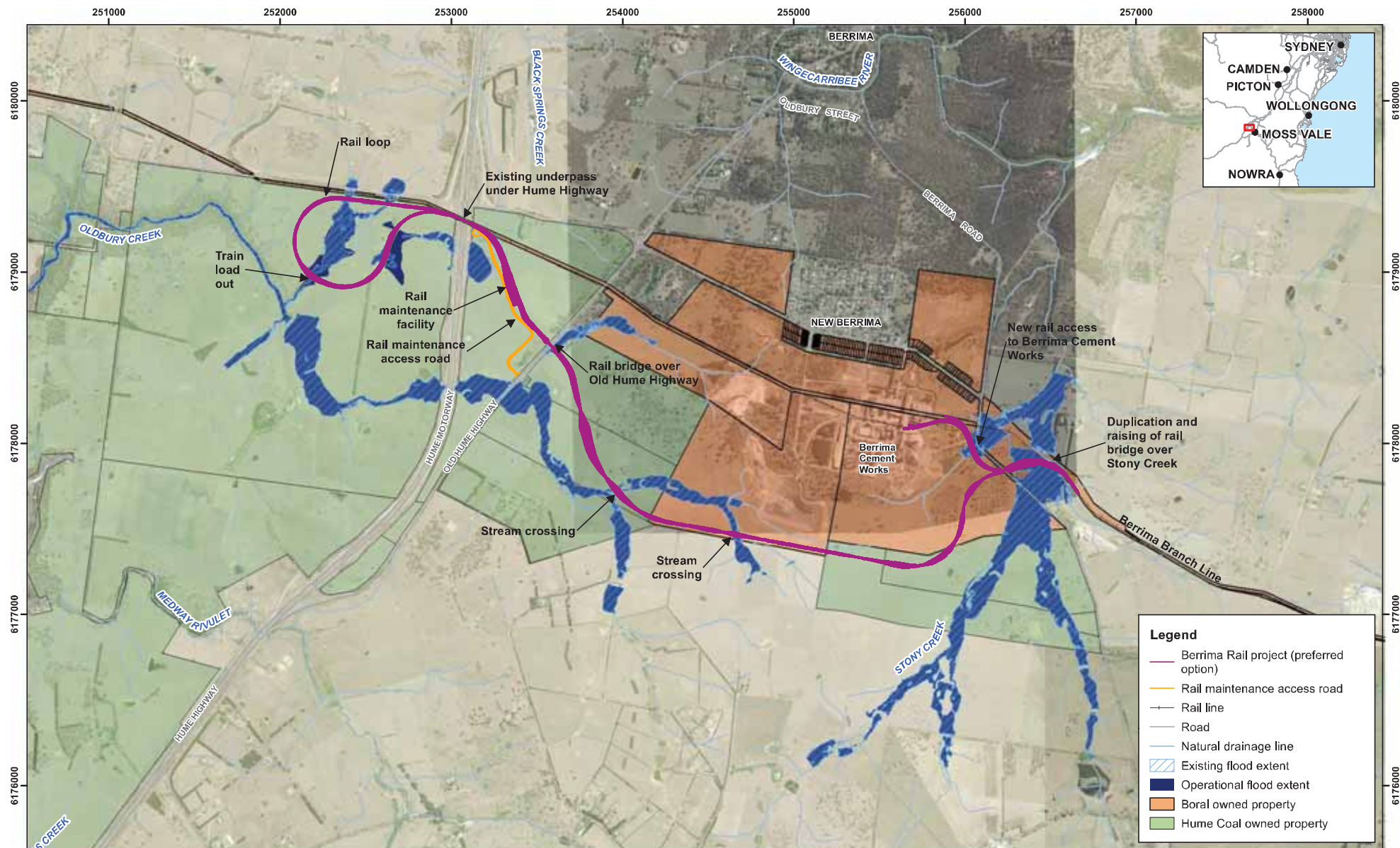


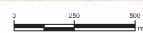
Appendix C

PREFERRED OPTION FLOOD MAPS



Map: 2200569A_GIS_010_A7

Author: RP



1:20,000

Date: 15/11/2016

Approved by: LR

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

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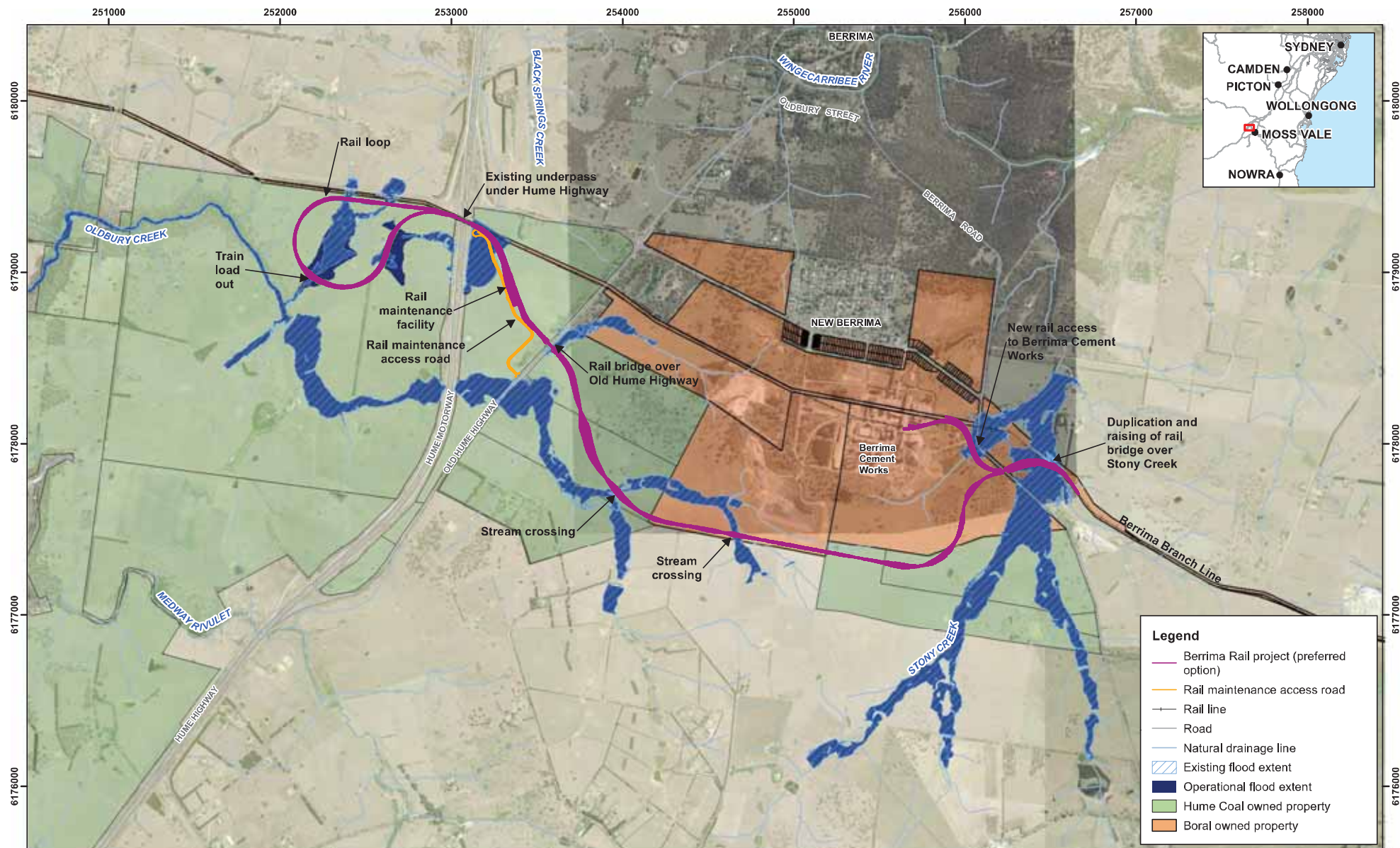


Hume Coal

Berrima Rail Project Appendix C1

5 Year ARI flood extent - Operation (Preferred option)

www.wsp-ph.com



Map: 2200569A_GIS_012_A7

Author: RP



0 250 500 m

Date: 15/11/2016

Approved by: LR

1:20,000

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Berrima Rail Project Appendix C2

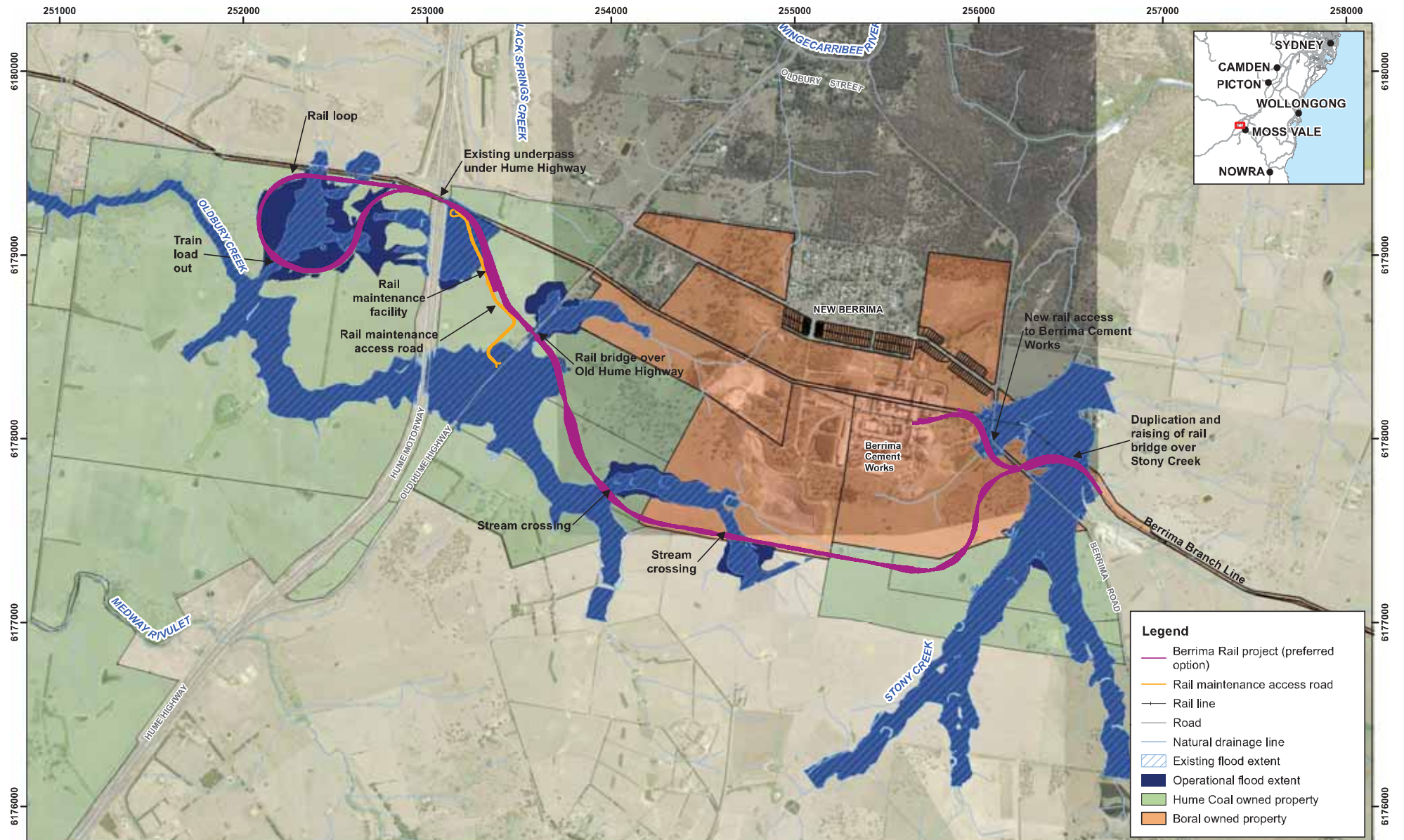
20 Year ARI flood extent - Operation (Preferred option)

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Map: 2200569A_GIS_016_A8

Author: RP

Date: 15/11/2016

Approved by: LR



1:18,520

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

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Hume Coal

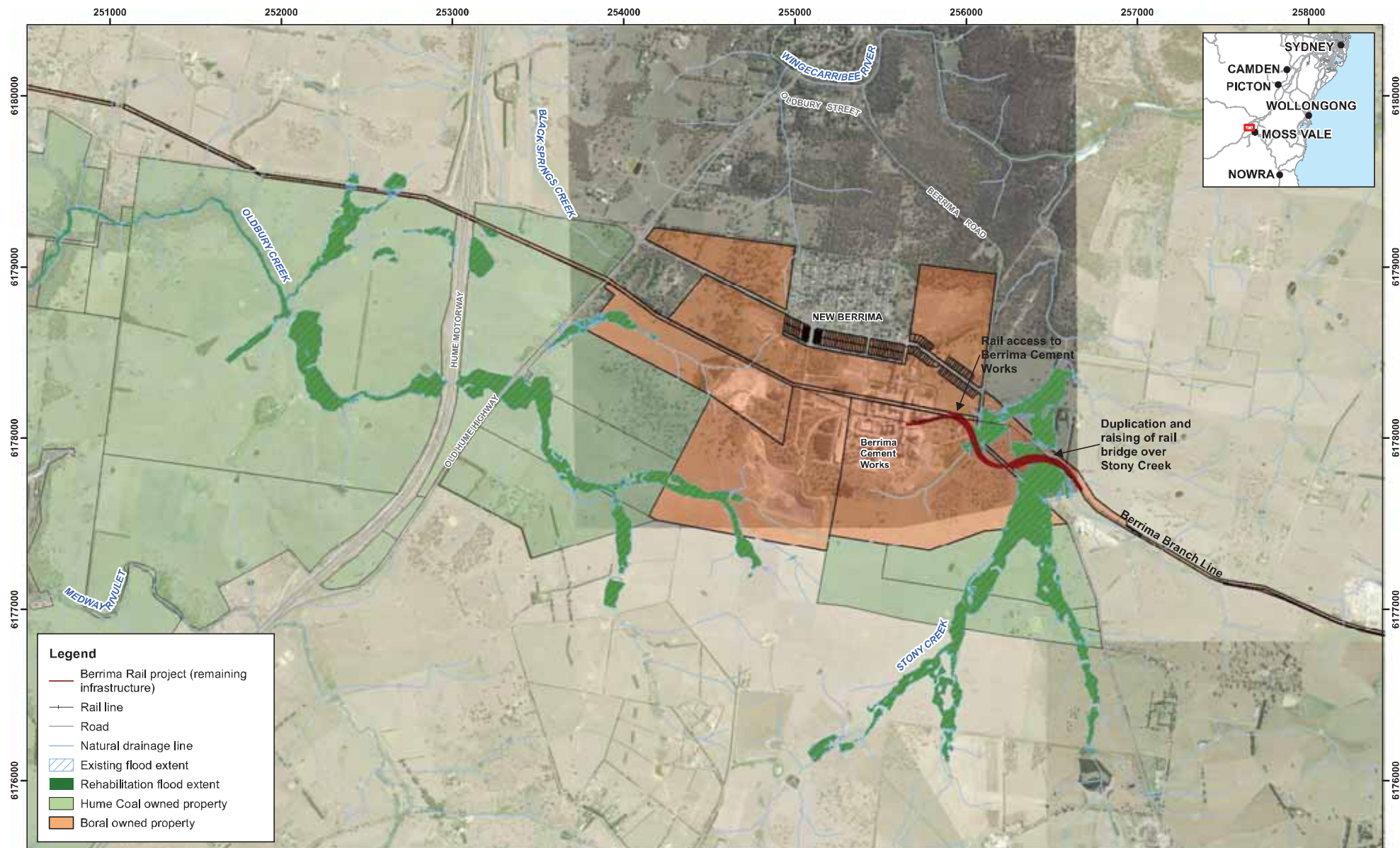
Berrima Rail Project Appendix C3

PMF flood extent - Operation (Preferred option)

www.wsp-ph.com

Appendix D

PREFERRED OPTION REHABILITATION FLOOD MAPS



Map: 2200569A_GIS_011_A7

Author: RP



0 250 500
m

Date: 15/11/2016

Approved by: LR

1:20,000

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

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Berrima Rail Project

Appendix D1

5 Year ARI flood extent - Rehabilitation (Preferred option)

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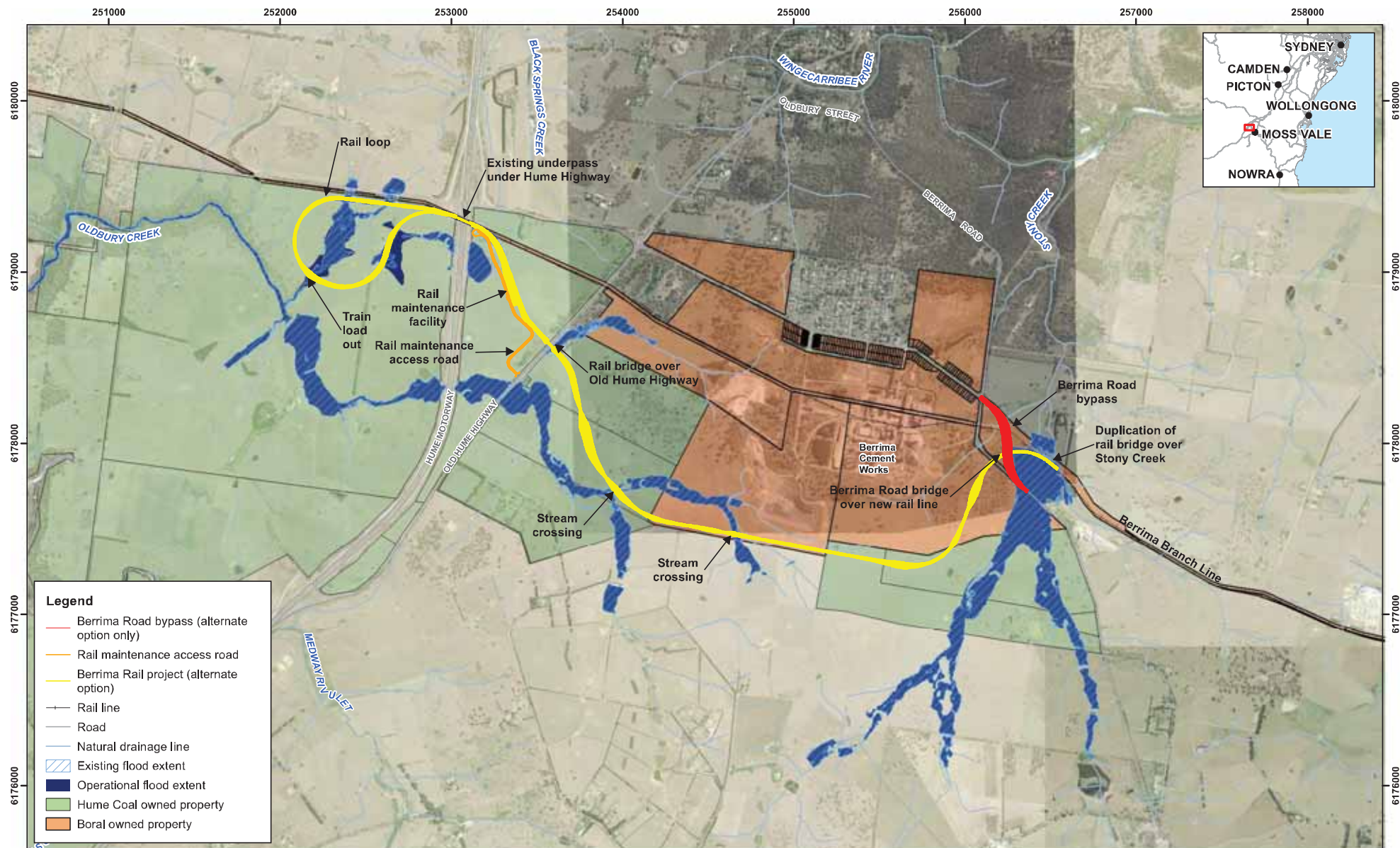
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Hume Coal

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Appendix E

ALTERNATE OPTION FLOOD MAPS



Map: 2200569A_GIS_002_A7

Author: RP



0 250 500 m

Date: 15/11/2016

Approved by: LR

1:20,000

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

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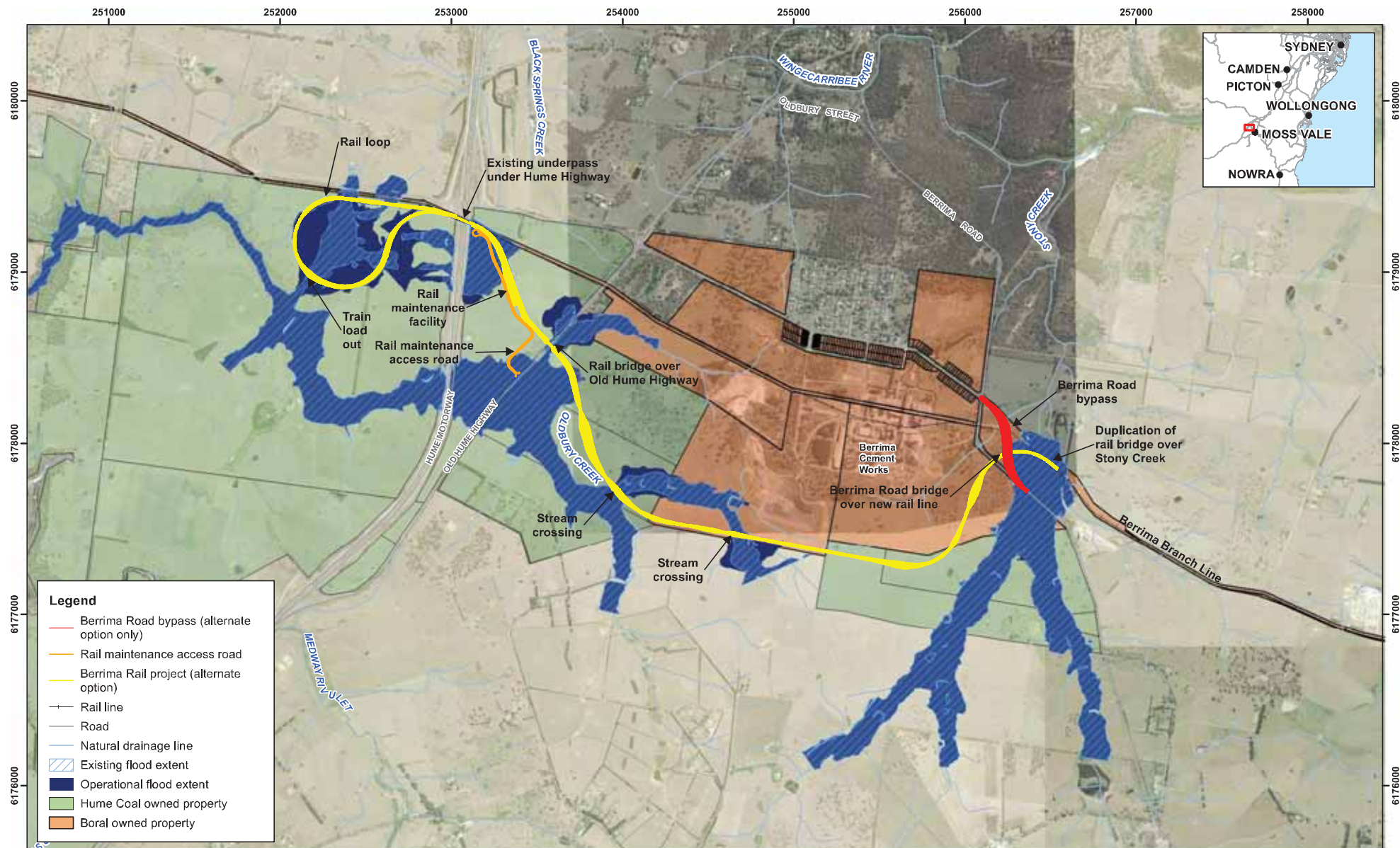
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Berrima Rail Project

Appendix E1

5 year ARI flood extent - Operation (Alternate option)

www.wsp-pb.com



Map: 2200569A_GIS_008_A6

Author: RP

Date: 15/11/2016

Approved by: LR

Data source: © Land and Property Information 2015, Hume Coal



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Coordinate system: GDA 1994 MGA Zone 56

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Berrima Rail Project

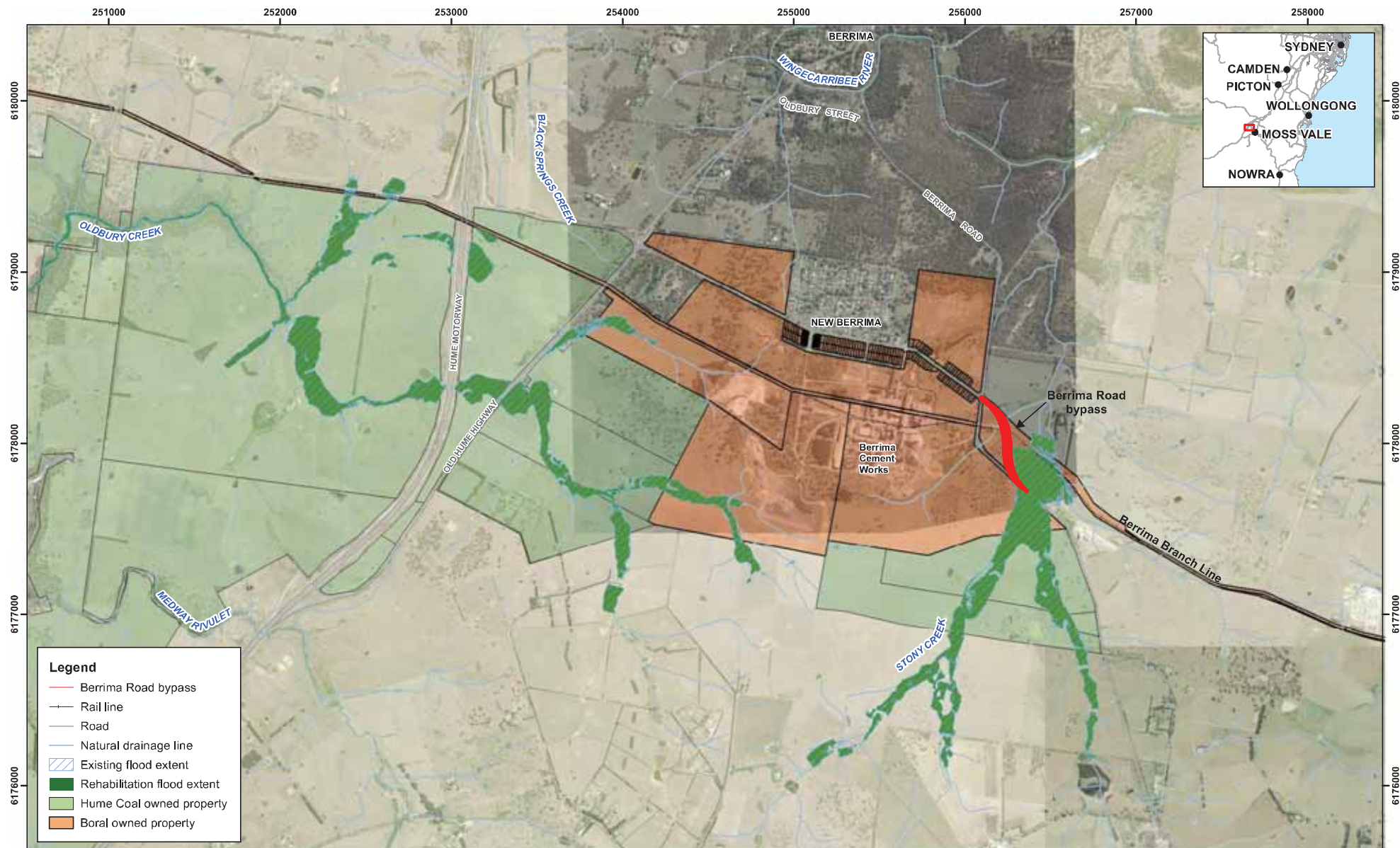
Appendix E3

PMF flood extent - Operation (Alternate option)

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Appendix F

ALTERNATE OPTION REHABILITATION FLOOD MAPS



Map: 2200569A_GIS_003_A7

Author: RP



0 250 500 m

Date: 15/11/2016

Approved by: - LR

1:20,000

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Berrima Rail Project

Appendix F1

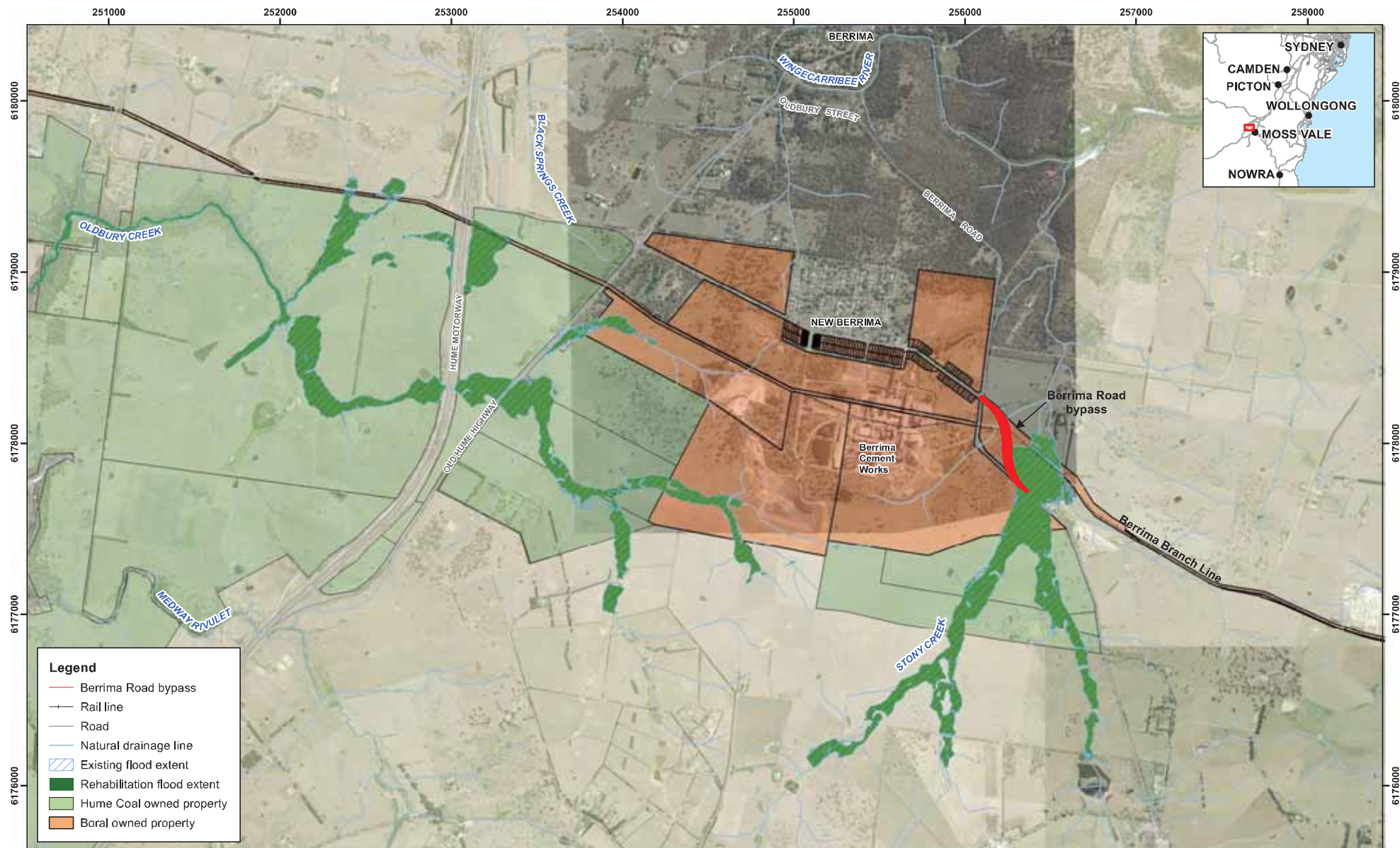
5 year ARI flood extent - Rehabilitation (Alternate option)

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Hume Coal

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Legend

- Berrima Road bypass
- Rail line
- Road
- Natural drainage line
- Existing flood extent
- Rehabilitation flood extent
- Hume Coal owned property
- Boral owned property

Map: 2200569A_GIS_005_A6

Author: RP

Date: 15/11/2016

Approved by: - LR



1:20,000

Coordinate system: GDA 1994 MGA Zone 56

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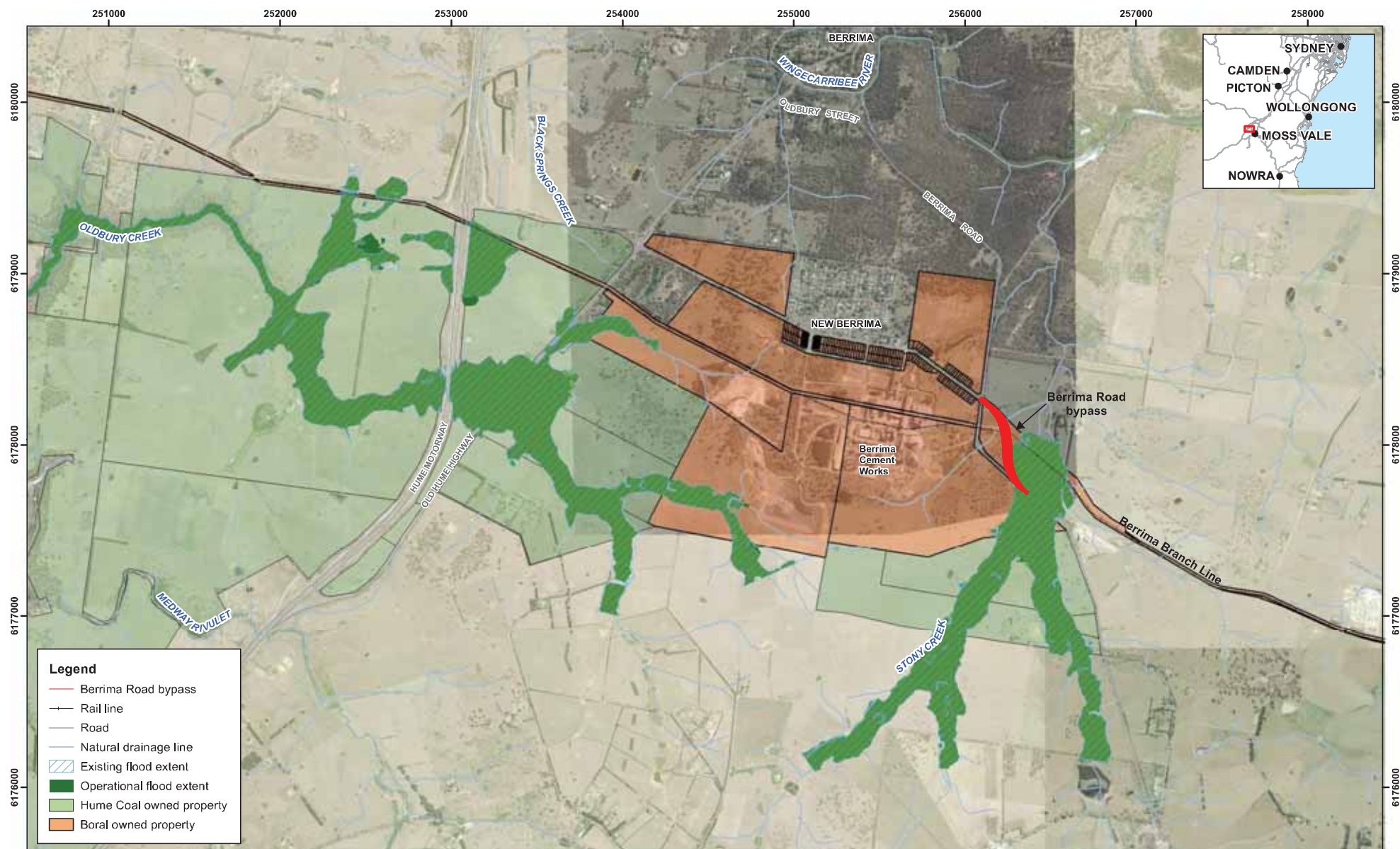
Hume Coal

Berrima Rail Project

Appendix F2

20 year ARI flood extent - Rehabilitation (Alternate option)

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Map: 2200569A_GIS_009_A6	Author: RP		
Date: 15/11/2016	Approved by: LR		
Data source: © Land and Property Information 2015, Hume Coal		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3	

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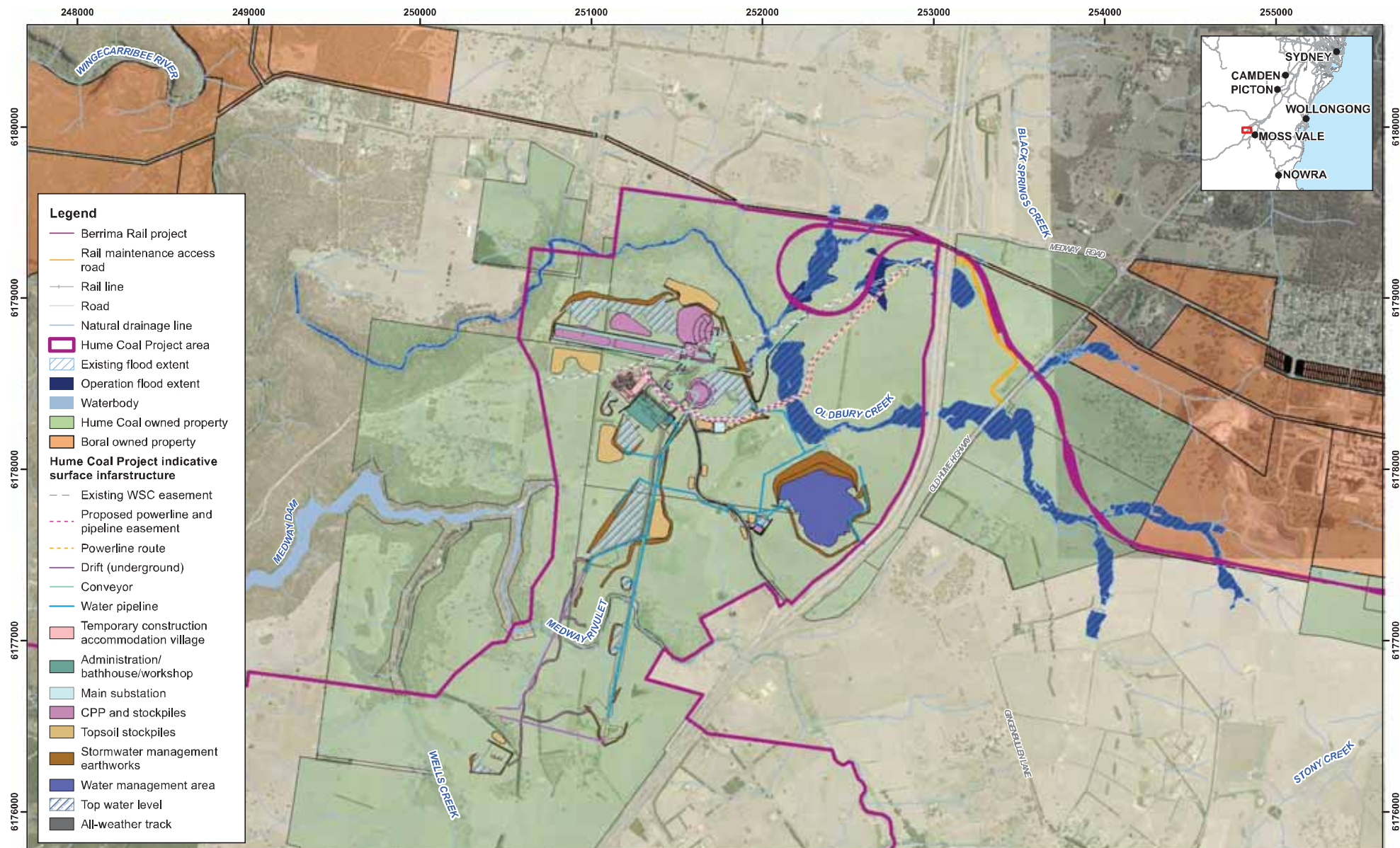
Hume Coal

Berrima Rail Project
Appendix F3
PMF flood extent - Rehabilitation (Alternate option)

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Appendix G

CUMULATIVE FLOOD MAPS

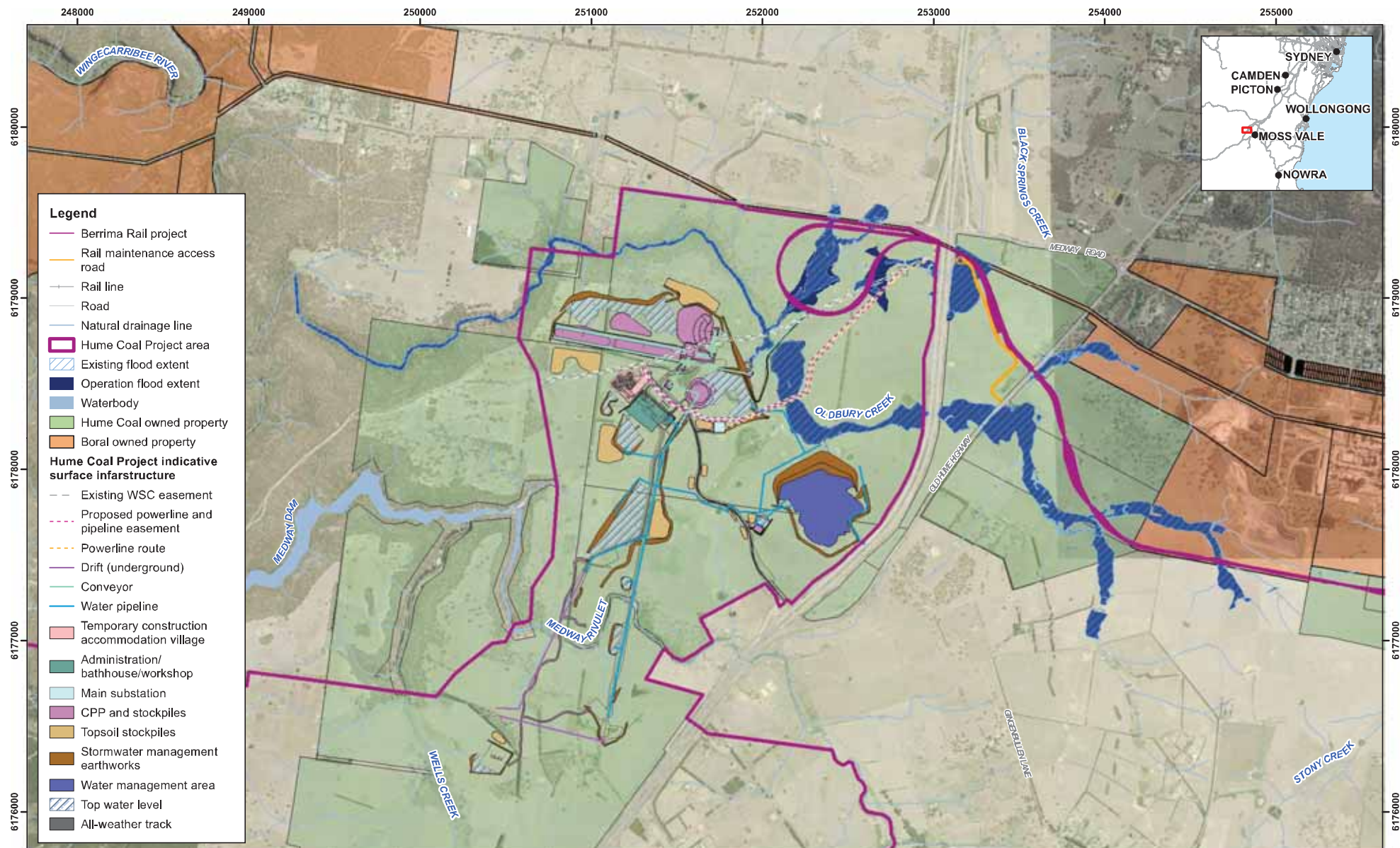


Berrima Rail Project
Appendix G1
Cumulative 5 Year ARI flood extent - Operation



Hume Coal

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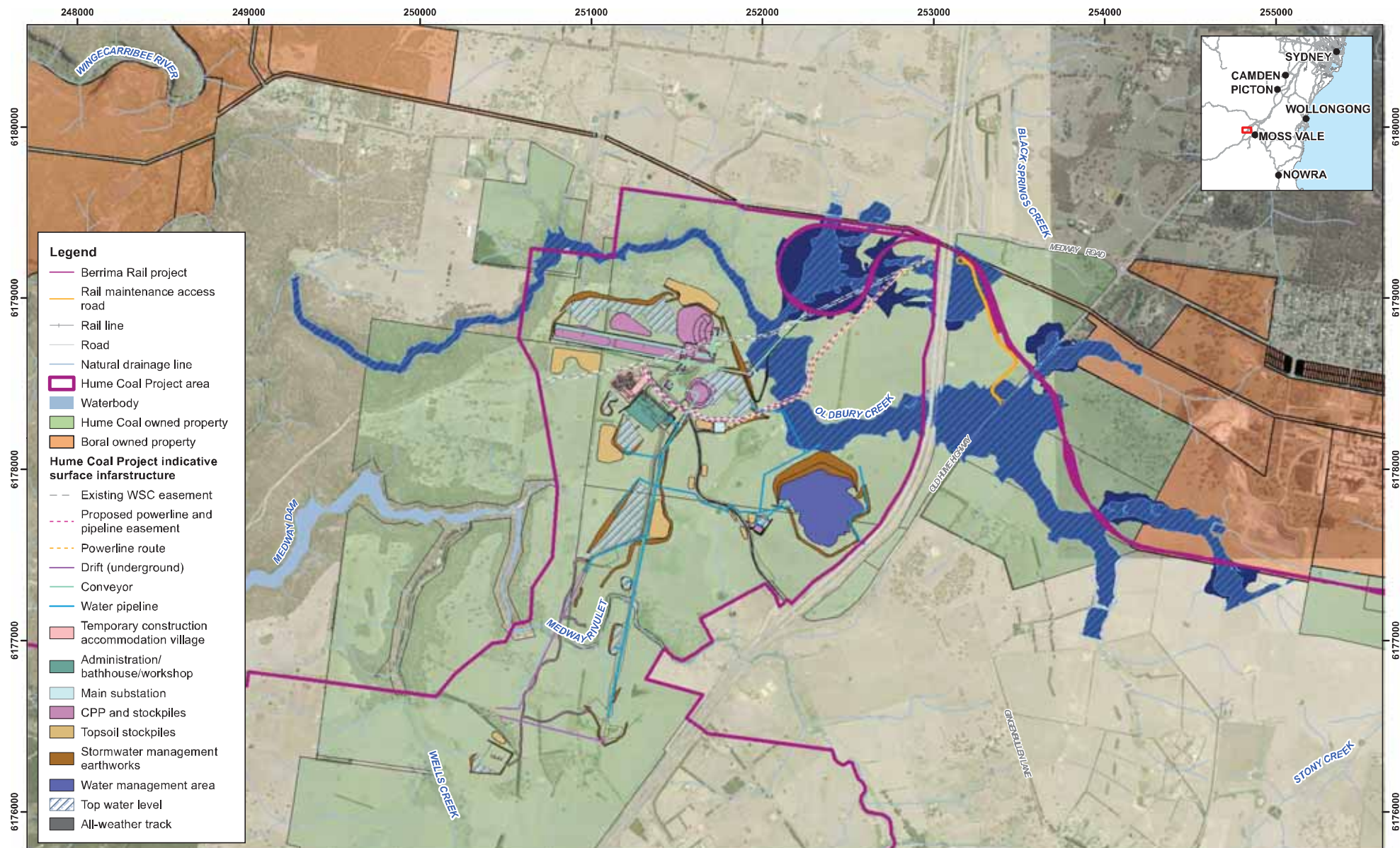
Berrima Rail Project
Appendix G2
Cumulative 20 Year ARI flood extent - Operation

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Hume Coal

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Map: 2200569A_GIS_033_A6

Author: RP

Date: 15/11/2016

Approved by: LR

Data source: © Land and Property Information 2015, Hume Coal



0 200 400
m

1:20,000

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Hume Coal

Berrima Rail Project
Appendix G3
Cumulative PMF flood extent - Operation

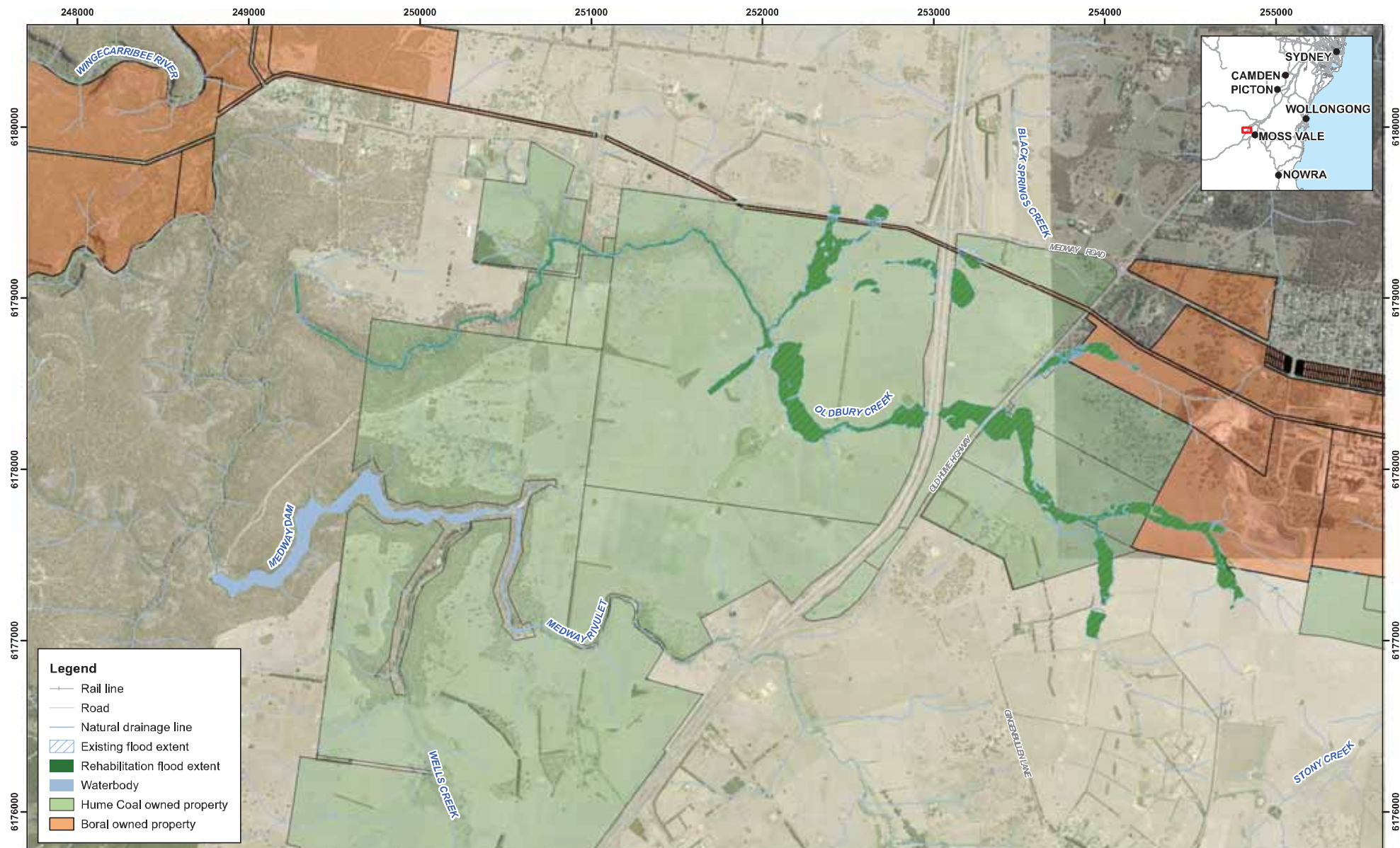
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Appendix H

CUMULATIVE REHABILITATION FLOOD MAPS



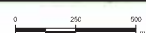
Map: 2200569A_GIS_030_A6

Author: RP

Date: 15/11/2016

Approved by: LR

Data source: © Land and Property Information 2015, Hume Coal



1:20,000

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Berrima Rail Project

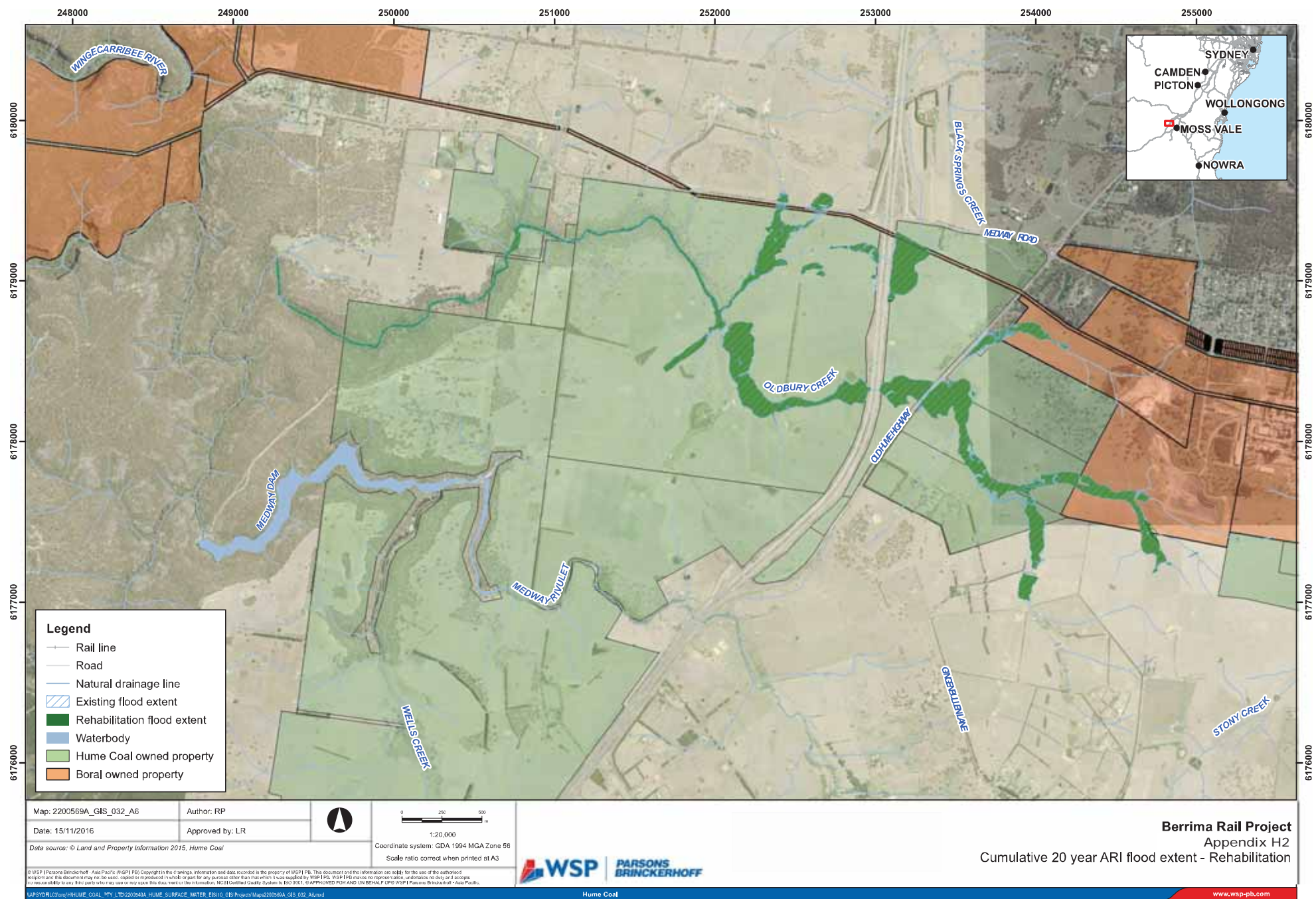
Appendix H1

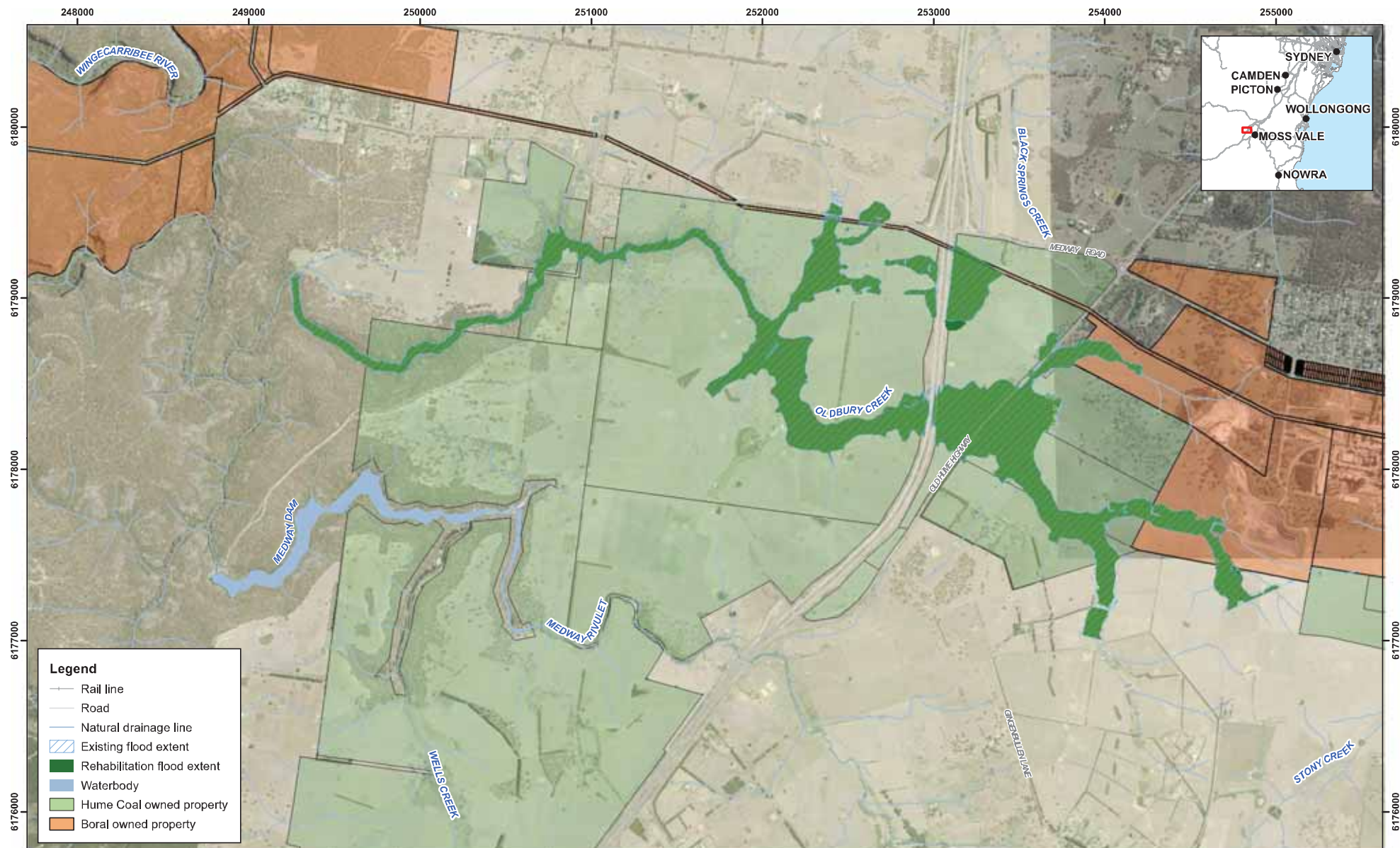
Cumulative 5 year ARI flood extent - Rehabilitation

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Hume Coal

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Legend

- Rail line
- Road
- Natural drainage line
- Existing flood extent
- Rehabilitation flood extent
- Waterbody
- Hume Coal owned property
- Boral owned property

Map: 2200569A_GIS_034_A6

Author: RP



0 200 400
m

Date: 15/11/2016

Approved by: LR

1:20,000

Data source: © Land and Property Information 2015, Hume Coal

Coordinate system: GDA 1994 MGA Zone 56

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Hume Coal

Berrima Rail Project
Appendix H3
Cumulative PMF flood extent - Rehabilitation

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Appendix I

**ADJUSTMENT OF NUTRIENT BACKGROUND CONCENTRATIONS IN
SWALES**

A key input parameter in MUSIC treatment nodes is the background pollutant levels, C* (stormflow background pollutant concentration) and C** (baseflow background pollutant levels) values. The default MUSIC background concentrations for TP and TN in swales are set high and are required to be revised to simulate more realistic values.

The C* estimate for total suspended solids (TSS) is obtained by Fletcher (2004) from the particle size at which only 20% removal is achieved. The method and particle distribution figures are provided in Fletcher (2004).

Applying the Fletcher (2004) methodology for TP results in a C* value of 0.18mg/L and an EMC of 0.26mg/L. This is significantly higher than the TP EMC recorded in the Hume Coal project baseline water quality data at 0.14mg/L. Therefore, it was considered reasonable to adjust the C* and C** values to reflect the lower recorded TP concentrations in the watercourses in the project area.

The C* was adjusted by identifying the ratio between the C* and the EMC identified in Fletcher (2004) and the EMC from the project area in the equation below.

$$C_{new}^* = EMC_{from\ baseline\ data} * \frac{C_{fletcher}^*}{EMC_{fletcher}}$$

MUSIC applies the same value for both C* and C** for swales. Therefore, the C*_{new} value was applied for both C* and C**.

The same method was applied for TN and the revised C* and C** for swales for both TP and TN are shown in the table below.

Table 1: Revised C* and C values for swales**

	k	C*	C**
TSS	8000	20	14
TP	6000	0.096^	0.096^
TN	500	0.89^	0.89^

^C* and C** values that were revised

By adjusting the C* it is assumed that the background concentration of the swales will not increase because the swales will be properly maintained.

Appendix J

MUSIC MODELLING OUTPUT – CUMULATIVE FREQUENCY PLOTS

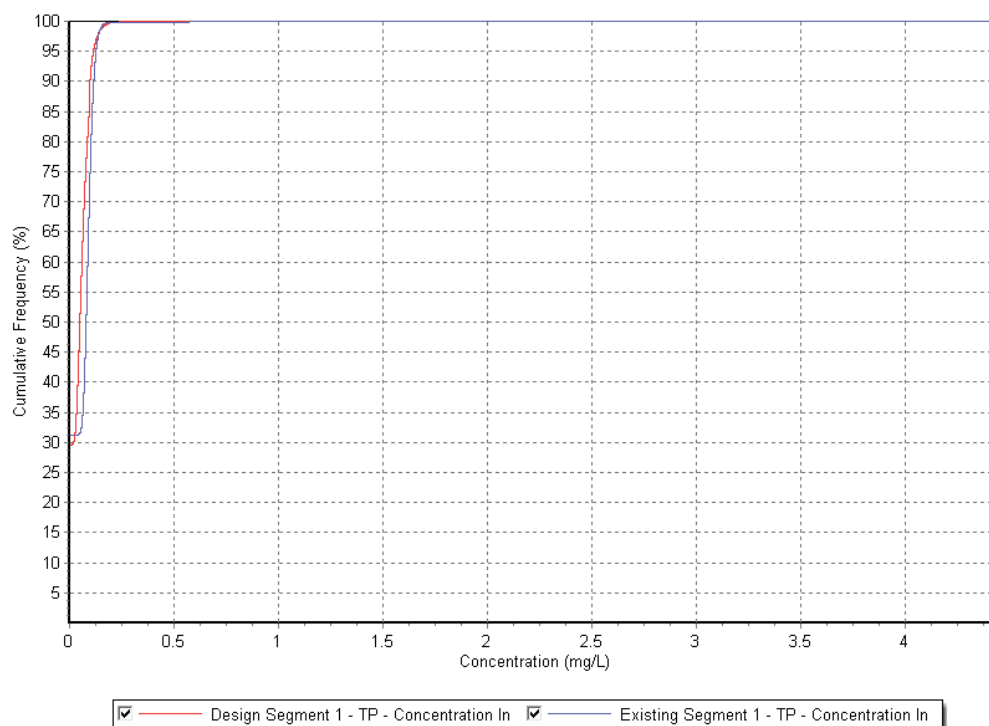


Figure J1: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Segment 1 of Oldbury Creek preferred and alternate options

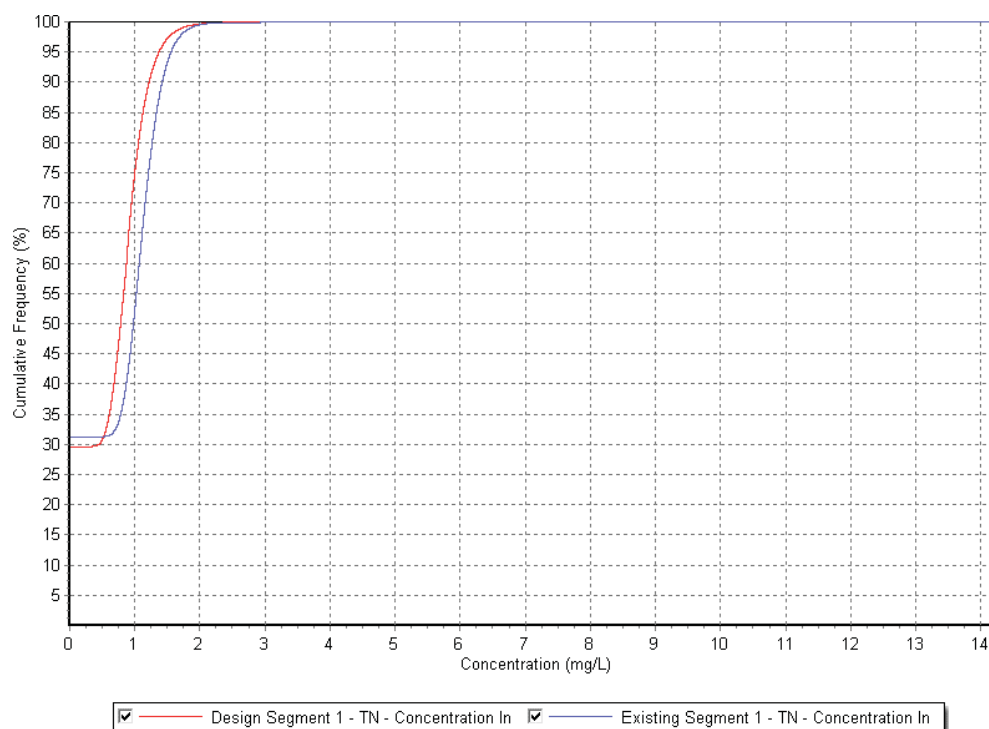


Figure J2: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Segment 1 of Oldbury Creek preferred and alternate options

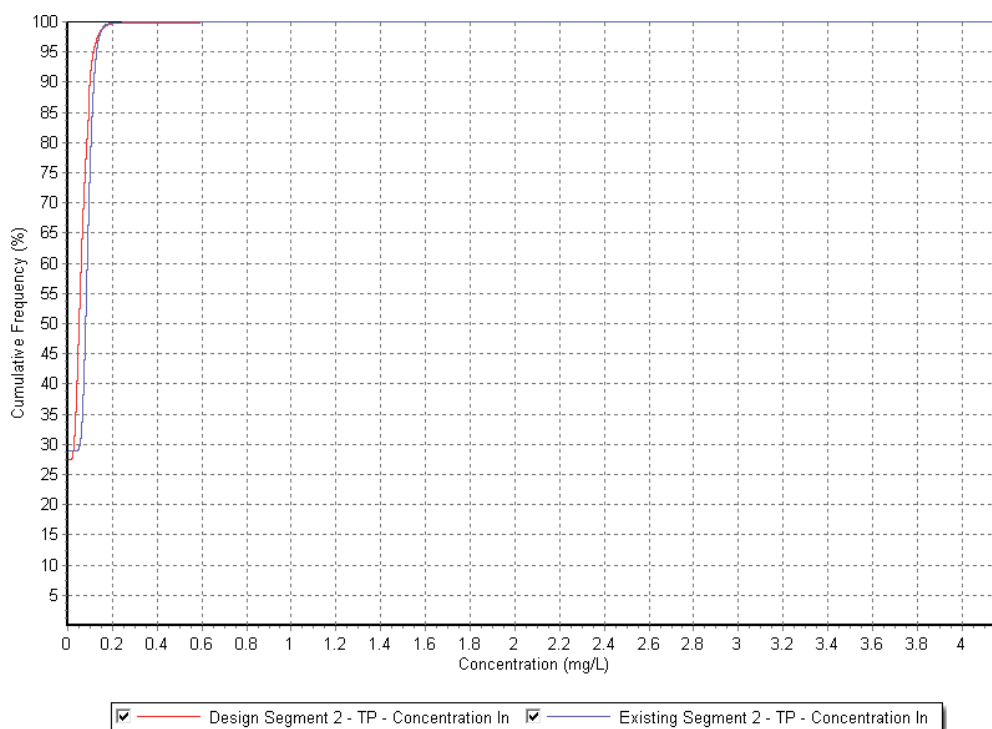


Figure J3: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Segment 2 of Oldbury Creek preferred and alternate options

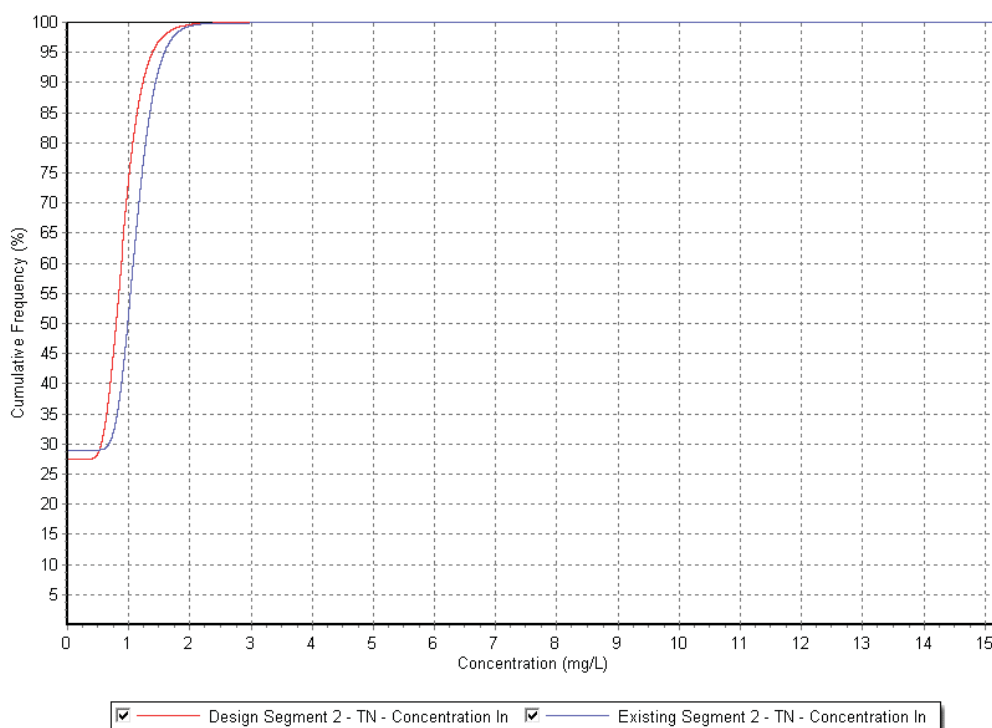


Figure J4: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Segment 2 of Oldbury Creek preferred and alternate options

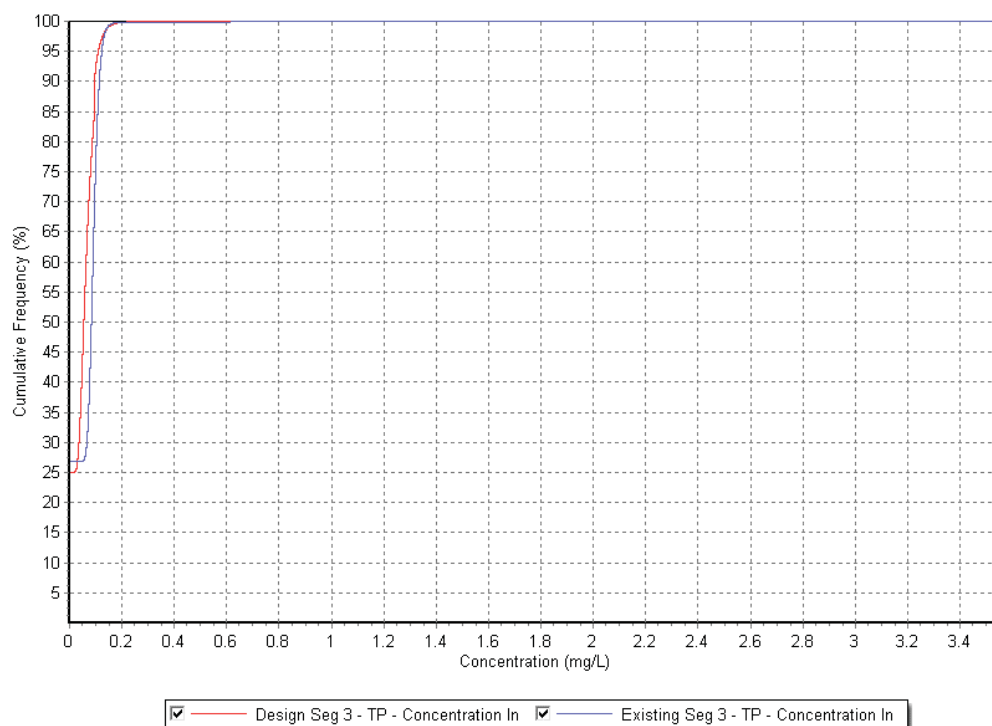


Figure J5: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Segment 3 of Oldbury Creek preferred and alternate options

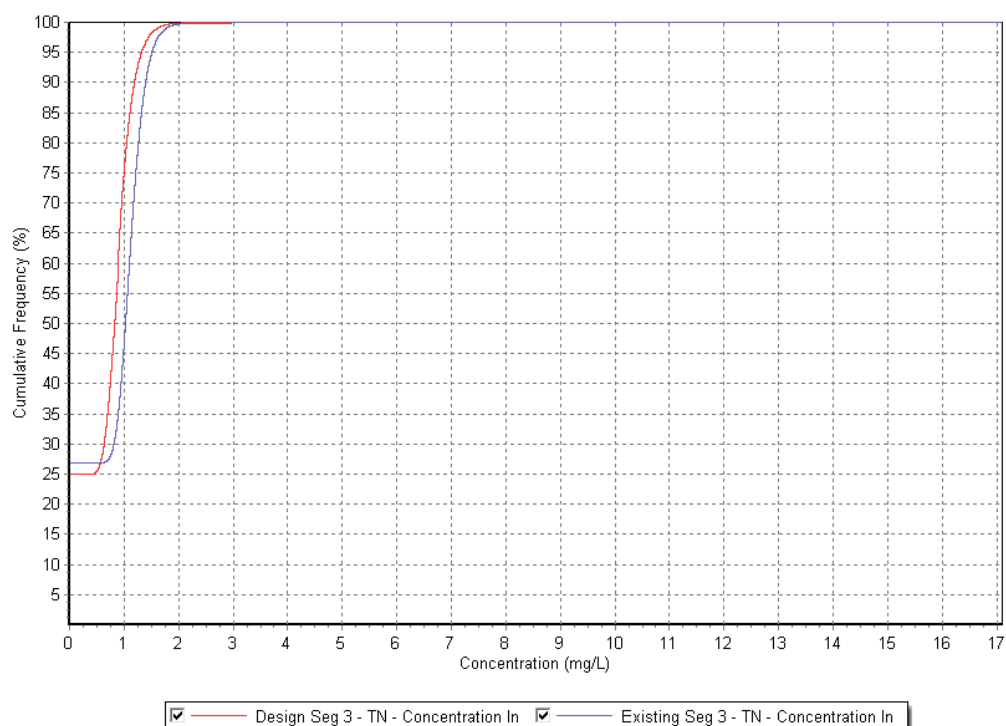


Figure J6: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Segment 3 of Oldbury Creek preferred and alternate options

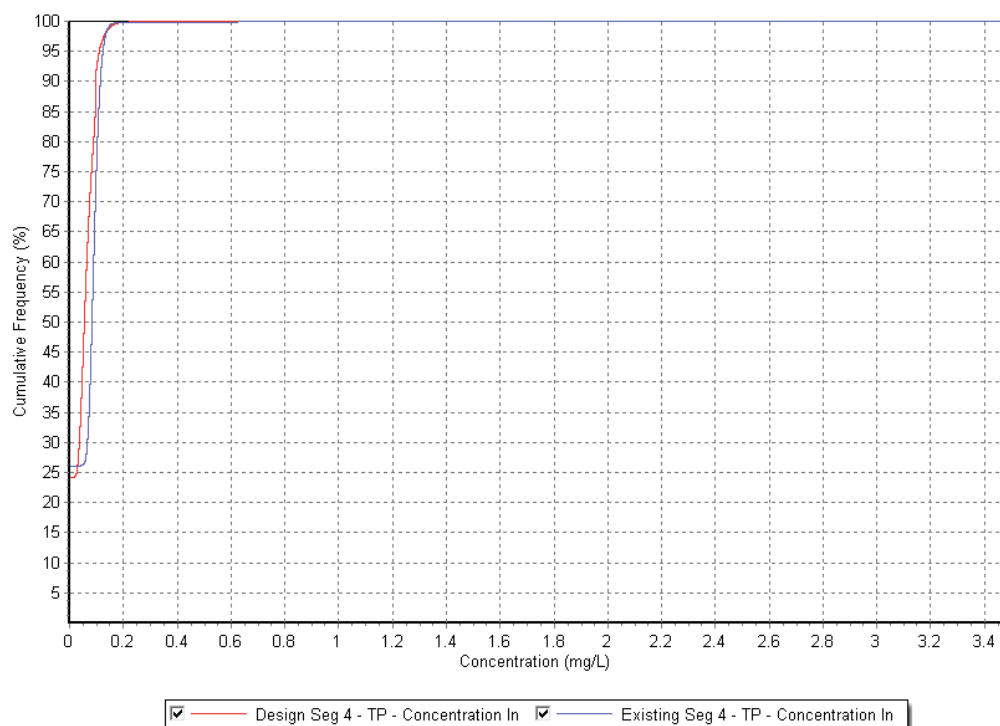


Figure J7: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Segment 4 of Oldbury Creek preferred and alternate options

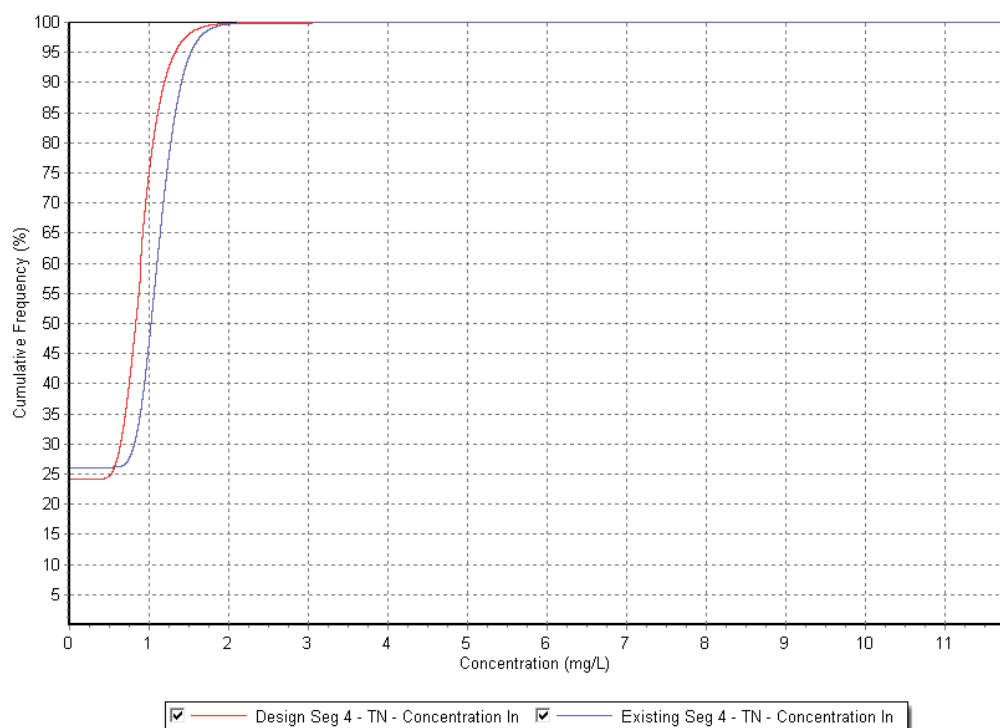


Figure J8: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Segment 4 of Oldbury Creek preferred and alternate options

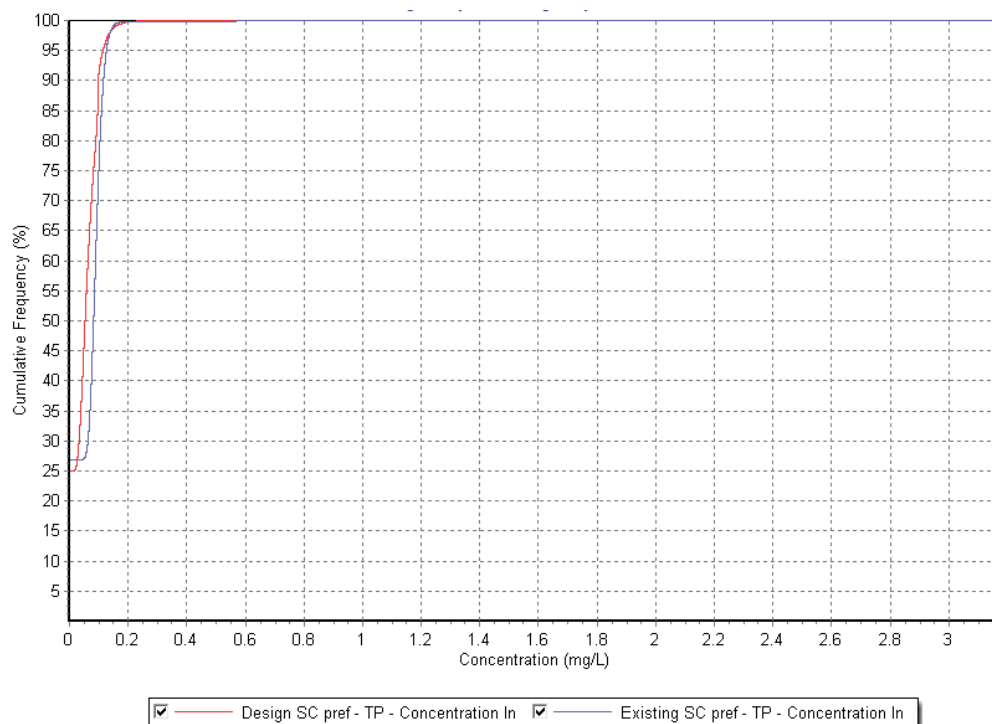


Figure J9: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Stony Creek preferred option

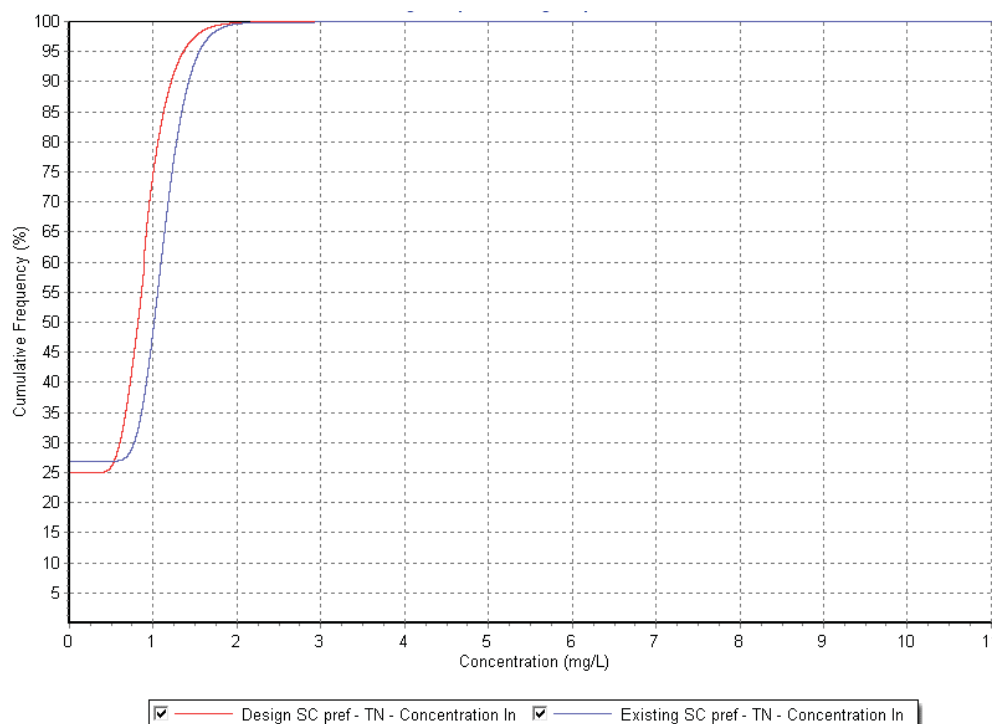


Figure J10: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Stony Creek preferred option

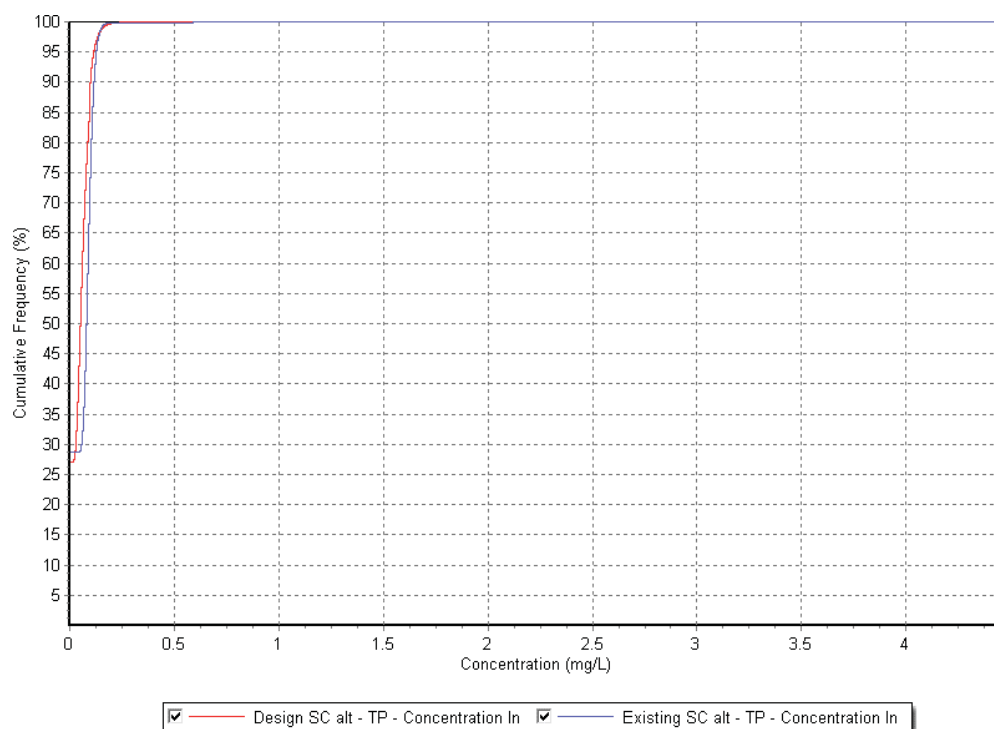


Figure J11: Cumulative Frequency Plots of TP for pre development (existing) and post development (operation) with treatment for Stony Creek alternate option

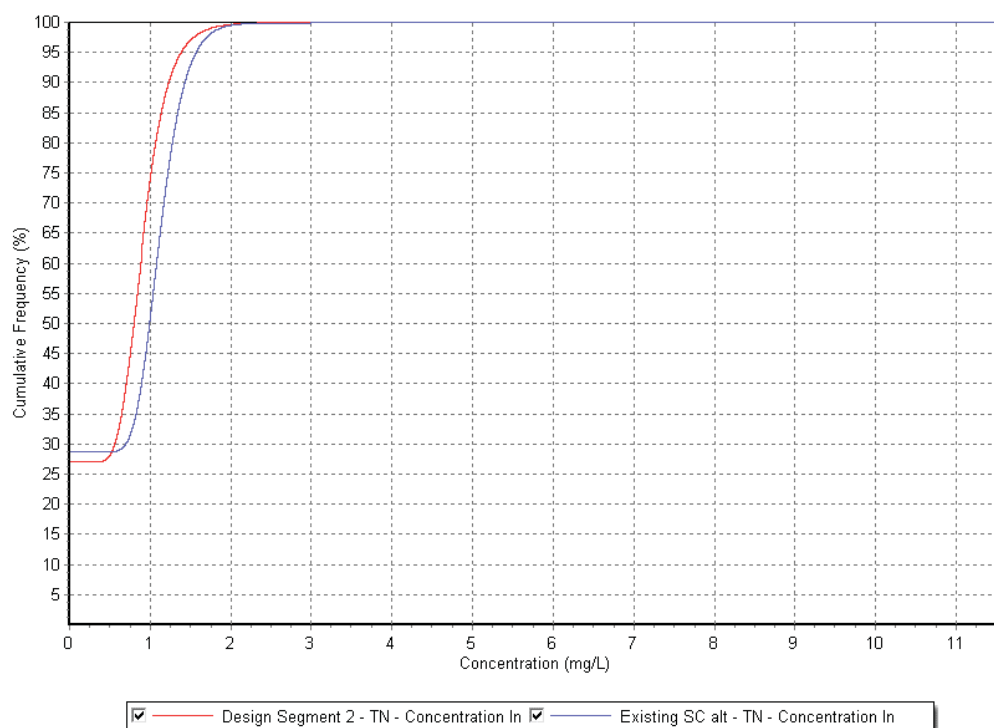


Figure J12: Cumulative Frequency Plots of TN for pre development (existing) and post development (operation) with treatment for Stony Creek alternate option

