justin.leonard@csiro.au

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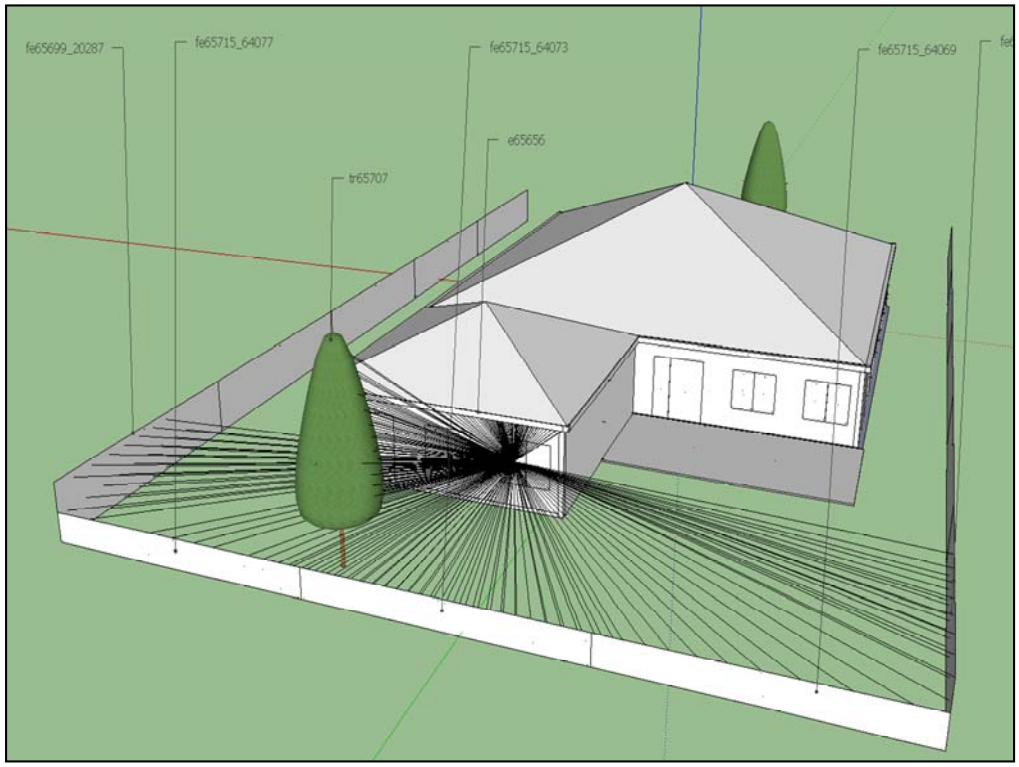
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