

WELL TEST ANALYSIS

Data Set: \...\PB03 20190502Barker Fractured.aqt

Date: 05/02/19

Time: 15:57:39

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: PB03

Test Date: 9/4/2019

AQUIFER DATA

Saturated Thickness: 58. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PB03	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PB03 MB	9	0

SOLUTION

Aquifer Model: Fractured

Solution Method: Barker

K = 1.702 m/day

Ss = 0.0002195

K' = 1.44 m/day

Ss' = 0.001 m⁻¹

n = 2.

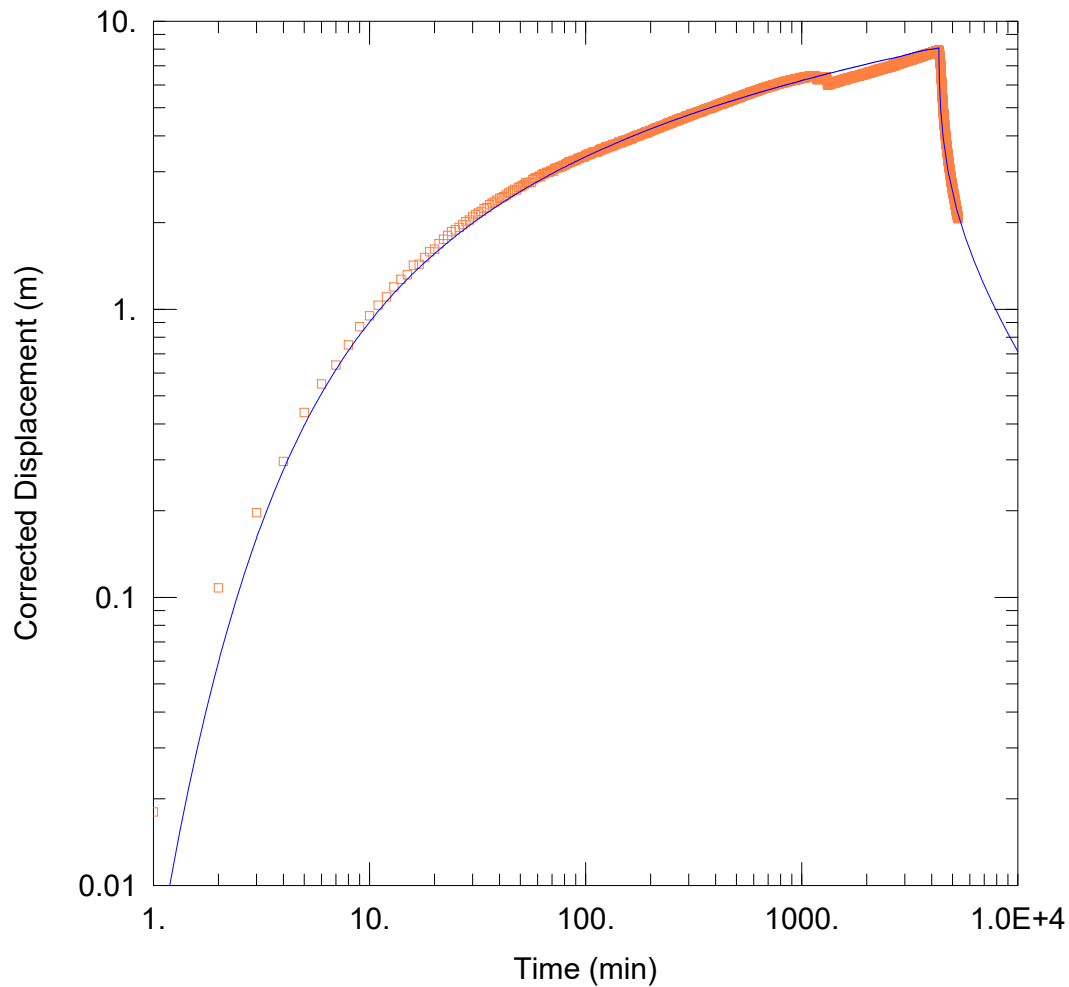
b = 58. m

Sf = 0.

Sw = 0.

r(w) = 0.095 m

r(c) = 0.095 m



WELL TEST ANALYSIS

Data Set: ...\PB03 20190502Barker Fractured.aqt

Date: 05/02/19

Time: 16:00:03

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: PB03

Test Date: 9/4/2019

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PB03	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ PB03 MB	9	0

SOLUTION

Aquifer Model: Unconfined

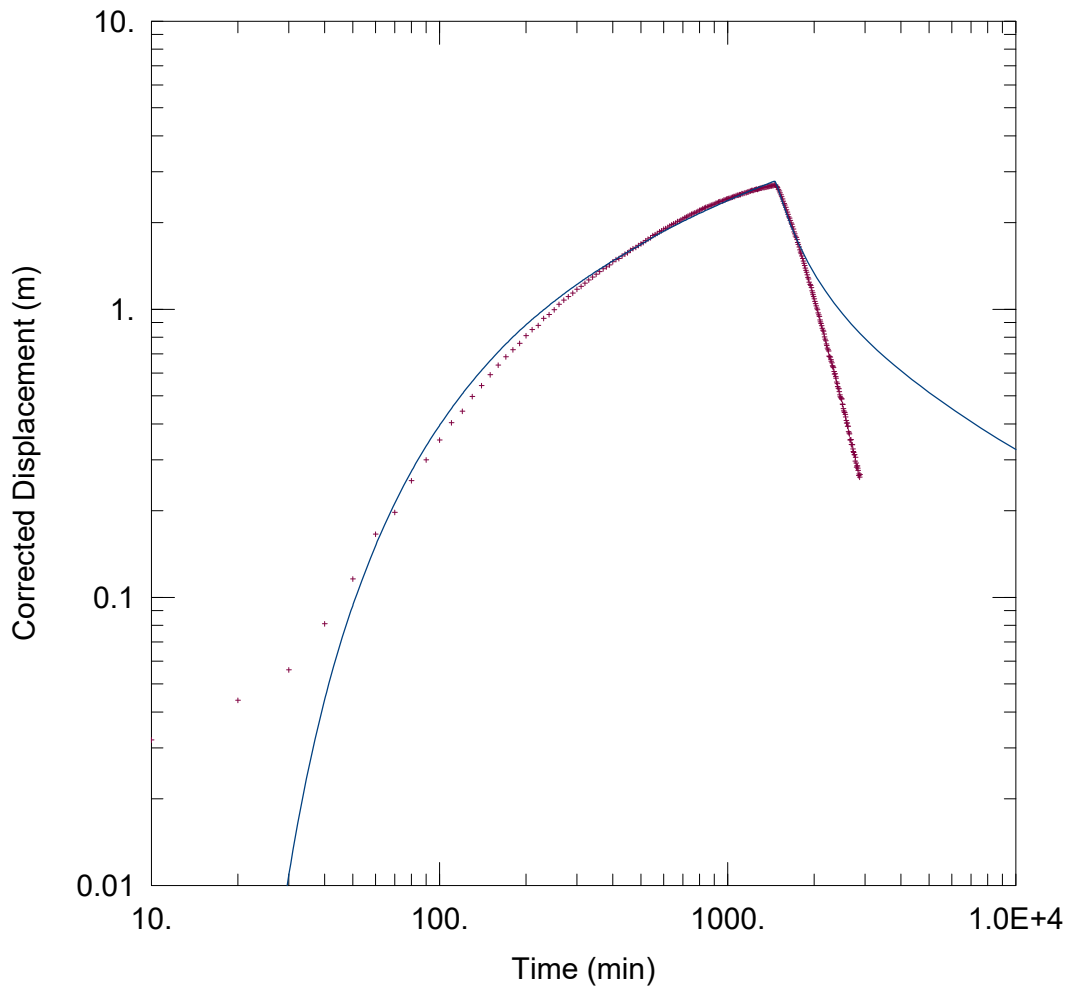
Solution Method: Theis

T = 136.8 m²/day

S = 0.01881

Kz/Kr = 1.

b = 58. m



WELL TEST ANALYSIS

Data Set: \...\PB04 20190506.aqt
 Date: 05/06/19

Time: 10:36:32

PROJECT INFORMATION

Company: GHD
 Client: FIJV
 Project: 6137117
 Test Well: PB04
 Test Date: 24/4/2019

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PB04	481040	6876439

Observation Wells

Well Name	X (m)	Y (m)
+ PB04 MB	480976	6876431

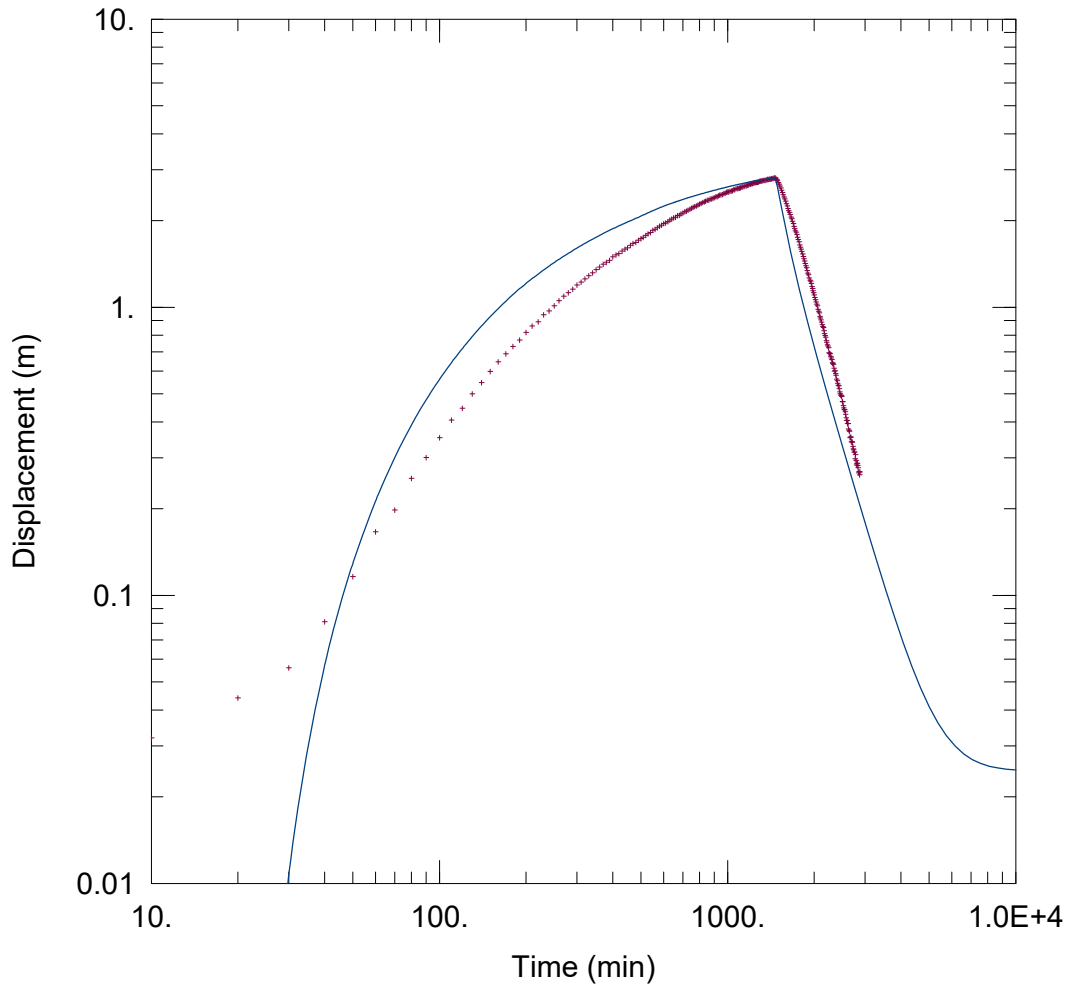
SOLUTION

Aquifer Model: Unconfined

Solution Method: Theis

T = 32.3 m²/day
 Kz/Kr = 1.

S = 0.001419
 b = 35.1 m



WELL TEST ANALYSIS

Data Set: \...\PB04 Moench v slow 20190506.aqt

Date: 05/06/19

Time: 10:55:04

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: PB04

Test Date: 24/4/2019

AQUIFER DATA

Saturated Thickness: 35.1 m

Anisotropy Ratio (Kz/Kr): 0.02962

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PB04	481040	6876439

Observation Wells

Well Name	X (m)	Y (m)
+ PB04 MB	480976	6876431

SOLUTION

Aquifer Model: Unconfined

Solution Method: Moench

T = 18.16 m²/day

S = 0.0008058

Sy = 0.1

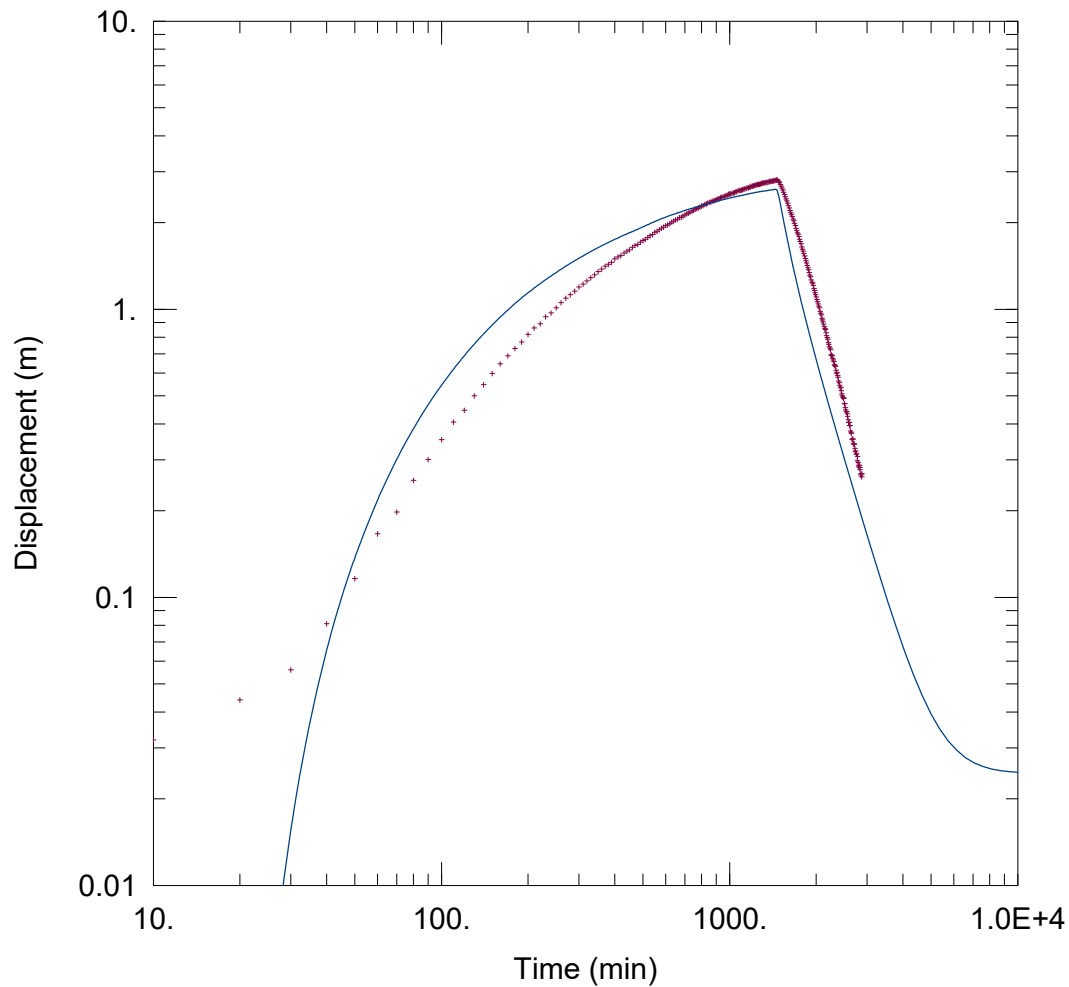
β = 0.1

Sw = 0.

r(w) = 0.095 m

r(c) = 0.095 m

alpha = 1.0E+30 min⁻¹



WELL TEST ANALYSIS

Data Set: \...\PB04 Neuman v slow 20190506.aqt

Date: 05/06/19

Time: 10:51:11

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: PB04

Test Date: 24/4/2019

AQUIFER DATA

Saturated Thickness: 35.1 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
PB04	481040	6876439

Observation Wells

Well Name	X (m)	Y (m)
+ PB04 MB	480976	6876431

SOLUTION

Aquifer Model: Unconfined

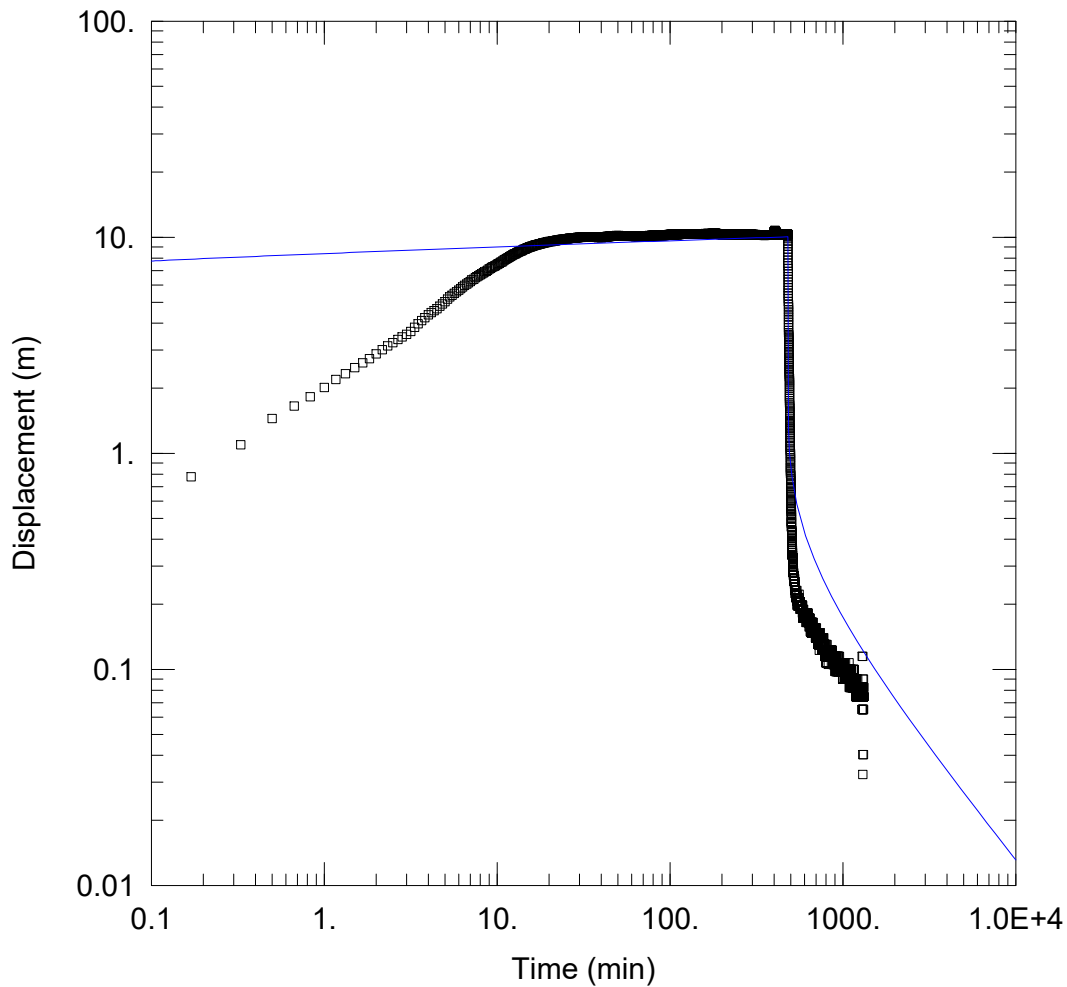
Solution Method: Neuman

T = 19.61 m²/day

S = 0.0008618

Sy = 0.1

β = 0.1



WELL TEST ANALYSIS

Data Set: \...\Geo Bore CRT Gring K is 0.169.aqt

Date: 02/21/19

Time: 12:26:46

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: Geo Bore

Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 55. m

Fracture Length: 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Geo Bore	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ Geo Bore	0	0

SOLUTION

Aquifer Model: Fractured

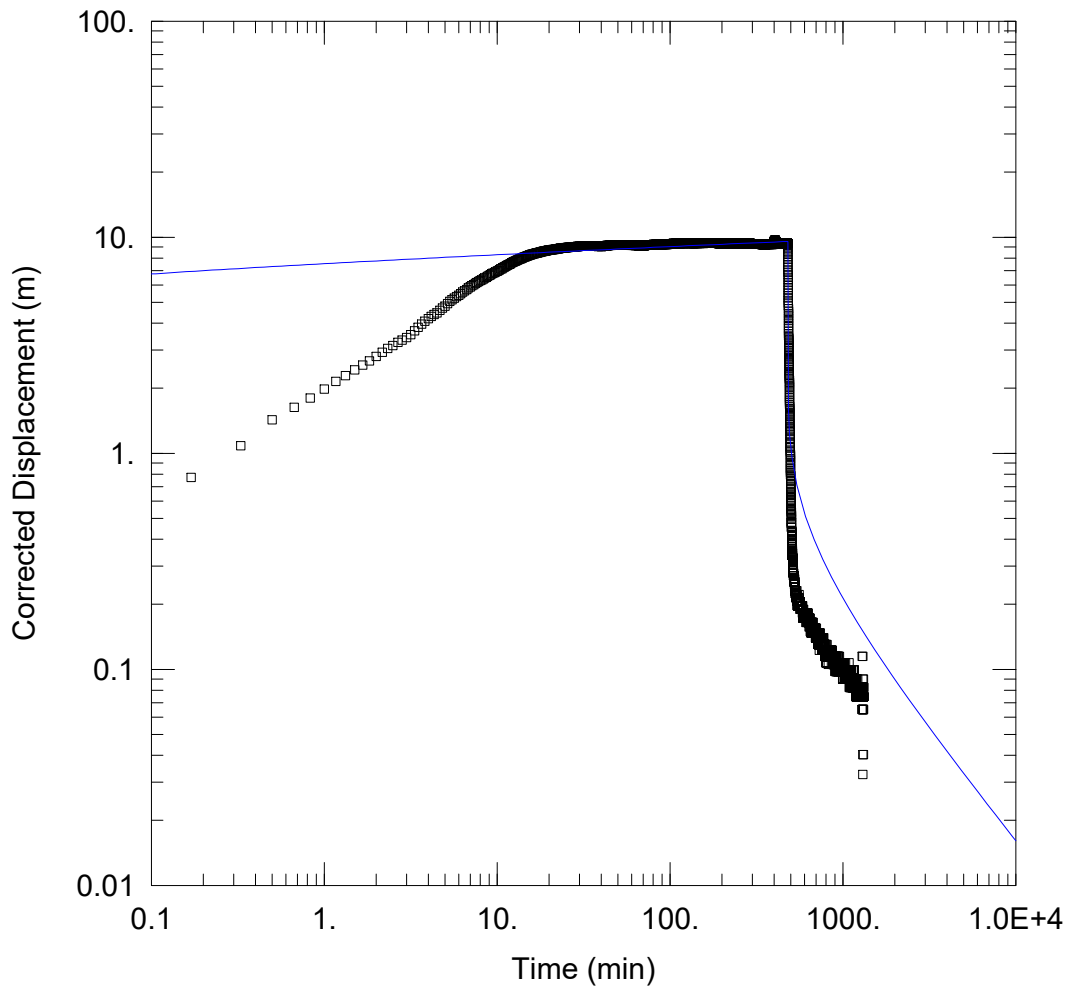
Solution Method: Gringarten (Vertical)

Kx = 0.2348 m/day

Ss = 2.131E-16 m⁻¹

Ky/Kx = 1.

Lf = 1. m



WELL TEST ANALYSIS

Data Set: ...\Geo Bore CRT Theis 20190506.aqt

Date: 05/06/19

Time: 11:03:47

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: Geo Bore

Test Date: 14/2/19

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Geo Bore	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ Geo Bore	0	0

SOLUTION

Aquifer Model: Unconfined

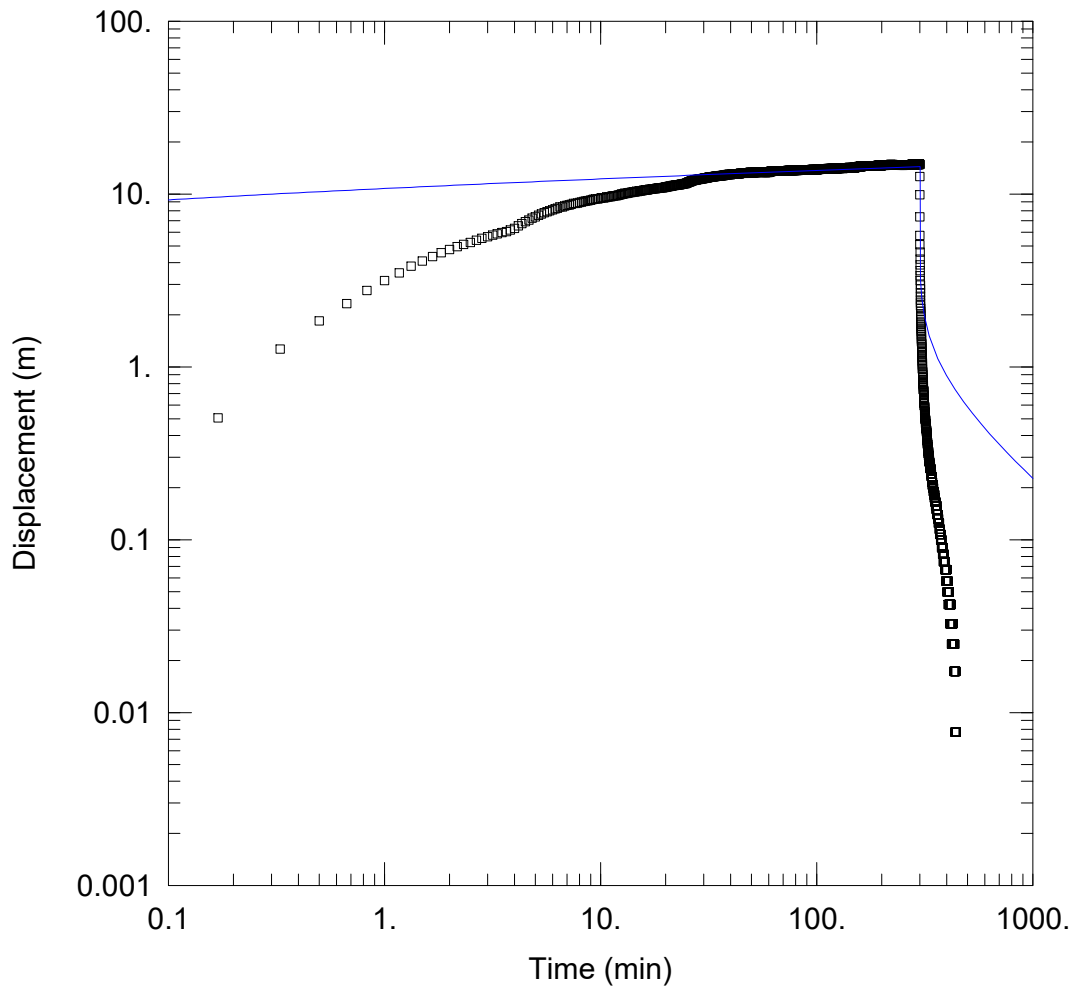
Solution Method: Theis

T = 10.53 m²/day

S = 6.171E-10

Kz/Kr = 1.

b = 55. m



WELL TEST ANALYSIS

Data Set: \\...\Drillers Bore CRT.aqt
 Date: 02/21/19

Time: 12:31:18

PROJECT INFORMATION

Company: GHD
 Client: FIJV
 Project: 6137117
 Test Well: Geo Bore
 Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 47.3 m

Fracture Length: 3.431 m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Drillers Bore	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ Drillers Bore	0	0

SOLUTION

Aquifer Model: Fractured

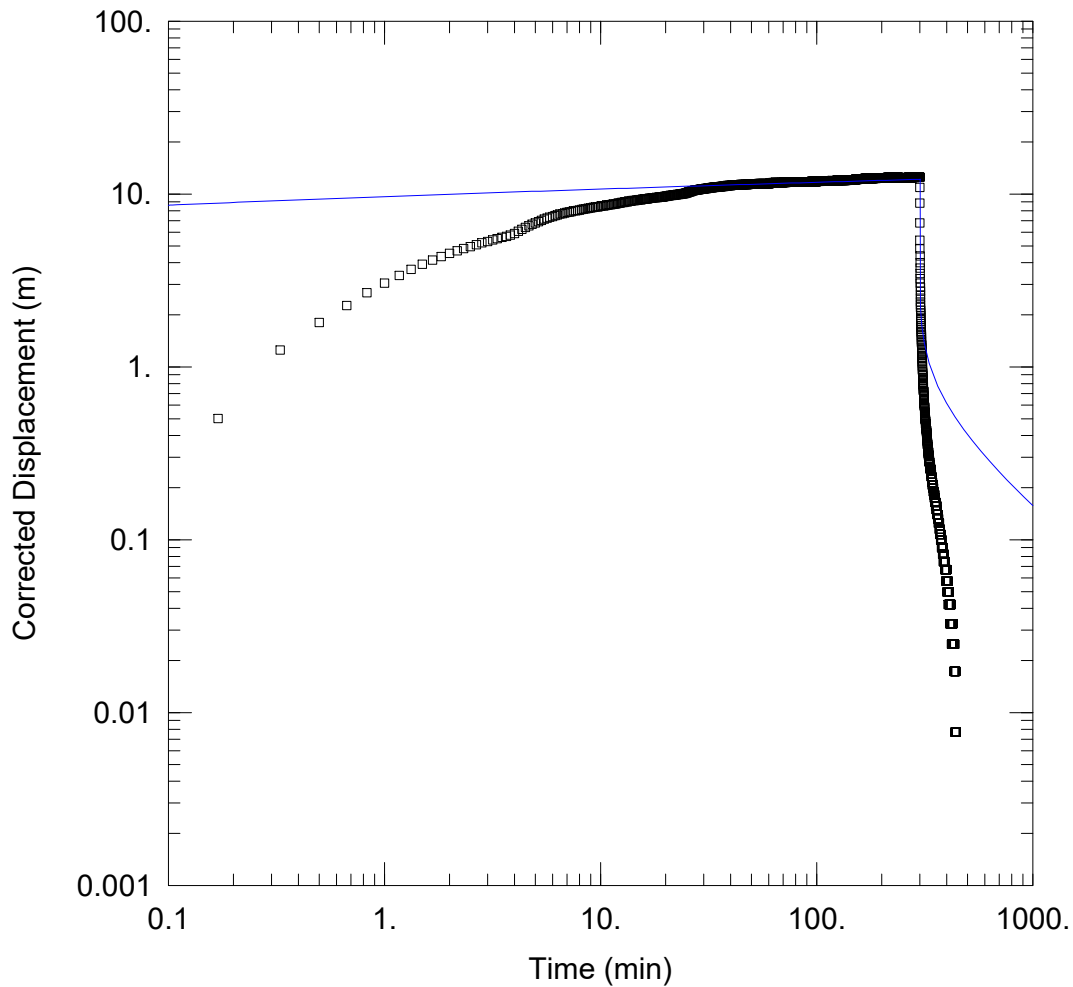
Solution Method: Gringarten (Vertical)

Kx = 0.4693 m/day

Ss = 7.575E-11 m⁻¹

Ky/Kx = 0.8551

Lf = 3.431 m



WELL TEST ANALYSIS

Data Set: \\...\Drillers Bore CRT Thisis.aqt

Date: 05/22/19

Time: 15:02:28

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: Geo Bore

Test Date: 14/2/19

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Drillers Bore	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ Drillers Bore	0	0

SOLUTION

Aquifer Model: Unconfined

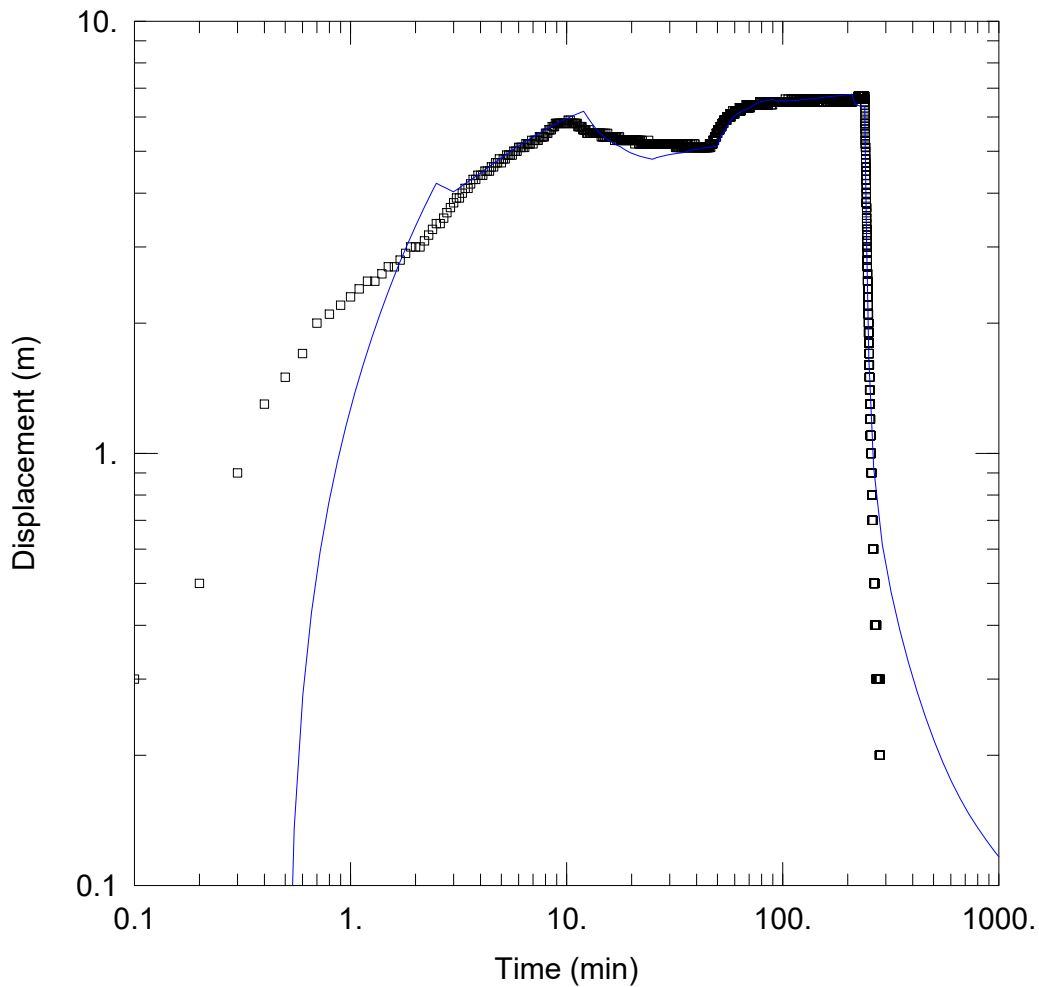
Solution Method: Thisis

T = 29.6 m²/day

S = 5.093E-9

Kz/Kr = 1.

b = 47.3 m



WELL TEST ANALYSIS

Data Set: \\...\YORC081CRT.aqt
 Date: 02/21/19

Time: 12:39:40

PROJECT INFORMATION

Company: GHD
 Client: FIJV
 Project: 6137117
 Test Well: Geo Bore
 Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 150. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
YORC081	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ YORC081	0	0

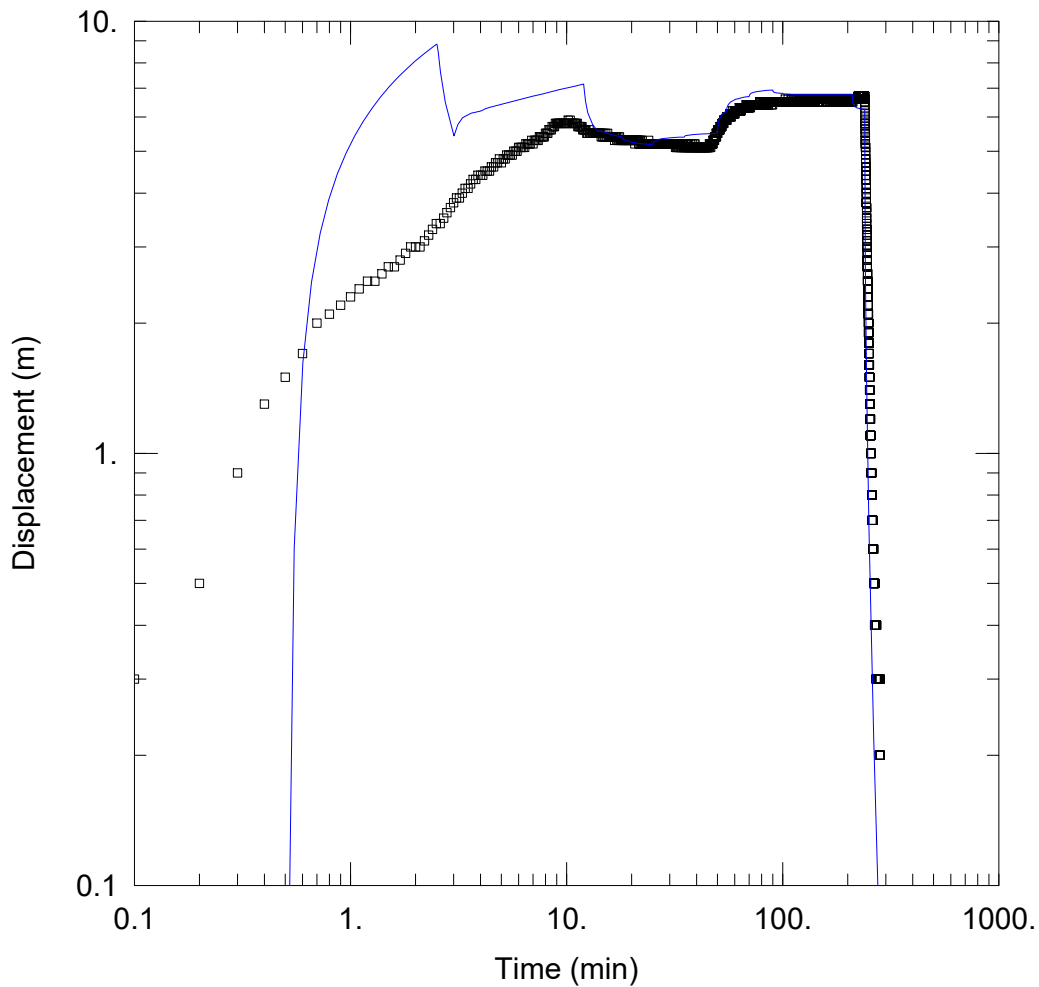
SOLUTION

Aquifer Model: Fractured

Solution Method: Barker

K = 0.02669 m/day
 K' = 1.902E-5 m/day
 n = 2.
 Sf = 0.
 r(w) = 0.075 m

Ss = 6.667E-13
 Ss' = 0.0001091 m⁻¹
 b = 150. m
 Sw = 0.
 r(c) = 0.075 m



WELL TEST ANALYSIS

Data Set: \\...\YORC081CRT hantush.aqt

Date: 05/06/19

Time: 11:11:47

PROJECT INFORMATION

Company: GHD

Client: FIJV

Project: 6137117

Test Well: Geo Bore

Test Date: 14/2/19

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
YORC081	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ YORC081	0	0

SOLUTION

Aquifer Model: Leaky

Solution Method: Hantush-Jacob

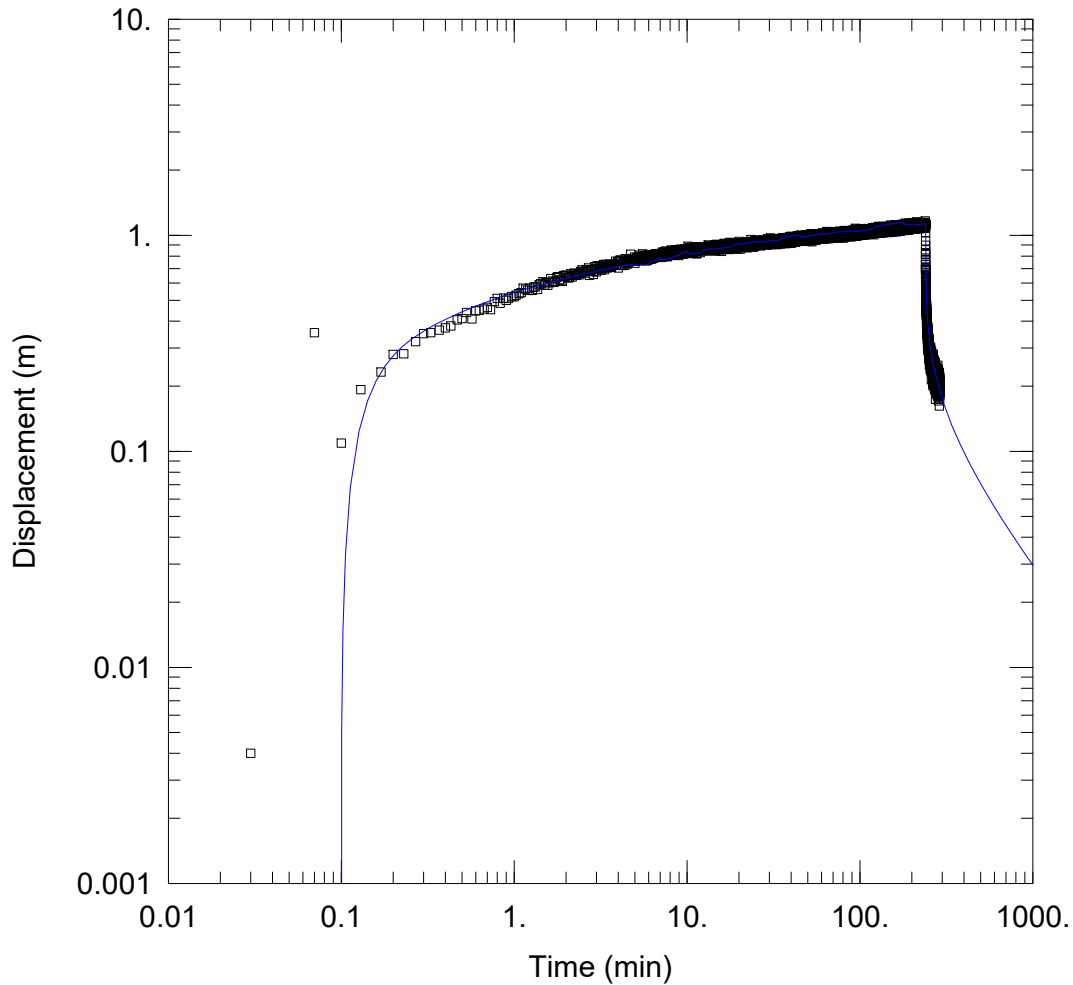
T = 1.873 m²/day

S = 0.04836

r/B = 0.1

Kz/Kr = 1.

b = 150. m



WELL TEST ANALYSIS

Data Set: \\...\YORC079CRT.aqt
 Date: 02/21/19

Time: 12:50:38

PROJECT INFORMATION

Company: GHD
 Client: FIJV
 Project: 6137117
 Test Well: YORC079
 Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 180. m

Slab Block Thickness: 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
YORC079	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ YORC079	0	0

SOLUTION

Aquifer Model: Fractured

Solution Method: Moench w/slab blocks

K = 0.6506 m/day

Ss = 2.088E-11 m⁻¹

K' = 1.44 m/day

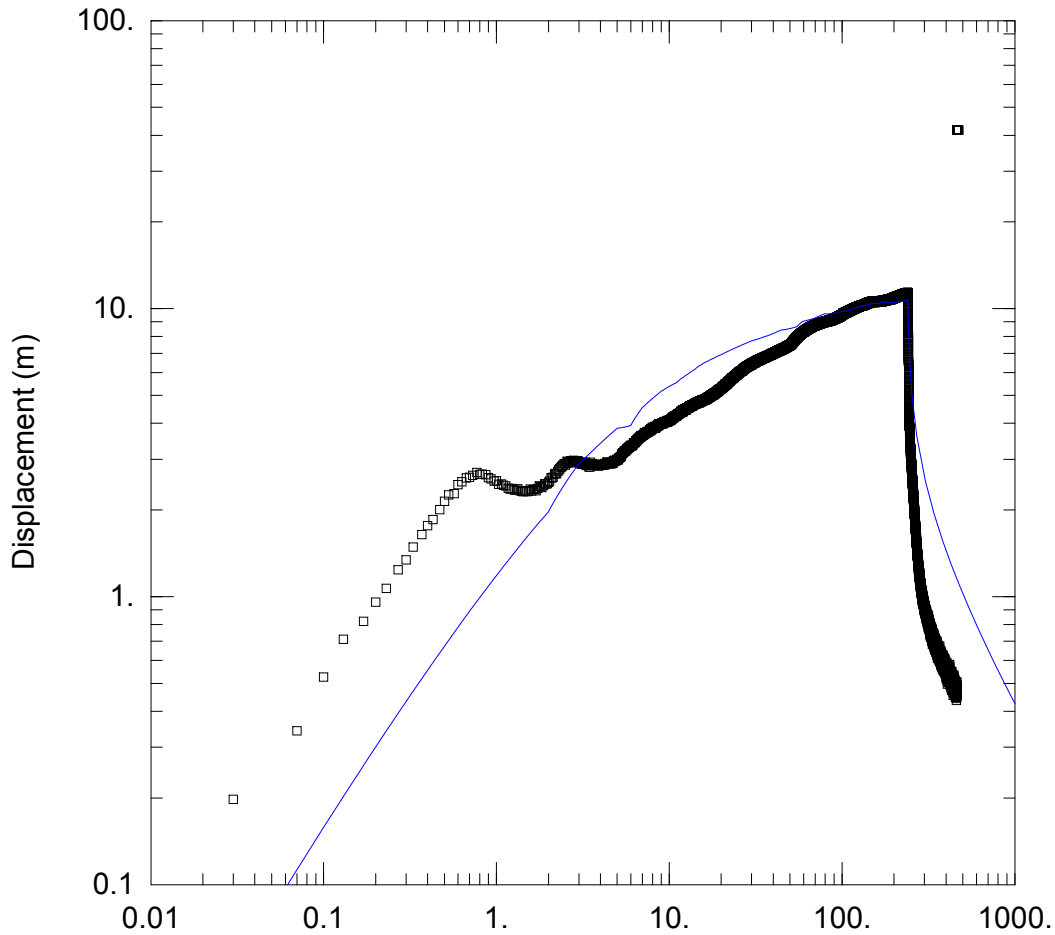
Ss' = 0.001 m⁻¹

Sw = 0.

Sf = 0.

r(w) = 0.075 m

r(c) = 0.075 m



Time (min)
WELL TEST ANALYSIS

Data Set: \...\YORC135 CRT.aqt
Date: 05/22/19

Time: 15:31:02

PROJECT INFORMATION

Company: GHD
Client: FIJV
Project: 6137117
Test Well: YORC135
Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 120. m

Slab Block Thickness: 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
YORC135	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ YORC135	0	0

SOLUTION

Aquifer Model: Fractured

Solution Method: Moench w/slab blocks

K = 0.02102 m/day

Ss = 2.986E-12 m⁻¹

K' = 1.44 m/day

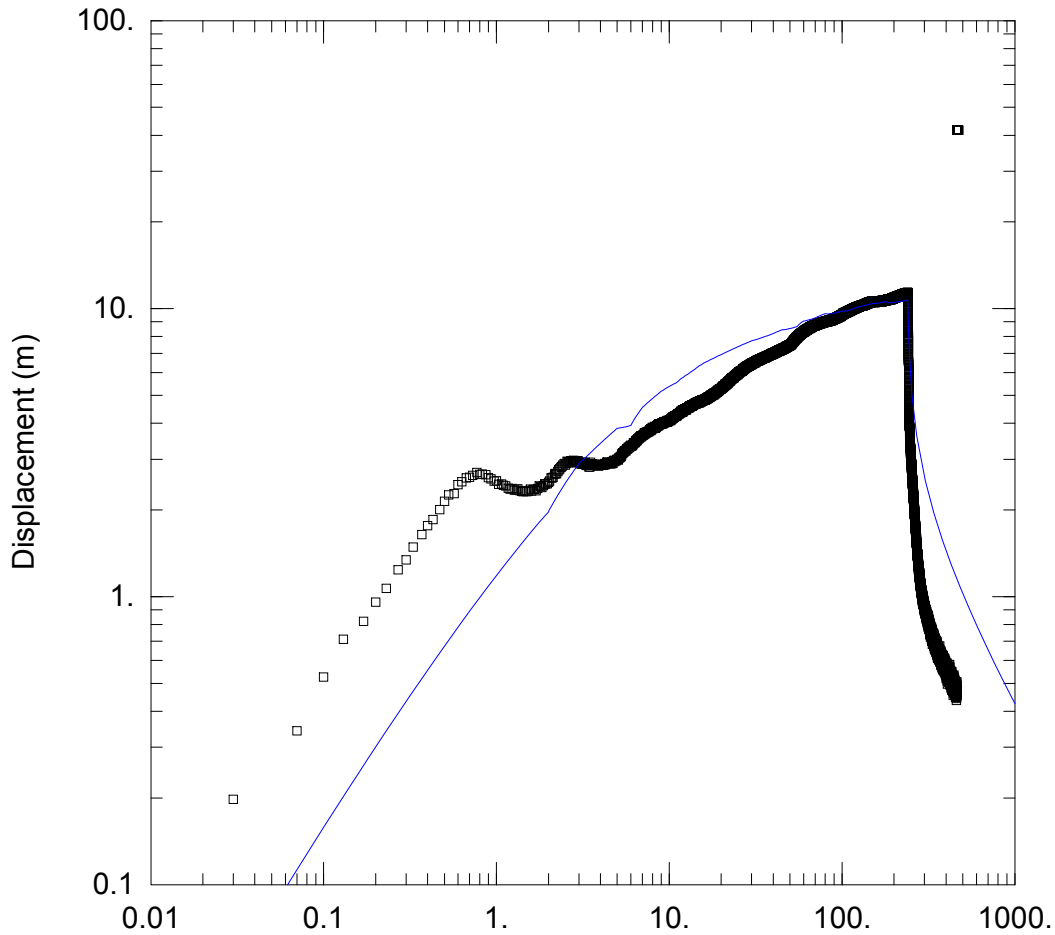
Ss' = 0.001 m⁻¹

Sw = 0.

Sf = 0.

r(w) = 0.075 m

r(c) = 0.075 m



Time (min)
WELL TEST ANALYSIS

Data Set: \...\YORC135 CRT Barker.aqt
Date: 05/22/19

Time: 15:32:28

PROJECT INFORMATION

Company: GHD
Client: FIJV
Project: 6137117
Test Well: Geo Bore
Test Date: 14/2/19

AQUIFER DATA

Saturated Thickness: 120. m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
YORC135	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ YORC135	0	0

SOLUTION

Aquifer Model: Fractured

Solution Method: Barker

K = 0.02102 m/day

Ss = 2.986E-12

K' = 1.44 m/day

Ss' = 0.001 m⁻¹

n = 2.

b = 120. m

Sf = 0.

Sw = 0.

r(w) = 0.075 m

r(c) = 0.075 m

Appendix D Groundwater quality laboratory results (including summary table)



Summary Table: Water Quality Results for Test Bores

Chem_Group	ChemName	output unit	EQL	ADWG 2011 Health (v3.5 updated 2018)	ANZECC 2000 - Stock Watering	ANZG (2018) - Freshwater - Unknown level of species protection	DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values	Location code and sampled date				
								PB01	PB02	PB03	PB04	
								2/04/2019	4/04/2019	12/04/2019	16/04/2019	
	pH Colour	pH Units	0.01					7.14	7.1	7.32	7.2	
Inorganics	Sulfate as SO4 - Turbidimetric (Filtered)	mg/L	1					774	776	80	80	
	pH (Lab)	pH Units	0.01					7.63	7.62	7.65	7.73	
	Electrical conductivity (lab)	µS/cm	1					15,900	16,400	1320	1410	
	Total Dissolved Solids	mg/L	10		5000			9570	10,100	808	842	
	Turbidity	NTU	0.1					0.2	0.3	0.2	16.4	
	Colour	PCU	1					<1	<1	<1	<1	
	Cyanide (Total)	mg/L	0.004	0.08			<u>0.8</u>	<0.004	<0.004	<0.004	<0.004	
Acidity & Alkalinity	Alkalinity (Carbonate as CaCO3)	mg/L	1					<1	<1	<1	<1	
	Alkalinity (Bicarbonate as CaCO3)	mg/L	1					125	112	73	78	
	Alkalinity (Hydroxide as CaCO3)	mg/L	1					<1	<1	<1	<1	
	Alkalinity (total as CaCO3)	mg/L	1					125	112	73	78	
	Hardness as CaCO3 (Filtered)	mg/L	1					1280	1510	204	261	
Major Ions	Calcium (Filtered)	mg/L	1		1000			107	146	34	42	
	Magnesium (Filtered)	mg/L	1					246	279	29	38	
	Potassium (Filtered)	mg/L	1					109	107	16	19	
	Sodium (Filtered)	mg/L	1					2670	2660	149	186	
	Chloride	mg/L	1				<u>250</u>	<u>5150</u>	<u>5360</u>	<u>335</u>	<u>364</u>	
	Sulfate (Filtered)	mg/L	1	500	1000		<u>1000</u>	774	776	80	80	
	Fluoride	mg/L	0.1	1.5	2		<u>15</u>	1.2	0.8	0.4	0.4	
	Cations Total	meq/L	0.01					144	149	11	13.8	
	Anions Total	meq/L	0.01					164	170	12.6	13.5	
	Ionic Balance	%	0.01					6.28	6.57	6.8	1.13	
	Sulfide	mg/L	0.1					<0.1	<0.1	<0.1	<0.1	
	Nutrients	Nitrite + Nitrate as N	mg/L	0.01					4.45	5.97	8.64	10.8
		Ammonia as N	mg/L	0.01					0.02	0.02	<0.01	0.01
Nitrate (as N)		mg/L	0.01	11.29	90			4.45	5.96	8.63	10.8	
Nitrite (as N)		mg/L	0.01	0.91	9.1		<u>30</u>	<0.01	0.01	0.01	<0.01	
Nitrogen (Total Oxidised) (as N)		mg/L	0.01					4.45	5.97	8.64	10.8	
Metals	Aluminium	mg/L	0.01		5	<i>0.0008</i>	<u>0.2</u>	<0.01	<0.01	<0.01	0.07	
	Antimony	mg/L	0.001	0.003		<i>0.009</i>	<u>0.03</u>	<0.001	<0.001	<0.001	<0.001	
	Arsenic	mg/L	0.001	0.01	0.5		<u>0.1</u>	0.001	<0.001	<0.001	0.001	
	Barium	mg/L	0.001	2			<u>20</u>	0.034	0.031	0.051	0.044	
	Boron	mg/L	0.05	4	5		<u>40</u>	1.5	1.44	0.46	0.48	
	Cadmium	mg/L	0.0001	0.002	0.01		<u>0.02</u>	<0.0001	<0.0001	<0.0001	<0.0001	
	Chromium (III+VI)	mg/L	0.001		1	<i>0.0033</i>		<0.001	<0.001	<0.001	0.001	
	Copper	mg/L	0.001	2	1		<u>20</u>	0.001	0.001	<0.001	<0.001	
	Iron	mg/L	0.05			<i>0.3</i>		<0.05	<0.05	<0.05	0.06	
	Lead	mg/L	0.001	0.01	0.1		<u>0.1</u>	<0.001	<0.001	<0.001	<0.001	
	Manganese	mg/L	0.001	0.5			<u>5</u>	0.007	0.004	0.005	0.002	
	Mercury	mg/L	0.0001	0.001	0.002		<u>0.01</u>	<0.0001	<0.0001	<0.0001	<0.0001	
	Molybdenum	mg/L	0.001	0.05	0.15	<i>0.034</i>		0.027	0.018	0.004	0.003	
	Nickel	mg/L	0.001	0.02	1		<u>0.2</u>	<0.001	0.001	<0.001	<0.001	
	Selenium	mg/L	0.01	0.01	0.02		<u>0.1</u>	<0.01	<0.01	<0.01	<0.01	
	Silver	mg/L	0.001	0.1			<u>1</u>	<0.001	<0.001	<0.001	<0.001	
	Zinc	mg/L	0.005		20		<u>3</u>	0.029	0.019	<0.005	0.006	

CERTIFICATE OF ANALYSIS

Work Order : EP1903774 Client : GHD PTY LTD Contact : MR ADAM OSBALDESTON Address : 999 HAY STREET PERTH WA, AUSTRALIA 6000 Telephone : +61 08 6222 8469 Project : 6137117 Order number : 613711705 C-O-C number : ---- Sampler : RWG Site : Quote number : EN/005/18 No. of samples received : 4 No. of samples analysed : 4	Page : 1 of 4 Laboratory : Environmental Division Perth Contact : Marnie Thomsett Address : 26 Rigali Way Wangara WA Australia 6065 Telephone : 08 9406 1311 Date Samples Received : 18-Apr-2019 14:36 Date Analysis Commenced : 18-Apr-2019 Issue Date : 29-Apr-2019 22:43
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Indra Astuty	Instrument Chemist	Perth Inorganics, Wangara, WA



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
∅ = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PB01	PB02	PB03	PB04	----
Client sampling date / time				02-Apr-2019 06:30	04-Apr-2019 09:30	12-Apr-2019 14:00	16-Apr-2019 08:00	----	
Compound	CAS Number	LOR	Unit	EP1903774-001	EP1903774-002	EP1903774-003	EP1903774-004	-----	
				Result	Result	Result	Result	----	
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit	7.63	7.62	7.65	7.73	----	
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm	15900	16400	1320	1410	----	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	9570	10100	808	842	----	
EA041: Colour (True)									
Colour (True)	----	1	PCU	<1	<1	<1	<1	----	
pH Colour	----	0.01	pH Unit	7.14	7.10	7.32	7.20	----	
EA045: Turbidity									
Turbidity	----	0.1	NTU	0.2	0.3	0.2	16.4	----	
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L	1280	1510	204	261	----	
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----	
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----	
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	125	112	73	78	----	
Total Alkalinity as CaCO3	----	1	mg/L	125	112	73	78	----	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	774	776	80	80	----	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	5150	5360	335	364	----	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	107	146	34	42	----	
Magnesium	7439-95-4	1	mg/L	246	279	29	38	----	
Sodium	7440-23-5	1	mg/L	2670	2660	149	186	----	
Potassium	7440-09-7	1	mg/L	109	107	16	19	----	
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	0.07	----	
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	<0.001	0.001	----	
Boron	7440-42-8	0.05	mg/L	1.50	1.44	0.46	0.48	----	
Barium	7440-39-3	0.001	mg/L	0.034	0.031	0.051	0.044	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	PB01	PB02	PB03	PB04	----
Client sampling date / time					02-Apr-2019 06:30	04-Apr-2019 09:30	12-Apr-2019 14:00	16-Apr-2019 08:00	----
Compound	CAS Number	LOR	Unit	EP1903774-001	EP1903774-002	EP1903774-003	EP1903774-004	-----	
				Result	Result	Result	Result	----	
EG020T: Total Metals by ICP-MS - Continued									
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	0.001	----	
Copper	7440-50-8	0.001	mg/L	0.001	0.001	<0.001	<0.001	----	
Manganese	7439-96-5	0.001	mg/L	0.007	0.004	0.005	0.002	----	
Molybdenum	7439-98-7	0.001	mg/L	0.027	0.018	0.004	0.003	----	
Nickel	7440-02-0	0.001	mg/L	<0.001	0.001	<0.001	<0.001	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----	
Zinc	7440-66-6	0.005	mg/L	0.029	0.019	<0.005	0.006	----	
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	0.06	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----	
EK025G: Free cyanide by Discrete Analyser									
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----	
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L	1.2	0.8	0.4	0.4	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	<0.01	0.01	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.01	0.01	<0.01	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	4.45	5.96	8.63	10.8	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	4.45	5.97	8.64	10.8	----	
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	----	
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L	164	170	12.6	13.5	----	
Total Cations	----	0.01	meq/L	144	149	11.0	13.8	----	
Ionic Balance	----	0.01	%	6.28	6.57	6.80	1.13	----	

Appendix E Numerical modelling maps

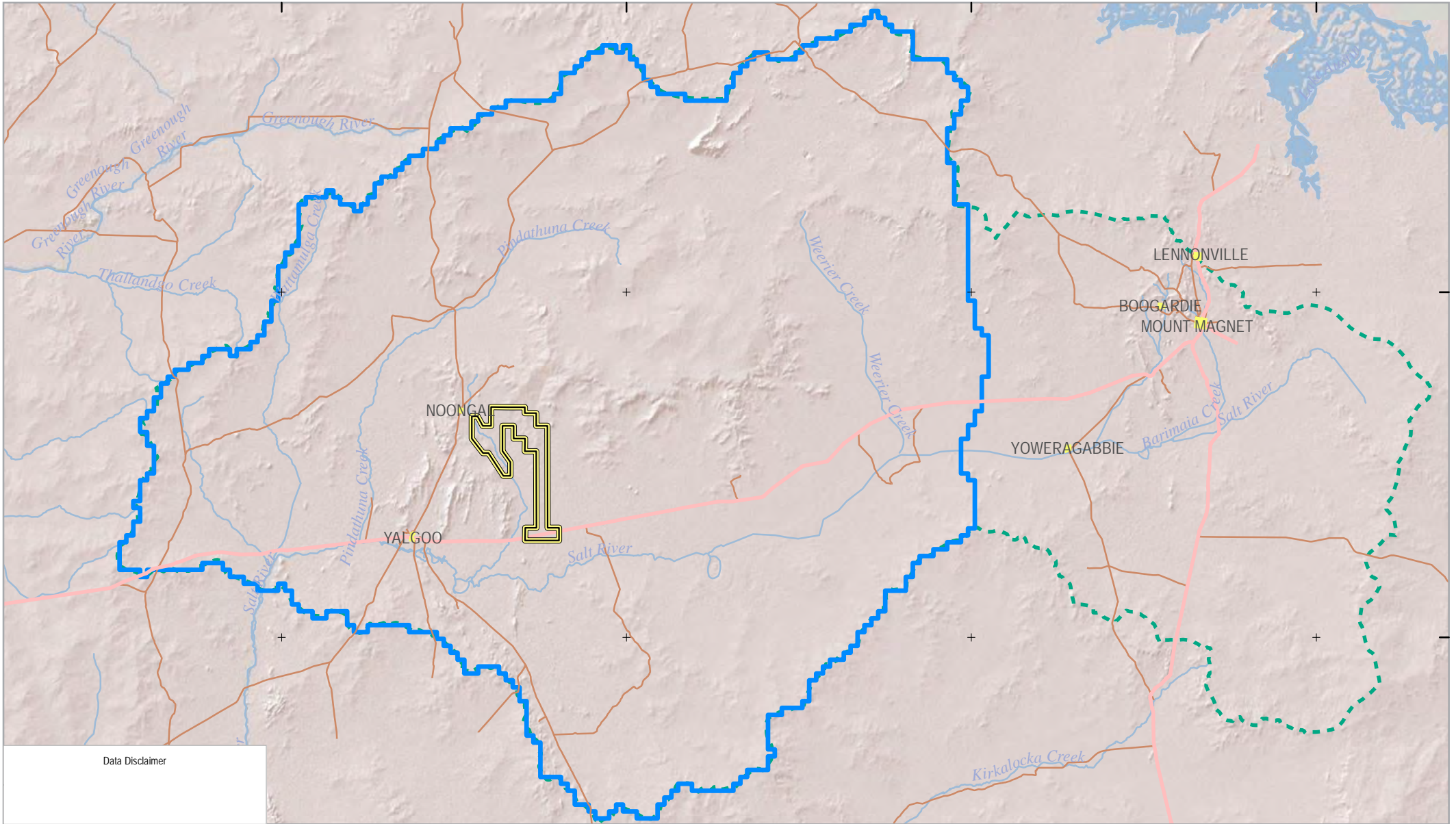
Figure E- 1	Model domain
Figure E- 2	Finite difference grid
Figure E- 3	Ground elevation, top of layer 1
Figure E- 4	Base elevation, layer 1
Figure E- 5	Base elevation, layer 2
Figure E- 6	Surface geology, 1:1,000,000
Figure E- 7	Basement geology, 1:500,000
Figure E- 8	Parameter zones, model layer 1
Figure E- 9	Parameter zones, model layer 2
Figure E- 10	Parameter zones, model layer 3
Figure E- 11	Recharge zones
Figure E- 12	Simulated water levels (steady state)

450,000

500,000

550,000




600,000








Data Disclaimer

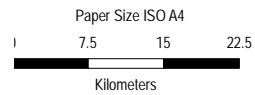
Legend

Roads (MRWA)

-  Local
-  State
-  River (DoW)

-  Yogi project
-  Town
-  Model domain

-  Yarra Yarra Salt R.
-  Catchment



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50

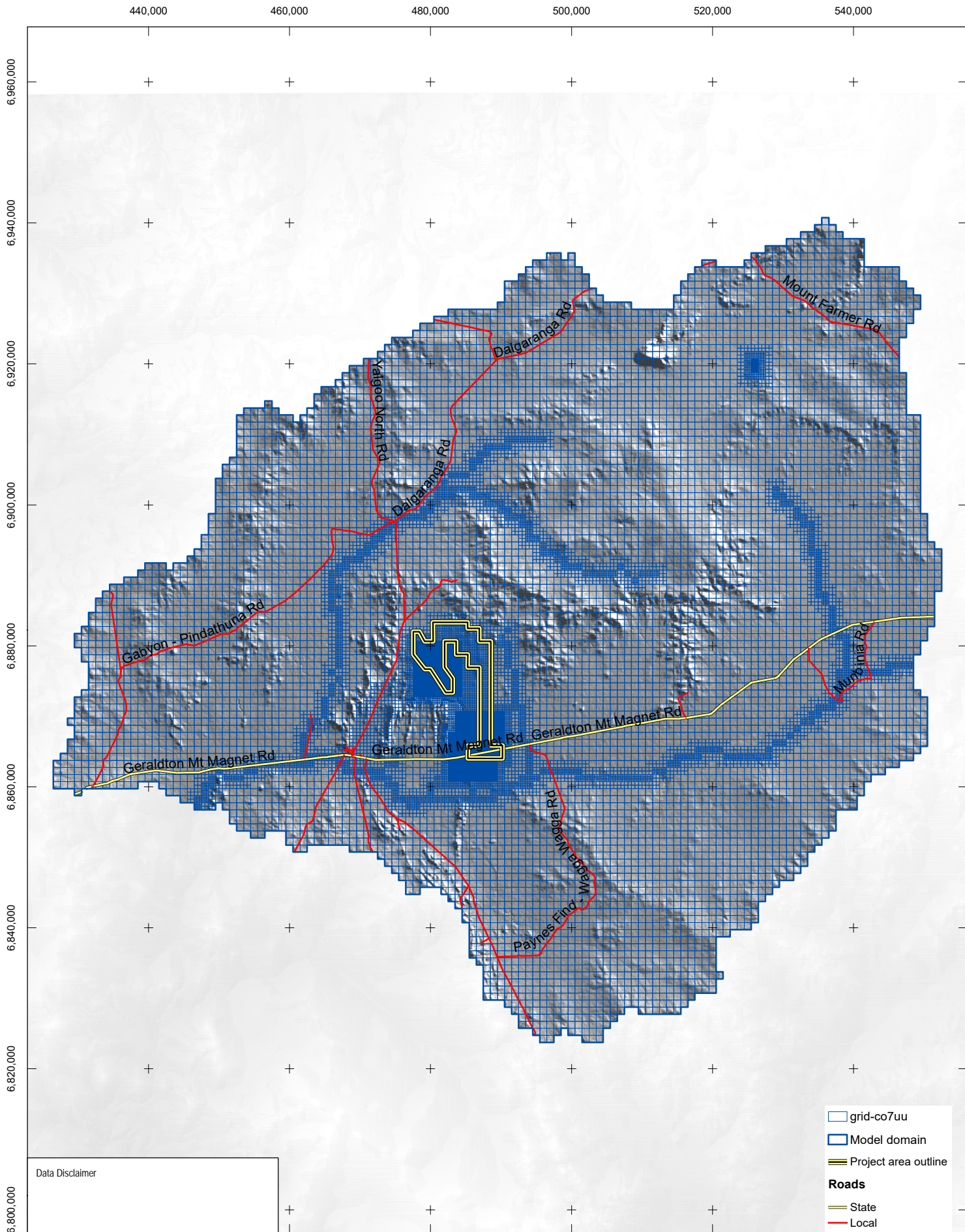


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 Yogi Magnetite Project

MODEL DOMAIN

Project No. 61-37117
 Revision No. -
 Date 20/06/2019

Figure E-01



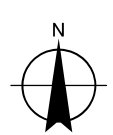
grid-co7uu
 Model domain
 Project area outline
Roads
 State
 Local

Data Disclaimer

Paper Size ISO A4

Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



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 Yogi-Magnetite Project

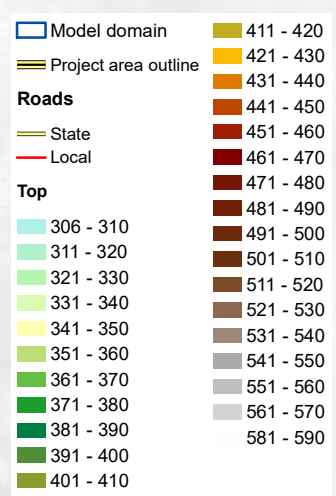
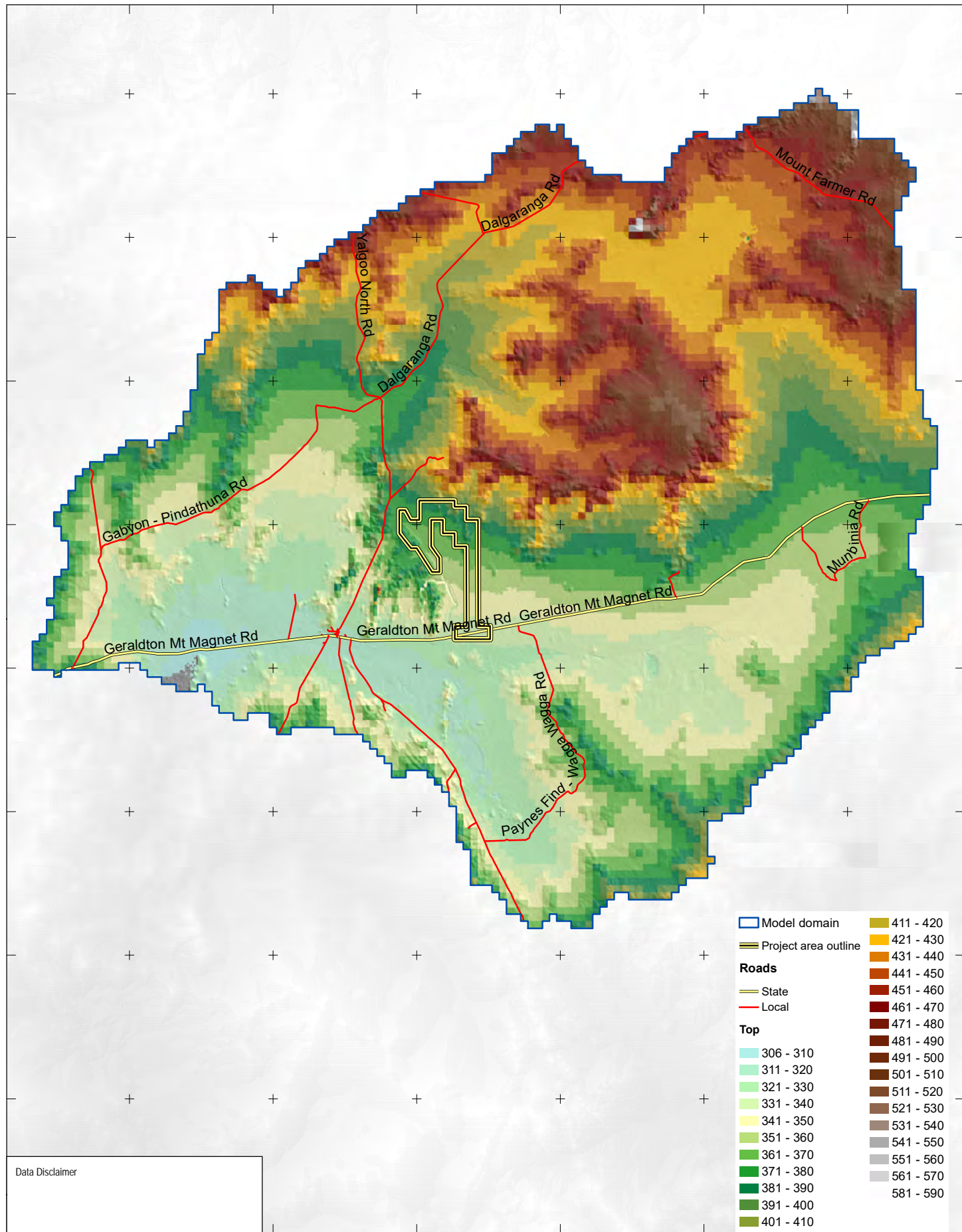
FINITE DIFFERENCE GRID

Project No. 61-37117
 Revision No. -
 Date 21/06/2019

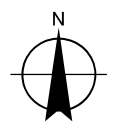
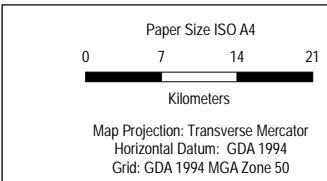
Figure E-02

440,000 460,000 480,000 500,000 520,000 540,000

6,940,000
6,920,000
6,900,000
6,880,000
6,860,000
6,840,000
6,820,000
6,800,000



Data Disclaimer



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Yogi-Magnetite Project

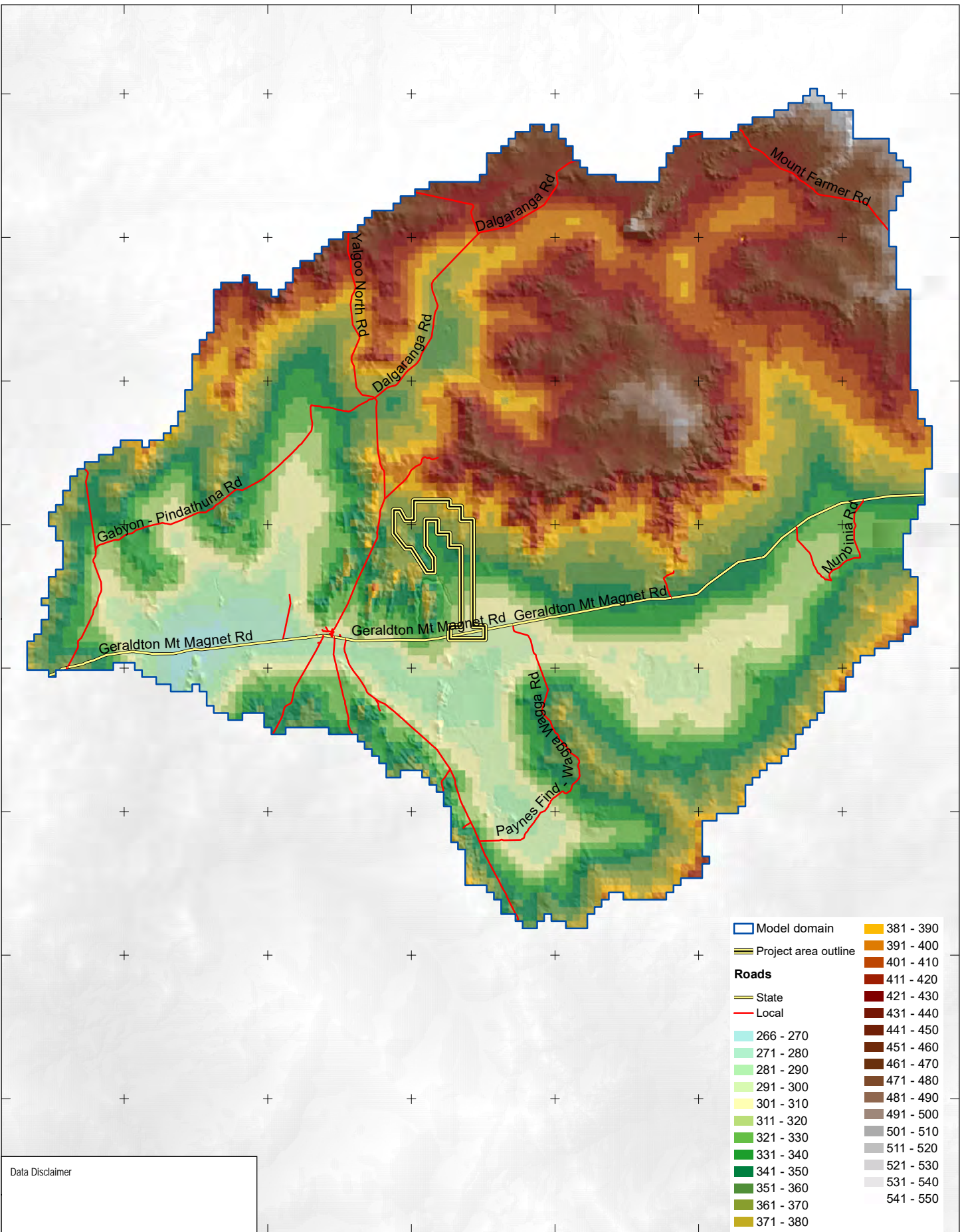
GROUND ELEVATION
TOP OF LAYER 1

Project No. 61-37117
Revision No. -
Date 20/06/2019

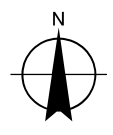
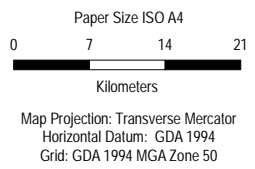
Figure E-03

440,000 460,000 480,000 500,000 520,000 540,000

6,800,000
6,820,000
6,840,000
6,860,000
6,880,000
6,900,000
6,920,000
6,940,000



Data Disclaimer



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Yogi-Magnetite Project

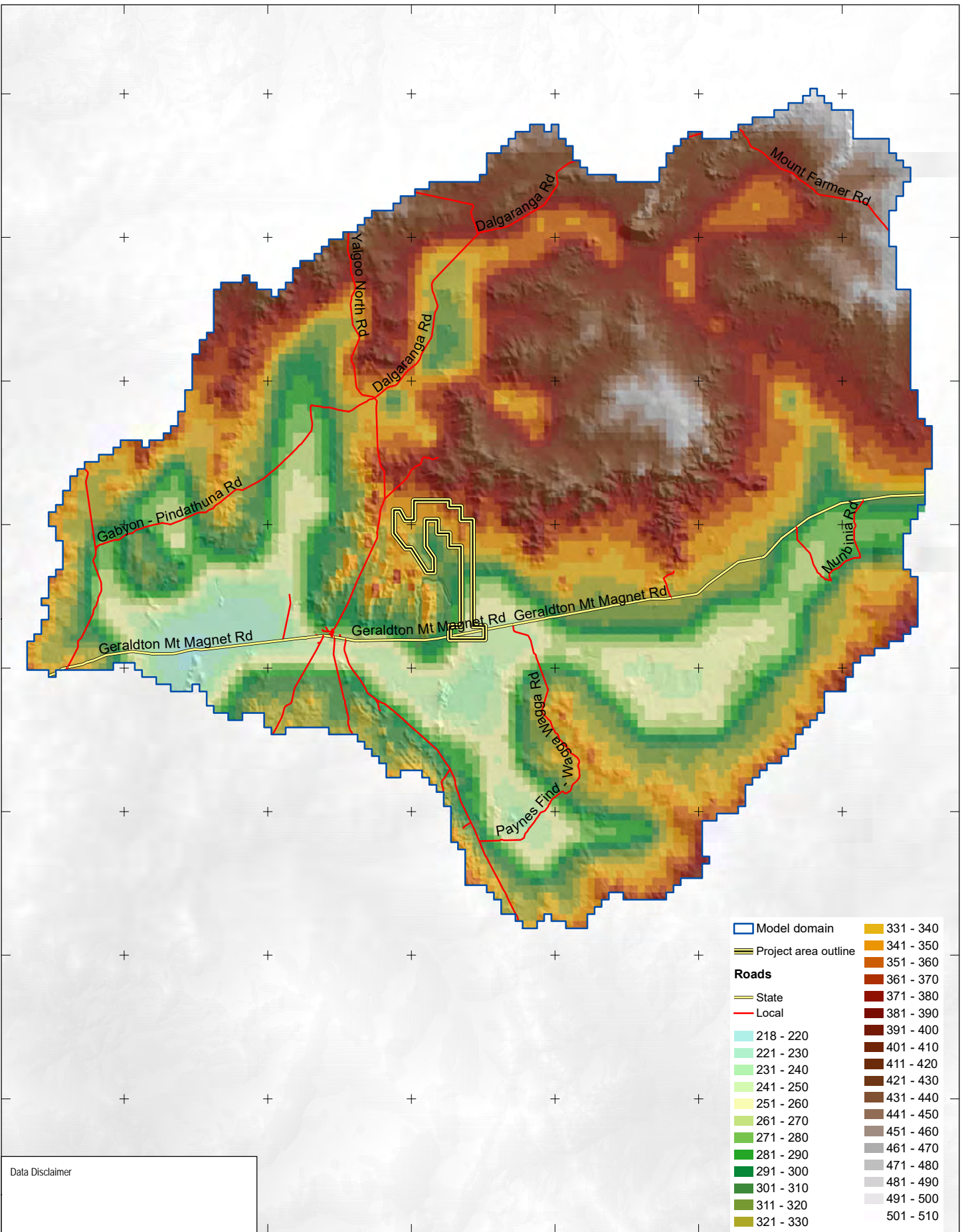
BASE ELEVATION
LAYER 1

Project No. 61-37117
Revision No. -
Date 20/06/2019

Figure E-04

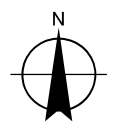
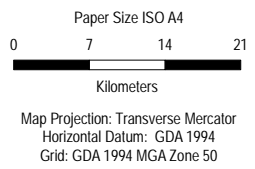
440,000 460,000 480,000 500,000 520,000 540,000

6,940,000
6,920,000
6,900,000
6,880,000
6,860,000
6,840,000
6,820,000
6,800,000



Model domain	331 - 340
Project area outline	341 - 350
Roads	
State	351 - 360
Local	361 - 370
	371 - 380
	381 - 390
	391 - 400
	401 - 410
	411 - 420
	421 - 430
	431 - 440
	441 - 450
	451 - 460
	461 - 470
	471 - 480
	481 - 490
	491 - 500
	501 - 510

Data Disclaimer



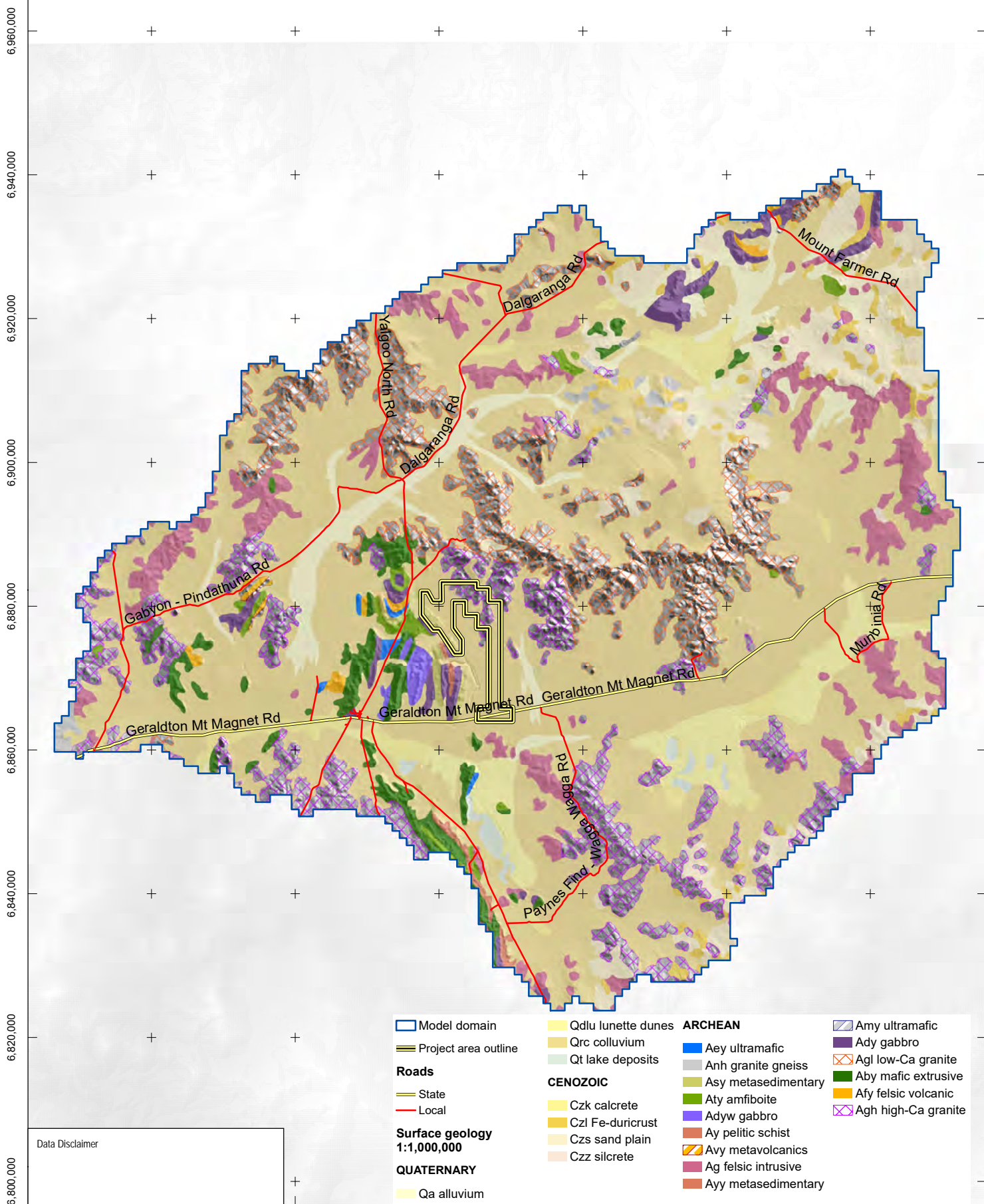
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Yogi-Magnetite Project

BASE ELEVATION
LAYER 2

Project No. 61-37117
Revision No. -
Date 20/06/2019

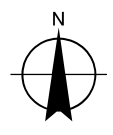
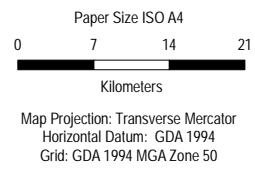
Figure E-05

440,000 460,000 480,000 500,000 520,000 540,000



- | | | | |
|------------------------|--------------------|---------------------|---------------------|
| Model domain | Qdlu lunette dunes | ARCHEAN | Amy ultramafic |
| Project area outline | Qrc colluvium | Aey ultramafic | Ady gabbro |
| Roads | Qt lake deposits | Anh granite gneiss | Agl low-Ca granite |
| State | CENOZOIC | Asy metasedimentary | Aby mafic extrusive |
| Local | Czk calcrete | Aty amfibolite | Afy felsic volcanic |
| Surface geology | Cz1 Fe-duricrust | Adyw gabbro | Agh high-Ca granite |
| 1:1,000,000 | Czs sand plain | Ay pelitic schist | |
| QUATERNARY | Czz silcrete | Avy metavolcanics | |
| Qa alluvium | | Ag felsic intrusive | |
| | | Ayy metasedimentary | |

Data Disclaimer

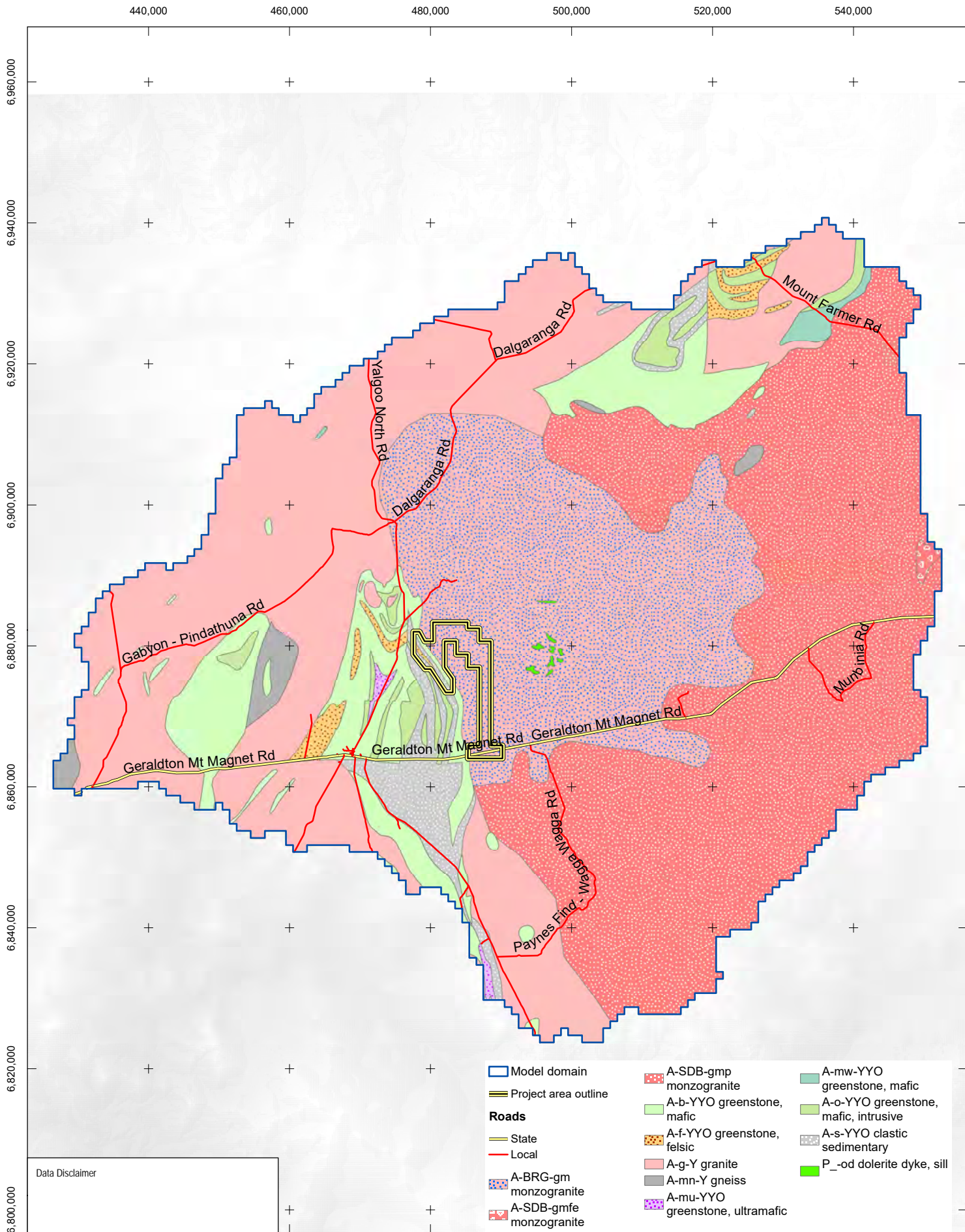


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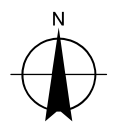
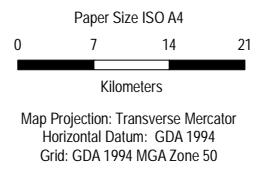
SURFACE GEOLOGY
1:1,000,000

Project No. 61-37117
Revision No. -
Date 21/06/2019

Figure E-06



Data Disclaimer



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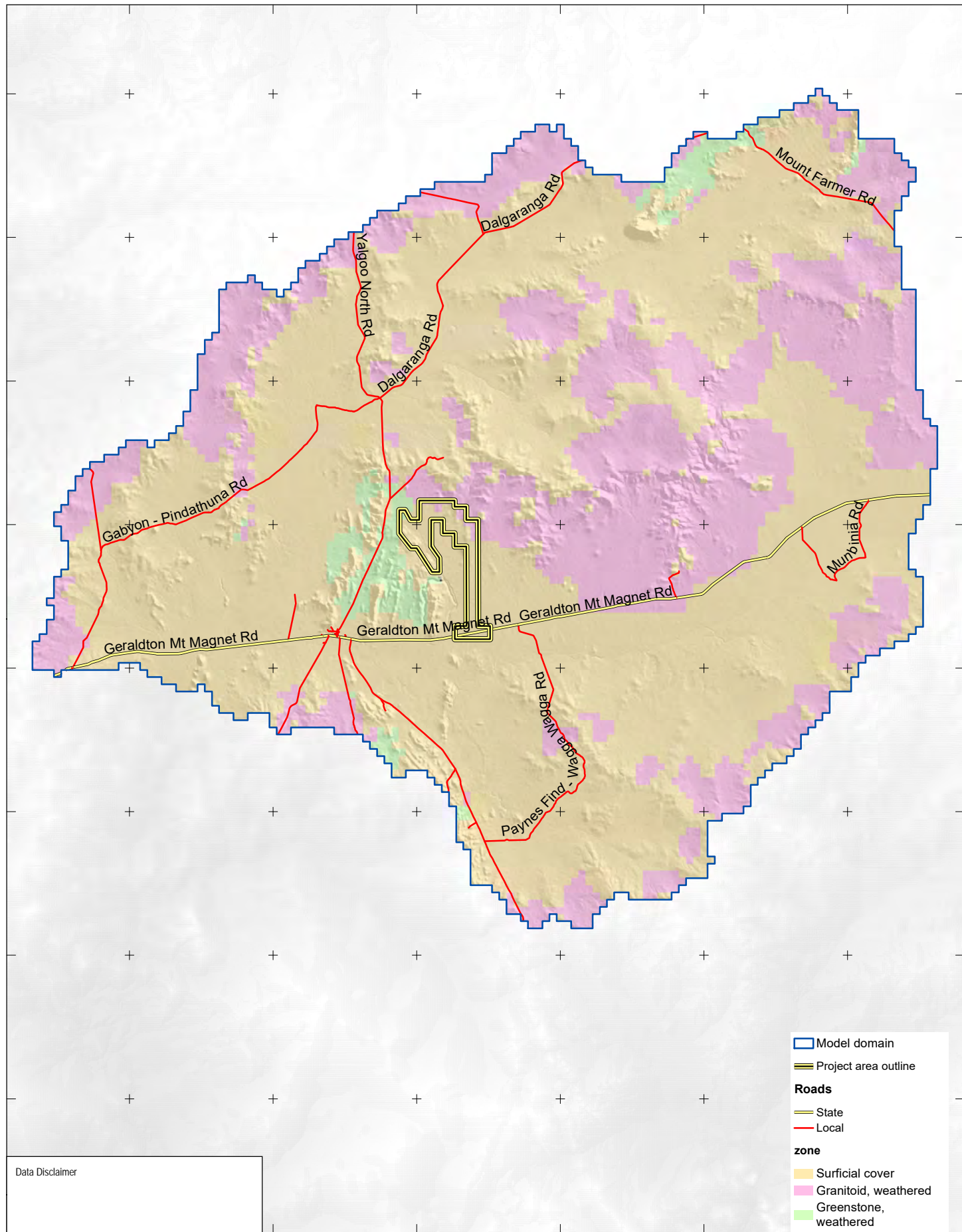
BASEMENT GEOLOGY
1:500,000

Project No. 61-37117
Revision No. -
Date 21/06/2019

Figure E-07

440,000 460,000 480,000 500,000 520,000 540,000

6,800,000
6,820,000
6,840,000
6,860,000
6,880,000
6,900,000
6,920,000
6,940,000



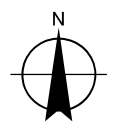
Model domain
 Project area outline
Roads
 State
 Local
zone
 Surficial cover
 Granitoid, weathered
 Greenstone, weathered

Data Disclaimer

Paper Size ISO A4

0 7 14 21
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

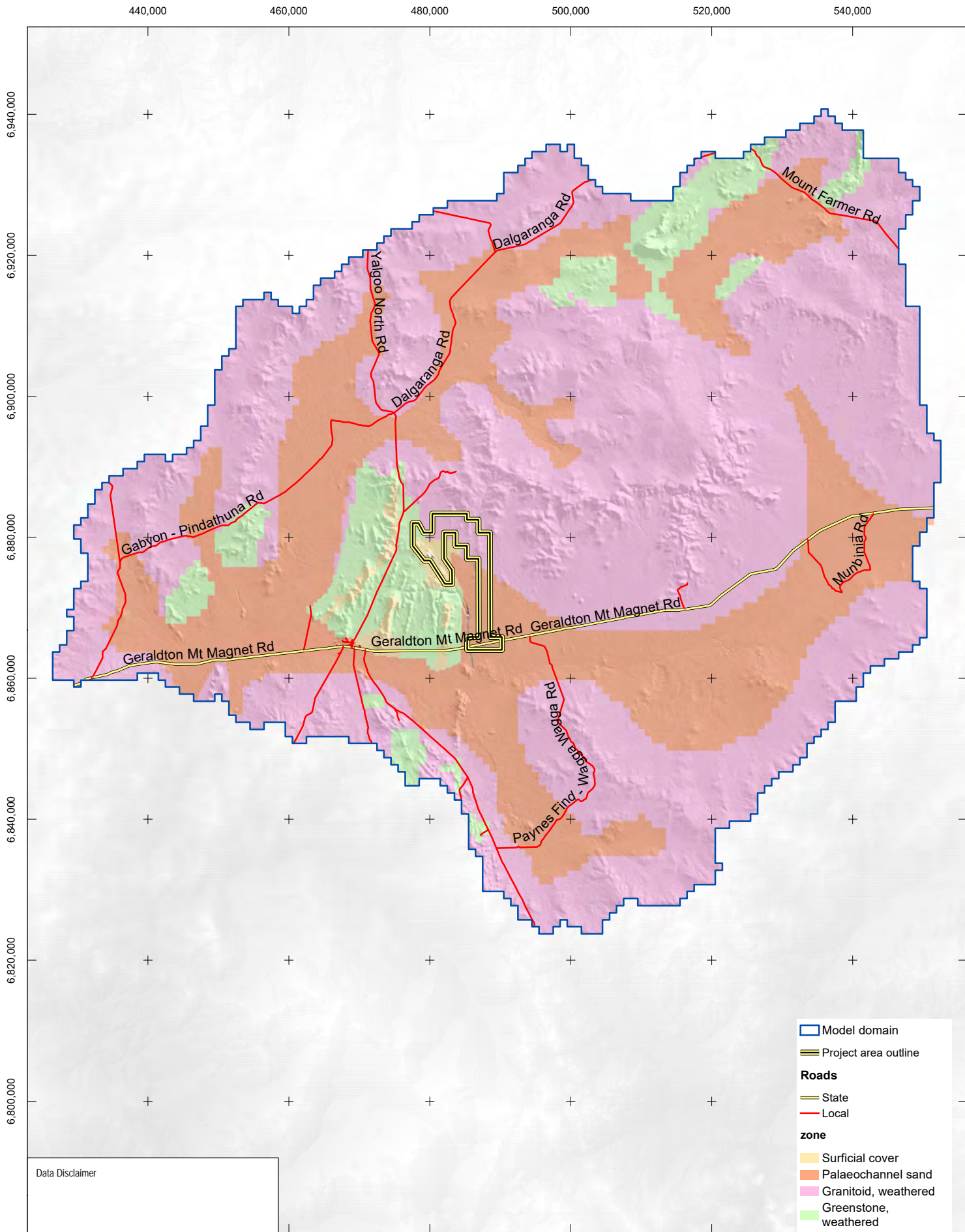


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PARAMETER ZONES MODEL LAYER 1

Project No. 61-37117
Revision No. -
Date 20/06/2019

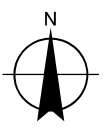
Figure E-08



Paper Size ISO A4

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Kilometers

Map Projection: Transverse Mercator
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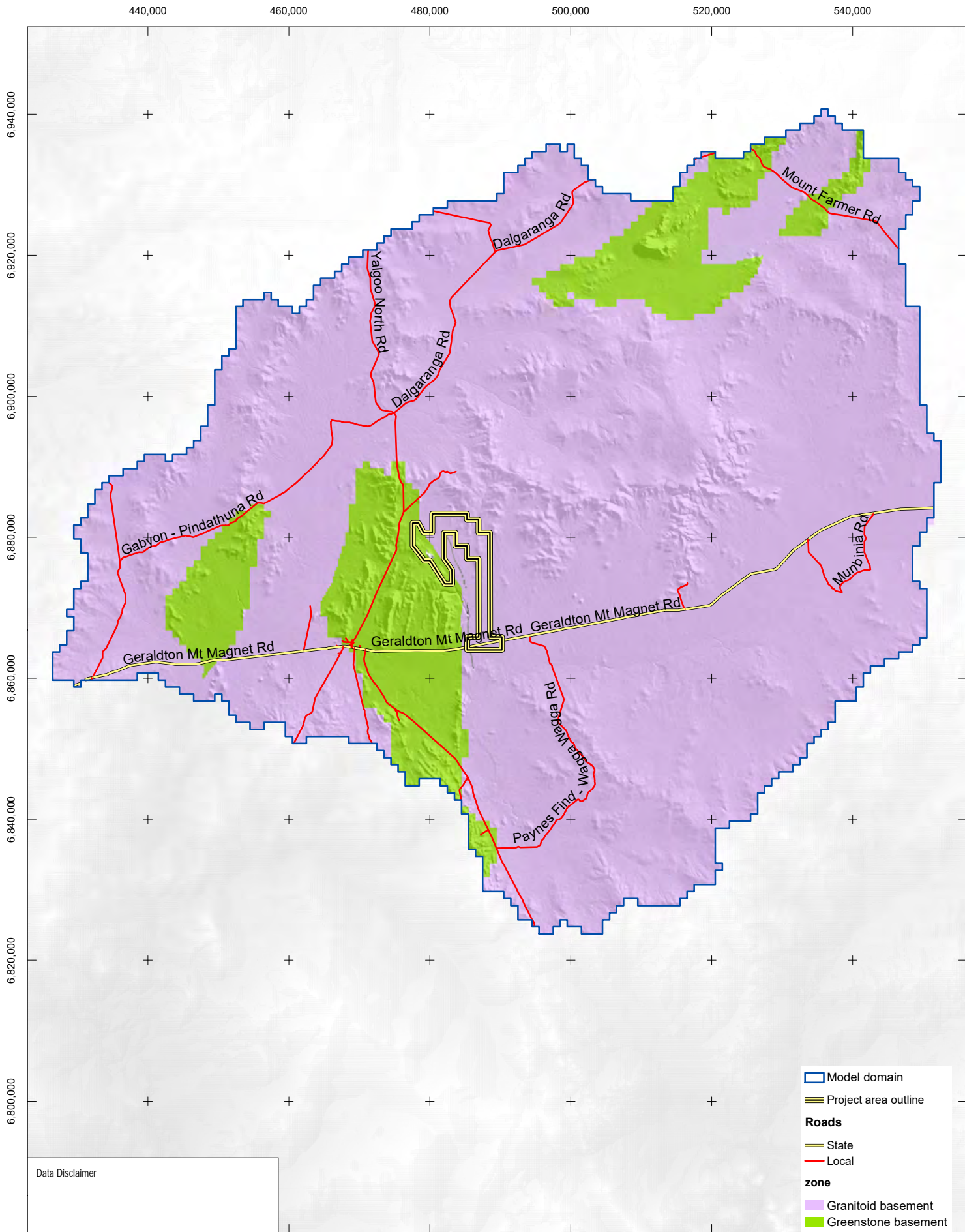


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**PARAMETER ZONES
MODEL LAYER 2**

Project No. 61-37117
Revision No. -
Date 20/06/2019

Figure E-09



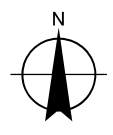
Model domain
 Project area outline
Roads
 State
 Local
zone
 Granitoid basement
 Greenstone basement

Data Disclaimer

Paper Size ISO A4

0 7 14 21
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50



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Yogi-Magnetite Project

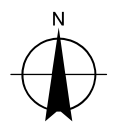
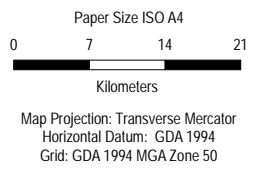
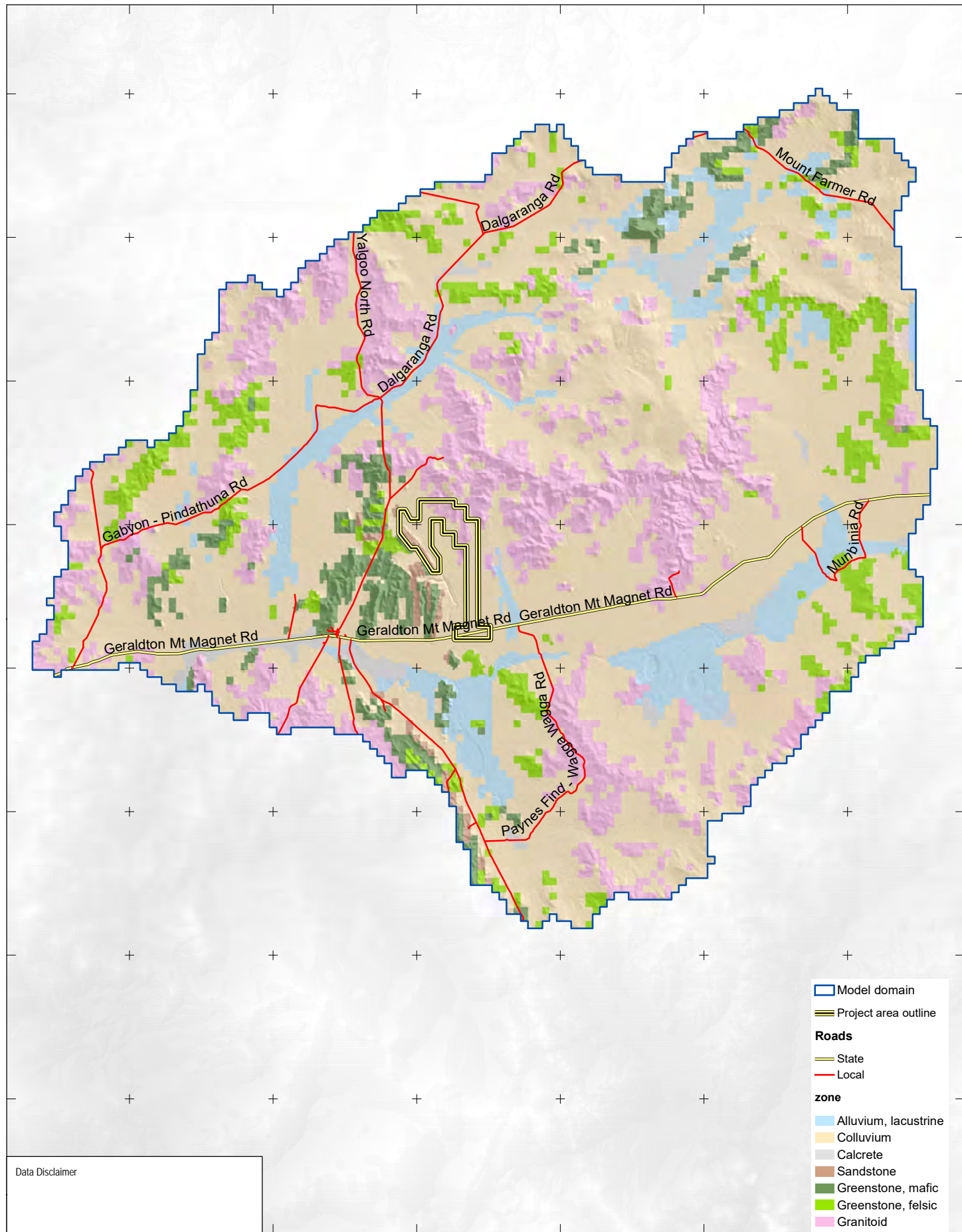
**PARAMETER ZONES
MODEL LAYER 3**

Project No. 61-37117
Revision No. -
Date 20/06/2019

Figure E-10

440,000 460,000 480,000 500,000 520,000 540,000

6,940,000
6,920,000
6,900,000
6,880,000
6,860,000
6,840,000
6,820,000
6,800,000

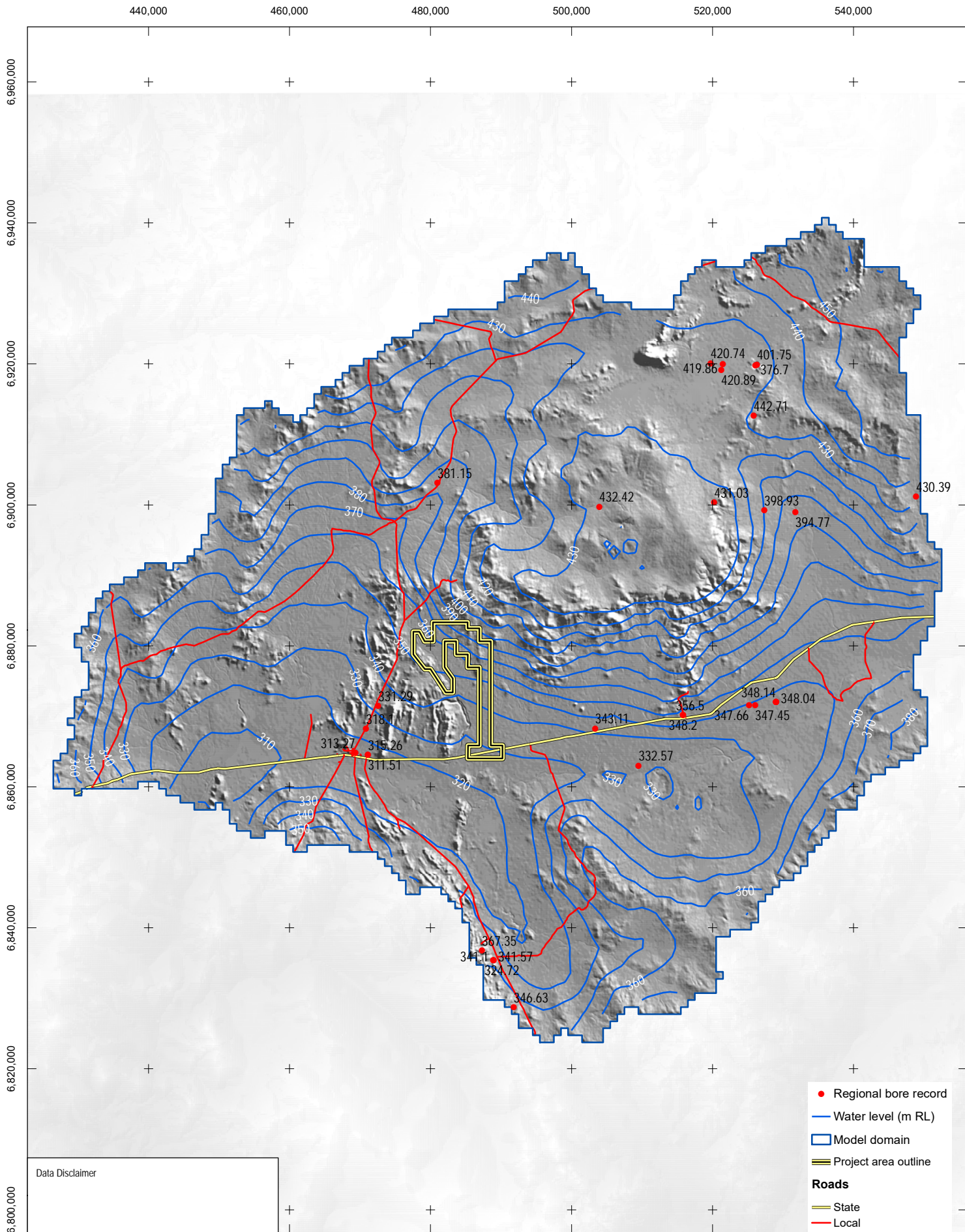


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RECHARGE ZONES

Project No. 61-37117
Revision No. -
Date 20/06/2019

Figure E-11

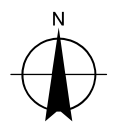


Data Disclaimer

- Regional bore record
 - Water level (m RL)
 - ▭ Model domain
 - ▭ Project area outline
- Roads**
- State
 - Local

Paper Size ISO A4
 0 7 14 21
 Kilometers

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



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Project No. 61-37117
 Revision No. -
 Date 21/06/2019

**SIMULATED WATER LEVELS
 (STEADY STATE)**

Figure E-12

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75721/[https://projects.ghd.com/oc/WesternAustralia1/yogimagnetiteproject/Delivery/Documents/6137117-REP_A_Hydrogeological Technical Report.docx](https://projects.ghd.com/oc/WesternAustralia1/yogimagnetiteproject/Delivery/Documents/6137117-REP_A_Hydrogeological%20Technical%20Report.docx)

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A Osbaldeston	M Simonic		M Brook		24/6/19

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