Final Report to the Commonwealth:

Implementation of recovery actions for priority EPBC listed threatened species and ecological communities in Western Australia

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Department of Environment and Conservation (DEC)

Project ID 45061439

Title: Threatened Flora of the Swan Coastal District

Detailed description of activities: The major activities of this project are weed mapping and weed control, dieback interpretation and dieback management for a number of sites containing populations of threatened flora. Each of these milestones is discussed in detail below.

Weed mapping has been achieved for the following sites:

Site	Threatened flora species	Species controlled
Muchea Nature Reserve, Muchea	*Darwinia foetida* & *Grevillea curvilova* subsp. *incurva*	Watsonia, Arum lily, Lupins & Paddy melons
Abernethy property, Oakford	*Verticordia plumosa* var. *pleiobotrya*	-
Dundas Nature Reserve, Forrestfield	*Conospermum undulatum* & *Macarthuria keigheryi*	Black flag, Tagasaste, Victorian tea tree, Lachenalia aloides, Silver wattle
Mundijong Road Reserve, Mardella	*Tetraria australiensis*	Bamboo
Lambkin Nature Reserve, Serpentine	*Tetraria australiensis*	Watsonia

A differential GPS was used at each of the sites to map the distribution and density of weed species including Watsonia, African lovegrass and Arum lily. Where the number of plants for a particular weed species were limited each individual was recorded, however where the infestation was larger and denser a polygon showing the approximate boundary of each species was mapped. For each of the polygons created a cover class was assigned in the field based on the density of the weed. The cover classes used were <5%, 5-75% and >75%. A map showing the distribution and density of each species was then produced (refer to attachments). Following on from the mapping, weed control was then undertaken to target specific weed infestations to protect the threatened flora, as outlined in the table above. The species that were recorded in the highest

densities for all of the sites were *Watsonia* sp. and *Eragrostis curvula* (African lovegrass). Due to the project timeline the lovegrass was unable to be treated as the most appropriate season is winter, however the Watsonia was treated at a number of sites in spring (just upon the species flowering). Different control techniques were applied depending upon the site and species being targeted. For example at Muchea Nature Reserve where arum lily occurs along the creek line the flowering heads were cut off and removed whereas the Watsonia was treated by carefully hand wiping chemical along the leaves of the plant. At Dundas Nature Reserve the weeds were removed by hand-pulling and cutting the woody weeds.

Dieback interpretation has been completed for the following nine sites:

Site	**Declared Rare Flora**
Breera Nature Reserve, Gingin	*Chamelaucium* sp. Gingin
Breera Road Reserve, Gingin	*Chamelaucium* sp. Gingin
Ioppolo Road Reserve, Gingin	*Chamelaucium* sp. Gingin
Kenwick x 3 properties	*Andersonia gracilis*
Fraser Road, Banjup	*Caladenia huegelii*
Abernethy property, Oakford	*Verticordia plumosa* var. *pleiobotrya*
Muchea Nature Reserve, Muchea	*Darwinia foetida* & *Grevillea curviloba* subsp. *incurva*

Each of the sites selected contain populations of declared rare flora (DRF) that are thought to be susceptible to *Phytophthora cinnamomi* (Pc). The interpretation was undertaken throughout the summer and autumn months by qualified dieback interpreters, who traversed the sites to identify the presence or absence of the pathogen in the field using key indicator species such as *Banksia* and *Xanthorrhoea*. Samples were also taken from some of the sites to confirm the presence of the pathogen. Upon completion of the fieldwork component and analysis of the samples a map showing the distribution of the disease was produced for each site (refer to attachments – note that the maps are not printed to scale). *P. cinnamomi* was detected at two sites: Fraser Road in Banjup and one of the properties located in Kenwick. The remaining sites were either entirely dieback free (2), or a combination of infested, un-infested or un-interpretable due to a lack of indicator species. Dieback hygiene plans containing recommendations regarding the most effective ways to protect the biodiversity values of the site will now be prepared and recovery actions will continue to be implemented at these sites.

To date the implementation of dieback management as a result of the assessments undertaken for this project have been carried out at some of the above sites. At Muchea Nature Reserve the northern boundary fence has been replaced to prevent access into the reserve and therefore prevent the introduction of dieback into the site. The photo below shows the new fence constructed along the northern boundary of Muchea Nature Reserve in February of this year.

Installation of new fence along northern boundary Muchea Nature Reserve, Muchea

A series of dieback signs have been purchased as part of this project and will be placed at all of the access points (i.e. entry gates) for each reserve informing visitors of the status of the reserve and what they can do to help stop the introduction of Pc and prevent its spread (refer to photo below).

Installation of signage on access gates to inform users of the dieback status of the reserve and how to prevent its spread

Track closures will be implemented at Fraser Road and Dundas NR using plank signage, bollards and chain to prevent access and therefore reduce further spread of the pathogen at the site (refer to photo below).

Track closure using bollards and plank sign to prevent further spread of *Phytophthora cinnamomi* through nature reserve

All of the activities undertaken as part of this project have been achieved within the project timeline and budget. The weed and dieback maps provide valuable baseline data and are useful tools for setting priorities for weed and dieback management within our reserves. Future mapping can be compared to those maps produced under this project to determine the effectiveness of the recovery actions being implemented at the reserves. The implementation of the weed control appears to have been effective to date, with the acknowledgement that follow-up treatment will be required in future years to maintain and enhance the condition of the reserves and to protect the threatened flora contained within each. Following on from the dieback maps, hygiene plans will now be prepared. By implementing track closures, controlling access and installing dieback signage the ability to protect threatened flora is increased immediately.

All of the allocated funds ($25,000) have been expended.

Distribution and density of weed species within Muchea Nature Reserve

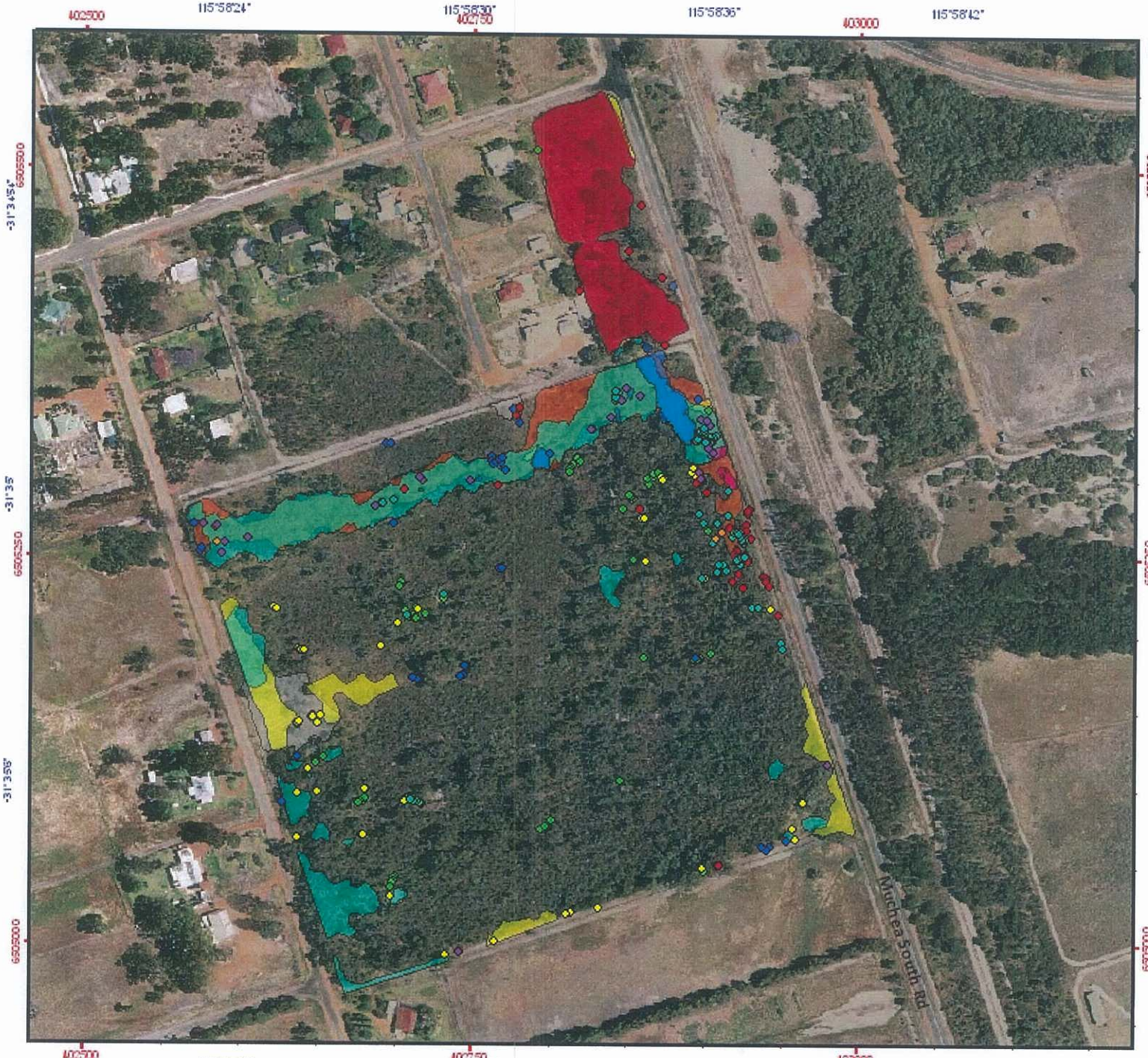


Fig
- 1-5%

Japenese Pepper
- 1-5%

Arum Lilly
- 1-5%

Watsonia
- 1-5%

Cape Tulip
- 1-5%

African Love Grass
- 1-5%

Lupins
- 1-5%

Arum Lilly
- 5-75%

Watsonia
- 5-75%
- 75-100%
- 5-75%

African Love Grass
- 5-75%
- Pink Gladiolous

Lupins
- 5-75%

N

1:3,500 (A4)

0 30 60 120 180 240

Meters

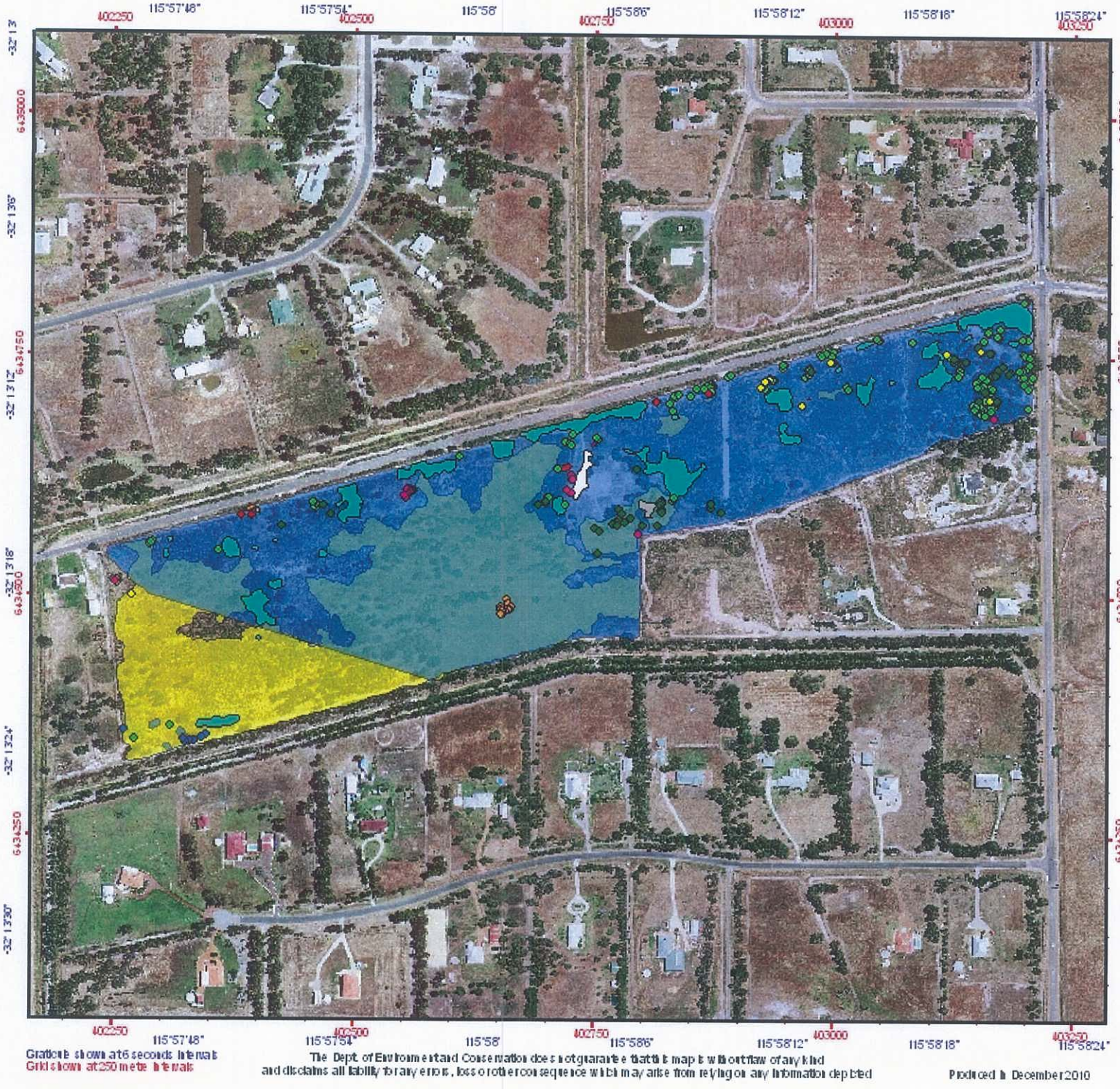
Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

Produced under the Direction of
Keiran McNamara
Director General, Department of Environment and Conservation

Gratitude shown at 6 seconds intervals
Grid shown at 250 metre intervals

Produced in December 2010

Distribution and density of weed species within Abernethy Rd property



Lupins
- 1-5%

Cotton Bush
- 1-5%

Cape Tulip
- 1-5%

Vic Tea Tree
- Vic Tea Tree

African Love Grass
- 1-5%

Arum Lilly
- 1-5%

Watsonia
- 1-5%

Buffalo Grass & Kikuyu
- 75-100%

Lupins
- 5-75%

Vic Tea Tree
- Vic Tea Tree

Arum Lilly
- 5-75%

Watsonia
- 5-75%
- 75-100%

African Love Grass
- 5-75%

Cape Tulip
- 5-75%

N

1:5,500 (A4)

0 45 90 180 270 360

Meters

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

Produced under the Direction of
Helen McNamara
Director General, Department of Environment and Conservation

Gratitude shown at 6 seconds intervals
Grid shown at 250 metre intervals

Produced in December 2010

Weed distribution and density of weed species at Dundas Rd Nature Reserve

African Love Grass
1-5
Lupins
1-5
Euphorbia
1-5
Vic Tea Tree
1-5
Castor Oil
1-5
Flinders Range Wattle
1-5
Watsonia
1-5
Pampas Grass
1-5
Pig Melon
1-5
Tagasaste
1-5
Snow Flake
1-5
Geraldton Wax
1-5
Rose pelargonium
Ischenalla
Black Flag
Queensland Silver

Euphorbia
5-75
Lupins
5-75
African Love Grass
5-75

Tagasaste
5-75
Vic Tea Tree
5-75
75-100

N

1:3,000 (A3)

0 35 70 140 210 280

Meters

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA 94

Department of Environment and Conservation

Produced under the Direction of
Keiran McNamara
Director General, Department of Environment and Conservation

Graticule shown at 6 seconds intervals
Grid shown at 260 metre intervals

Produced in December 2009

Distribution and density of weed species along Mundijong Road Reserve

Cape Tulip
- 1-5

Watsonia
- 1-5

PVG & African Love Grass
- 5-75
- 75-100

Cape Tulip
- 5-75

N

0 12.5 25 50 75 100
1:2,500 (A4)
Meters

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

Produced under the Direction of
Ieuan McNamara
Director General, Department of
Environment and Conservation

Graticule shown at 6 seconds intervals
Grid is shown at 250 metre intervals

Produced at 15:52pm, on January 29, 2010

Distribution and density of weed species in Lambkin Nature Reserve

Cotton Bush
- 1-5%

African Love Grass
- 1-5%

Woody Weeds
- Cootamundra Wattle
- Flinders Range Wattle
- Queensland Silver wattle
- Sydney Golden Wattle
- Tagasaste

Watsonia
- 1-5%

Lupins
- 5-75%

African Love Grass
- 5-75%
- 75-100%

Watsonia
- 5-75%

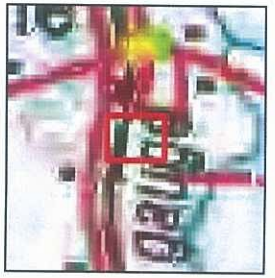
N

1:2,000 (A4)

0 15 30 60 90 120

Meters

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94



Produced under the Direction of
Ketan McNamara
Director General, Department of
Environment and Conservation

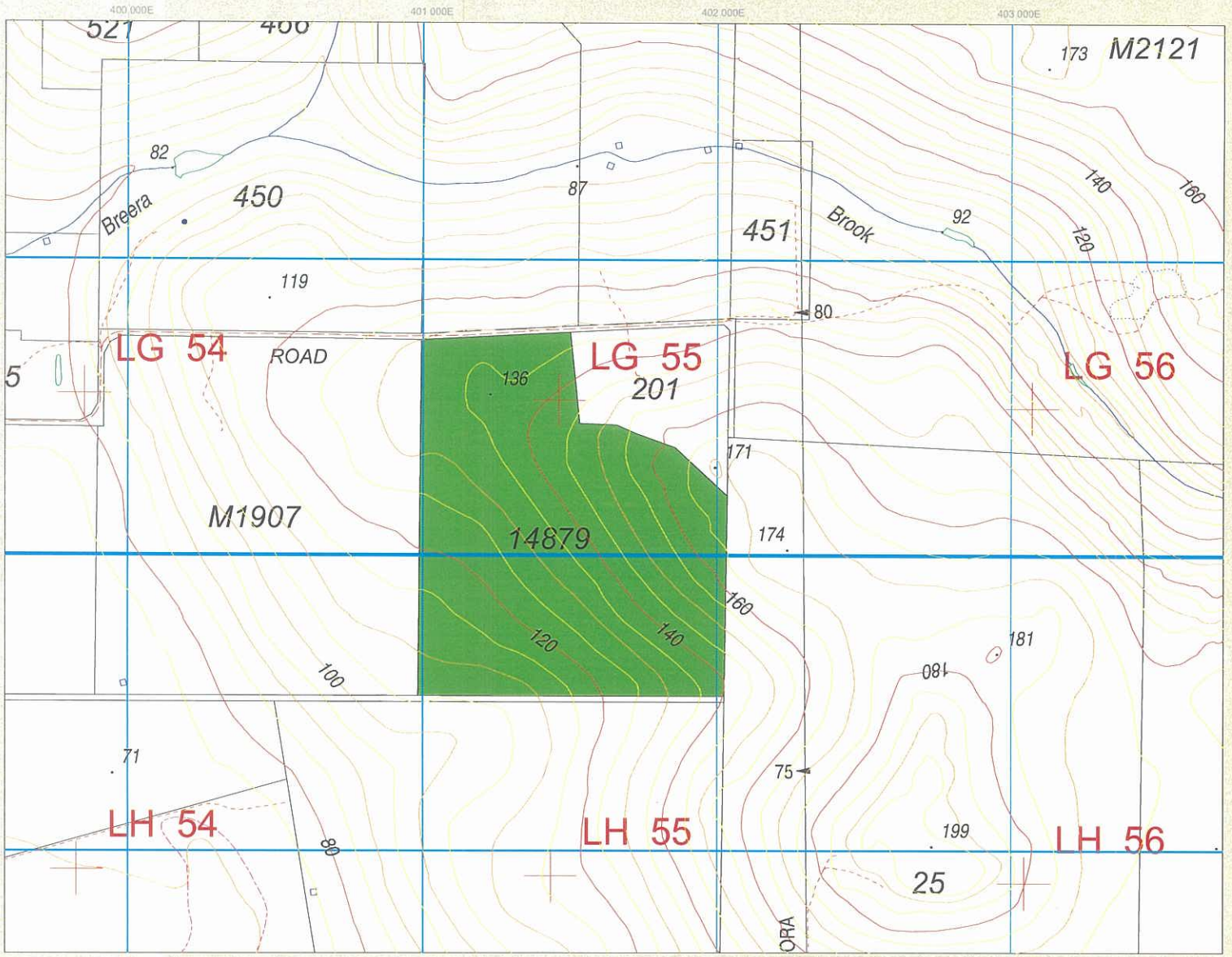
Graticule shown at 6 seconds intervals
Grid shown at 250 metre intervals

Produced at 15:42pm, on January 29, 2010

Occurrence V1 25/11/09
Product - Version 1 - 10/03/2010

PERTH HILLS DISTRICT
BREERA
NATURE RESERVE

PHYTOPHTHORA CINNAMOMI
OCCURRENCE MAP



MAP LEGEND

UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P.cinnamomi*.

UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of *P.cinnamomi* presence or absence.

INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of *P.cinnamomi*.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (25/11/10).

This map should not be used if it is older than 3 years (25/11/12).

Areas that have had an Operation in them become unreliable and should be checked prior to Further (New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing 10.0 metres diameter on the ground.
Areas less than this are symbolised to this size.

MAP METHOD

Interpreted using strip line survey.

Boundaries captured using GPS.
Boundaries positioned relative to map features.

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Initials		Recheck Due	Expiry Date
			Interps	Digitised		
Occurrence	Breera HR Occ v1	25/11/09	MP, LM	MP - 10/03/10	25/11/10	25/11/12

AREA STATEMENT

Categories	Area ha	Notes
UNINFESTED	107.8	
UNINTERPRETABLE		
INFESTED		
UNPROTECTABLE		
TOTAL AREA	107.8	

LEGEND

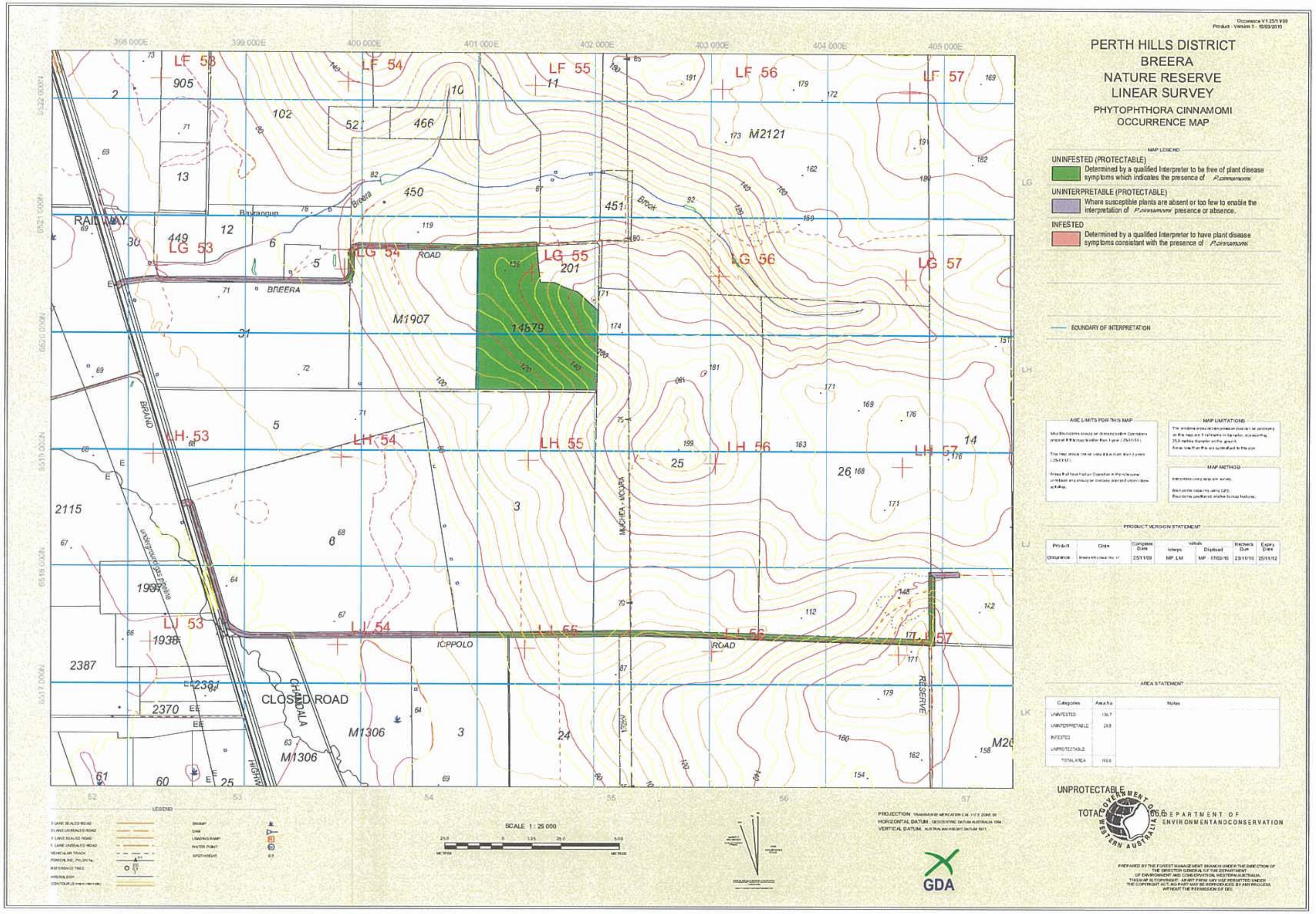
2 LANE SEALED ROAD
2 LANE UNSEALED ROAD
1 LANE SEALED ROAD
1 LANE UNSEALED ROAD
VEHICULAR TRACK
POWERLINE, PYLON No
REFERENCE TREE
HYDROLOGY
CONTOUR (5 metre interval)
SWAMP
DAM
LOADING RAMP
WATER POINT
SPOT HEIGHT 69

SCALE 1 : 10 000
250 0 125 250 500
METRES METRES

PROJECTION: TRANSVERSE MERCATOR C.M. 117 E ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971

GDA

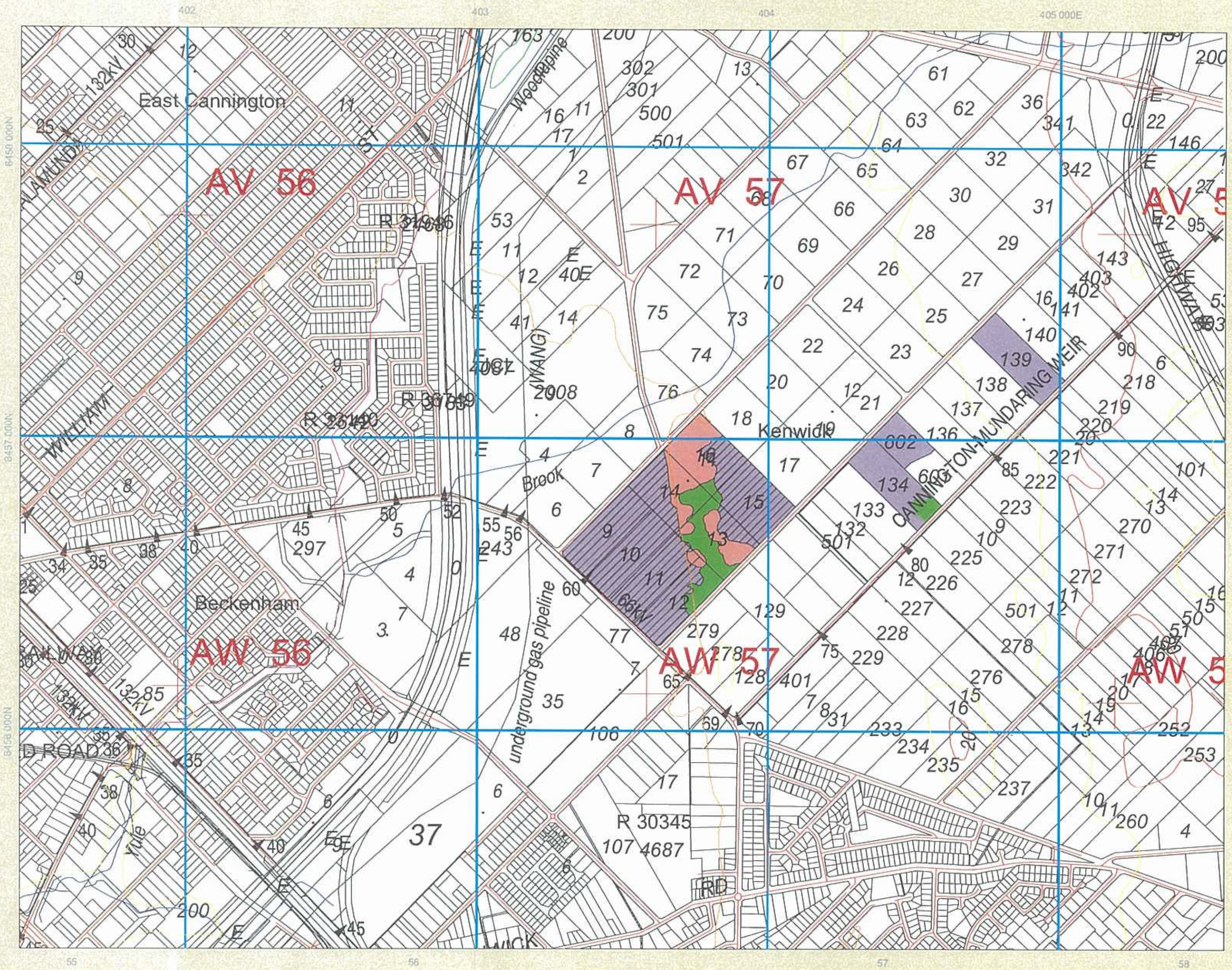
GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENTANDCONSERVATION


PERTH HILLS DISTRICT
BREERA
NATURE RESERVE
LINEAR SURVEY
PHYTOPHTHORA CINNAMOMI
OCCURRENCE MAP
UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of P.cinnamomi
UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of P.cinnamomi presence or absence.
INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of P.cinnamomi
BOUNDARY OF INTERPRETATION
UNPROTECTABLE
TOTAL
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
SCALE 1 : 25 000
GDA
CLOSED ROAD
BREERA
ROAD
ICPPOLO
RESERVE
BRAND
RAILWAY
M1907
M2121
M1306
14579

Occurrence V1 08/03/2010
Product - Version 1 - 10/03/2010

PERTH COASTAL DISTRICT
NAME
NATURE RESERVES

PHYTOPHTHORA CINNAMOMI
OCCURRENCE MAP



MAP LEGEND

UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P.cinnamomi*

UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of *P.cinnamomi* presence or absence.

INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of *P.cinnamomi*.

UNPROTECTABLE
Where current *P.cinnamomi* symptoms may spread into these areas autonomously.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (08/03/11).

This map should not be used if it is older than 3 years (08/03/13).

Areas that have had an Operation in them become unreliable and should be checked prior to Further / New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing [illegible]
Areas less than this are symbolised to this size.

MAP METHOD

Interpreted using step line survey.

Boundaries captured using GPS.
Boundaries positioned relative to map features.

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Initials Interps	Initials Digitised	Recheck Due	Expiry Date
Occurrence	Kenwick Nature Reserves Occ	08/03/10	MP, LM, JC	MP - 10/03/10	08/03/11	08/03/13

AREA STATEMENT

Categories	Area ha	Notes
UNINFESTED	4.1	
UNINTERPRETABLE	53.9	
INFESTED	5.4	
UNPROTECTABLE		(22.2) Overlays other Categories
TOTAL AREA	63.4	

LEGEND

2 LANE SEALED ROAD
2 LANE UNSEALED ROAD
1 LANE SEALED ROAD
1 LANE UNSEALED ROAD
VEHICULAR TRACK
POWERLINE, PYLON No.
REFERENCE TREE
HYDROLOGY
CONTOUR (5 metre interval)
SWAMP
DAM
LOADING RAMP
WATER POINT
SPOT HEIGHT

SCALE 1:20000

METRES

PROJECTION: TRANSVERSE MERCATOR C.M. 117 E ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971

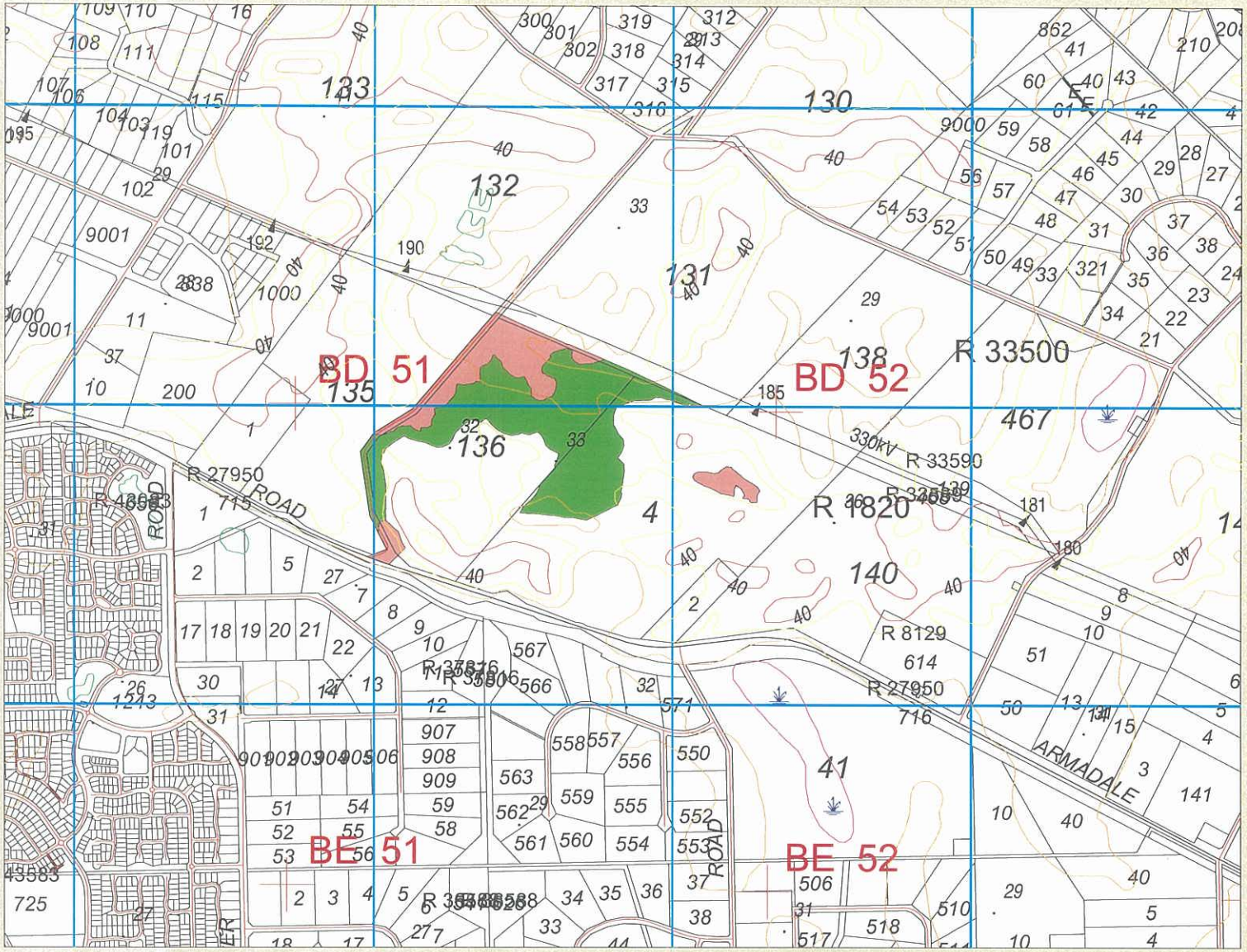
GDA

GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENTANDCONSERVATION

Occurrence V1 26/02/2010
Product - Version 1 - 26/02/2010

PERTH COSTAL DISTRICT
FRASER ROAD
NATURE RESERVE

PHYTOPHTHORA CINNAMOMI
OCCURRENCE MAP



MAP LEGEND

UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P.cinnamomi*.

UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of *P.cinnamomi* presence or absence.

INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of *P.cinnamomi*.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (26/02/11).

This map should not be used if it is older than 3 years (26/02/13).

Areas that have had an Operation in them become unreliable and should be checked prior to Further / New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing 10.0 metres diameter on the ground.
Areas less than this are symbolised to this size.

MAP METHOD

Interpreted using a trip line survey.

Boundaries captured using GPS
Boundaries positioned relative to map features

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Initials		Recheck Due	Expiry Date
			Interps	Digitised		
Occurrence	Fraser Road NR Occ v1	26/02/10	MP, LM, JC	MP - 16/03/10	26/02/11	26/02/13

AREA STATEMENT

Categories	Area ha	Notes
UNINFESTED	232	
UNINTERPRETABLE		
INFESTED	8.9	
UNPROTECTABLE		
TOTAL AREA	33.1	

LEGEND

2 LANE SEALED ROAD
2 LANE UNSEALED ROAD
1 LANE SEALED ROAD
1 LANE UNSEALED ROAD
VEHICULAR TRACK
POWERLINE, PYLON No
REFERENCE TREE
HYDROLOGY
CONTOUR (5 metre interval)
SWAMP
DAM
LOADING RAMP
WATER POINT
SPOT HEIGHT

SCALE 1 : 10 000

250 0 125 250 500
METRES METRES

PROJECTION: TRANSVERSE MERCATOR C.M. 117 E ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971.

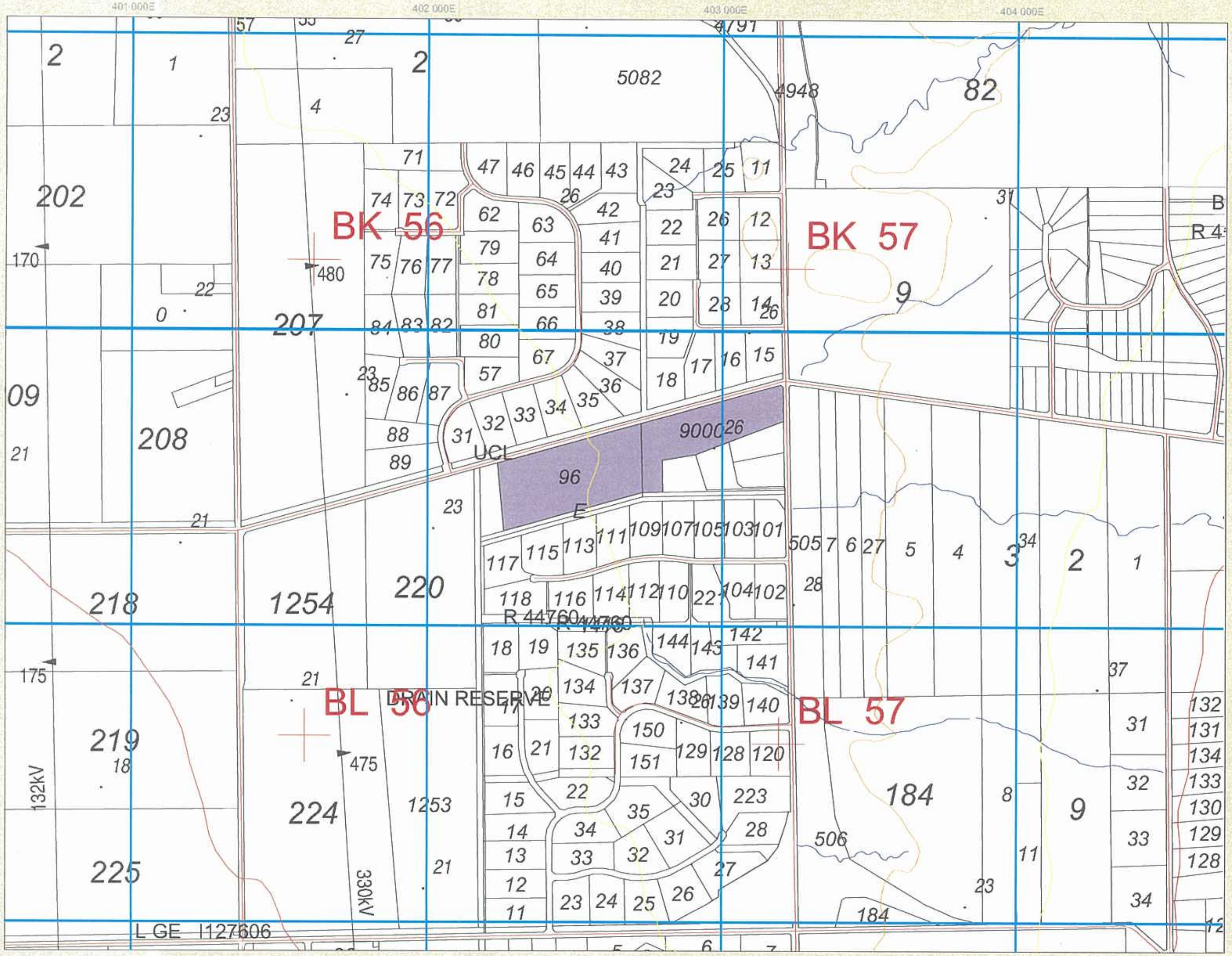
GDA

GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENTANDCONSERVATION

Occurence V1 25/02/10
Product - Version 1 - 10/03/2010

PERTH COASTAL DISTRICT
ABERNETHY ROAD
NATURE RESERVE

PHYTOPHTHORA CINNAMOMI OCCURRENCE MAP



MAP LEGEND

UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P.cinnamomi*.

UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of *P.cinnamomi* presence or absence.

INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of *P.cinnamomi*.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (25/02/11).

The map should not be used if it is older than 3 years (25/02/13).

Areas that have had an Operation in them become [illegible] and should be checked prior to Further / New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 mm in diameter, representing 10.0 metres diameter on the ground.
Areas less than this are symbolised to this size.

MAP METHOD

Interpreted using strip line survey.

Boundaries captured using GPS.
Boundaries positioned relative to map features.

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Initials: Interps	Initials: Digitised	Recheck Due	Expiry Date
Occurence	Abernethy Road NR Occ V1	25/02/10	MP, LM, JC	MP - 10/03/10	25/02/11	25/02/13

AREA STATEMENT

Categories	Area ha	Notes
UNINFESTED		
UNINTERPRETABLE	'8.8	
INFESTED		
UNPROTECTABLE		
TOTAL AREA	'8.8	

SCALE 1 : 10 000

PROJECTION: TRANSVERSE MERCATOR [illegible] ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM [illegible]

GDA

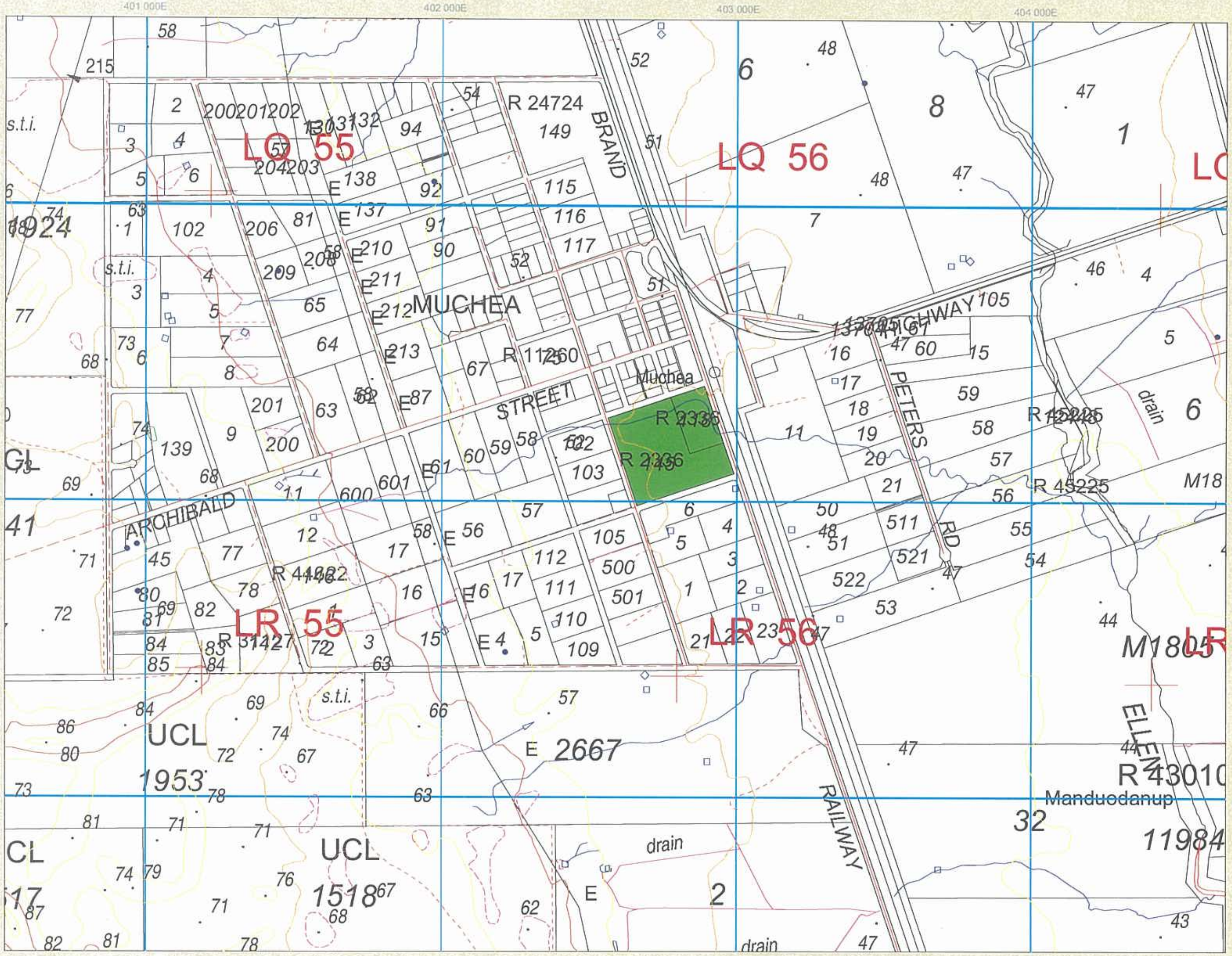
GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

PREPARED BY THE FOREST MANAGEMENT BRANCH UNDER THE DIRECTION OF THE DIRECTOR GENERAL OF THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION, WESTERN AUSTRALIA.

Occurrence V1 25/02/10
Product - Version 1 - 10/03/2010

PERTH COASTAL DISTRICT
MUCHEA
NATURE RESERVE

PHYTOPHTHORA CINNAMOMI OCCURRENCE MAP



MAP LEGEND

UNINFESTED (PROTECTABLE)
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of *P.cinnamomi*.

UNINTERPRETABLE (PROTECTABLE)
Where susceptible plants are absent or too few to enable the interpretation of *P.cinnamomi* presence or absence.

INFESTED
Determined by a qualified Interpreter to have plant disease symptoms consistant with the presence of *P.cinnamomi*.

BOUNDARY OF INTERPRETATION

AGE LIMITS FOR THIS MAP

Map Boundaries should be checked before Operations proceed if this map is older than 1 year (25/02/11).

This map should not be used if it is older than 3 years (25/02/13).

Areas that have had an Operation in them become unreliable and should be checked prior to Further / New activities.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing 10.0 metres diameter on the ground.
Areas less than this are symbolised to this size.

MAP METHOD

Interpreted using strip line survey.

Boundaries captured using GPS.
Boundaries positioned relative to map features.

PRODUCT VERSION STATEMENT

Product	Code	Complete Date	Initials: Interps	Initials: Digitised	Recheck Due	Expiry Date
Occurrence	MucheaNR Occ v1	25/02/10	MP, LM, JC	MP - 10/03/10	25/02/11	25/02/13

AREA STATEMENT

Categories	Area ha	Notes
UNINFESTED	109	
UNINTERPRETABLE		
INFESTED		
UNPROTECTABLE		
TOTAL AREA	109	

LEGEND

SCALE 1 : 10 000

250 0 125 250 500 METRES

PROJECTION: TRANSVERSE MERCATOR C.M. 117 E ZONE 50
HORIZONTAL DATUM: GEOCENTRIC DATUM AUSTRALIA 1994.
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM 1971.

GDA

GOVERNMENT OF WESTERN AUSTRALIA
DEPARTMENT OF ENVIRONMENTANDCONSERVATION

PREPARED BY THE FOREST MANAGEMENT BRANCH UNDER THE DIRECTION OF THE DIRECTOR GENERAL OF THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION, WESTERN AUSTRALIA.