HANCOCK COAL PTY LTD

Alpha Coal Project Supplementary EIS • **ADDENDUM**

B

Alpha Coal Mine Project Air Quality Assessment — Model Refinements

Report

Alpha Coal Mine Project Air Quality Assessment - Model Refinements

21 NOVEMBER 2011

Prepared for

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URS

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Abbreviations

Abbreviation	Description
ACIRP	Australian Coal Industry Research Program
AED	Advanced Environmental Dynamics
AHD	Australian Height Datum
BFS	Bank Feasibility Study
CHPP	Coal Handling and Processing Plant
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EETM	Emissions Estimation Technique Manual
EIS	Environmental Impact Statement
EM Plan	Environmental Management Plan
EPP	Environmental Protection Policy
FEL	Front End Loader
HCPL	Hancock Coal Pty Ltd
IPCC	In-Pit Crushing and Conveying
MLA	Mining License Application
NPI	National Pollutant Inventory
PM	Particulate Matter
ROM	Run of Mine
SEIS	Supplementary Environmental Impact Statement
US EPA	United States Environmental Protection Agency
VKT	Vehicle Kilometres Travelled

Introduction

1.1 Scope

Hancock Coal Pty Ltd (HCPL) is proposing to develop the Alpha Coal Project (the Project), a 30 million tonnes per annum (Mtpa) product open-cut thermal coal mine to target the seams in the Upper Permian coal measures of the Galilee Basin, Queensland, Australia. The Project will be supported by the development of a standard gauge, single track, non-electrified, 495 kilometre (km) long railway line for the purposes of transporting processed coal from the Alpha coal mine to the Port of Abbot Point.

An Environmental Impact Statement (EIS) was prepared to assess the environmental impacts of the Project (November 2010), and in response to submissions received and changes to the Project Description, a Supplementary EIS (SEIS) report was also prepared (September 2011).

As part of HCPL's ongoing development of their technical assessments, the mine air quality assessment provided as part of the SEIS has now been updated. This has included a review of all emissions sources, modelling methodology and new information that has become available since the SEIS was completed. The review has been undertaken by Dr. Darlene Heuff of Advanced Environmental Dynamics (AED) in an independent technical review role. A summary of this review is provided in Appendix A. The URS response to this review is provided in Appendix B.

This Technical Report sets out the model changes and the revised model results. It is intended that this Technical Report will be used to inform the development of a detailed Environmental Management Plan (EM Plan) including air quality monitoring and mitigation measures.

Model Refinements

The refinements applied to the SEIS air quality assessment ('the refined model') consist of the incorporation of new datasets to the emissions inventory, introduction of new dust source mitigation controls and the update of the inventory to remove overly-conservative assumptions and double counting of key inventory sources. The refinements are summarised and justified in Section 2.1.

2.1 Description of Key Model Refinements

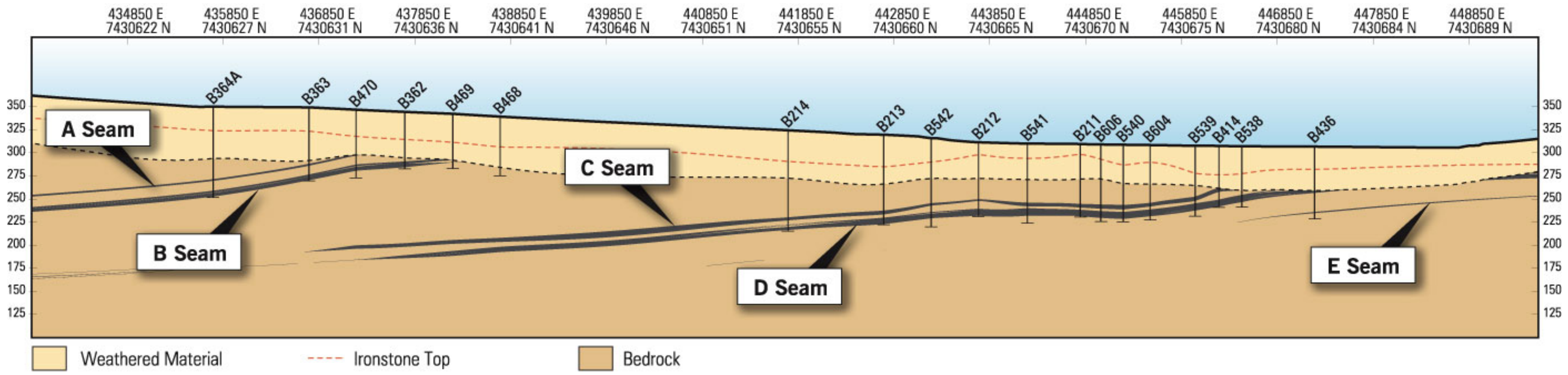
2.1.1 Moisture Content Conceptual Model

The moisture contents of overburden and product coal have been updated on the release of the Bank Feasibility Study (BFS) Design Criteria Coal Handling and Preparation Plant (CHPP) 'BFS Criteria Report' (Hancock Coal, 2010). The document shows that Alpha coal is a lower rank bituminous thermal coal with a relatively high level of both air dry and total product moisture. A series of sized coal samples for each main seam section (C, DU and DL) have been tested for moisture by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and are described in the BFS Design Criteria Report. These tests were developed for the Australian Coal Industry and have been proven to provide accurate estimates of product moisture for higher rank thermal and coking coals from existing operations. Estimates of Run of Mine (ROM) or plant feed moisture were based on work from another Australia Coal Industry Research Program (ACIRP) study on in-situ moisture.

To estimate overburden moisture content, a simple conceptual model of the pit geology has been developed on the basis of a review of available borehole data. A typical cross section is shown in Figure 2-1.

2 Model Refinements

Figure 2-1 Typical Mine Cross Section



2 Model Refinements

The key assumptions are as follows:

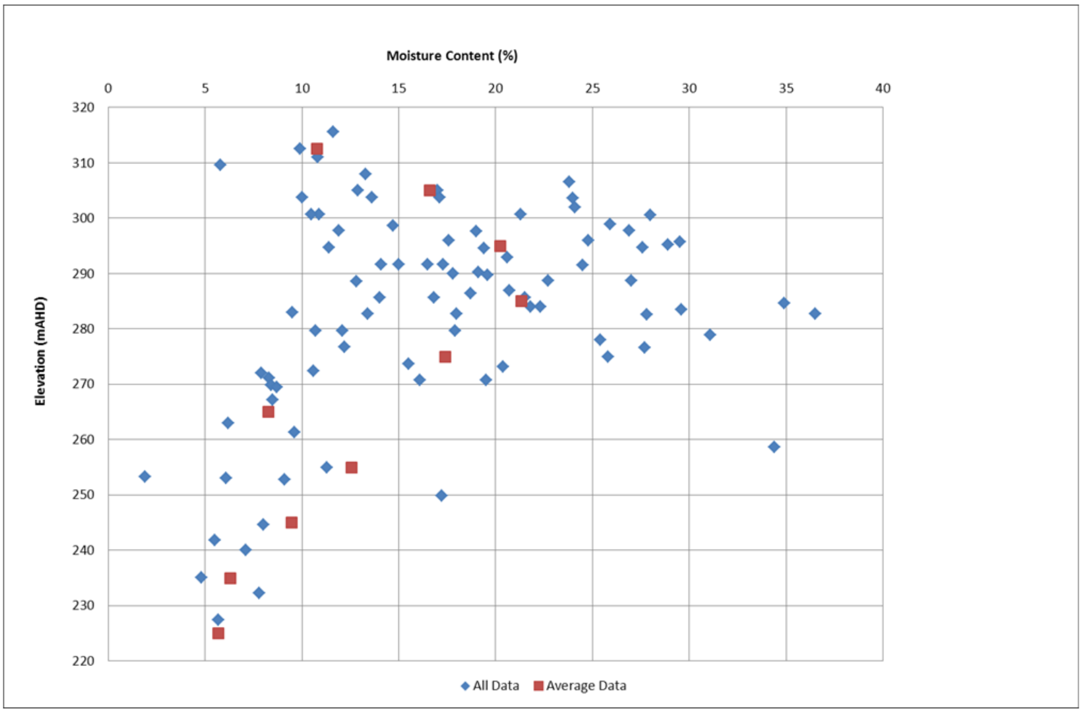
1. There are two layers, being tertiary weathered material and Bandanna formation sandstone bedrock.
2. The tertiary layer has a constant depth of 50m along the profile of the pit.
3. The depth of sandstone is 25m in year 5 and 125m in year 30.
4. There is a linear progress through the cross section over time

Although the mine plan indicates that progress through the pit depends on specific location, these assumptions are considered to provide a reasonable estimate of the relative proportions of overburden coming from each of the layers in any given year.

Moisture content data from the BFS (see Figure 2-2) were analysed to determine the moisture content in each of the layers. Moisture content data from the test pit were found to be consistent with this data set. An average of all data points in each layer would introduce an unintentional bias because samples are not regularly distributed with depth. To alleviate this, data were placed into 10m sample groups and the arithmetic mean moisture content was calculated for each group (shown as Average Data in Figure 2-2). The geometric mean of these data was calculated for each layer, resulting in moisture content estimates of 16.8% for the tertiary layer (assumed to be down to 270m Australian Height Datum (AHD) in the test pit data) and 8.1% for the Bandanna Formation (assumed to be below 270m AHD in the test pit data).

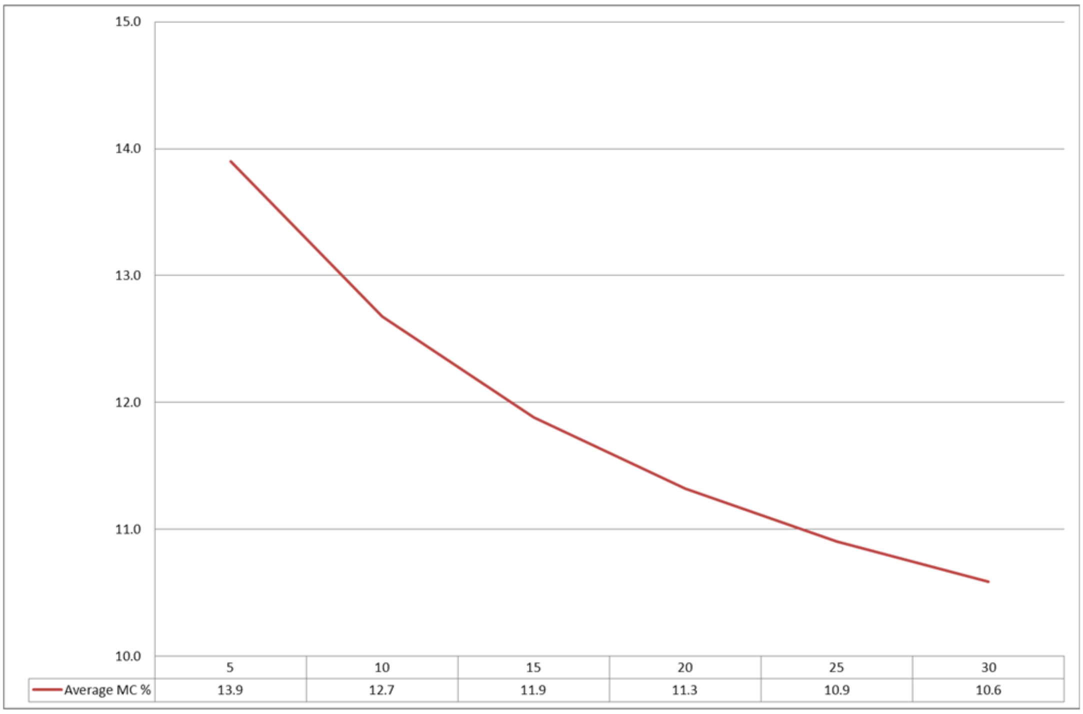
Following this, the depth of each layer to be handled in each year and the resulting annual average moisture content were calculated according to the assumptions above. The results are shown in Figure 2-3.

Figure 2-2 Moisture Content Depth



2 Model Refinements

Figure 2-3 Calculated Moisture Content by Year of Operation



A summary of the overburden moisture contents applied in the model refinements is shown in Table 2-1 and Table 2-2.

Table 2-1 Overburden moisture contents applied in Model Refinements

Layer	Year					
	5	**10**	**15**	**20**	**25**	**30**
Tertiary/Weathered Material (m) (moisture content 16.8%)	50	50	50	50	50	50
Bandanna/Sandstone (m) (moisture content 8.1%)	25	45	65	85	105	125
Weighted Average Moisture Content (%)	**13.9**	**12.7**	**11.9**	**11.3**	**10.9**	**10.6**

2 Model Refinements

Table 2-2 ROM and product coal moisture contents applied in the studies

Coal	Moisture Content (%)	
	SEIS	Refined Model*
Coal – in-situ	5	14
Coal – ROM	6.9	14
Coal – product	6.9	17.3
Miscellaneous	6.9	14

* From non-centrifugal moisture testing by CSIRO (product) and ACARP study on in-situ moisture (ROM) (Hancock Coal Pty Ltd (2010)).

2.1.2 New Emission Factors

2.1.2.1 US EPA AP42

For Front End Loading (FEL) of trucks, under the National Pollutant Inventory (NPI) no effective mitigation is listed and so a control factor cannot be applied on this basis. However, the default NPI emission factor makes no allowance for moisture content and is based on research studies in the Hunter Valley, where the moisture content of overburden is significantly lower than found in this study. The NPI Emissions Estimation Technique Manual (EETM) for Mining notes at section 1.1.1 that a moisture content of 1% would be plausible for the Hunter Valley. The US EPA AP42 (Section 13.2.4-3)[1] emission factor equation for FEL of Trucks suggests that increasing moisture content by a factor of two results in a reduction in PM_{10} emissions of more than 60%. Although the calculated AP42 emission factor is considered in the NPI Manual to be unrealistically low for Australian (Hunter Valley) conditions, it is reasonable to assume that the very high moisture content of overburden at the Alpha Coal Mine would significantly reduce particulate emissions from this source. This principle has been applied to the mitigation of emissions from truck dumping of overburden.

2.1.2.2 Dragline drop height

The drag-line drop heights have been reduced from 15 m to 6 m in the emissions inventory, which is a more realistic approach to the representation of emissions from this source based on proposed mining techniques.

2.1.2.3 CHPP activities moisture contents

The emissions inventory has been reduced for all activities beyond the CHPP as the material will be in the form of a 'slurry' with a moisture content in excess of the 15.7% threshold for dust generation described in the Hancock Prospecting Pty Ltd 'Dustiness Moisture Relationship Report' (ACIRL, 2010). These mitigation controls are summarised in Table 2-3.

[1] http://www.epa.gov/ttnchie1/ap42/

2.1.2.4 Reduction in Overburden Haulage

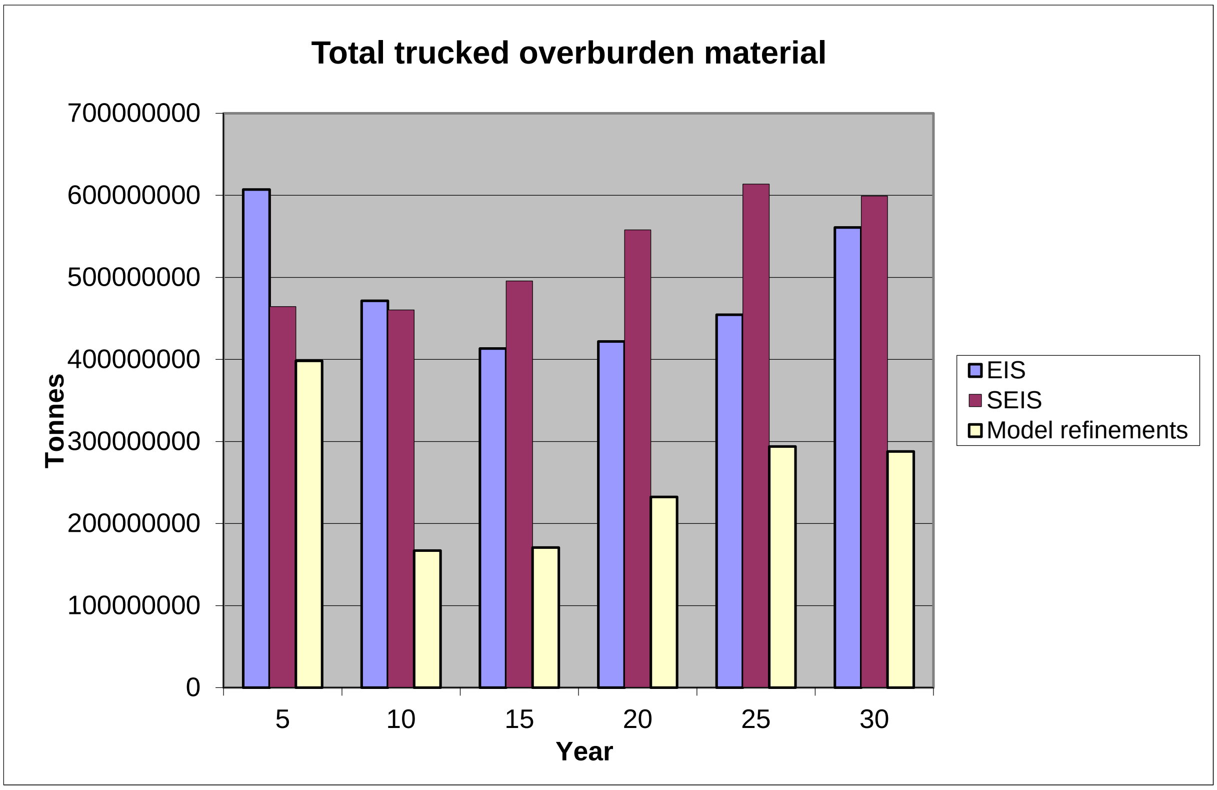
A review of the emissions inventory identified an over-estimation of overburden haulage emissions. In the refined model, these emissions have been reduced by making the following amendments to the inventory:

- Reducing the overburden material transported by haul road as a result of the introduction of In-Pit Crushing and Conveying (IPCC); and
- Reducing the overburden material transported by haul road by the overburden material removed by dragline. This was double counted in the SEIS inventory.

Figure 2-4 shows is a comparison of the total trucked overburden waste between in the EIS, SEIS and model refinement inventories.

Figure 2-4 also shows that in the refined model, the amount of overburden material removed by road is reduced in all modelled years. In years 10, 15, 20, 25 and 30 this reduction is by approximately 50% in comparison to the SEIS inventory.

Figure 2-4 Update to total trucked overburden material



2.2 Model Refinements Overview

Table 2-3 is a summary of the refinements made to the SEIS atmospheric dispersion model and new mitigation controls. In all instances, the mitigation applied is new mitigation i.e. additional controls to the level 2 watering applied to sources of wheel generated dust in the SEIS.

2 Model Refinements

Table 2-3 Model Refinements

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
New data	Overburden and In-Pit	FEL of coal trucks Dozers	Increase to product and overburden moisture contents based on information from BFS and test pit borehole sampling	• Coal moisture contents available from BFS Design Criteria. • New overburden moisture content data from test pit sampling. • A single average for overburden moisture for the whole profile is applied unique to each year, depending on the proportion of material in each layer.
	ROM Activities	Truck dumping at ROM FEL at ROM Dozer hours (coal at ROM)		
	CHPP Activities	FEL at CHPP Dozer hours (coal at CHPP) CHPP conveyor transfer points		
New mitigation	Overburden & In Pit	Drilling	99% control applied to total emission and 70% to the remainder	• Drills to be fitted with hydraulic dust control curtains, water sprays (70% control) and dust cyclones (99% control).
		Dragline	Changed drop height from 15m to 6m	• 6 m is considered a more realistic estimate of drop height
		FEL of overburden into trucks	50% control for PM_{10}	• No specific controls are proposed in Table 4 of the NPI EETM for mining for FEL of overburden into trucks. However, the USEPA AP42 (Section 13.2.4-3) emission factor takes account of moisture content. Although this emission factor is considered in the NPI Manual to be unrealistically low for Australian conditions, it is

2 Model Refinements

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
				reasonable to assume that the very high moisture content of overburden at the Alpha Coal Mine would significantly reduce particulate emissions from this source. Calculations using the USEPA equation indicate that an increase in moisture content by a factor of 2 would be expected to result in a 62% reduction in emissions of PM_{10}, so a 50% control factor is applied.
		Truck dumping at overburden dumps	50% control for PM_{10}	• USEPA AP42 uses the same equation as for truck loading, therefore, the same rationale as for FEL of overburden into trucks applies. • NPI allows a 70% control for water sprays, confirming the relevance of moisture content for this dust source.
	ROM Activities	Truck dumping at ROM	50% control for PM_{10}	• NPI control factor for water sprays
		Wind erosion from coal stockpiles	50% control for PM_{10}	• NPI control factor for water sprays
	ROM to CHPP Conveyor	Miscellaneous transfer points	70% control for PM_{10}	• Partial enclosure and moisture will be lower than CPP conveyor
	CHPP Activities	CHPP Processing	98% inventory reduction for PM_{10}	• Coal (-50mm) during processing/washing is mostly in slurry form with a high total moisture content and are therefore almost entirely removed as a source.
		FEL at CPP	70% inventory reduction for PM_{10}	• FEL activities can generate fines and increase potential for dusting. However, this activity is low volume with total moistures > 17%.
		Dozer hours-	98% inventory	• Dozing operations are less likely

2 Model Refinements

Refinement Reason	Source Group	Sources Impacted	Model Refinement	Notes and justification
		coal at CPP	reduction for PM_{10}	to generate as many fines as FEL and is also low volume with total moistures > 17%.
		Loading stockpiles	98% inventory reduction for PM_{10}	• Loading stockpiles is by stacking equipment and can generate fines if drop heights are not managed. However, the material will be wet and dust sprays will be in operation which allowed for 50% control in NPI.
		Unloading from stockpiles	98% inventory reduction for PM_{10}	• Unloading stockpiles is by bucket wheel reclaiming equipment and unlikely to generate many fines.
		CHPP conveyors	90% inventory reduction for PM_{10}	• Conveyors in the CHPP are shorter and wider than in the raw coal area and transfer material with total moistures between 17 and 23%. The material is so wet this amounts to the same using water sprays in the NPI.
		Miscellaneous transfer points	90% inventory reduction for PM_{10}	• The transfer points in the CHPP are partially enclosed, have dust sprays and transfer material with total moistures between 17 and 23%. The material is so wet this amounts to the same using water sprays in the NPI.
		Wind erosion from stockpiles	70% inventory reduction for PM_{10}	• Product stockpiles are built for minimum exposure to prevailing winds with low batter angles to minimise wind erosion.
Corrections to SEIS	Tailings Dams	Tailings Dams	Area reduced to 10% of SEIS	• Estimated from aerial photography of tailings dams for other projects.
	Overburden and In-Pit	Wheel generated dust - transfer of overburden to dumps	Wheel generated dust - transfer of overburden to dumps reduced	• Total overburden waste removed from site by vehicle included all Dragline and Conveyed waste in the SEIS. The VKT are therefore significantly reduced under the model refinements.

2.3 Revised Modelling Results

This section shows the modelling results presented as contour plots for 24-hour average PM_{10}, 24-hour average $PM_{2.5}$ and annual average $PM_{2.5}$ and the number of exceedences predicted in the SEIS and refined model for 24-hour average PM_{10}.

2.3.1 24-hour average PM_{10}

Figures 2-5 to 2-10 show the predicted contours for the model refinements for the 24-hour averaging period (5th highest) for PM_{10}. The EPP (Air) 50 µg.m^{-3} contours for the model refinement assessments are highlighted to show the impact of the model refinements on the position of the EPP (Air) objective contour.

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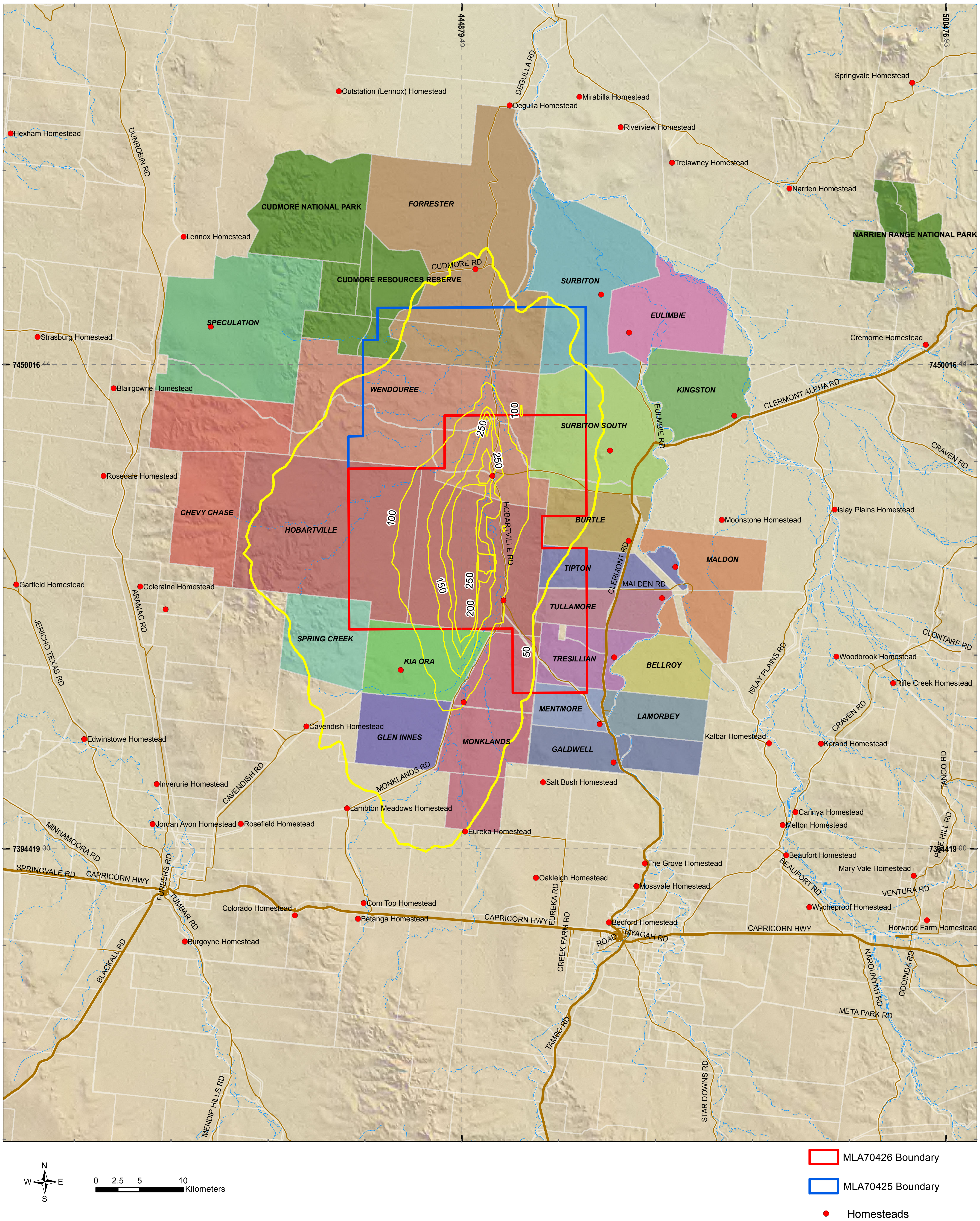

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)

MODEL REFINEMENTS YEAR 5

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-5**

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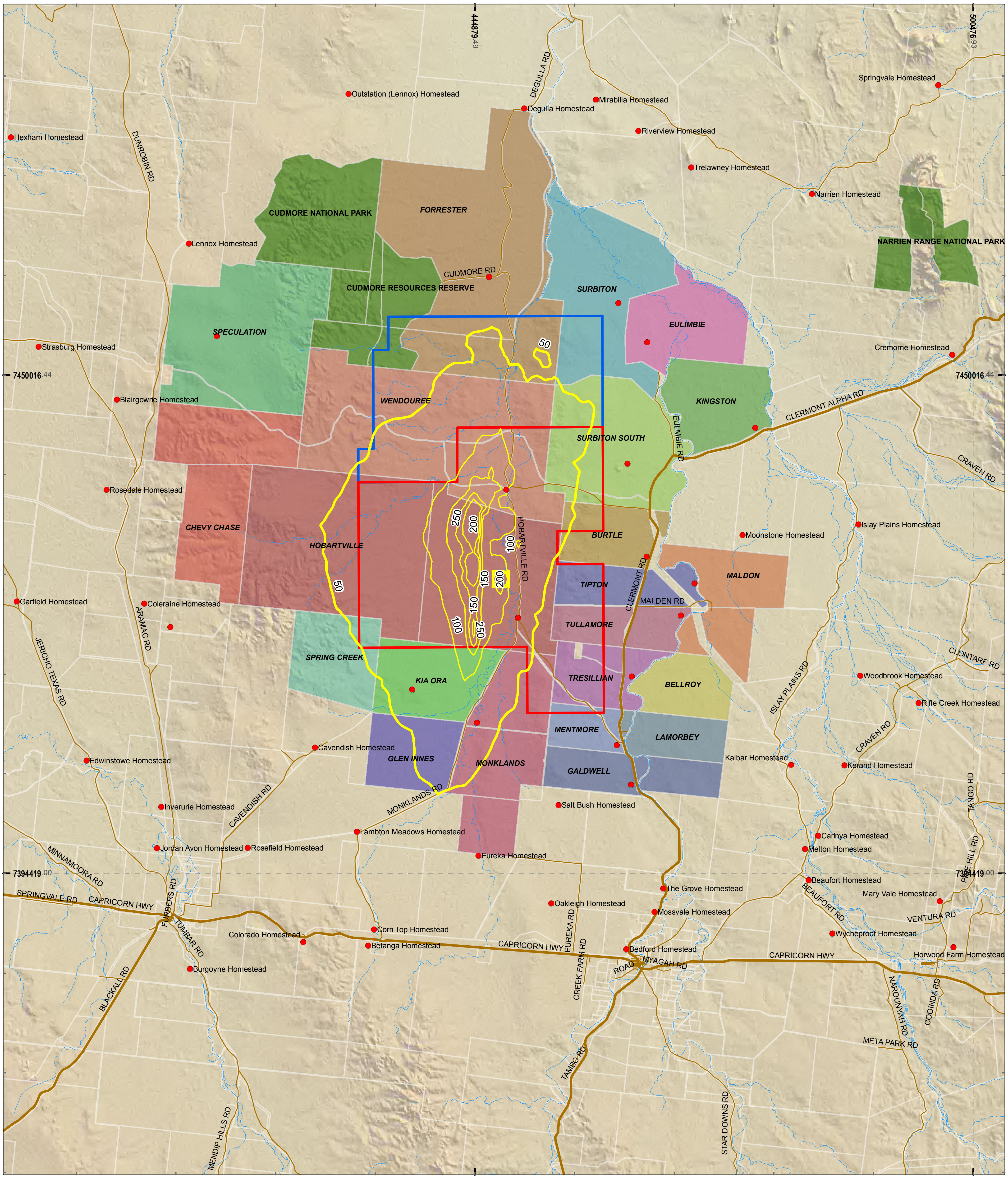

N
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0 2.5 5 10 Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)

MODEL REFINEMENTS YEAR 10

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-6**

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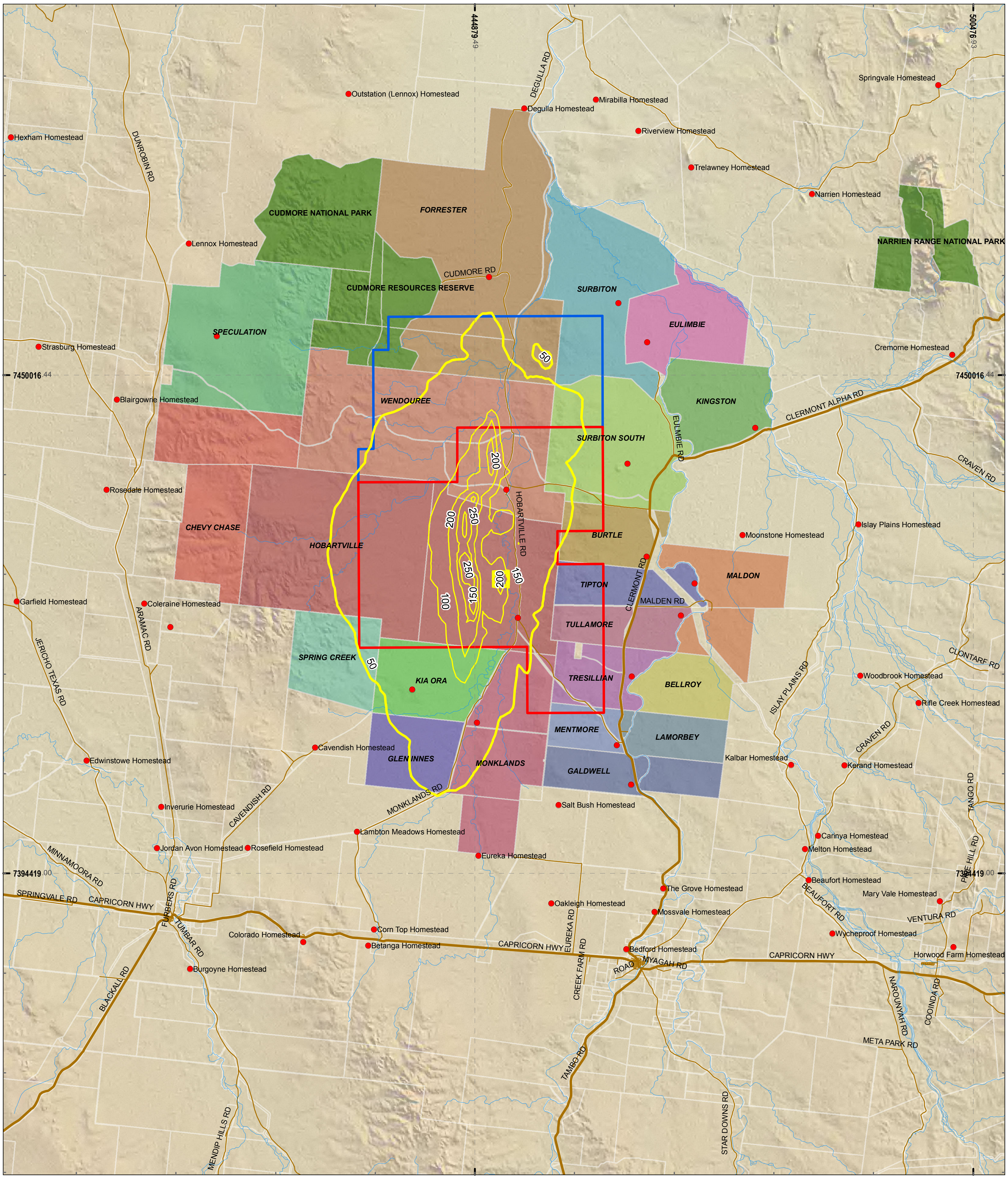

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)

MODEL REFINEMENTS YEAR 15

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: 2-7

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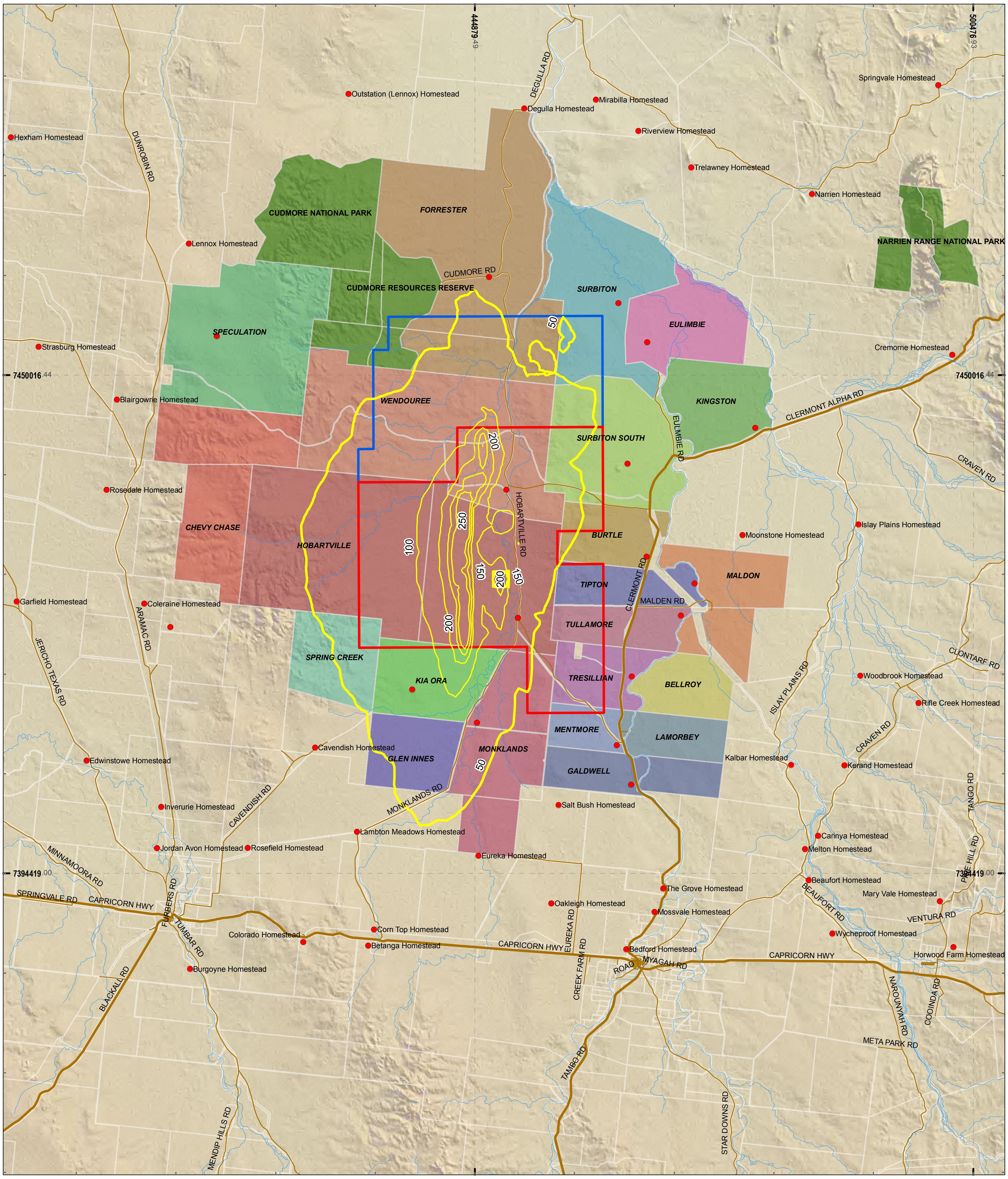

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0 2.5 5 10
Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)

MODEL REFINEMENTS YEAR 20

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-8**

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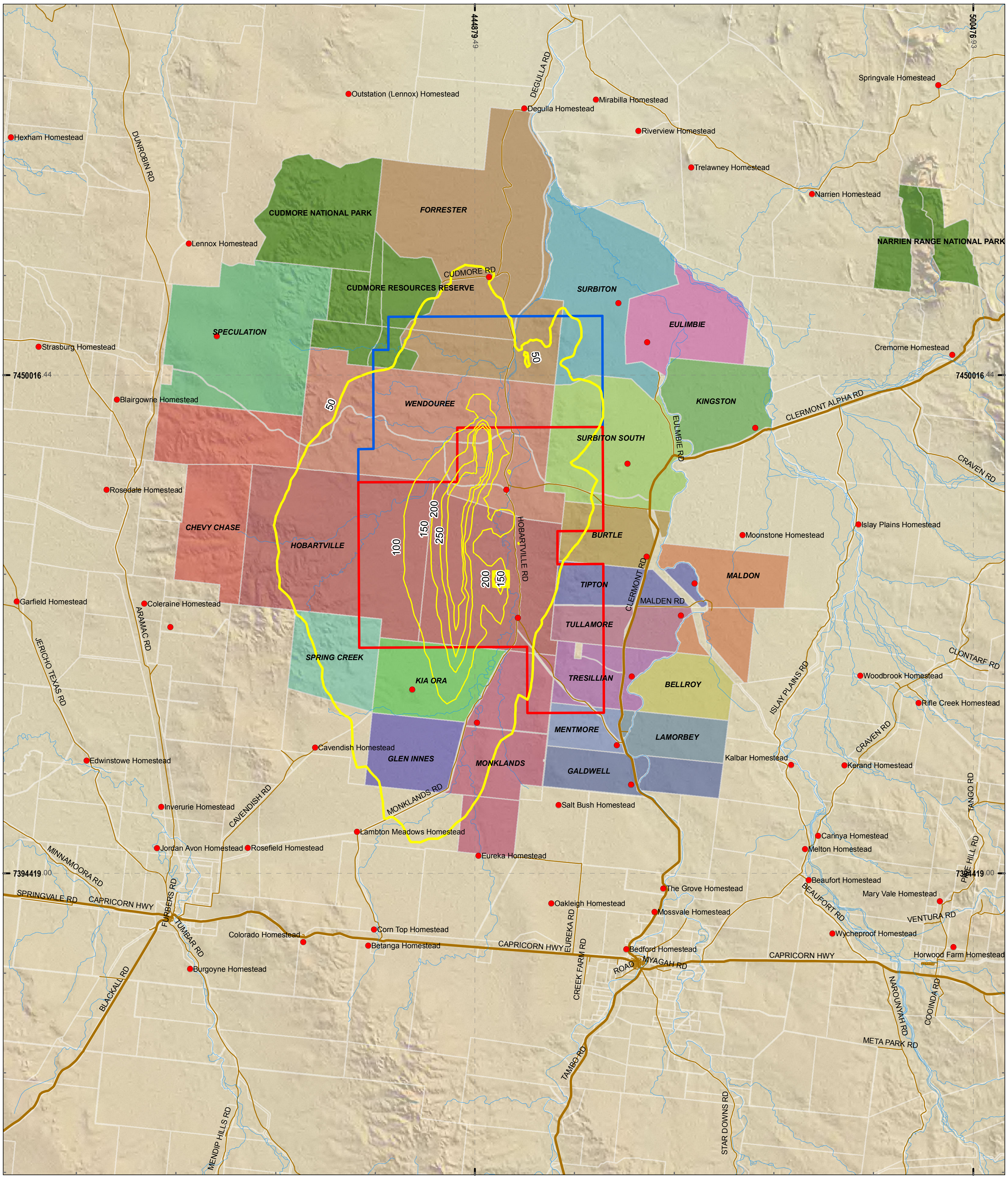

N
W E
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0 2.5 5 10 Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (μg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27μg/m³)

MODEL REFINEMENTS YEAR 25

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-9**

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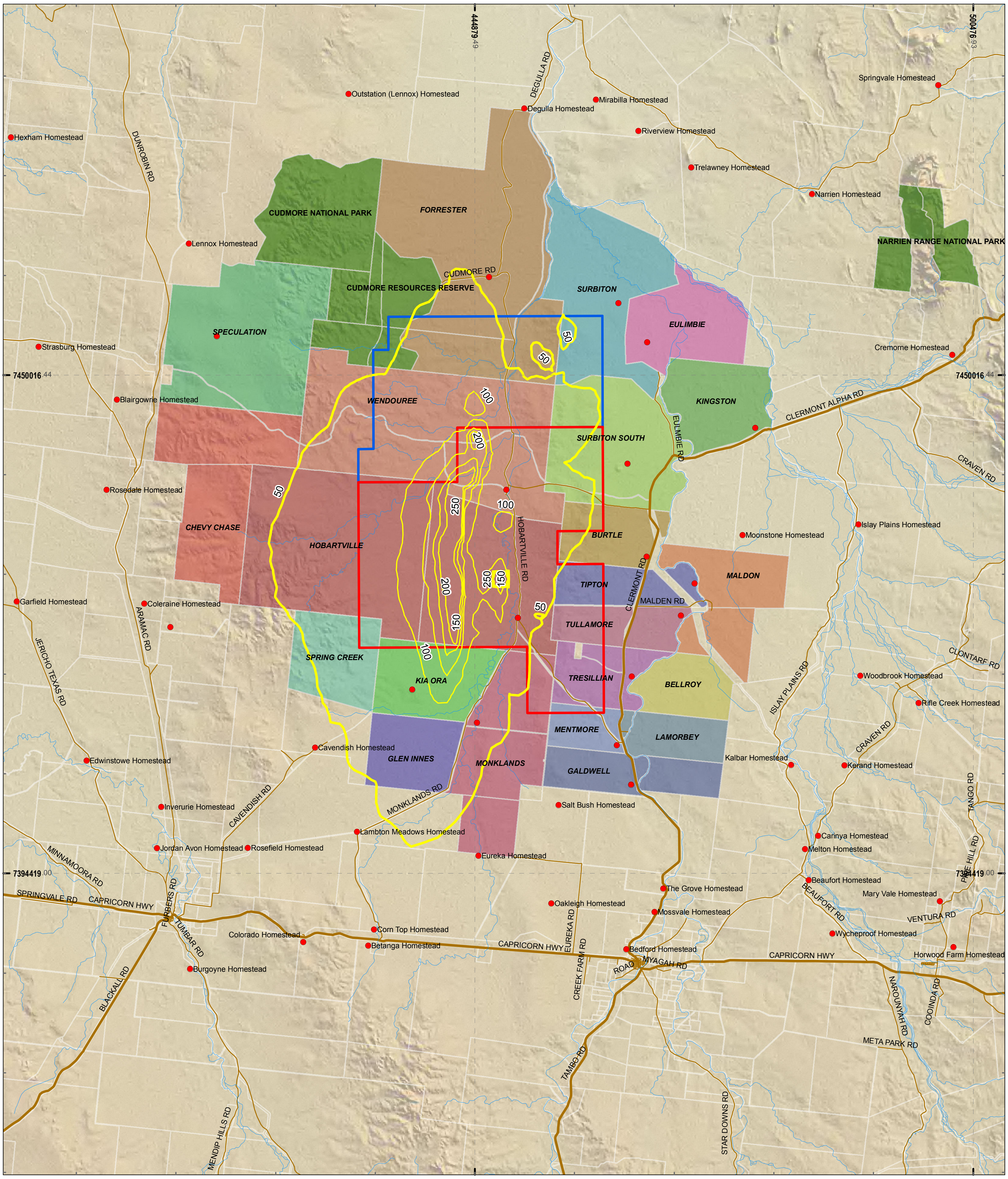


Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE PM_{10} (µg/m³)
(5th HIGHEST, INCLUDING BACKGROUND CONTRIBUTION OF 27µg/m³)

MODEL REFINEMENTS YEAR 30

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-10**

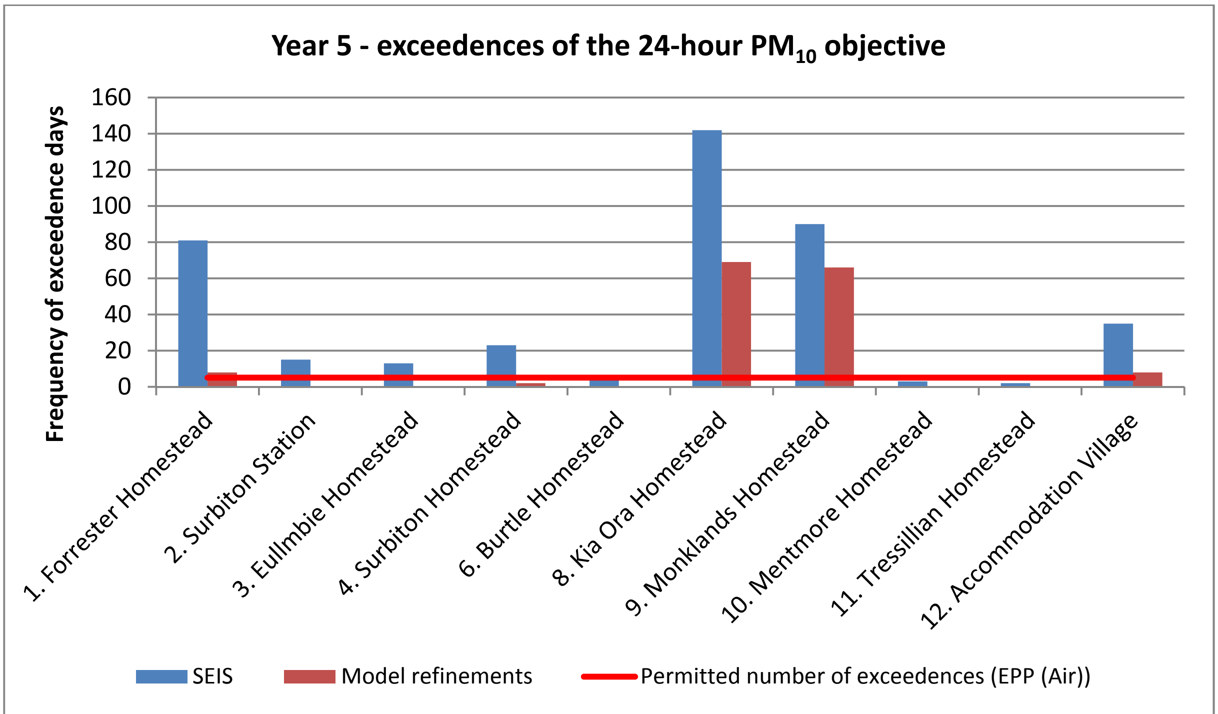
File No: **42626680-g-594.mxd** Drawn: **RG** Approved: **RS** Date: **04-11-2011** Rev. **A** A4

2 Model Refinements

Figure 2-5 shows that in Year 5, the model refinement 50 µg.m^{-3} contours extend outside Mining Lease Application (MLA) 70426. However, the model refinement 50 µg.m^{-3} contour is significantly smaller than that presented in the SEIS. Figure 2-11 shows that in the SEIS, exceedences were predicted at all ten sensitive receptors in Year 5. The refined model shows that exceedence days are only predicted in the SEIS at the Forrester Homestead, Kia Ora Homestead, Monklands Homestead and the Accommodation Village. Where excedeence days are predicted, they are almost entirely removed following model refinement at the Forrester Homestead and the Accommodation Village and reduced from 142 to 69 days at Kia Ora Homestead and from 90 to 66 days at the Monklands Homestead. It should be noted that the Environmental Protection Policy (EPP) (Air) objective allows 5 days where exceedences are permitted to represent natural fluctuations in background concentration. Surbiton Homestead is predicted to experience less than 5 days exceeding the 50 µg.m^{-3} threshold. Management and mitigation measures will be incorporated into the EM Plan.

The trend for a reduction in the size of the 50 µg.m^{-3} contour footprint and frequency of exceedence days is applicable to all modelled years as shown in Figures 2-5 to 2-11 and 2-11 to 2-16. Figure 2-6 shows that the contour footprint is significantly smaller in year 10 than in year 5. The number of days exceeding the 50 µg.m^{-3} threshold is also lower at all sensitive receptors. This reduction corresponds to the introduction of IPCC which reduces the number of vehicle movements to the overburden dumps.

Figure 2-11 Year 5 - exceedences of the 24-hour PM_{10} objective



2 Model Refinements

Figure 2-12 Year 10 - exceedences of the 24-hour PM_{10} objective

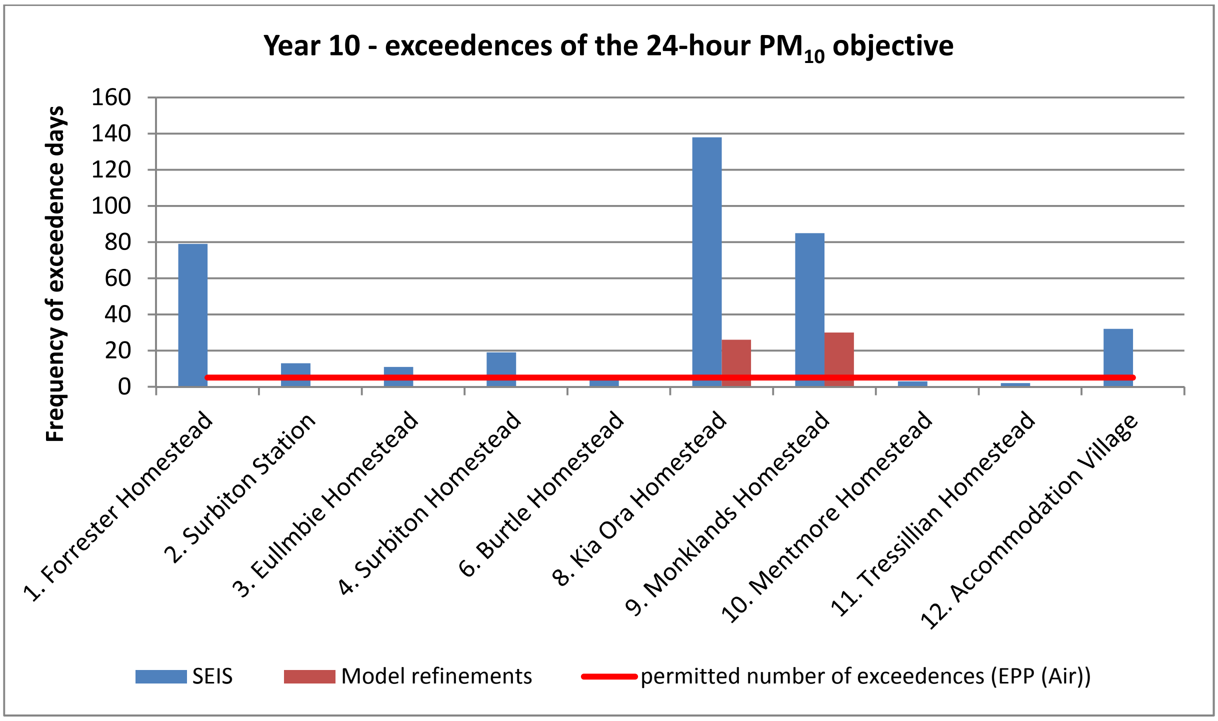
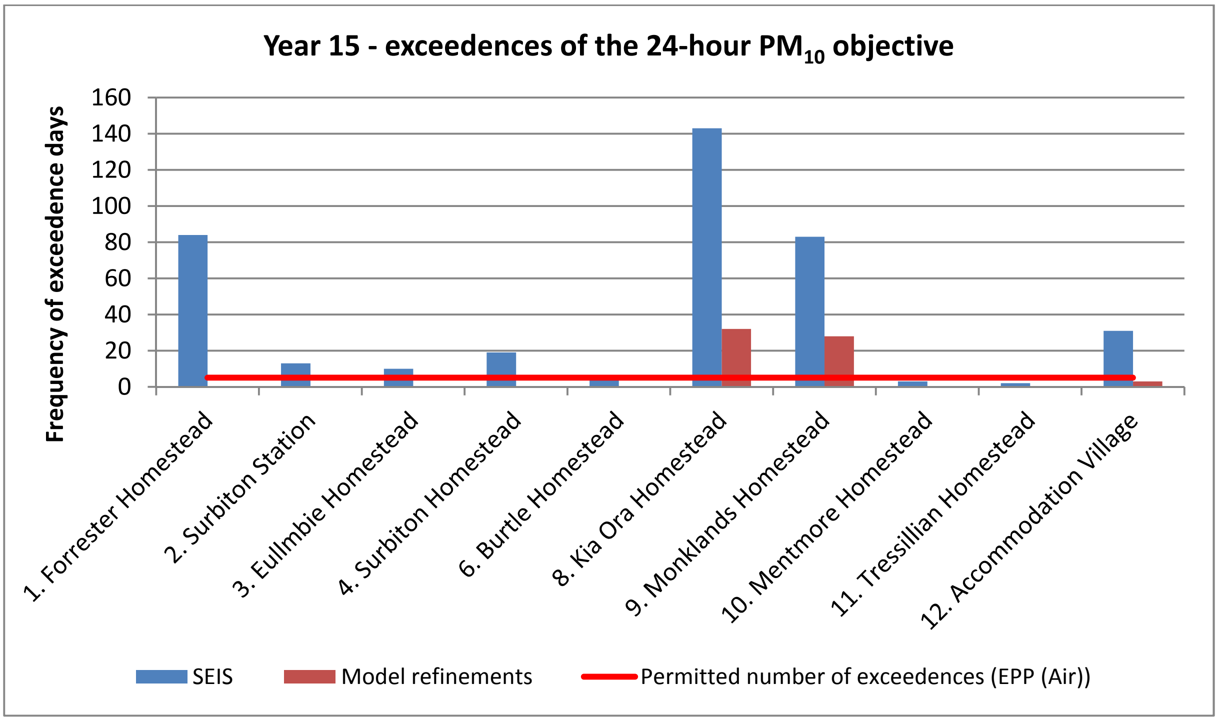


Figure 2-13 Year 15 - exceedences of the 24-hour PM_{10} objective



2 Model Refinements

Figure 2-14 Year 20 - exceedences of the 24-hour PM_{10} objective

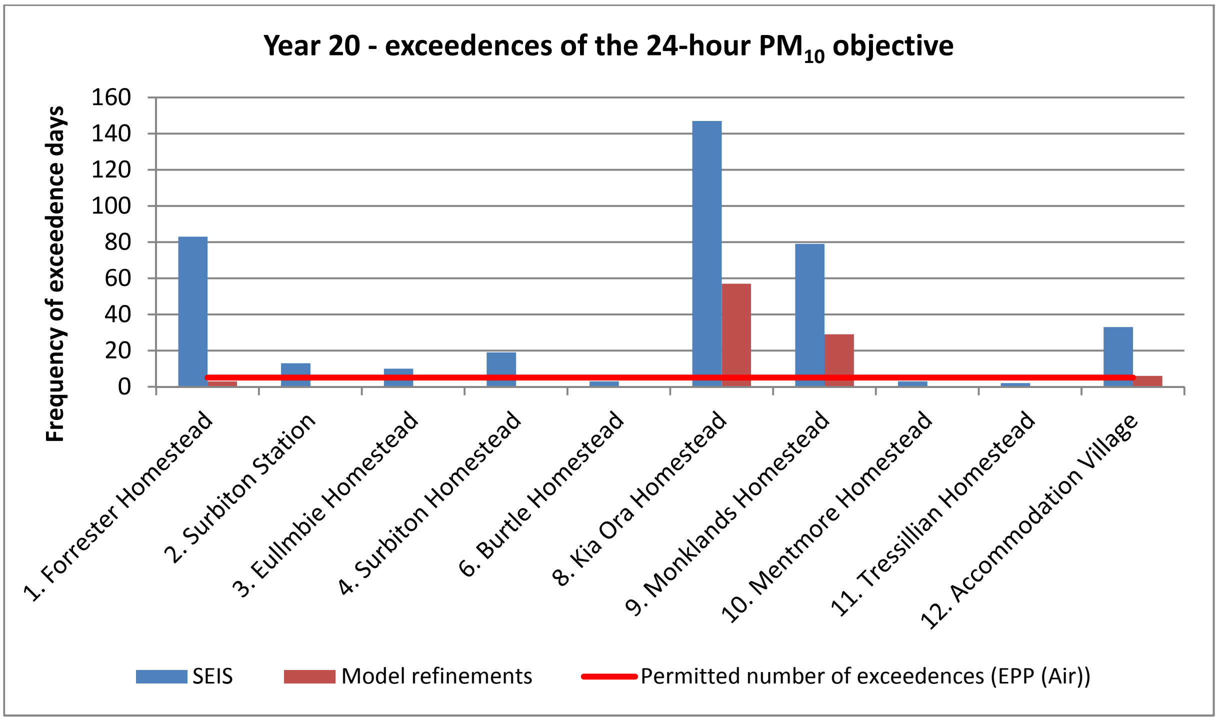
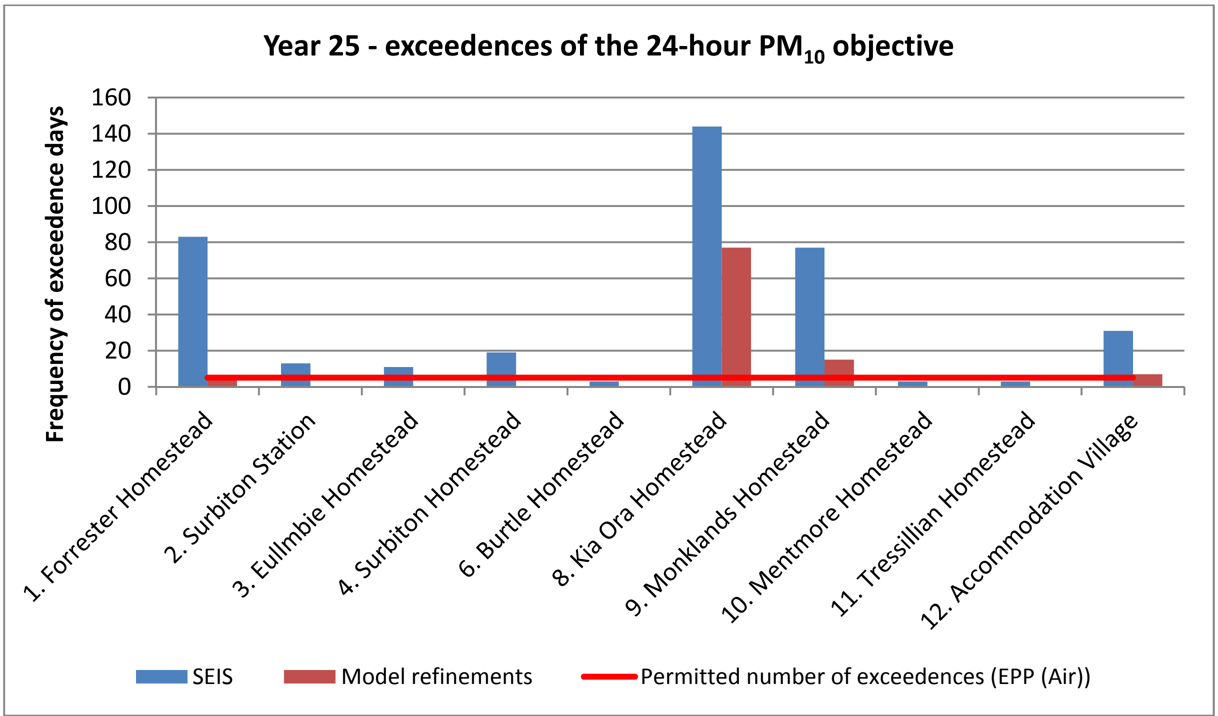
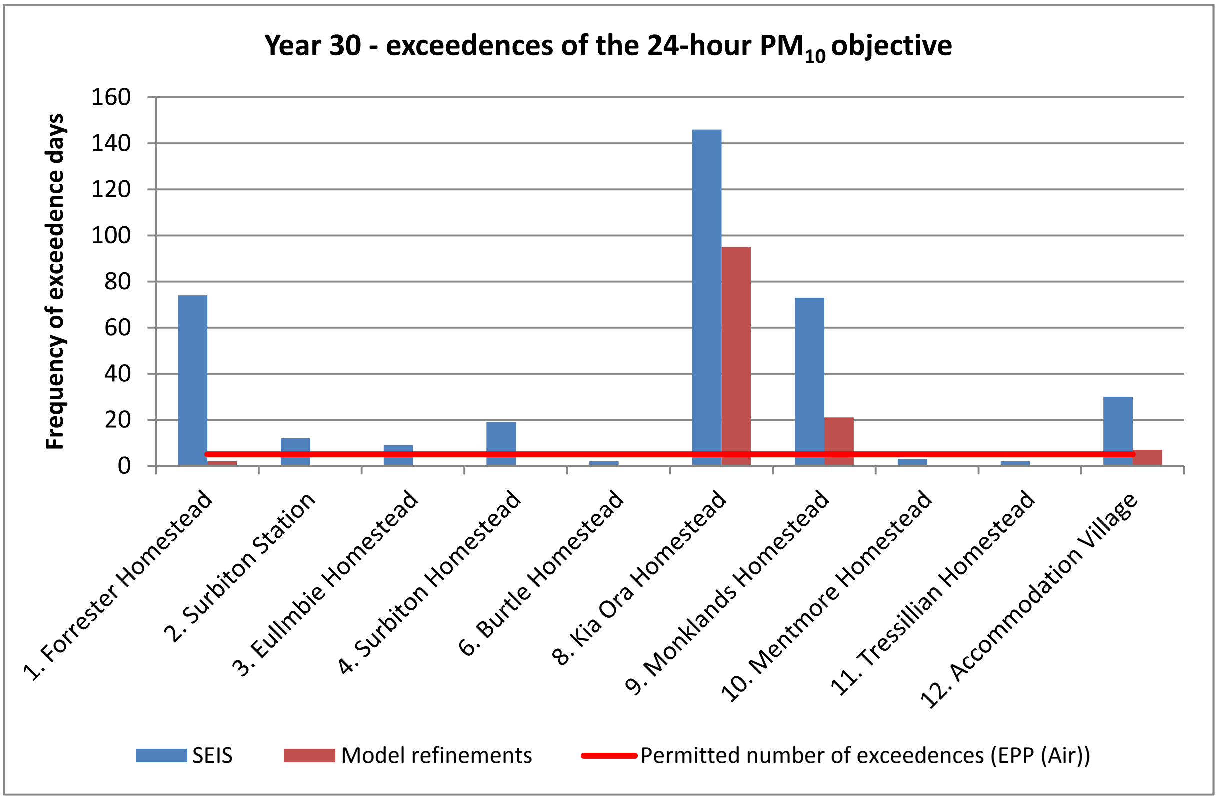


Figure 2-15 Year 25 - exceedences of the 24-hour PM_{10} objective



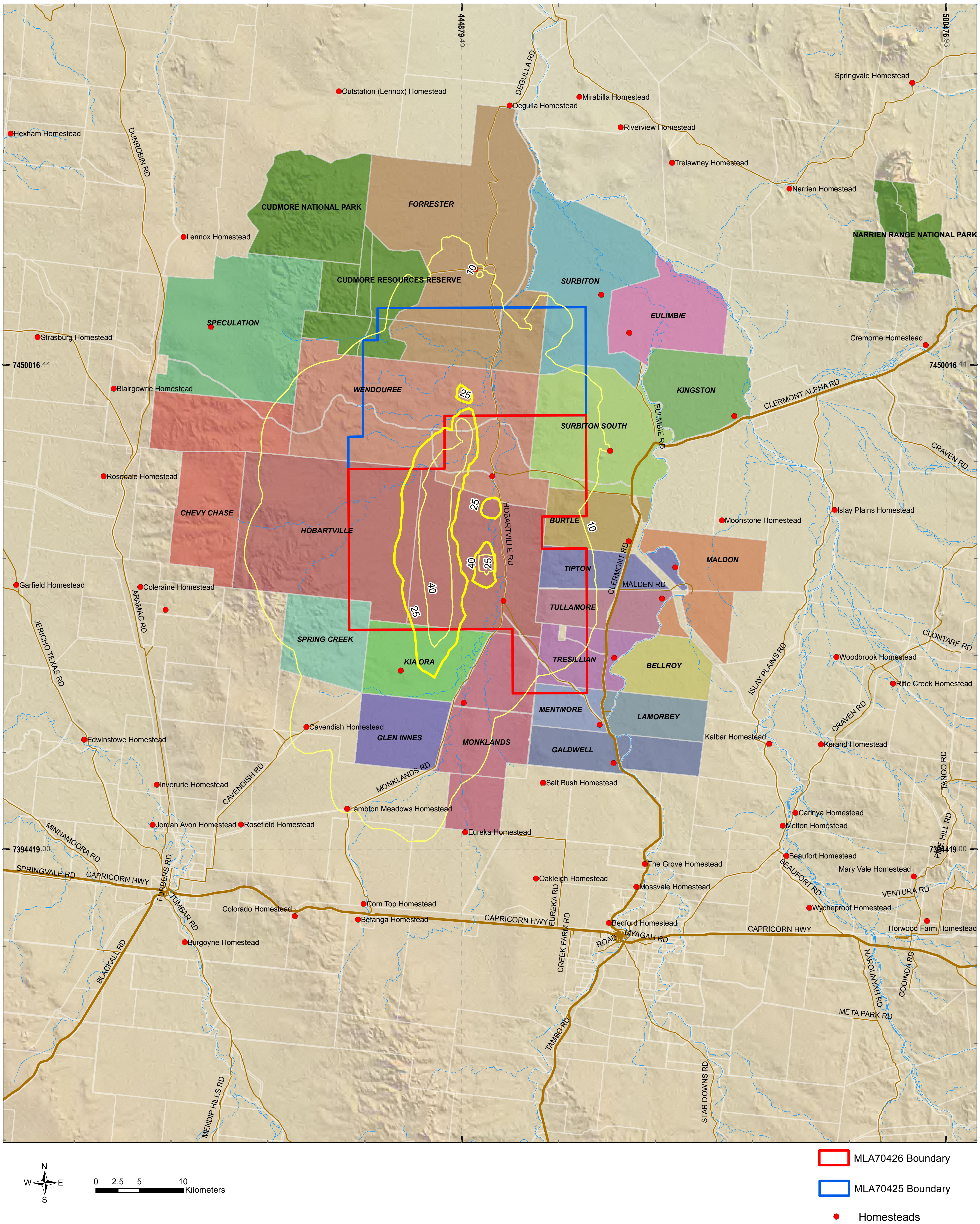
2 Model Refinements

Figure 2-16 Year 30 - exceedences of the 24-hour PM_{10} objective



2.3.2 24-hour average $PM_{2.5}$

Figures 2-17 to 2-22 show the predicted contours for the model refinements for the 24-hour averaging period for $PM_{2.5}$. The 25 µg.m^{-3} contour is highlighted on each plot for the model refinements.



Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ (µg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 5.4µg/m³)

MODEL REFINEMENTS YEAR 5

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-17**

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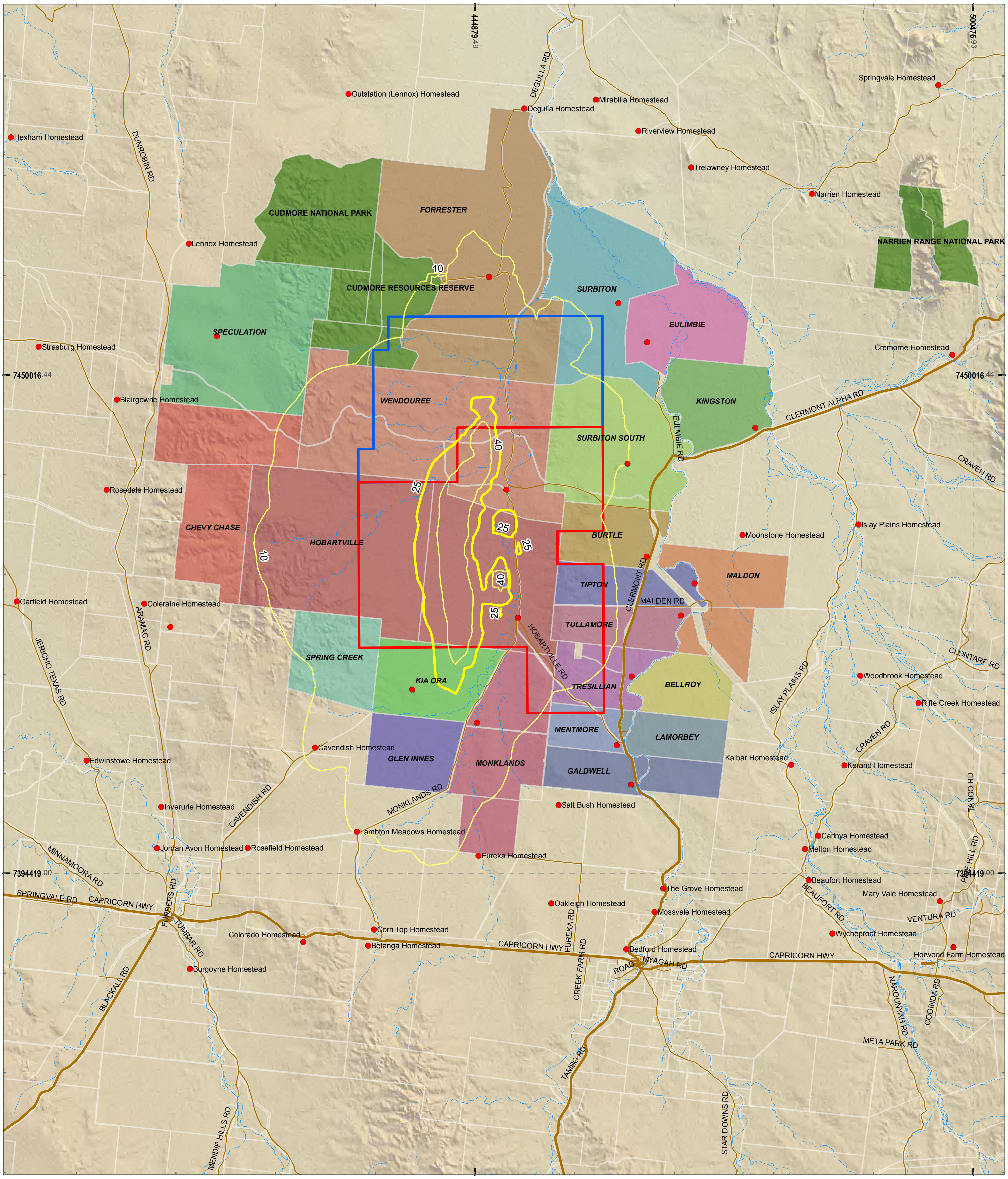

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0 2.5 5 10 Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ (μg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 5.4μg/m³)

MODEL REFINEMENTS YEAR 10

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-18**

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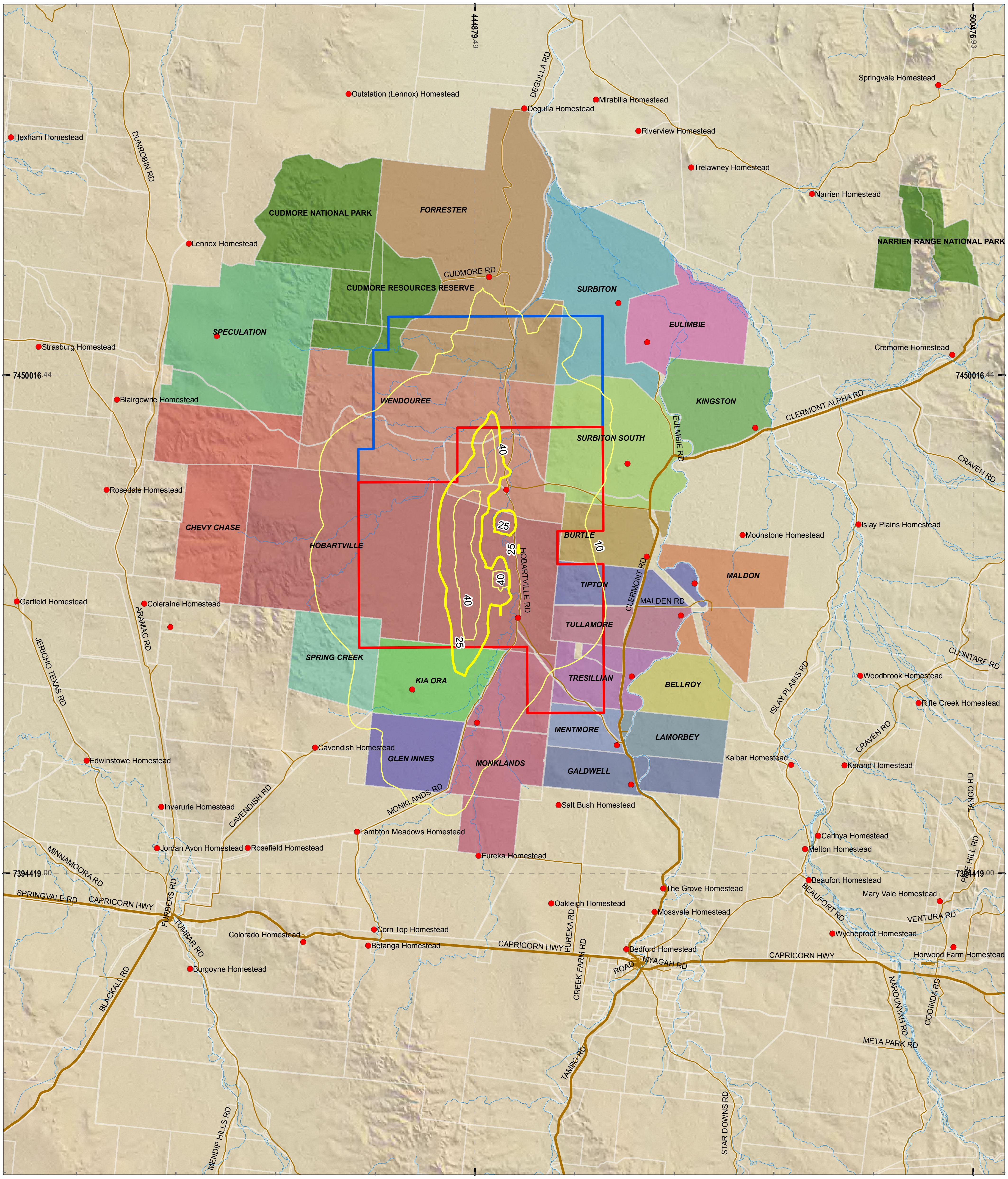

N
W E
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0 2.5 5 10
Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ (µg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 5.4µg/m³)

MODEL REFINEMENTS YEAR 15

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-19**

File No: **42626680-g-603b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011**

Rev. **A** A4

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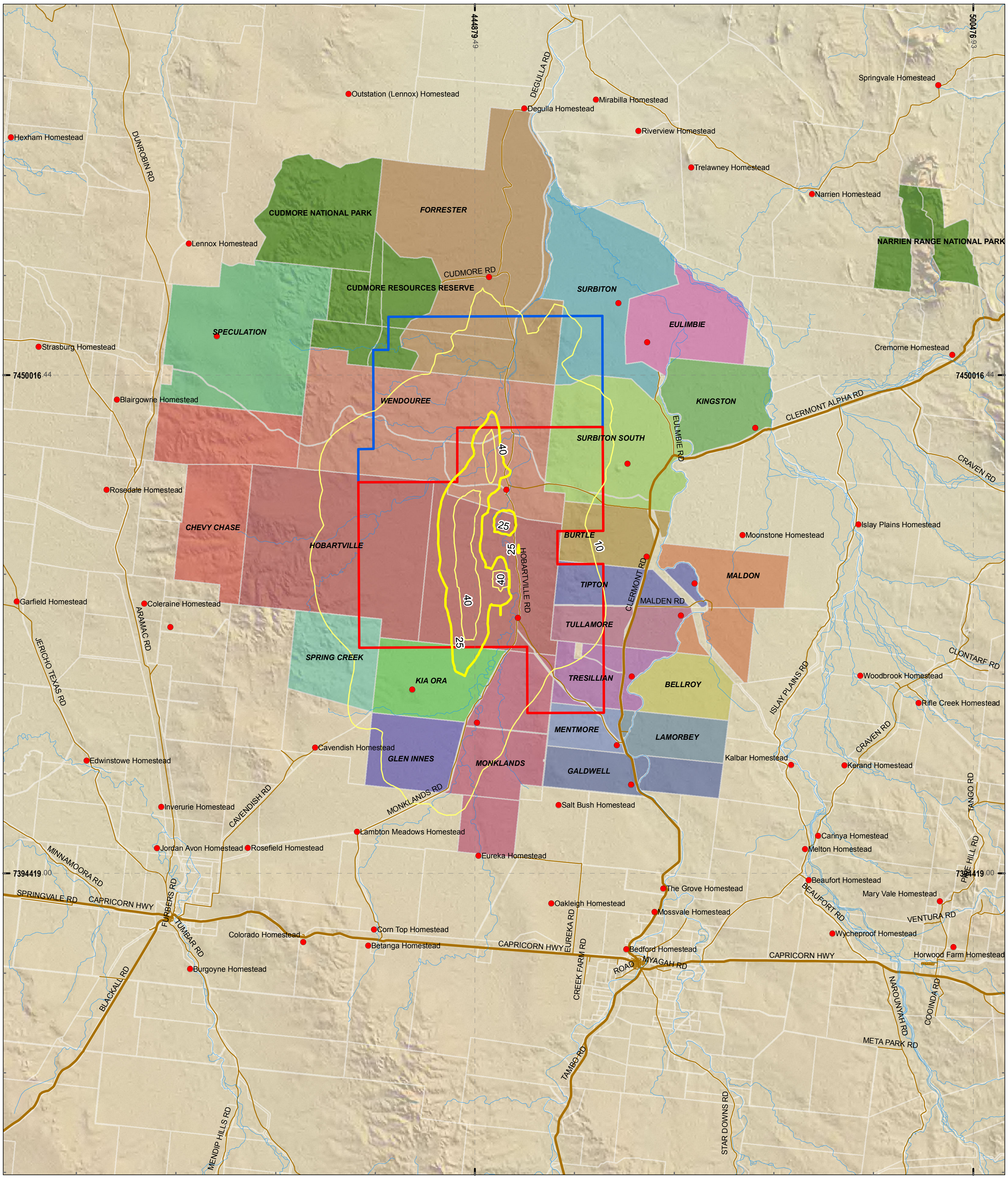

N
W E
S

0 2.5 5 10
Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ (μg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 5.4μg/m³)

MODEL REFINEMENTS YEAR 20

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-20**

File No: **42626680-g-603b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4

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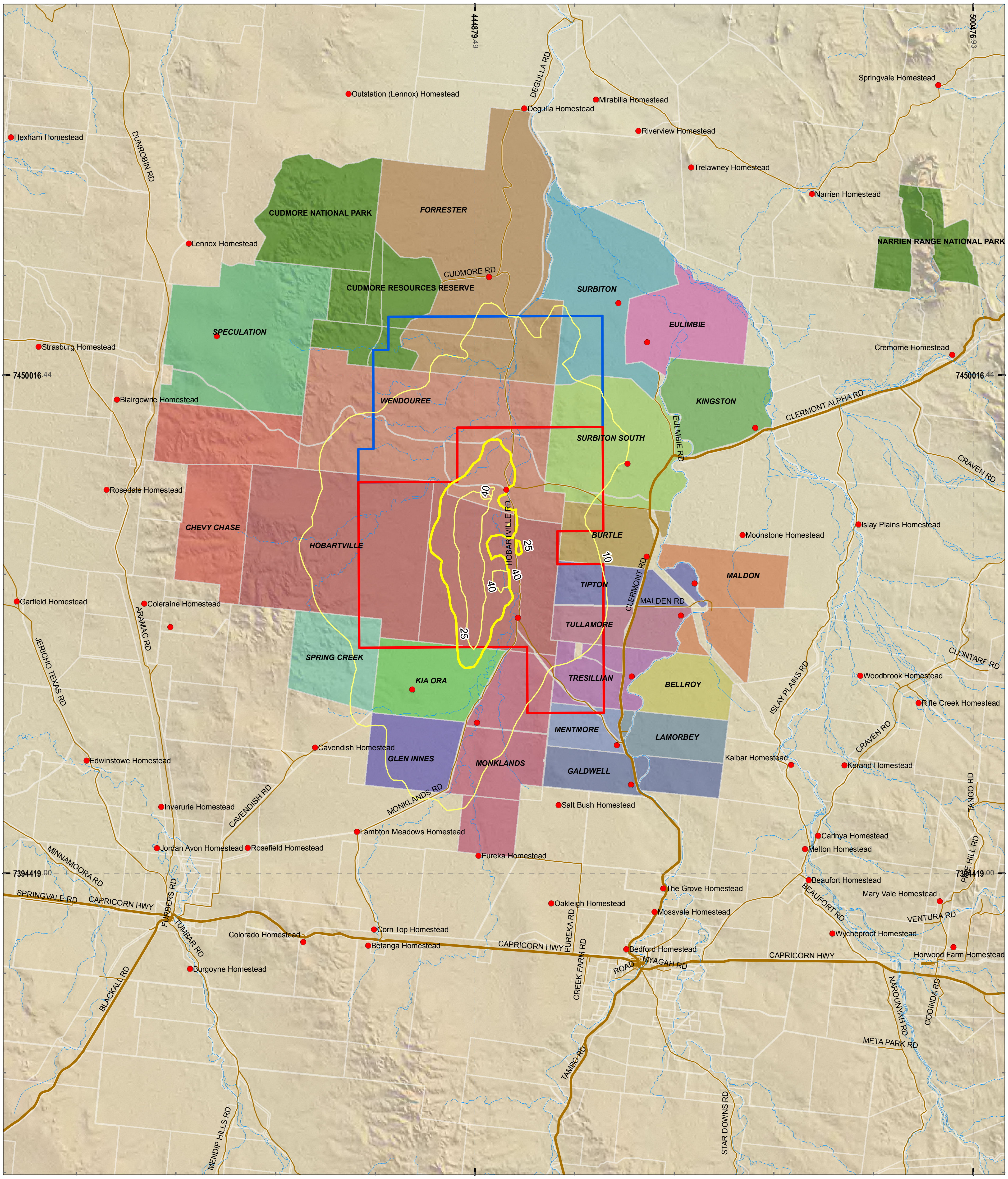


MLA70426 Boundary

MLA70425 Boundary

Homesteads

N W E S

0 2.5 5 10 Kilometers

Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ (µg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 5.4µg/m³)

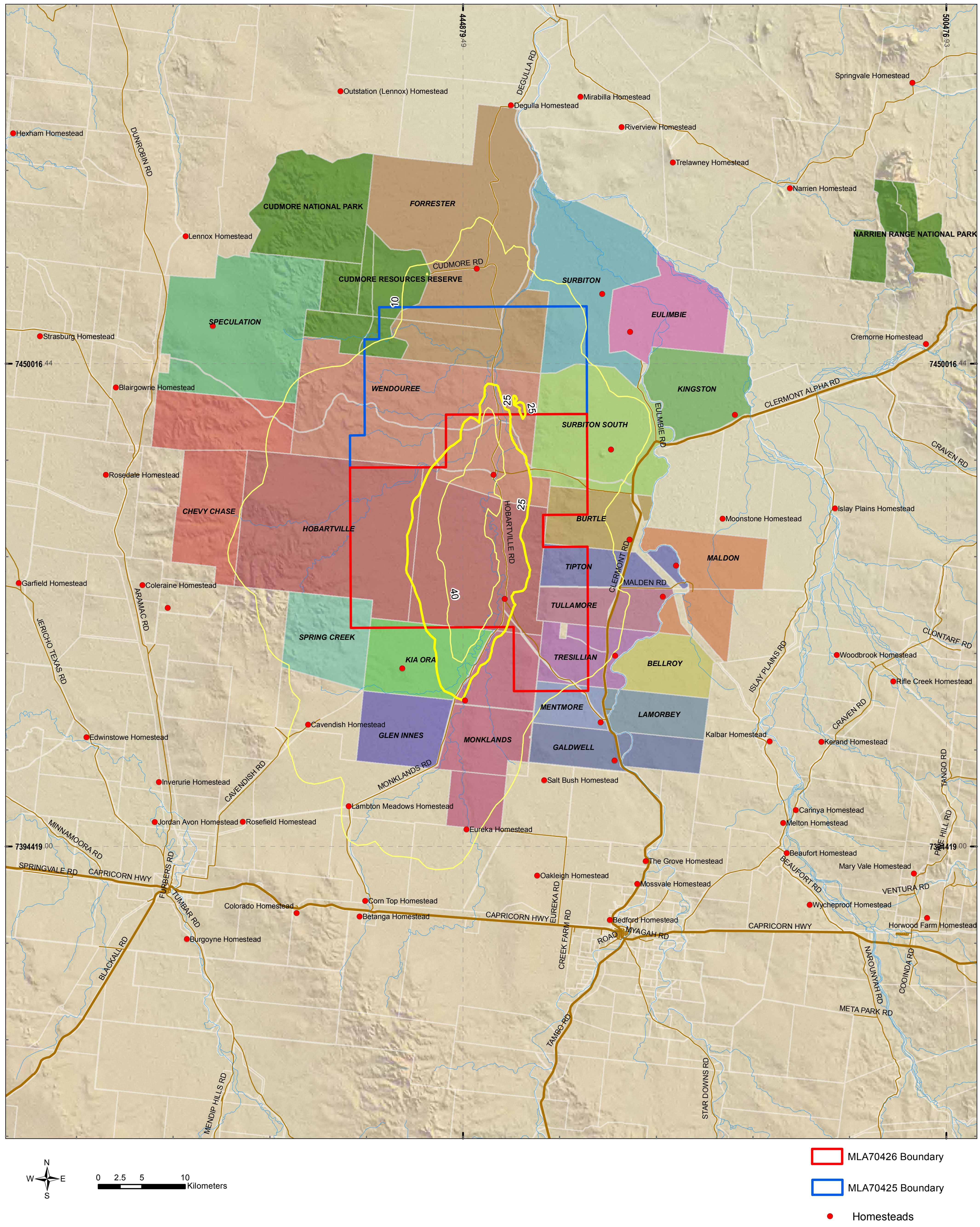
MODEL REFINEMENTS YEAR 25

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-21**

File No: **42626680-g-604b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4



Source: Client Supplied Data

HANCOCK COAL PTY LTD

24-HOUR AVERAGE $PM_{2.5}$ ($\mu g/m^3$)
(INCLUDING BACKGROUND CONTRIBUTION OF $5.4 \mu g/m^3$)

MODEL REFINEMENTS YEAR 30

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-22**

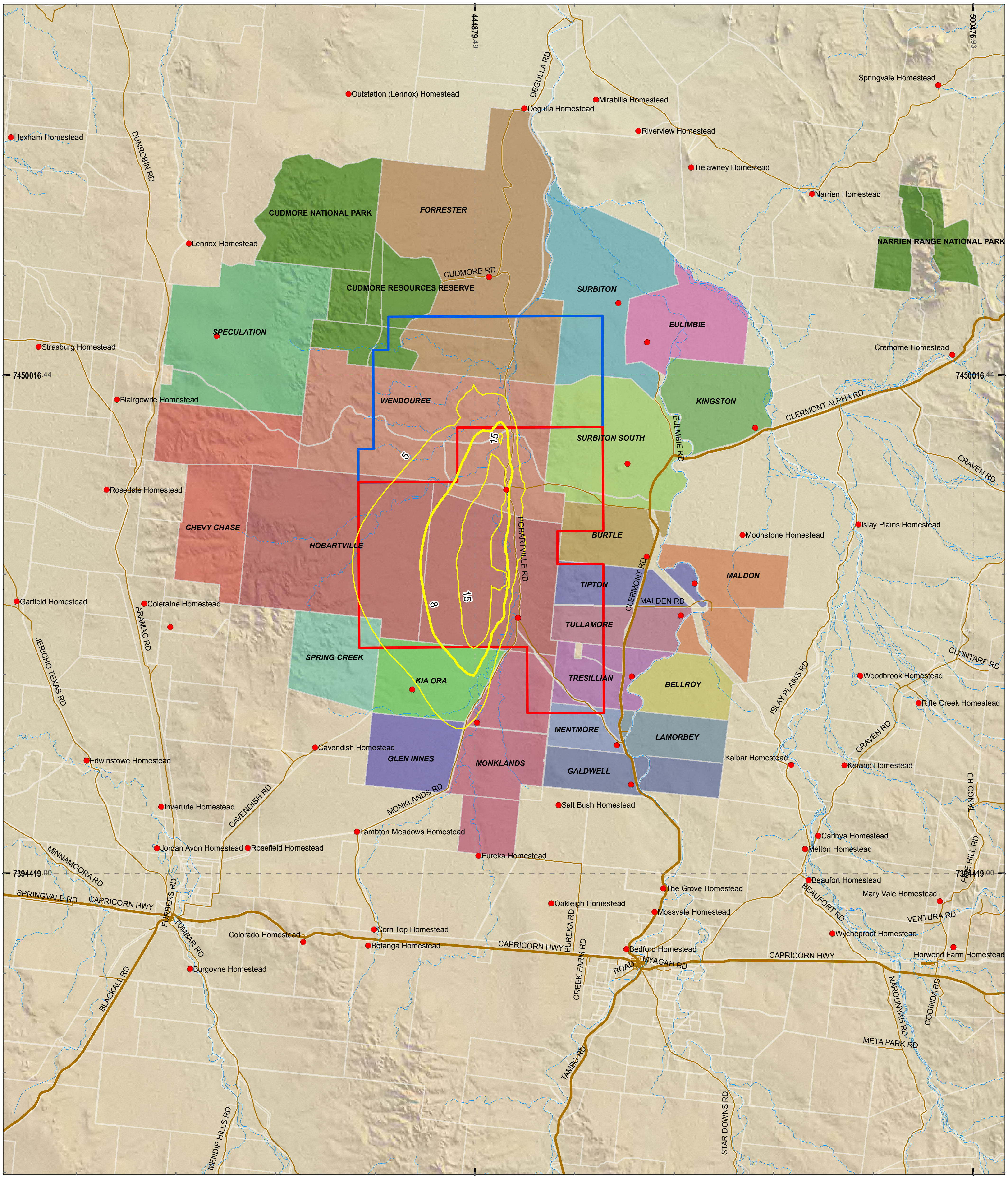
File No: **42626680-g-605b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4

2 Model Refinements

Figures 2-17 to 2-22 show no 24-hour average $PM_{2.5}$ exceedences of the EPP (Air) objective is predicted and therefore no mitigation is required. However, actions to reduce PM_{10} emissions are also expected to have a beneficial effect on concentrations of $PM_{2.5}$.

2.3.3 Annual average $PM_{2.5}$

Figures 2-23 to 2-28 show the predicted contours for the model refinements for the 24-hour averaging period for $PM_{2.5}$. The 8 $\mu g.m^{-3}$ contour is highlighted on each plot for the model refinements.



MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (μg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 2.8μg/m³)

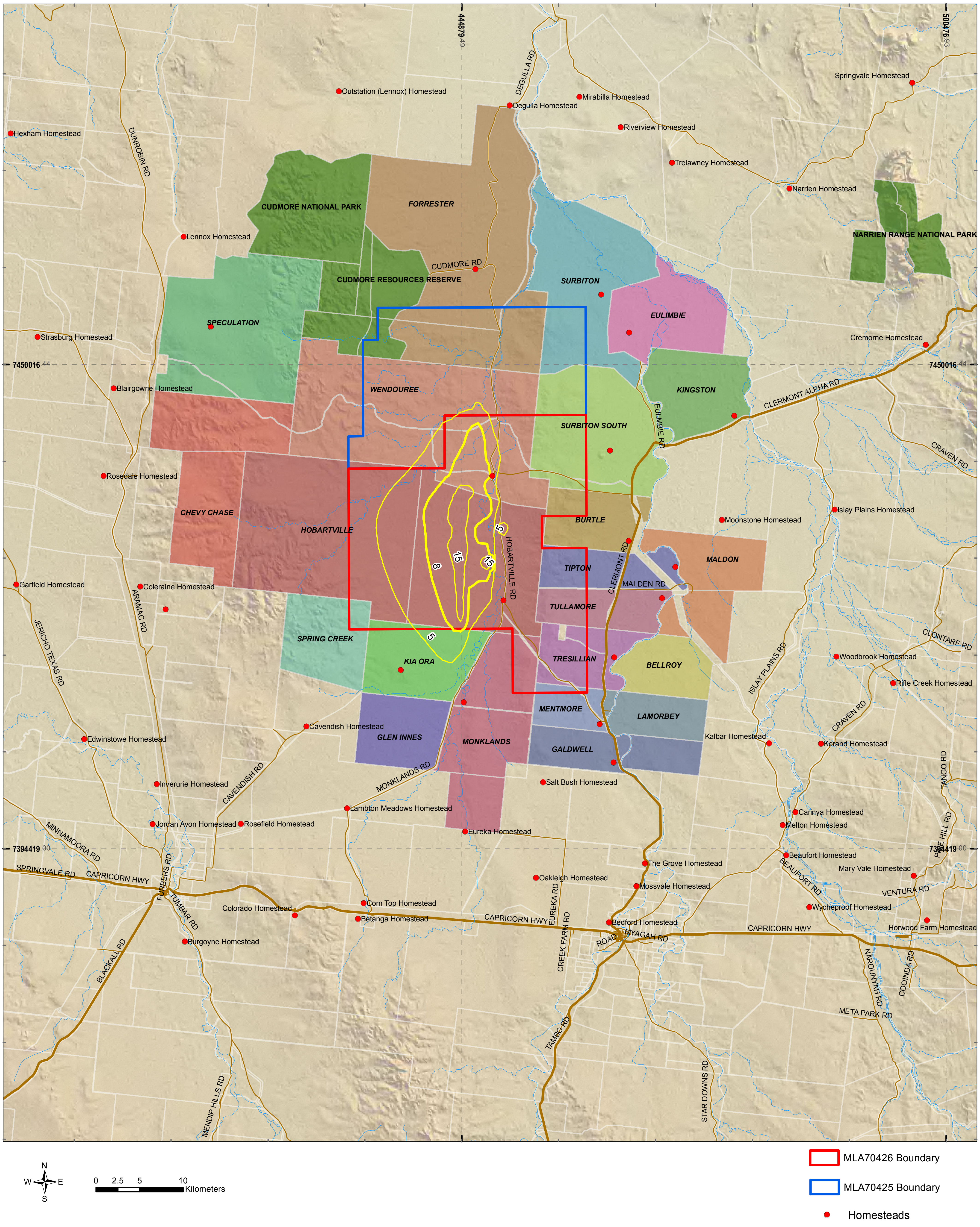
MODEL REFINEMENTS YEAR 5

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-23**

File No: **42626680-g-606.mxd** Drawn: **RG** Approved: **RS** Date: **21-11-2011** Rev. **A** A4



Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (µg/m³) (INCLUDING BACKGROUND CONTRIBUTION OF 2.8µg/m³)

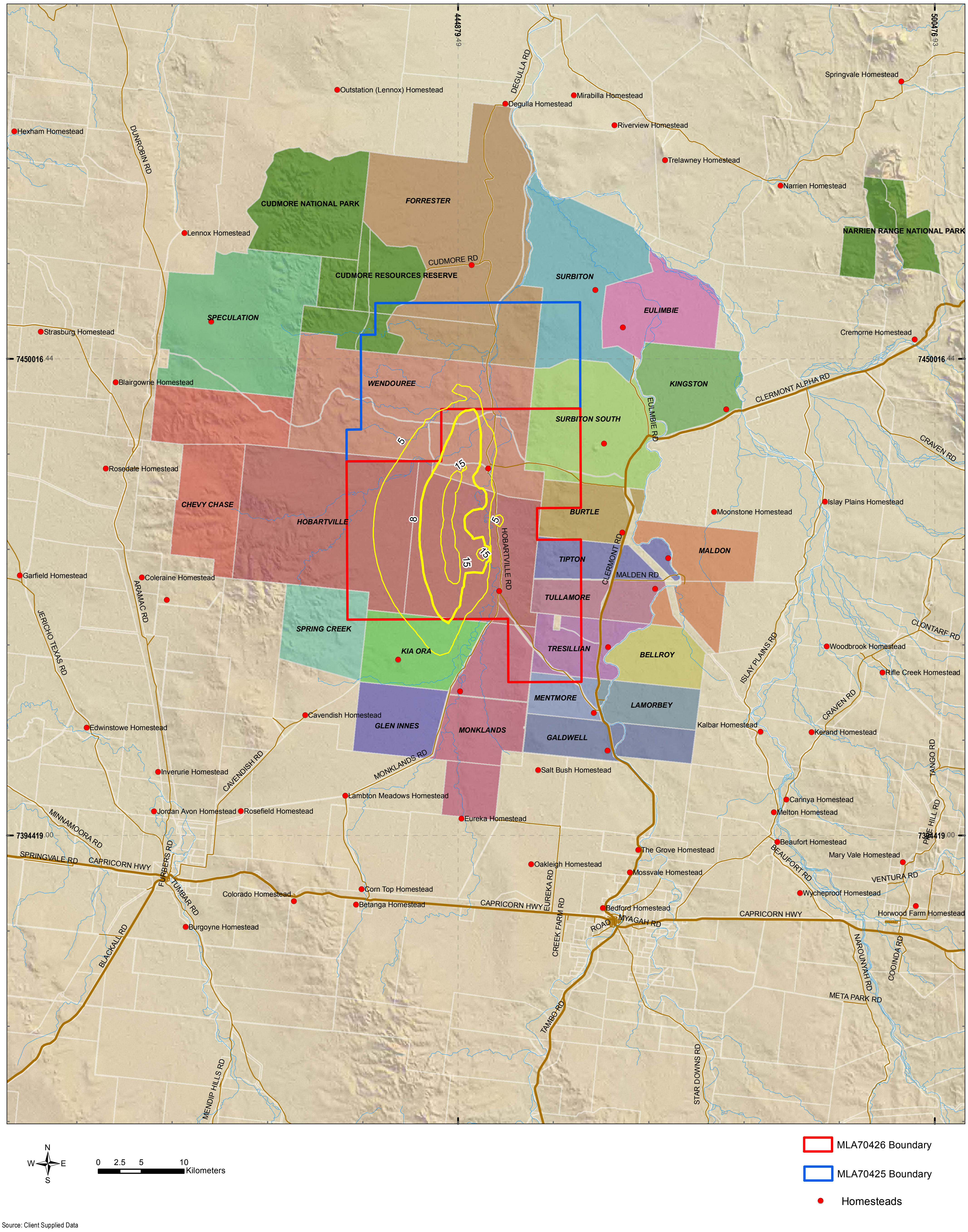
MODEL REFINEMENTS YEAR 10

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-24**

File No: **42626680-g-607b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4



Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (µg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 2.8µg/m³)

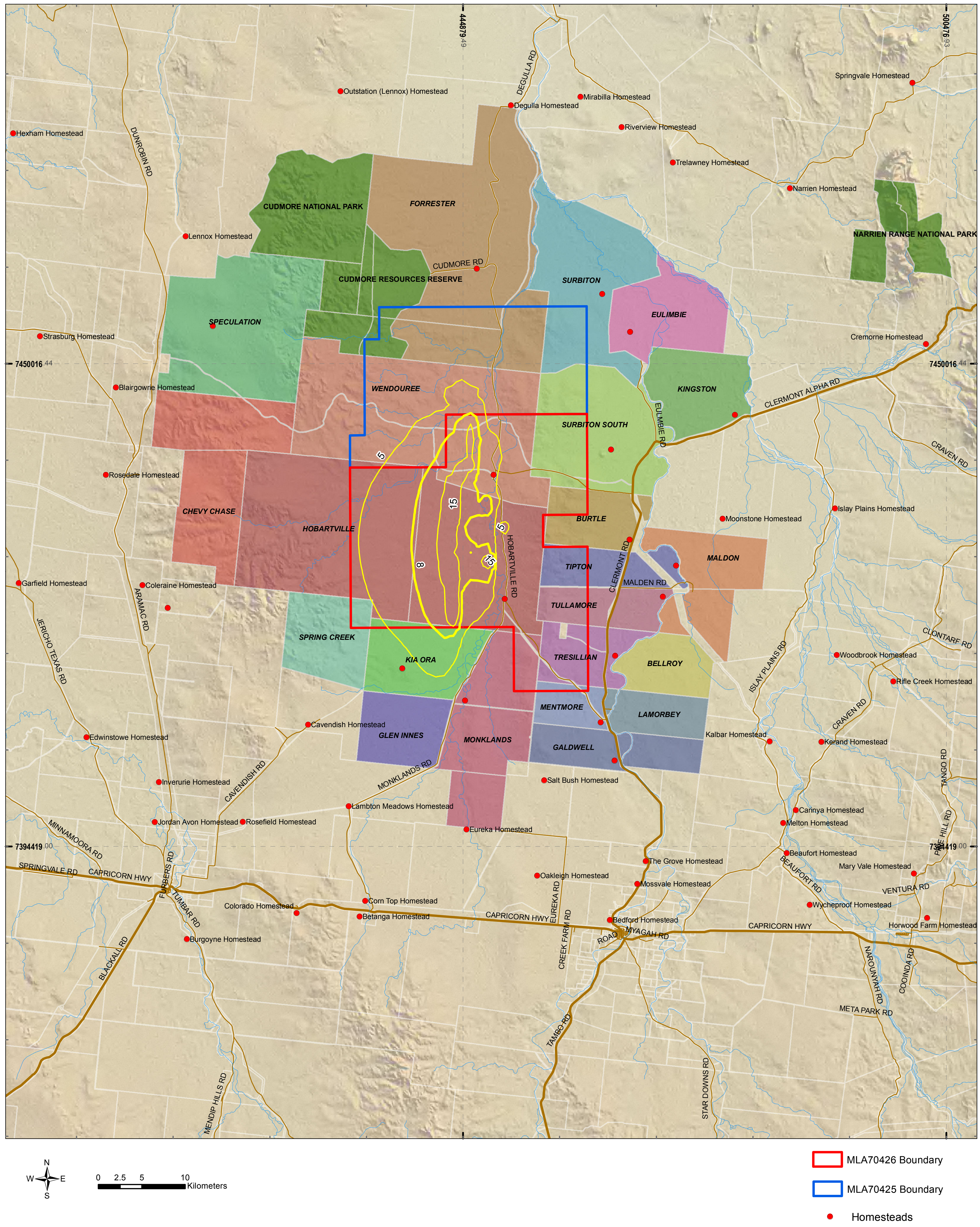
MODEL REFINEMENTS YEAR 15

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-25**

File No: **42626680-g-608b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4



Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (µg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 2.8µg/m³)

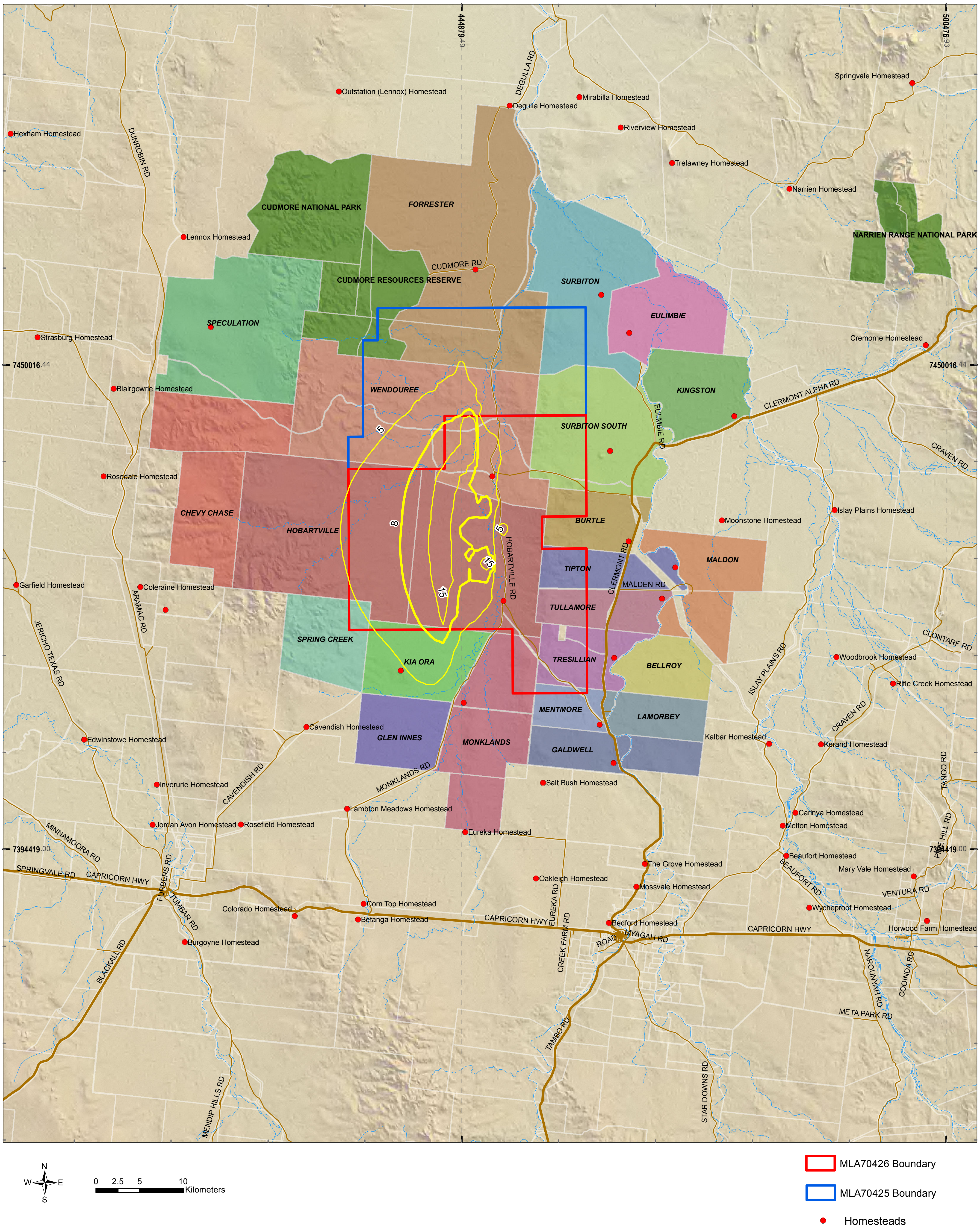
MODEL REFINEMENTS YEAR 20

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-26**

File No: **42626680-g-609b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4



Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (μg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 2.8μg/m³)

MODEL REFINEMENTS YEAR 25

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-27**

File No: **42626680-g-610b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4

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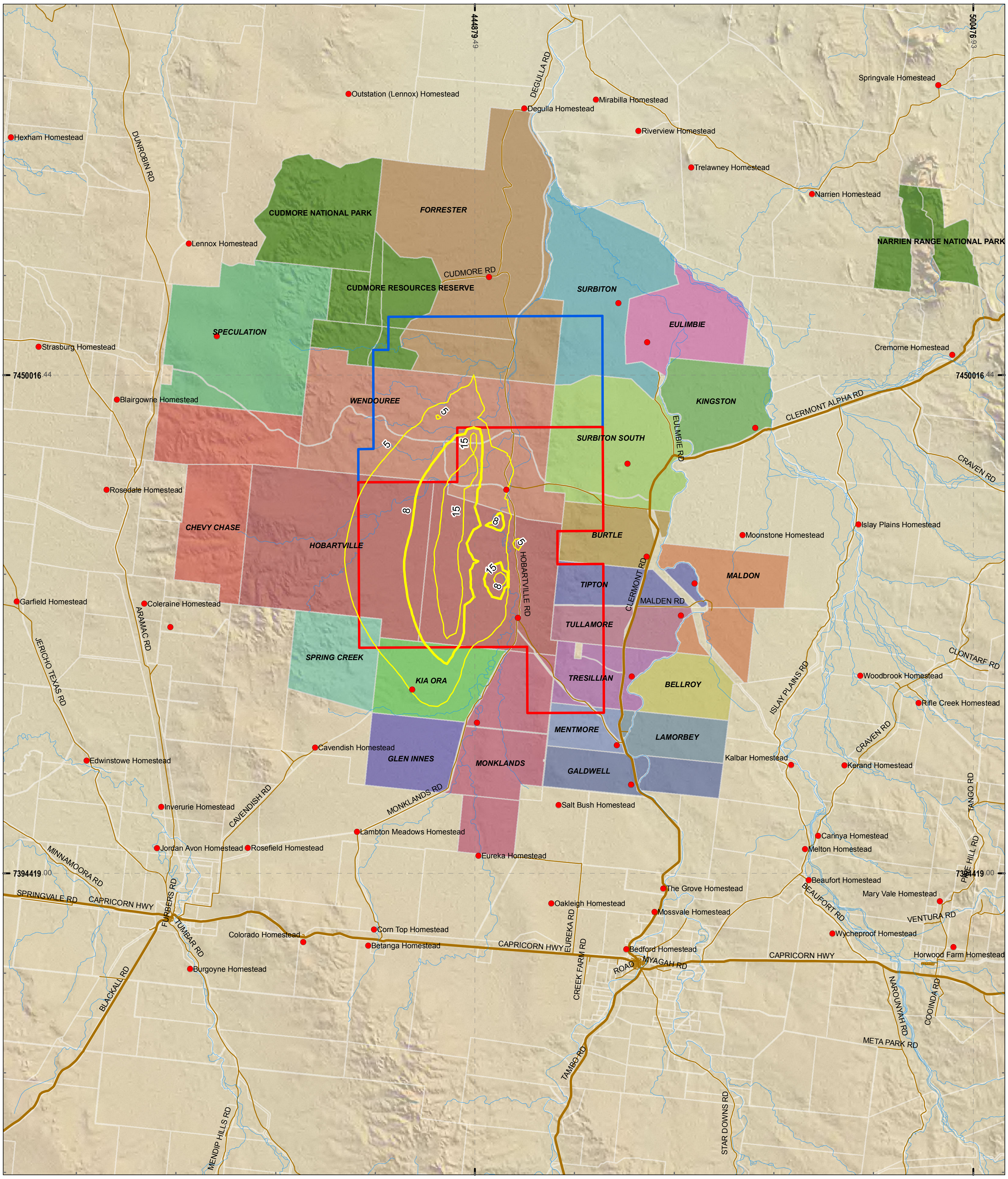

N
W E
S

0 2.5 5 10 Kilometers

MLA70426 Boundary

MLA70425 Boundary

Homesteads

Source: Client Supplied Data

HANCOCK COAL PTY LTD

ANNUAL AVERAGE $PM_{2.5}$ (μg/m³)
(INCLUDING BACKGROUND CONTRIBUTION OF 2.8μg/m³)

MODEL REFINEMENTS YEAR 30

URS

ALPHA COAL (MINE) PROJECT MODEL REFINEMENTS

Figure: **2-28**

File No: **42626680-g-611b.mxd** Drawn: **RG** Approved: **RS** Date: **17-11-2011** Rev. **A** A4

2 Model Refinements

Figures 2-23 to 2-28 show that no exceedences of the annual average $PM_{2.5}$ EPP (Air) objective is predicted and therefore no mitigation on the grounds of exceedence of the annual average $PM_{2.5}$ EPP (Air) objective is required. However, actions to reduce PM_{10} emissions are also expected to have a beneficial effect on concentrations of $PM_{2.5.}$

Summary and Conclusions

URS has completed a reassessment of particulate emissions from the Alpha Coal Project (Mine). The refinements made to the SEIS air quality assessment in this study consist of the incorporation of new datasets to the emissions inventory, introduction of new dust source mitigation controls and the update of the inventory to remove double counting of key inventory sources.

For 24-hour average PM_{10}, the study has shown that in Year 5, both the SEIS and model refinement 50 µg.m^{-3} contours extend outside MLA70426. It has been shown that in the SEIS, exceedences were predicted at all ten sensitive receptors. The refined model shows that although the number of exceedence days is reduced, exceedences are still predicted at the Forrester and Kia Ora Homesteads for the life of the mine. If the EPP (Air) objective exceedence allowance of 5 days is considered, it is predicted that exceedences will be removed from most other receptors almost entirely for the life of the mine.

The 24-hour and annual average $PM_{2.5}$ footprints are reduced in all directions in the refined model. No exceedences of the EPP (Air) objectives are predicted and therefore no mitigation on the grounds of exceedence of either $PM_{2.5}$ EPP (Air) objective is required.

References

Hancock Coal Pty Ltd (2010). Alpha Coal Project. BFS Design Criteria. Coal Handling and Preparation Plant. HC-TSV-30000-RPT-00001_C

ACIRL (2010). Report: Dustiness Moisture Relationship Determination – Hancock Resources Pty Ltd. 2000-9307.

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Hancock Coal Pty Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 14th October 2011 (42626880-VAR-001).

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between the 2nd and 21st November 2011 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

A

Appendix A AED Peer Review Comments

Advanced Environmental Dynamics

Specialist Consultants

Memorandum

To: Rob Storrs (URS)

From: Darlene Heuff

Date: 20 November 2011

Subject: Peer Review of Alpha Coal Project SEIS Air Quality Re-Modelling

At the request of Hancock Coal, I have conducted a review of the remodelling of the impacts of dust emissions associated with the Alpha Coal Project which was undertaken by URS in support of the Alpha Cola Project supplementary EIS and have prepared this memo outlining my findings.

My review focused on an assessment of the methodology with some examination of model input files including dust emission estimations. However, I have not undertaken what I would describe as a detailed technical review of the modelling work. Additionally, I have reviewed the URS Report *Alpha Coal Mine Project Air Quality Assessment – Model Refinements*, dated 17 November 2011.

In summary, the standard and methodology of the assessment is consistent with similar studies undertaken recently for mining projects in Queensland including (but not limited to):

- BHPBilliton Mitsubishi Alliance's Caval Ridge Mine Project.
- Xstrata Coal's Wandoan Coal Project.

Additionally, I am in general agreement with the revised methodology particularly with respect to the majority of the additional controls that have been adopted. However, I do have a number of comments which may warrant consideration:

1. **Comment**: It is likely that the correction to the error in the calculation of overburden transport associated with the SEIS has resulted in a significant reduction of predicted impacts. Revised SEIS results based on this correction have not been presented so it is not possible to quantify the level of reduction in predicted impacts that is associated with the correction and that which is attributable to the refinement in parameter values such as overburden moisture content, dragline drop height, coal moisture content, engineering controls (such as dust curtains on drills, water sprays), etc. This insight would have been informative but is not critical to the interpretation of the results presented.

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www.aedconsultants.com.au

2. **Comment:** The revised model has incorporated new site-specific data that has become available since the SEIS. In particular, sampling of the moisture content of overburden (OB) is a significant contribution to the project-specific data set. This data set has been used to identify two key layers of overburden material, namely (URS Table 2-1): tertiary/weathered material (16.8% moisture content) and; Bandanna/Sandstone material (8.2% moisture content). Depending on the scenario modelled (i.e. Year 5, Year 10, through Year 30) a weighted average OB moisture content was developed and applied. This approach is consistent with the methodology that is applied to a number of on-site dust generating activities such as overburden hauling for which annual averages are calculated and then used to predict 24-hour average ground-level concentrations at receptor locations for comparison with regulatory criteria. This notwithstanding however, it is important to acknowledge that emission factors for overburden handling by draglines, front end loaders and dozers are all dependent on the value adopted for the OB percentage moisture. As these activities are associated with a significant portion of the site's overall dust emissions inventory, it is important that consideration is given to potential dust emissions associated with the handling of the Bandanna/sandstone layer over a 24-hour period as it is recognised that the handling of this material (as opposed to the weathered material) is more likely to lead to elevated levels of dust. Either an estimate of the sensitivity of the results to OB moisture content or an estimate of the likelihood of a combination of worst-case meteorology and the handling of material in Bandanna/sandstone layer would assist in quantifying the likelihood that the results presented based on an annual average moisture content has led to conservative results for the 24-hour average ground level impacts at receptor locations. Nonetheless, I do not anticipate that the outcomes of a more detailed investigation of the sensitivity of the results to the OB percentage moisture content will alter significantly the learnings of the assessment, i.e. that impacts at Kia Ora homestead and Monklands homestead will require the implementation of additional mitigation measures under adverse meteorological conditions. Impacts at other receptor locations are likely to remain manageable under the proposed level of dust controls.

3. **Comment:** Although wind erosion associated with disturbed areas (i.e. pre-striping), stockpiles and tailings dams has been included in the assessment, one significant emission source that has not been included is wind erosion from exposed areas. As the footprint of exposed areas is typically on the order of the footprint of the mine itself, this dust emission source can form a significant part of the site-emissions inventory. The omission of this emission source could potentially be demonstrated not to have a significant impact on the results presented if it can be demonstrated that worst-case meteorology is not associated with periods of elevated wind speeds.

4. **Comment:** It is not clear where the revised ROM and product coal moisture contents have been derived from. It is assumed that these have been provided by Hancock Coal. It is noted however that the values presented in Table 2-2 are higher (i.e. the coal is more moist) than expected.

5. **Comment**: It is not clear which activities associated with the CHPP are acting on ROM coal, raw coal and/or product coal and thus we have not been able to assess the appropriateness of the applied controls. However, based on the percentage moisture for coal presented in Table 2-2, significant dust emissions would not be expected in relation to activities associated with the CHPP.

6. **Comment**: It is not clear whether or not a pit retention factor for TSP (50%) and PM_{10} (5%) has been applied which would reduce predicted impacts of dust emissions from the site.

7. **Comment**: If using CALMET derived rainfall in association with wind speed dependent emission factors to estimate wind erosion, the predicted rainfall should be validated against reliable monitoring data in order to ensure that rain is input into the system during the correct times of the year and for durations and volumes consistent with that observed. Else a conservative approach should be adopted that is based on wind speed only and assumes no reduction due to rainfall.

Kindest Regards,

Darlene Heuff

Director and Principal Scientist
Advanced Environmental Dynamics

B

Appendix B URS Response to Peer Review Comments

URS

This Appendix outlines URS's response to the comments provided by Dr. Darlene Heuff of AED Consultants in her role as external peer reviewer of the Alpha Model Refinements re-modelling and technical report. Her comments are provided in memo *'Peer Review of Alpha Coal SEIS Air Quality Re*-Modelling' dated 20th November 2011.

Table 1 – summary of peer review responses and resultant actions

Comment	**URS Response**
1	Figure 2-4 which shows the reduction to the overburden material removed by haul road provides an indication of the magnitude of reduction to this source attributable to the double counting of drag-line waste and removal of material by conveyor.
2	It is agreed that a detailed assessment of the sensitivity of the results to overburden moisture content would not significantly alter the conclusions of the assessment. However, URS is of the opinion that the representation of overburden moisture content should vary on annual basis if test data are available. It is considered overly conservative to apply the lowest overburden moisture content from the driest layer for the year because mining activities are transient and likely to be happening at different depths, including both of the identified layers of the pit at any given time. For this reason, a depth-weighted approach to the derivation of annual average overburden moisture content is considered more likely to realistically represent the 24-hour peak.
3	Model analysis carried out by URS has shown that wind speed dependant sources do not contribute significantly to peak dust events. This indicates that the worst-case meteorological conditions are not associated with high wind speeds.
4	Coal moisture parameters are based on non-centrifugal moisture testing by CSIRO for product coal and an additional ACARP study on in-situ moisture for ROM. The % moisture contents reported are adapted from the Hancock Coal CHPP BFS Design Criteria Report.
5	All mitigation controls applied to CHPP activities have been approved by the Hancock CHPP Operations Advisor.
6	A pit retention factor has not been applied. It is not expected that a 5% reduction in PM_{10} generation would alter the conclusions of the assessment.
7	URS agrees that such a validation study would be of interest to investigate whether peak emissions have been incorrectly dampened down. However, subsequent source apportionment studies have shown that wind generated sources form a relatively minor component of peak emissions in comparison to wheel generate sources, dumping or draglines. Such a study is therefore unlikely to change the conclusions of the report at this stage.

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