Appendix A

Geology and hydrostratigraphic classification

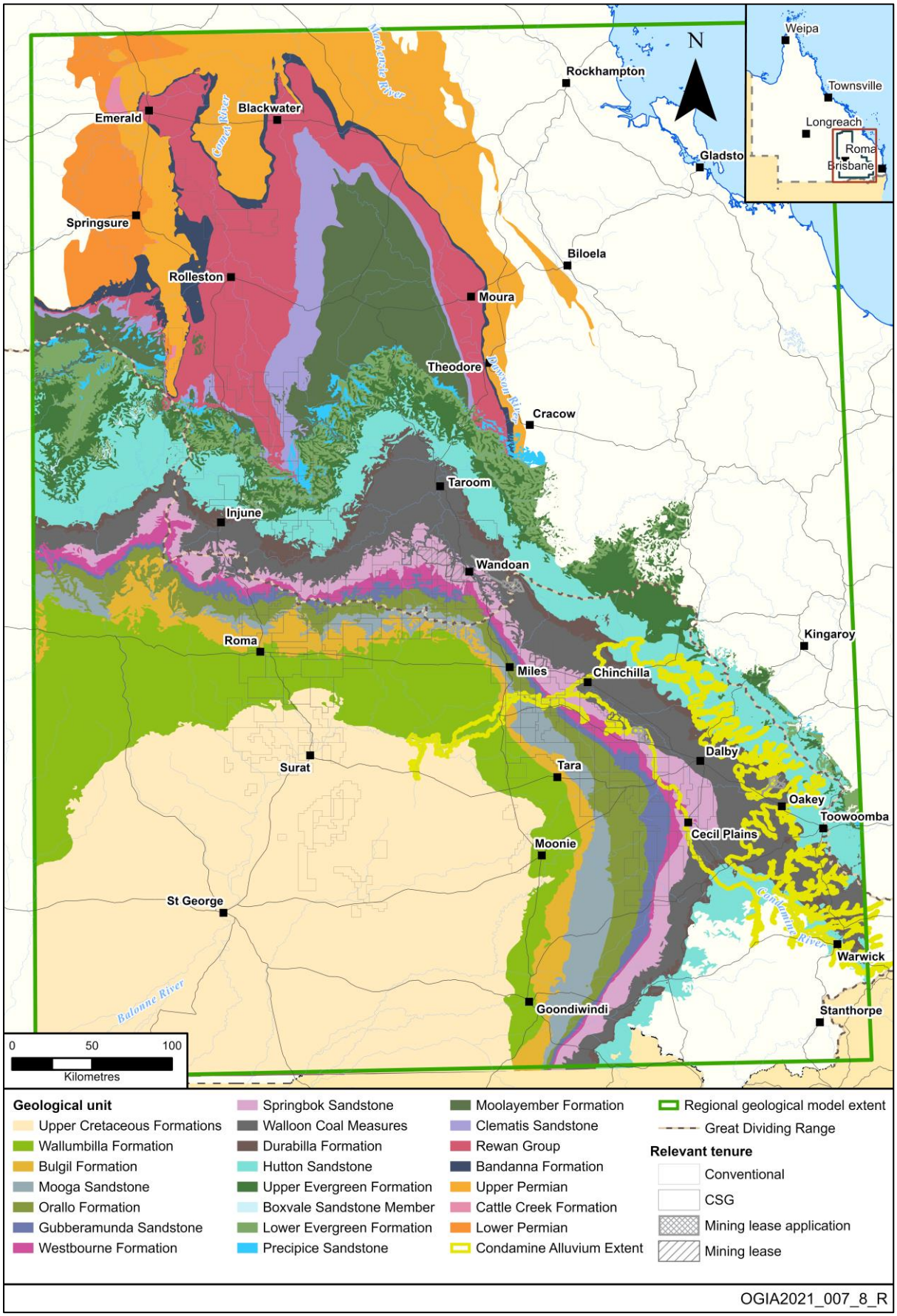

Figure A-1: Solid geology in the model domain (Cenozoic cover removed)

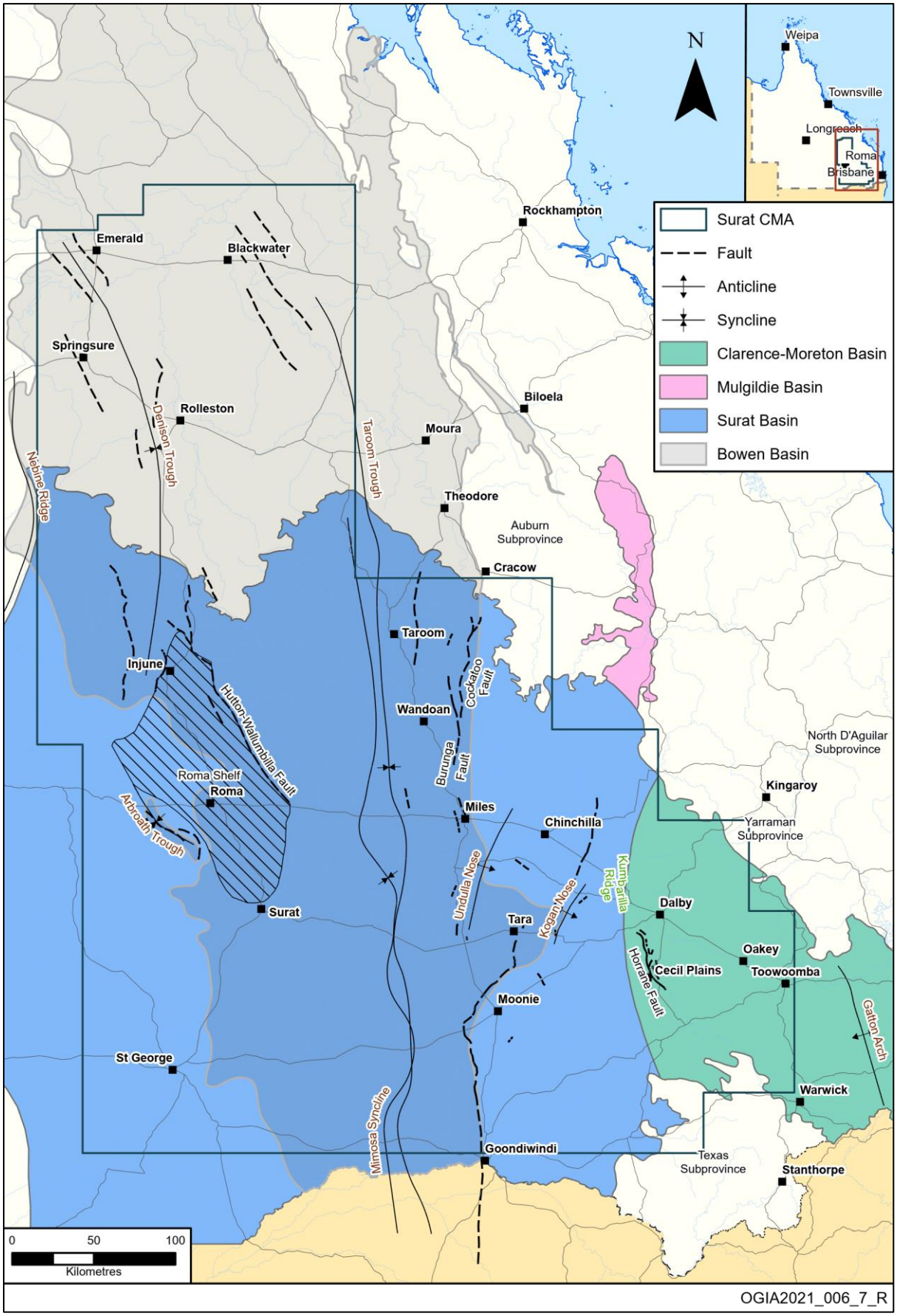

Figure A-2: Geological basins and major structural elements in the Surat CMA

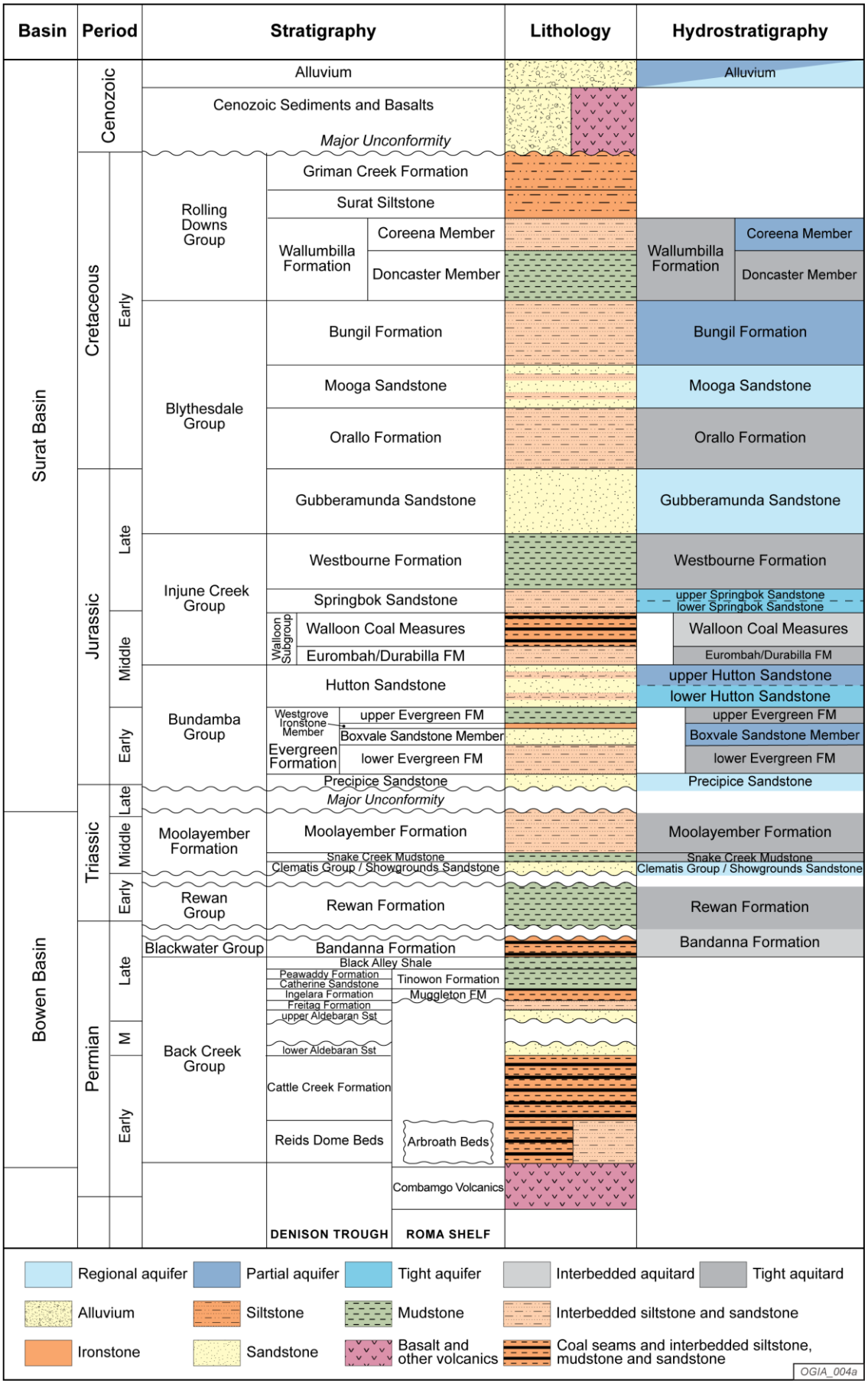

Figure A-3: Generalised hydrostratigraphic classification in the Surat CMA

Appendix B

Key datasets and scientific assessments underpinning the UWIR

B.1 Datasets

This is a list of key raw datasets used in the assessment in the UWIR.

- Downhole geophysical logs from 9,365 CSG and P&G wells such as gamma, resistivity, neutron density, calliper logs etc and well construction details such as casing and screens, plugs and slotted intervals.
- Downhole geophysical logs from over 9,000 coal holes with gamma ray, density, and some other common log types
- Data from 67,046 water bores from the GWDB with locations, of which 62,595 have recorded depths and 43,944 contain construction details.
- Around 12,000 permeability measurements, from Core and Drill Stem Tests sourced form tenure holders
- 5,100 2D-seismic lines and 10 3D-Seismic Surveys
- Bore baseline, bore assessment and bore census information collected by tenure holders
- Water level and hydrochemical information from the GWDB, WMS and bore and baseline assessments
- WMS database (pressure, water chemistry and associated water volumes)
- Non-consumptive groundwater use by P&G tenure holders from GSQ open data portal
- Coal tenure holder associated water estimates from the GSQ open data portal
- Airborne Electromagnetic data aquifer by Geoscience Australia in the Surat Basin (Ray et al. 2021)
- InSAR data of observed ground motion over time (Acquired by OGIA directly from ALTAMIRA)

B.2 Primary data analysis

This is a list of key primary data analysis by OGIA or others that is used in supporting the assessment and management strategies in the UWIR.

- Stratigraphic interpretation of 9,365 petroleum wells, 4,480 coal holes and 35 water bores together with lithological interpretation of wireline logs at 10cm for six lithological classes: sandstone (clean sand), sandstone dominated heterolith (dirty sand), mudstone dominated heterolith (siltstone), mudstone, carbonaceous shale and coal – by Integrated Geoscience
- Depth-converted seismic interpretation from about 100 seismic lines – commissioned by OGIA and undertaken by UQ
- Outcrop mapping – by GSQ (Cranfield 2017)
- Desktop verification of 4,094 bore baseline and bore census records, with some field verification, resulting in an update to approximately 2,000 bore locations– by OGIA
- Interpretation of bore construction data in relation to intercepted geology to determine source aquifer from which the bore is likely to be accessing water – by OGIA

- Compilation of respective resource development profiles – provided by the industry and compiled by OGIA
- Compilation and QAQC of water chemistry data from GWDB, WMS, Baseline, OGIA projects as well as supplementary datasets from CSIRO and GA
- Compilation and QAQC of water level data from GWDB, WMS, Baseline and OGIA projects
- Automated generation of potentiometric surfaces from available data (OGIA 2021a)
- Identification of CSG wells and coal holes screened across multiple formations and assessment of implications for connectivity (OGIA 2021b)

B.3 Development of methods and techniques by OGIA

This is a list of key methods and techniques primarily developed by OGIA in supporting the assessment and management strategies in the UWIR.

- Determination of source aquifers for bores and wells (OGIA 2021c)
- A method for estimating unmetered water use (stock and domestic (S&D) and non-S&D) – developed originally by OGIA in 2012 and modified in 2016 and 2020 (Singh et al. 2020)
- A method to perform fault juxtaposition and seal analysis (OGIA 2020)
- Development of a spring typology to classify springs in the Surat CMA (OGIA 2016a)
- Refined chloride mass balance (CMB) techniques for estimating groundwater recharge (OGIA 2016b)
- Numerical permeameters for obtaining regionally upscaled Hydraulic conductivity from detailed lithology and permeability data (OGIA 2016c, 2019a)
- A method to approximate two phase flow in MODFLOW-USG (Herckenrath, Doherty & Panday 2015)
- Estimation of permeability enhancement due to placement of CSG wells (OGIA 2016c)
- A method to represent geological faults in groundwater models (OGIA 2016c)
- Advanced signal processing techniques to determine the influence of stressors on groundwater levels (OGIA 2021a)
- Development of an analytical geomechanical modelling code to predict Subsidence (OGIA 2021d)
- Analytical estimates of drawdown and radius of influence in formations adjacent to WCM at coal exploration holes and selected production wells (OGIA 2021b)

B.4 Models

This is a list of various models developed by OGIA in supporting the assessment in the UWIR.

- Regional-scale geological model of the Surat and the southern Bowen basins, covering an area of approximately 450×650 km, including 21 layers (all majors units), 32 major faults at 250-m grid resolution – developed by OGIA in Petrel (OGIA 2019b, 2021e)
- Detailed sub-regional geological model developed for the Northern Coal Area, at 250-m resolution, covering an area of approximately 150×115 km, with 7 model layers (OGIA 2021e)

- Detailed sub-regional geological model around the New Acland mine at a 100-m grid resolution, covering an area of approximately 75×65 km, with 8 model layers and 10 faults (OGIA 2021e)
- Local-scale model around the Horrane Fault at 100 m resolution, covering an area of approximately 25×40 km, with 10 layers (OGIA 2021e)
- A two-phase flow model in Eclipse designed to test pseudo-dual phase approximation (OGIA 2016c)
- A dual steady state and transient calibrated regional groundwater flow model comprising of 35 layers with a 1.5×1.5 km grid resolution, covering an area of approximately 450×650 km and supported by 3,000 calibrated parameter sets obtained using PEST++IES (OGIA 2021f, 2019a)
- A detailed groundwater model for the Condamine Alluvium designed to support water planning, at a 500-m grid resolution with two layers (KCB 2011)
- A sub-regional groundwater model developed by OGIA for the purpose of assessing near-surface cumulative groundwater impacts from resource development in the Northern Coal Area (OGIA 2021f)
- A local groundwater model developed by SLR to assess groundwater impacts arising from the New Acland coal mine (SLR 2018)
- A 3D geomechanical model for the Condamine Alluvium area covering an area of approximately 50×130 km) at 750-m resolution, with 88 layers, developed to support OGIA in collaboration with Schlumberger
- A history-matched, analytical subsidence model, coupled to OGIA's regional groundwater model and calibrated to InSAR observations in the Condamine Alluvium (OGIA 2021d)

B.5 Scientific assessments

This is a list of key assessments, but not limited to, by the industry and other research organisations that OGIA has incorporated in supporting the assessment and management strategies in the UWIR.

- An updated geological and hydrogeological assessment of the Precipice Sandstone (Hayes, Nicol & Underschultz 2019)
- Conceptualisation and characterisation of faults in the Surat Basin (OGIA 2020)
- Assessment of groundwater connectivity between the Condamine Alluvium and the Walloon Coal Measures by OGIA in collaboration with Arrow (OGIA 2016d)
- Hydrogeological conceptualisation in the Surat Cumulative Management Area (OGIA 2016b)
- Hydrochemical characterisation of aquifers in the Surat CMA (OGIA 2021a)
- Assessment of CSG-induced subsidence in the Surat CMA (OGIA 2021d)
- CSIRO tracer study (Siade et al. 2018)
- GABWRA study (Smerdon & Ransley 2012)

B.6 Workflow automation

- Automation of multicriteria trend analysis workflows (OGIA 2021a)
- Custom model clipping and refinement tools to automate the construction of local sub-models
- Automated compilation and plotting of timeseries data (OGIA 2021a)
- Model postprocessing codes to combine impacts from models at different spatial and temporal scales
- Model post processing utilities to extract stochastic impact predictions at bores, springs and GDE's and to obtain impacted areas for key aquifers.

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Appendix C

Planned commencement and cessation of CSG production areas

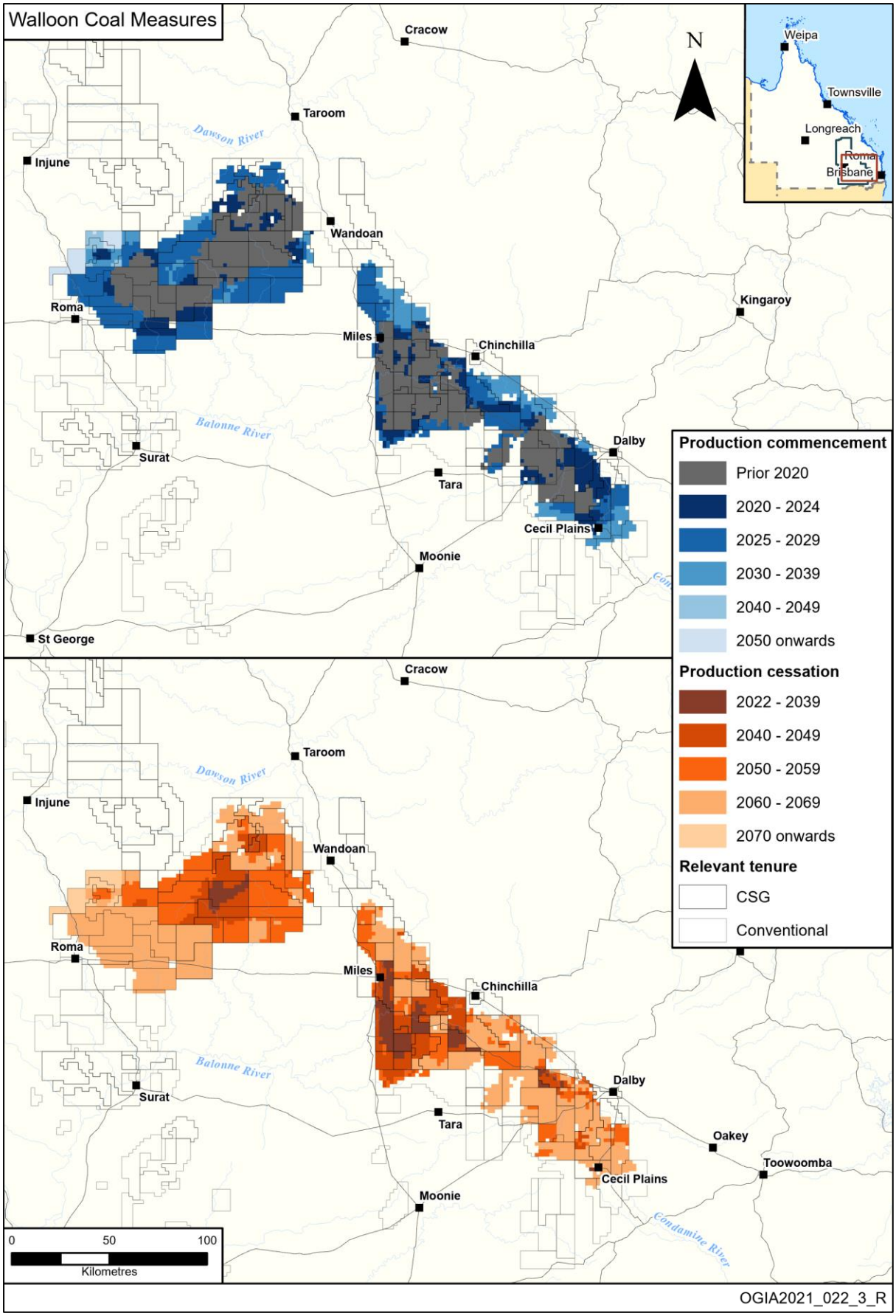

Figure C-1: Planned commencement and cessation of CSG production areas in the Surat Basin

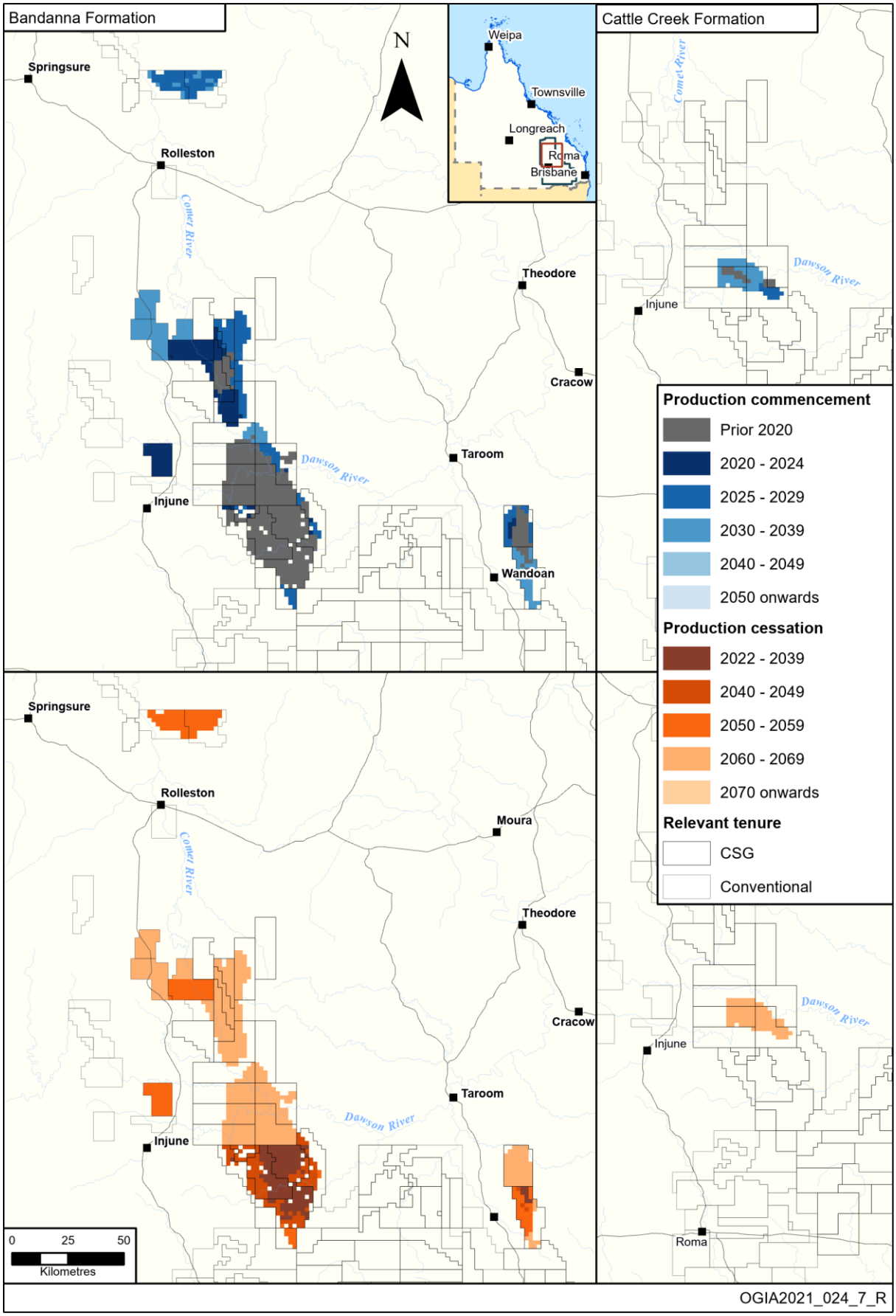

Figure C-2: Planned commencement and cessation of CSG production areas in the Bowen Basin

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Appendix D

Groundwater level trends

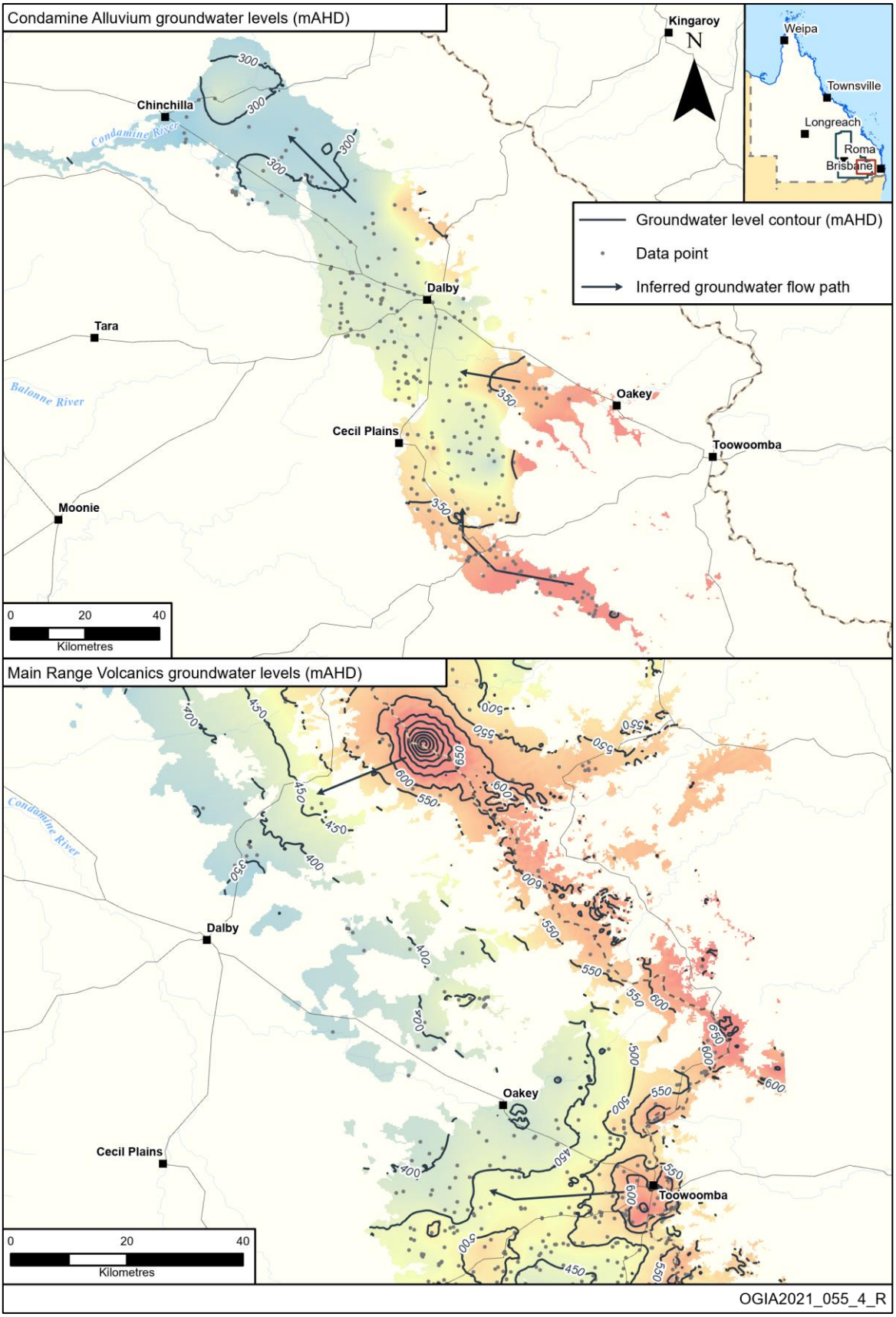

Figure D-1: Interpreted groundwater flow directions – Condamine Alluvium and Main Range Volcanics

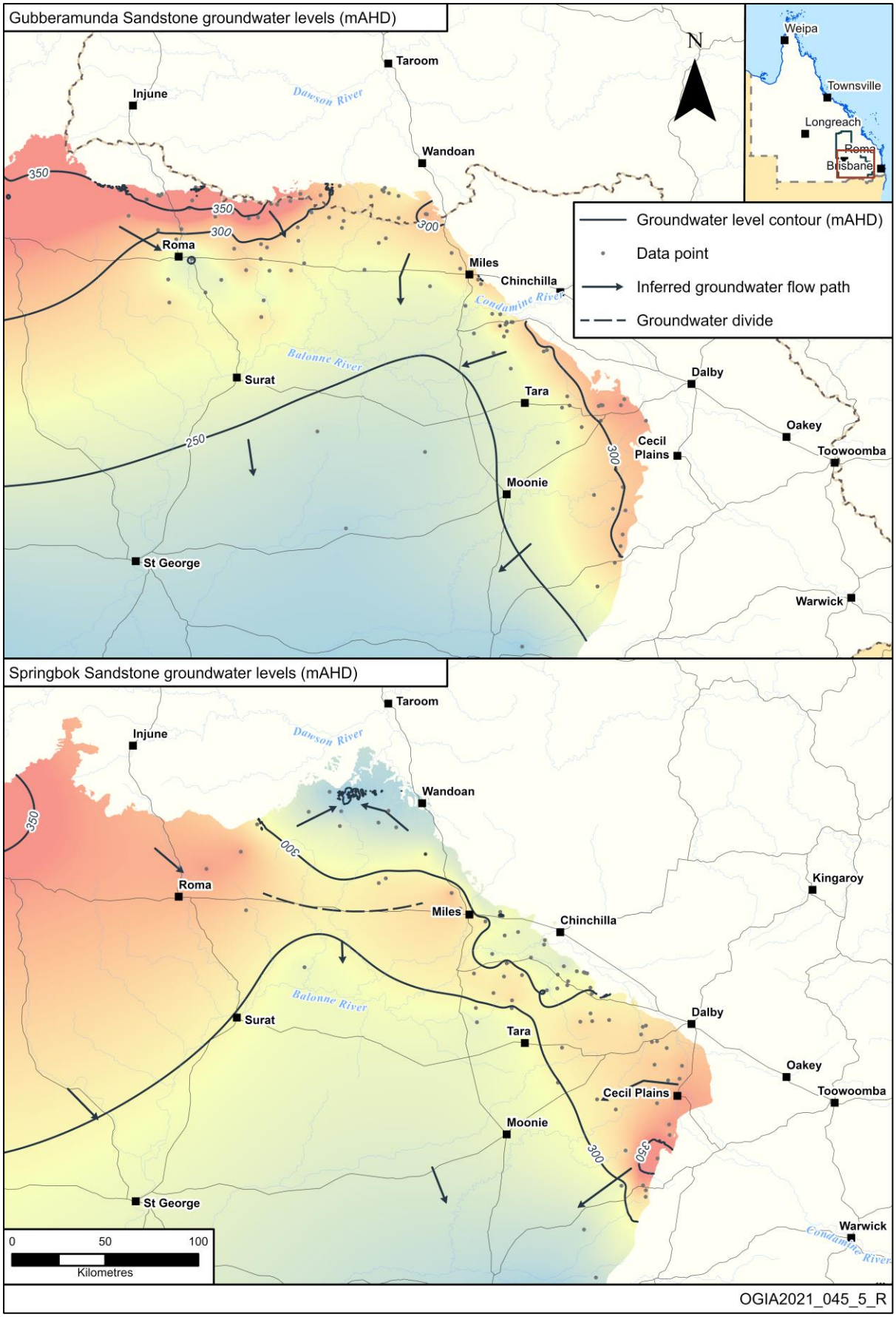

Figure D-2: Interpreted groundwater flow directions – Gubberamunda Sandstone and Springbok Sandstone

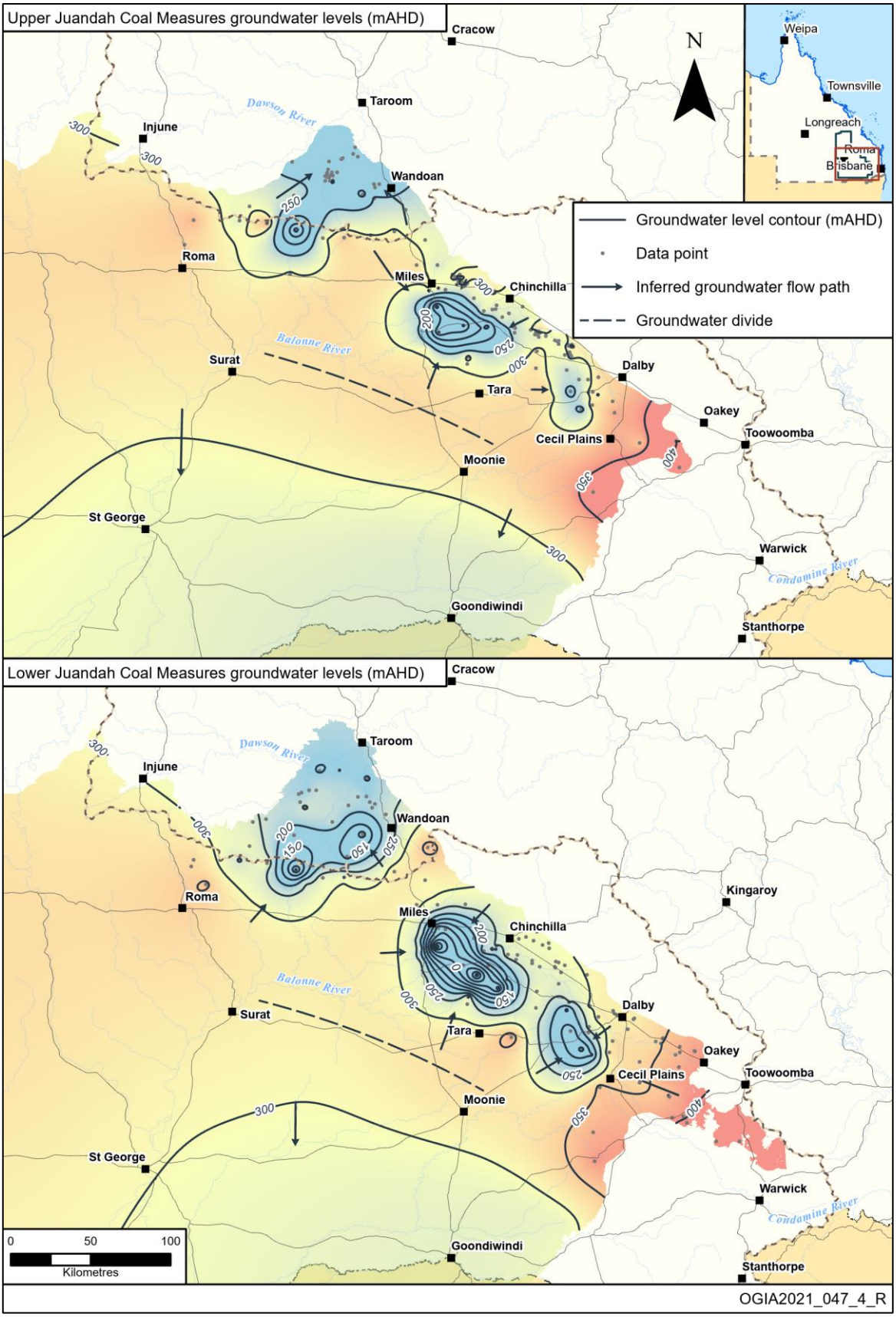

Figure D-3: Interpreted groundwater flow directions – Upper Juandah Coal Measures and Lower Juandah Coal Measures

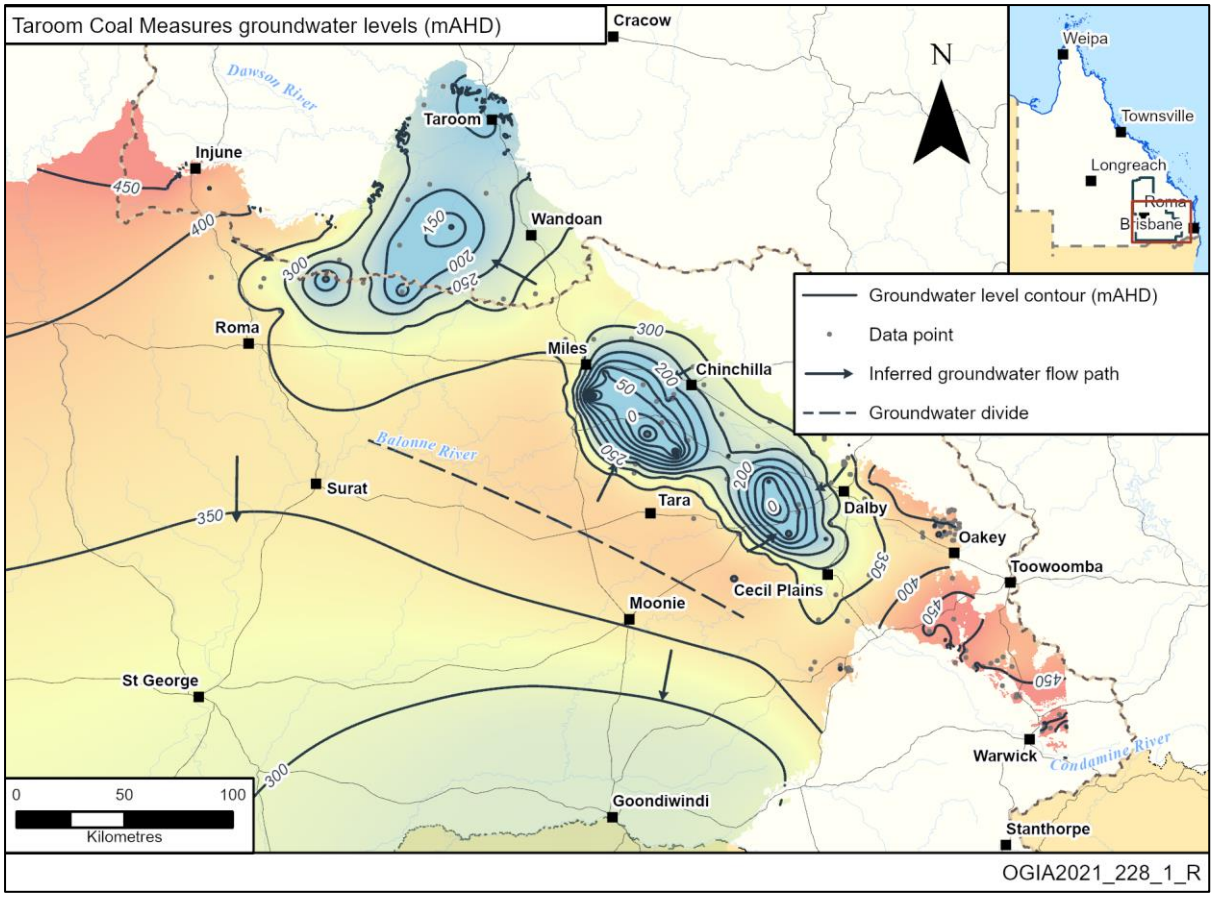

Figure D-4: Interpreted groundwater flow directions – Taroom Coal Measures

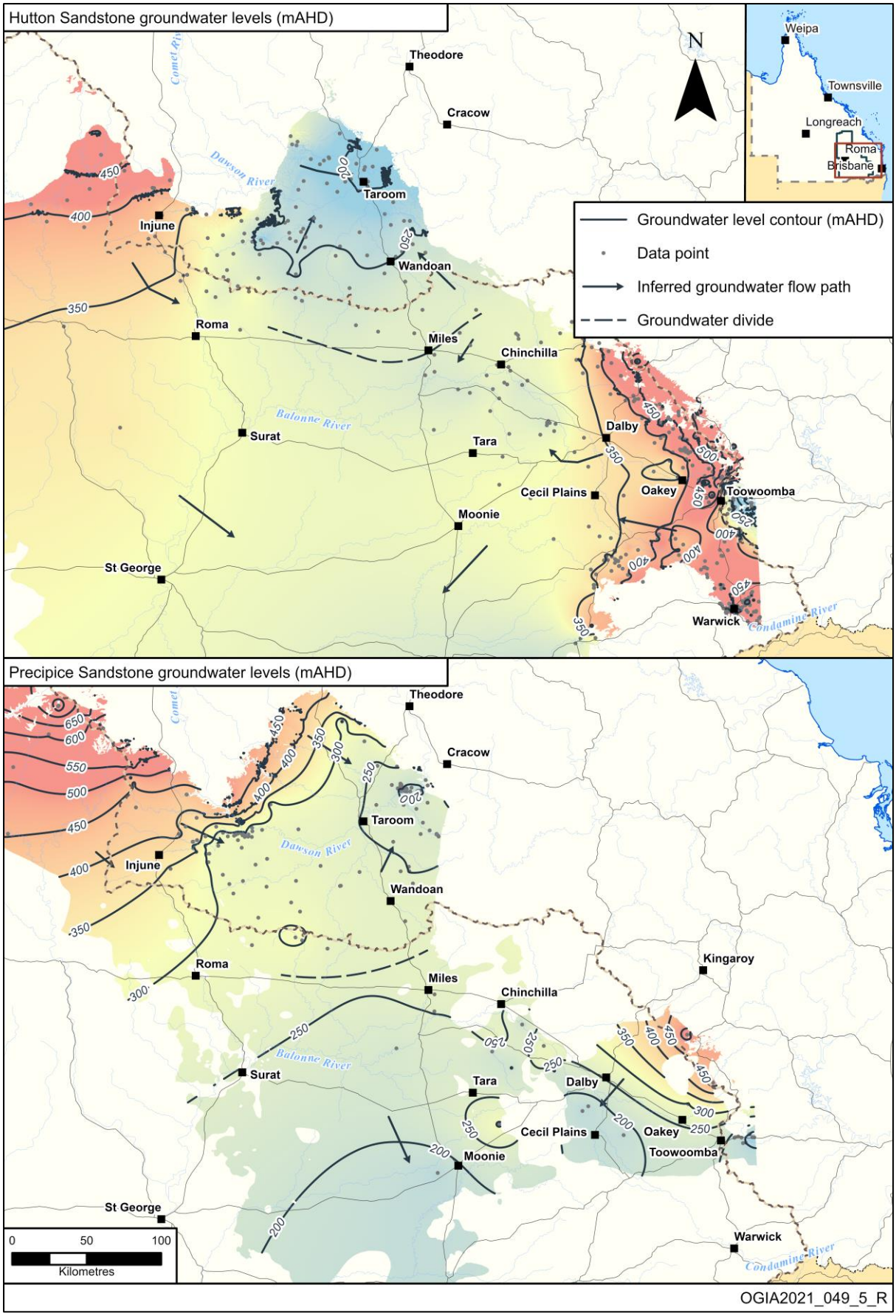

Figure D-5: Interpreted groundwater flow directions – Hutton Sandstone and Precipice Sandstone

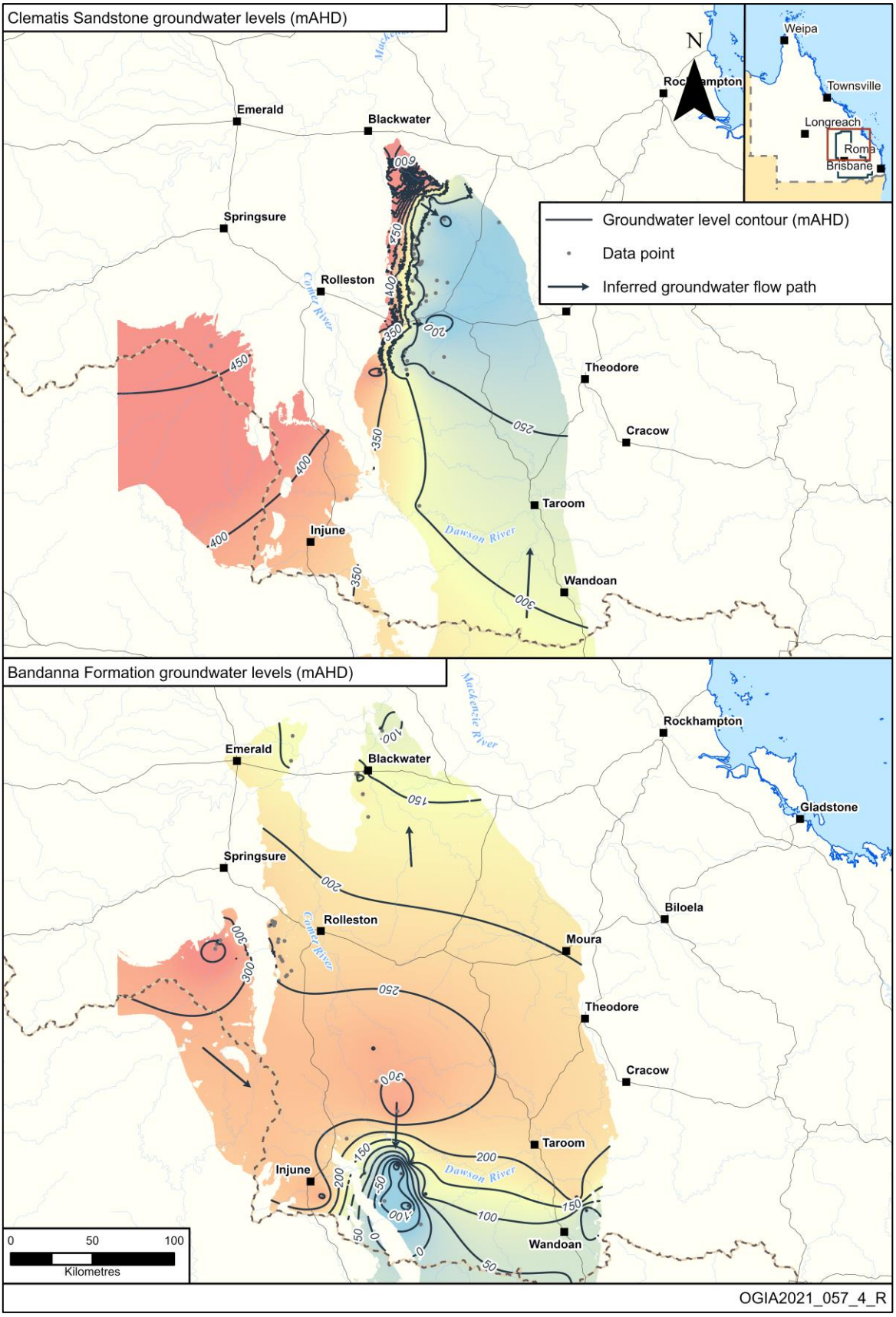

Figure D-6: Interpreted groundwater flow directions – Clematis Sandstone and Bandanna Formation

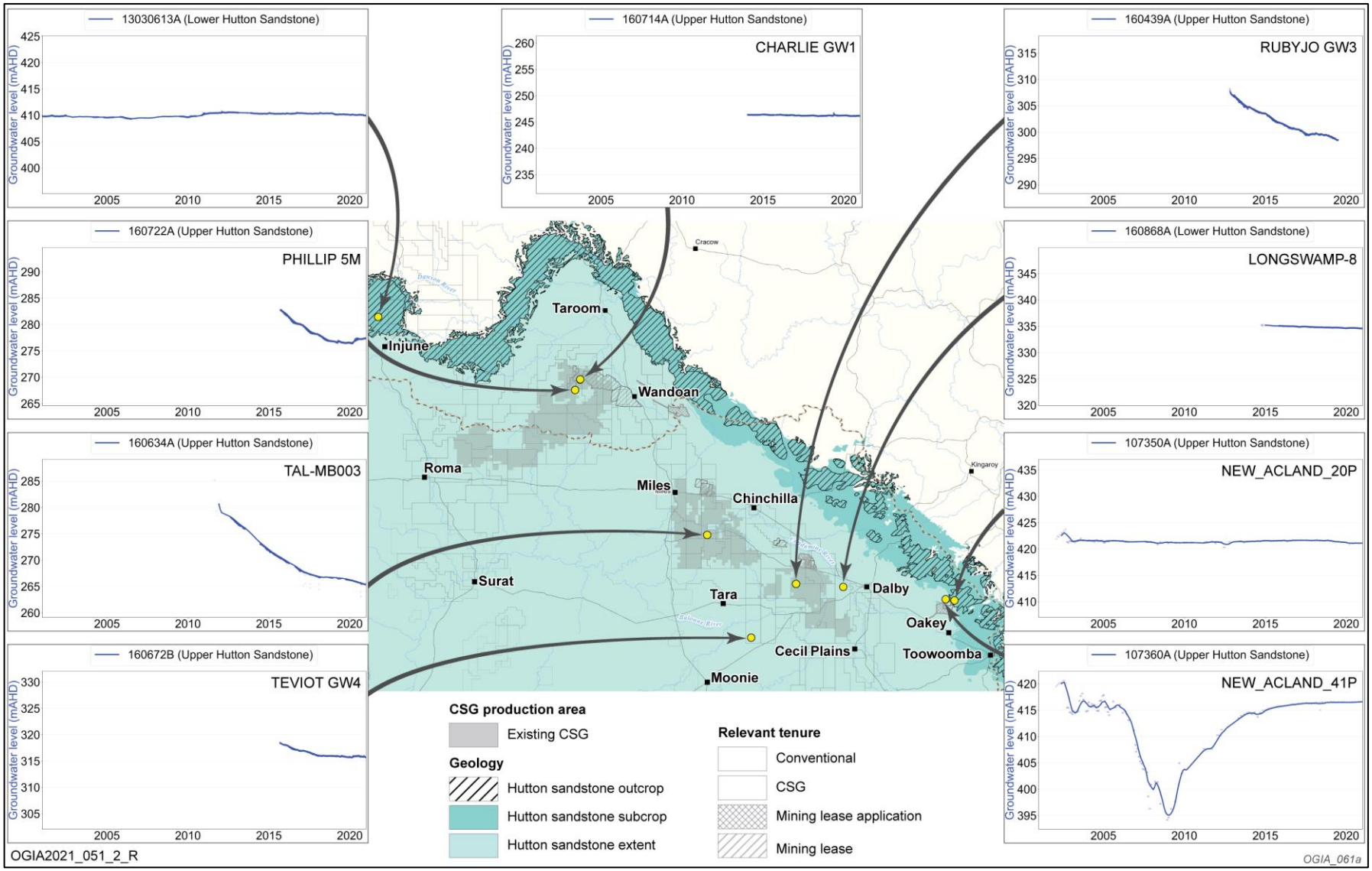

Figure D-7: Spatial distribution of selected hydrographs in the Hutton Sandstone

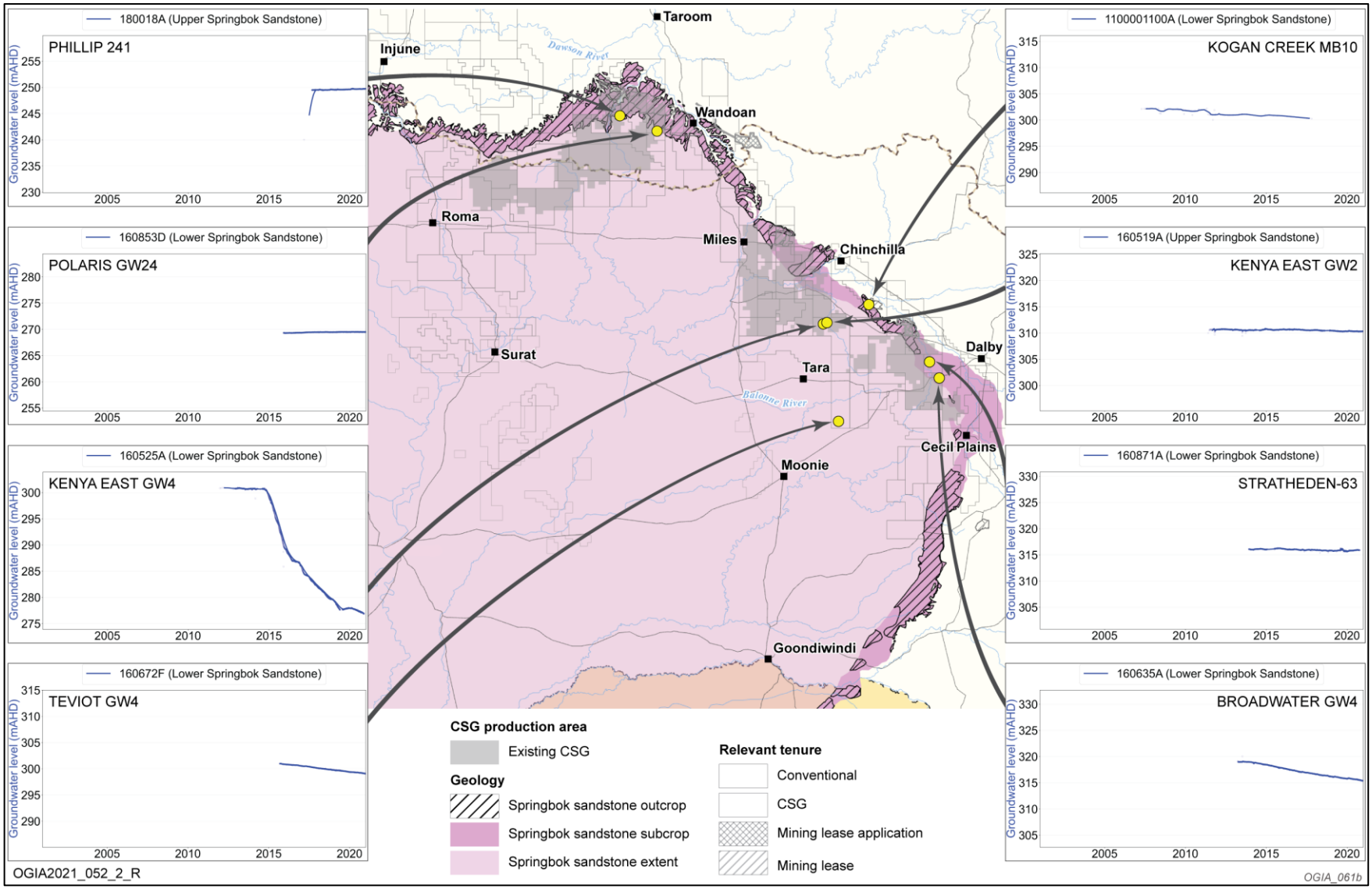

Figure D-8: Spatial distribution of selected hydrographs in the Springbok Sandstone

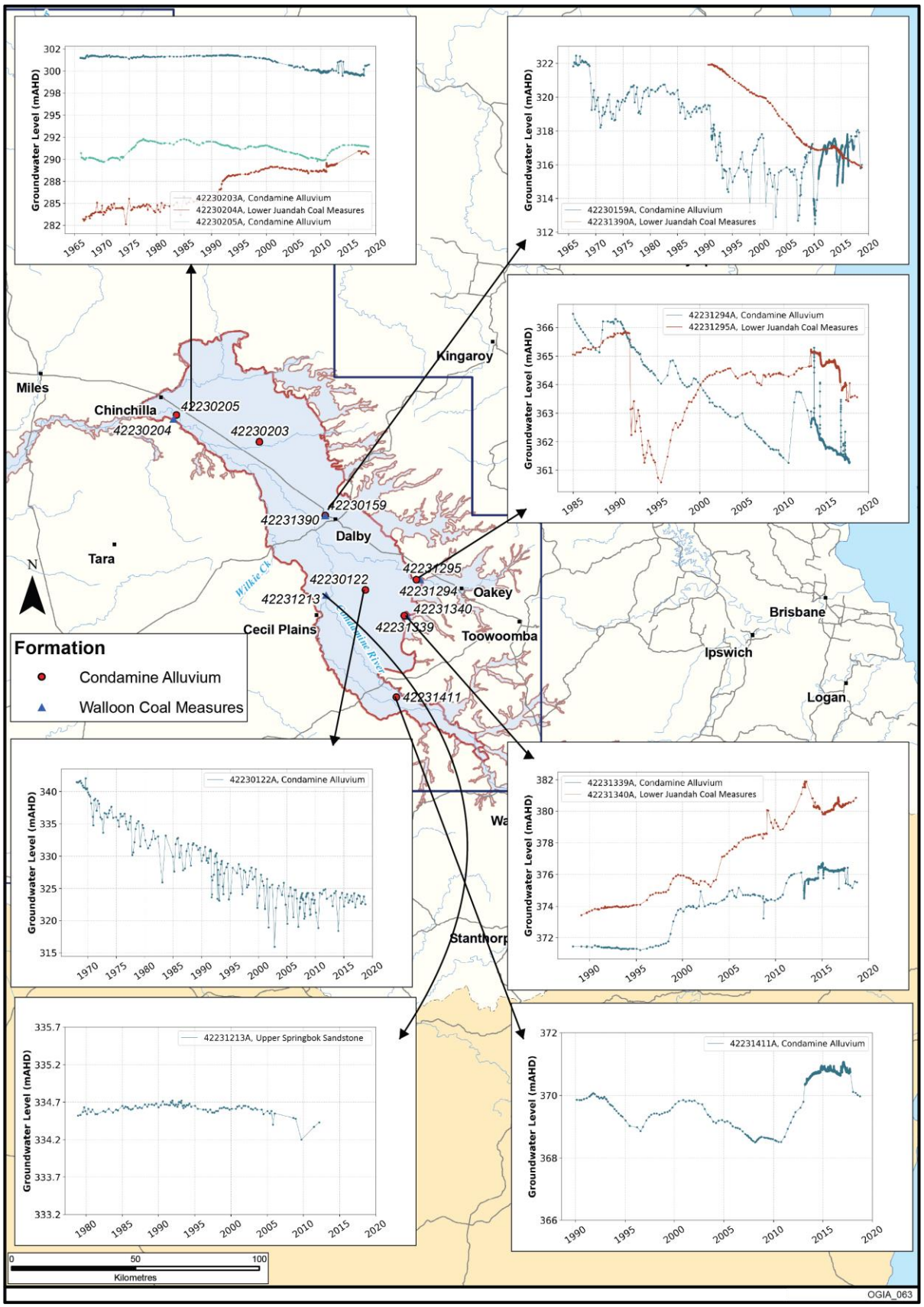

Figure D-9: Spatial distribution of selected hydrographs in the Condamine Alluvium footprint

Appendix E

Predictions of impacts

E.1 Cumulative pressure impact pattern for long-term impacts in key formations

A series of maps showing the distribution of long-term impacts in key formations is presented in following figures. These maps also show the upper (95th percentile) and lower bounds (5th percentile) of predicted impacts based on the predictive uncertainty analysis.

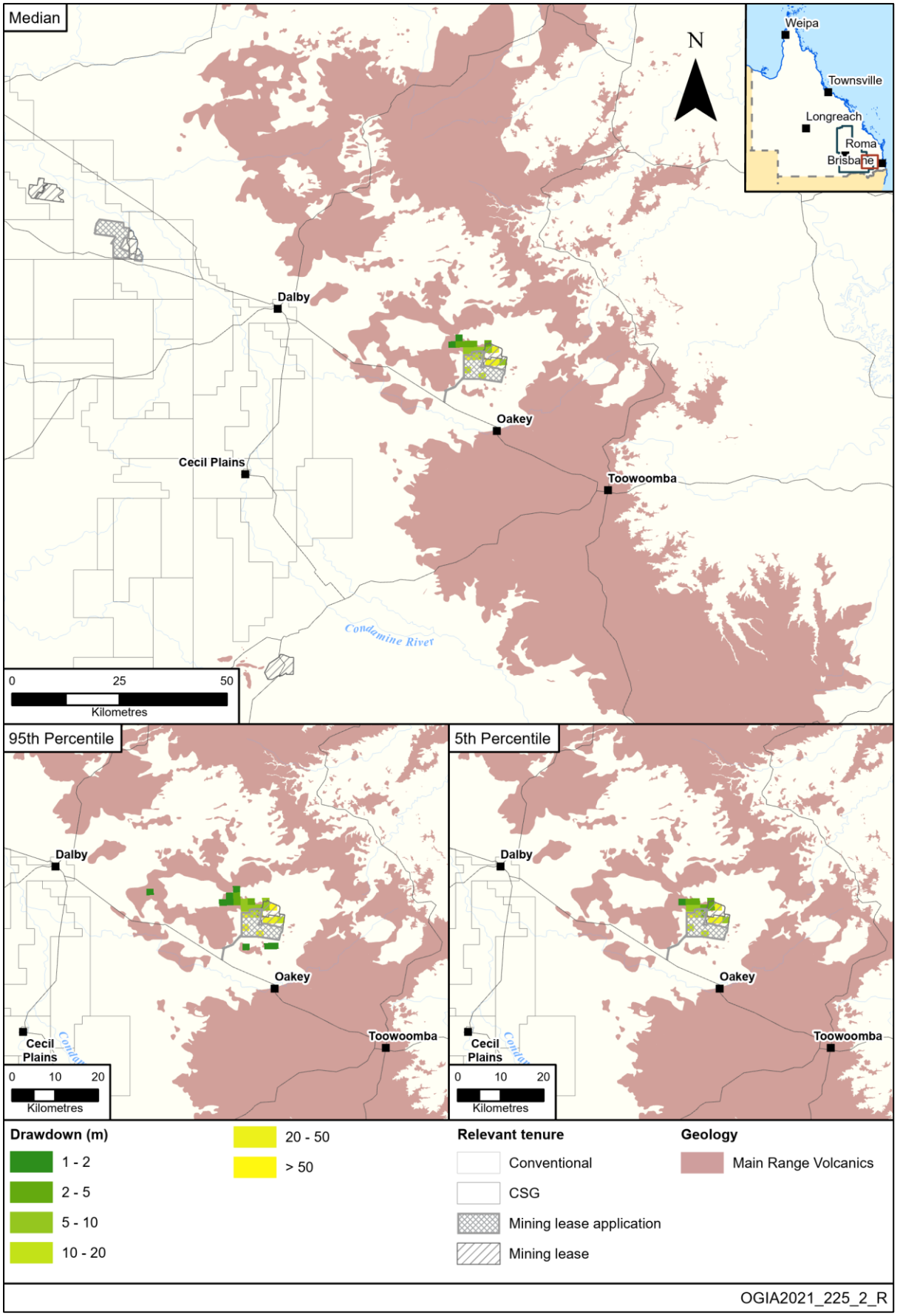

Figure E-1: Distribution of long-term impacts – Main Range Volcanics

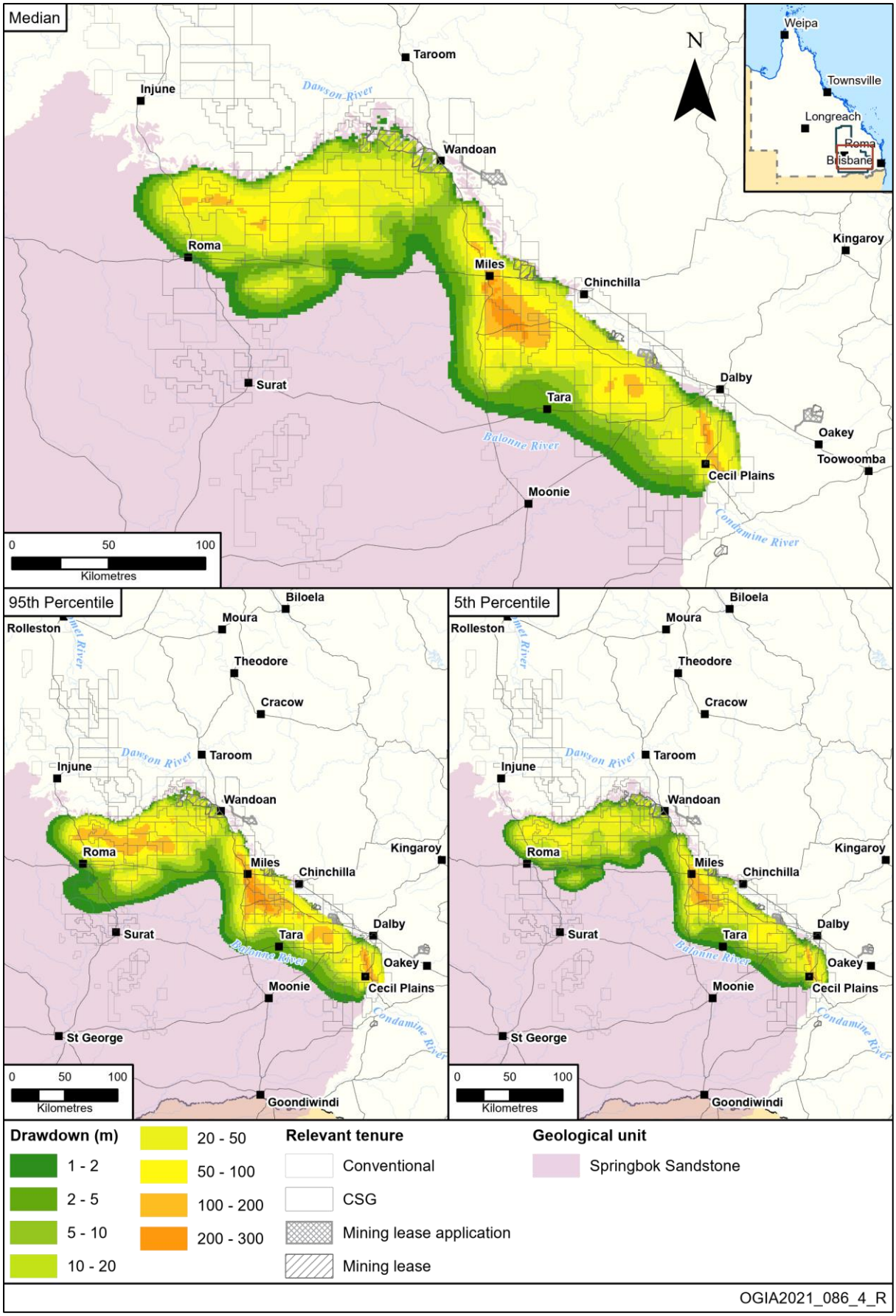

Figure E-2: Distribution of long-term impacts – Springbok Sandstone

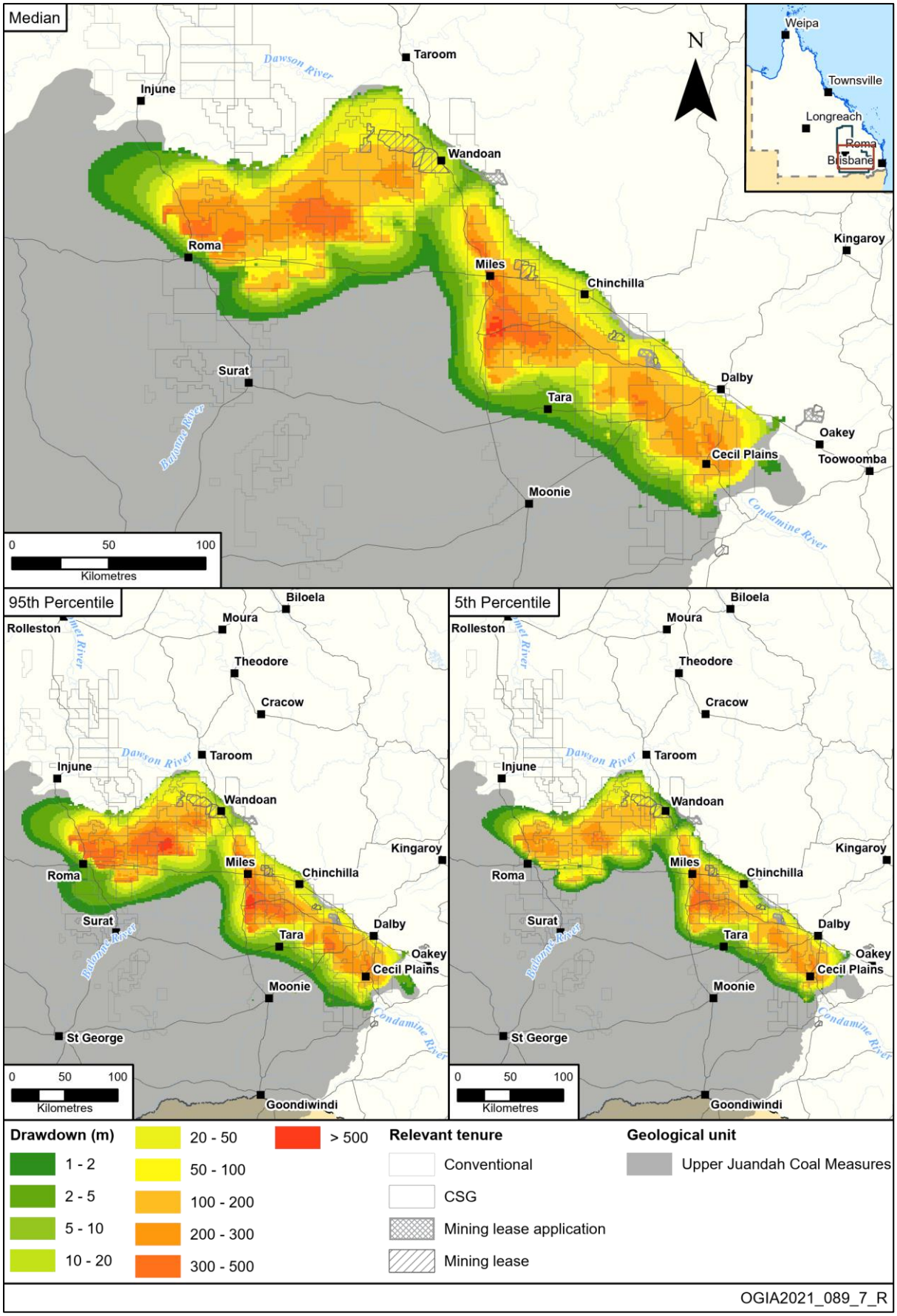

Figure E-3: Distribution of long-term impacts – Upper Juandah Coal Measures

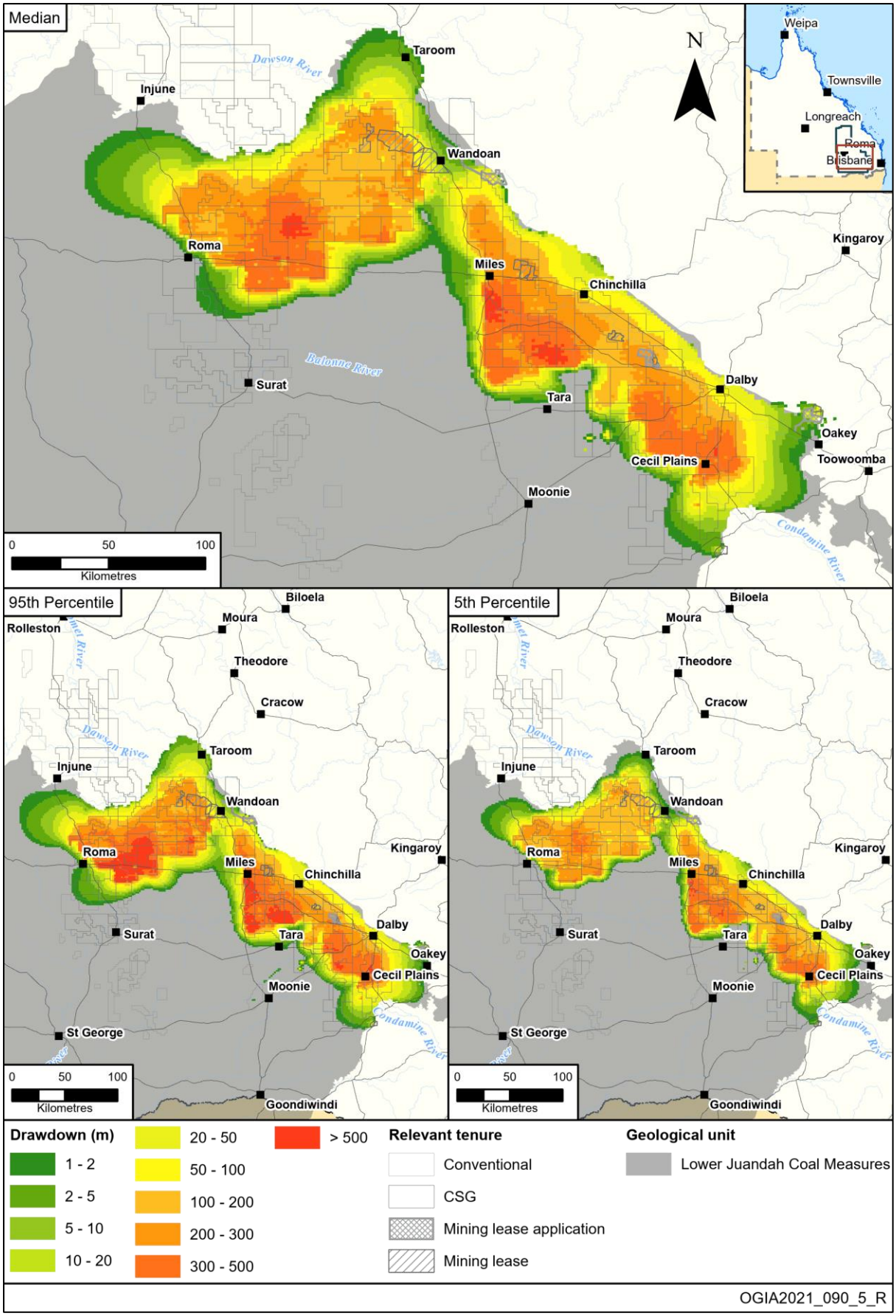

Figure E-4: Distribution of long-term impacts – Lower Juandah Coal Measures

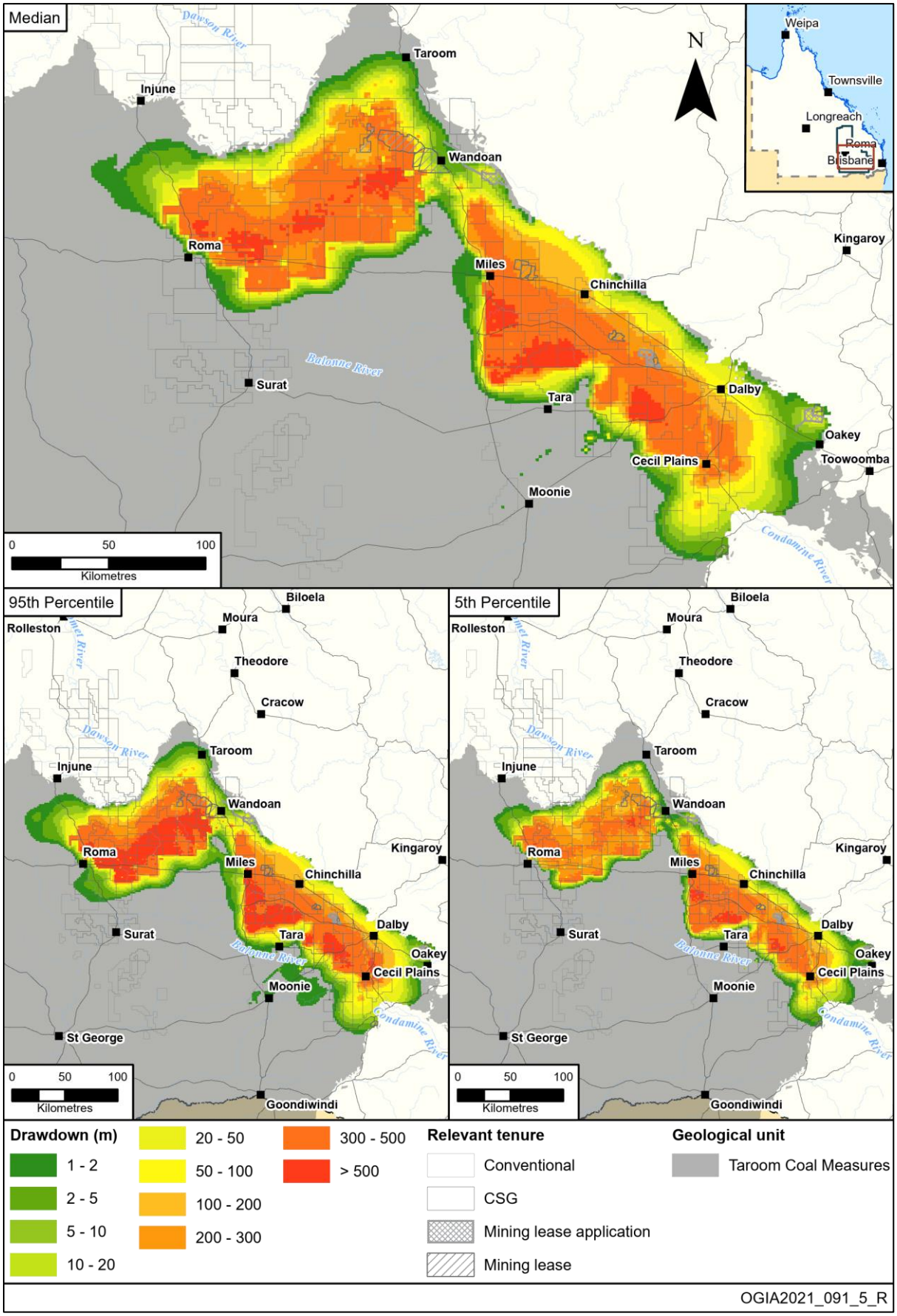

Figure E-5: Distribution of long-term impacts – Taroom Coal Measures

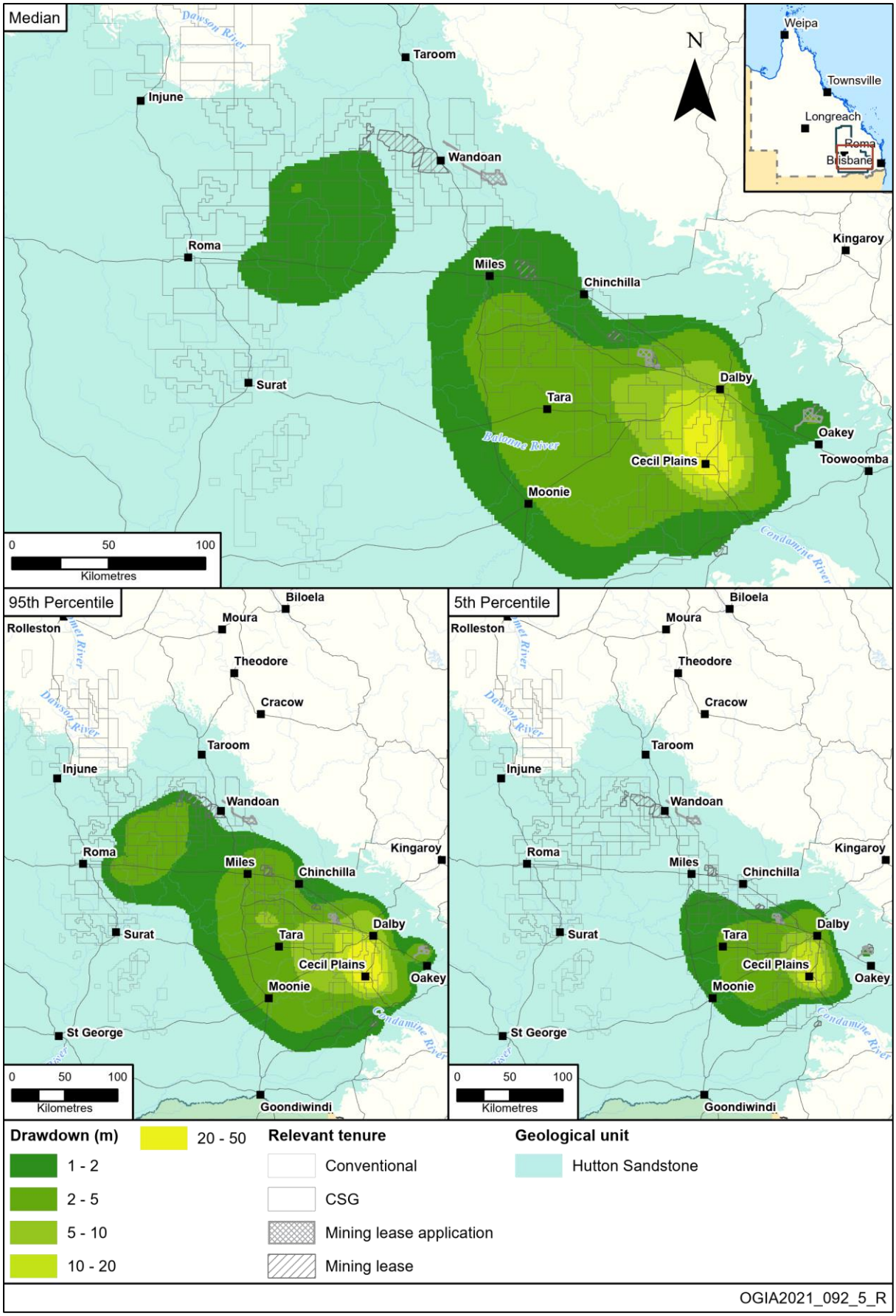

Figure E-6: Distribution of long-term impacts – Hutton Sandstone

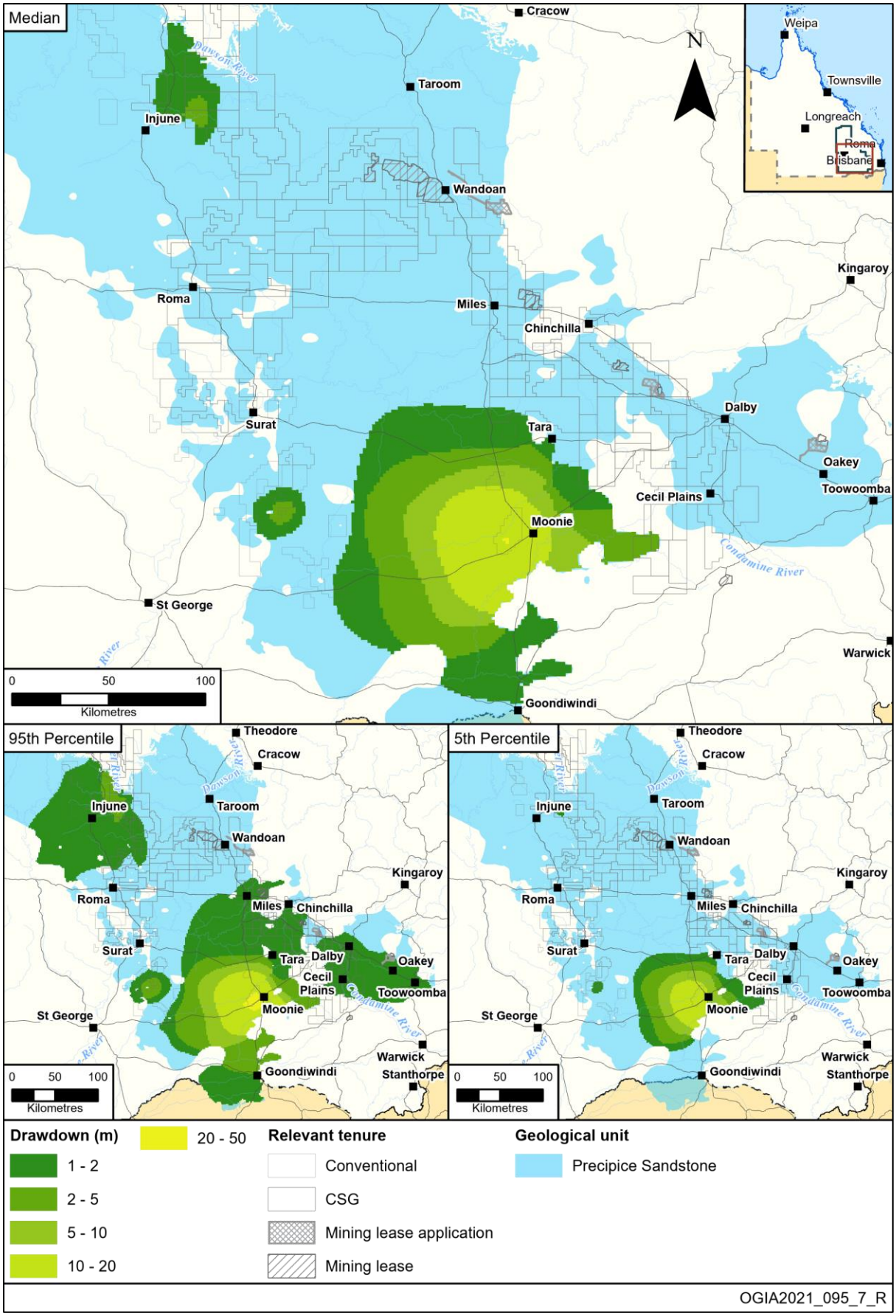

Figure E-7: Distribution of long-term impacts – Precipice Sandstone

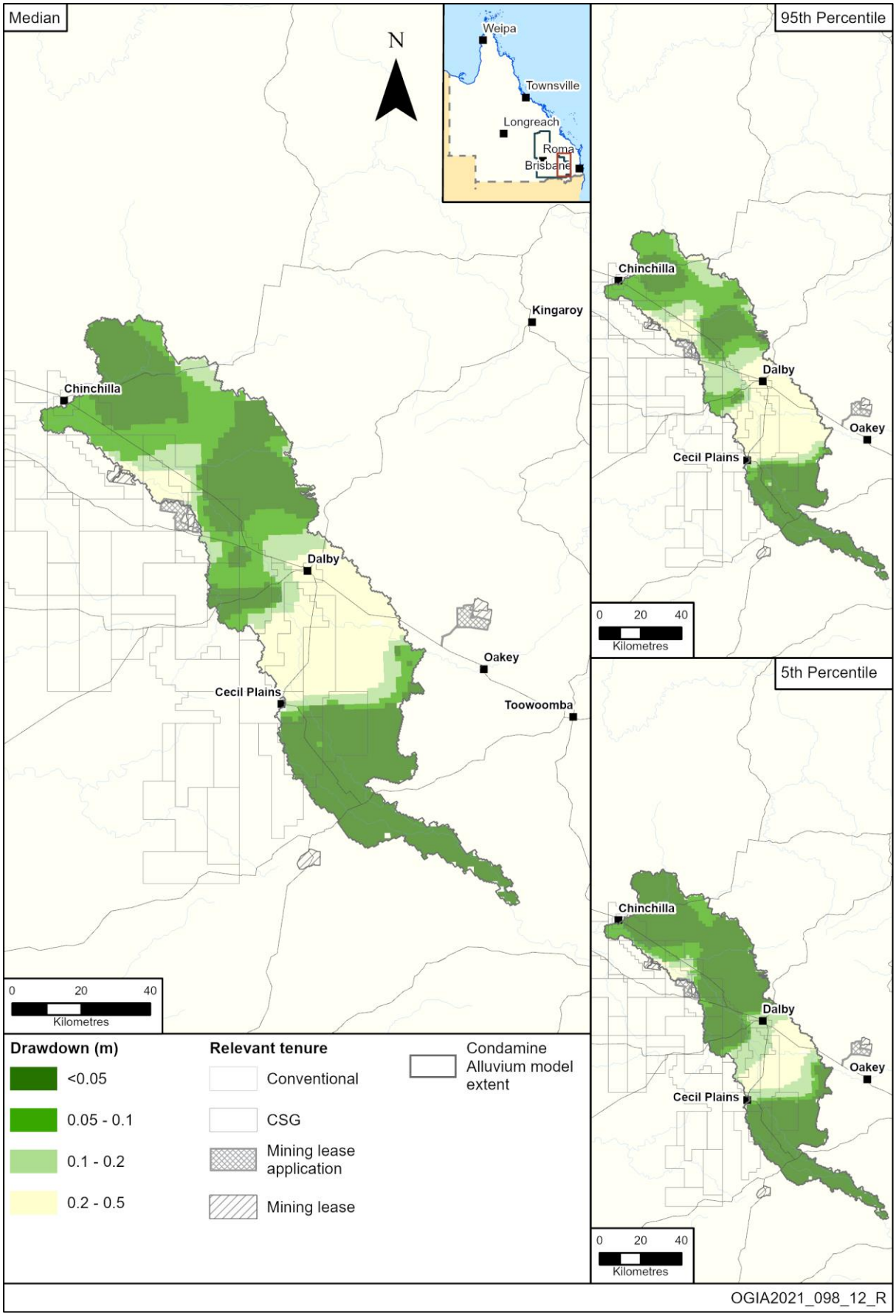

Figure E-8: Distribution of long-term impacts – Condamine Alluvium

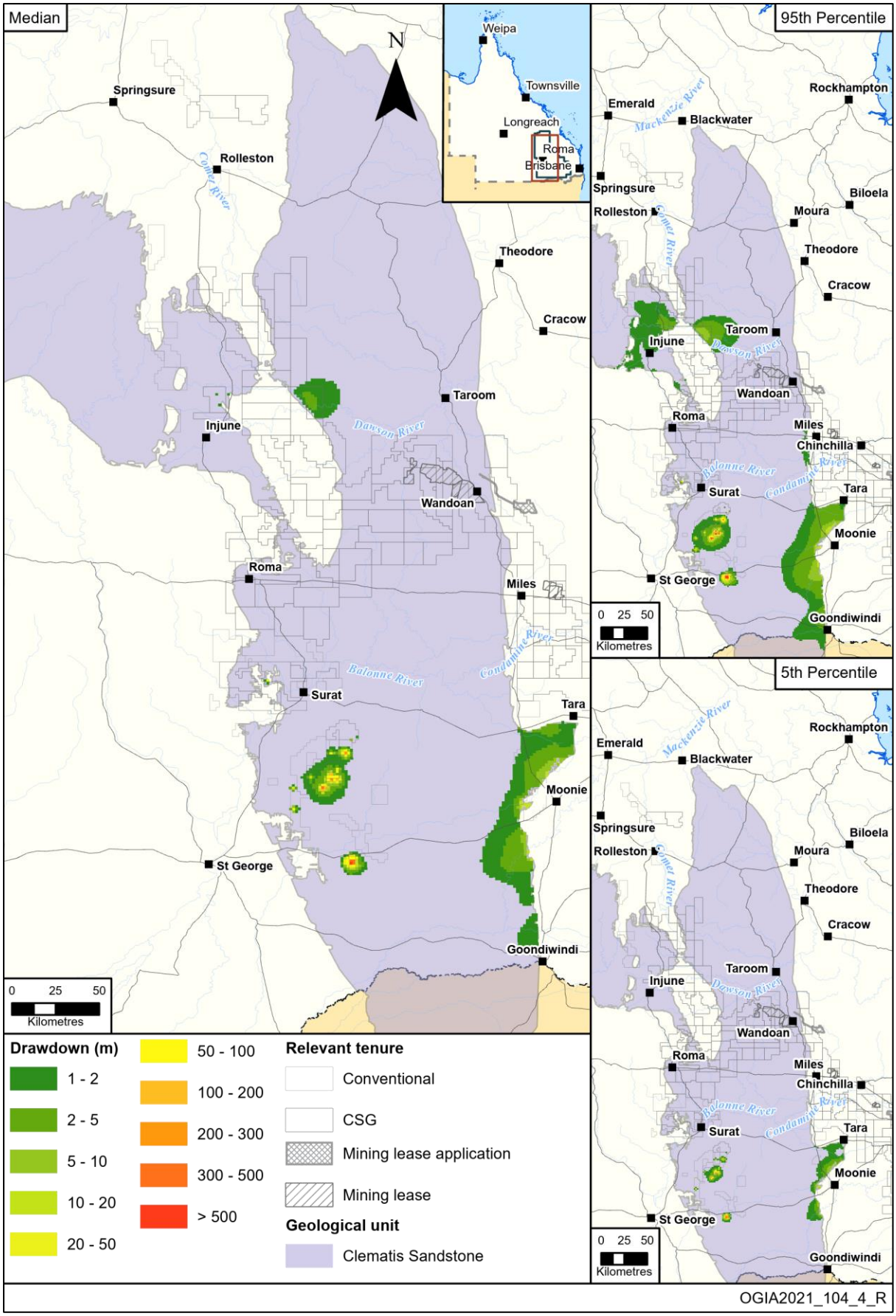

Figure E-9: Distribution of long-term impacts – Clematis Sandstone

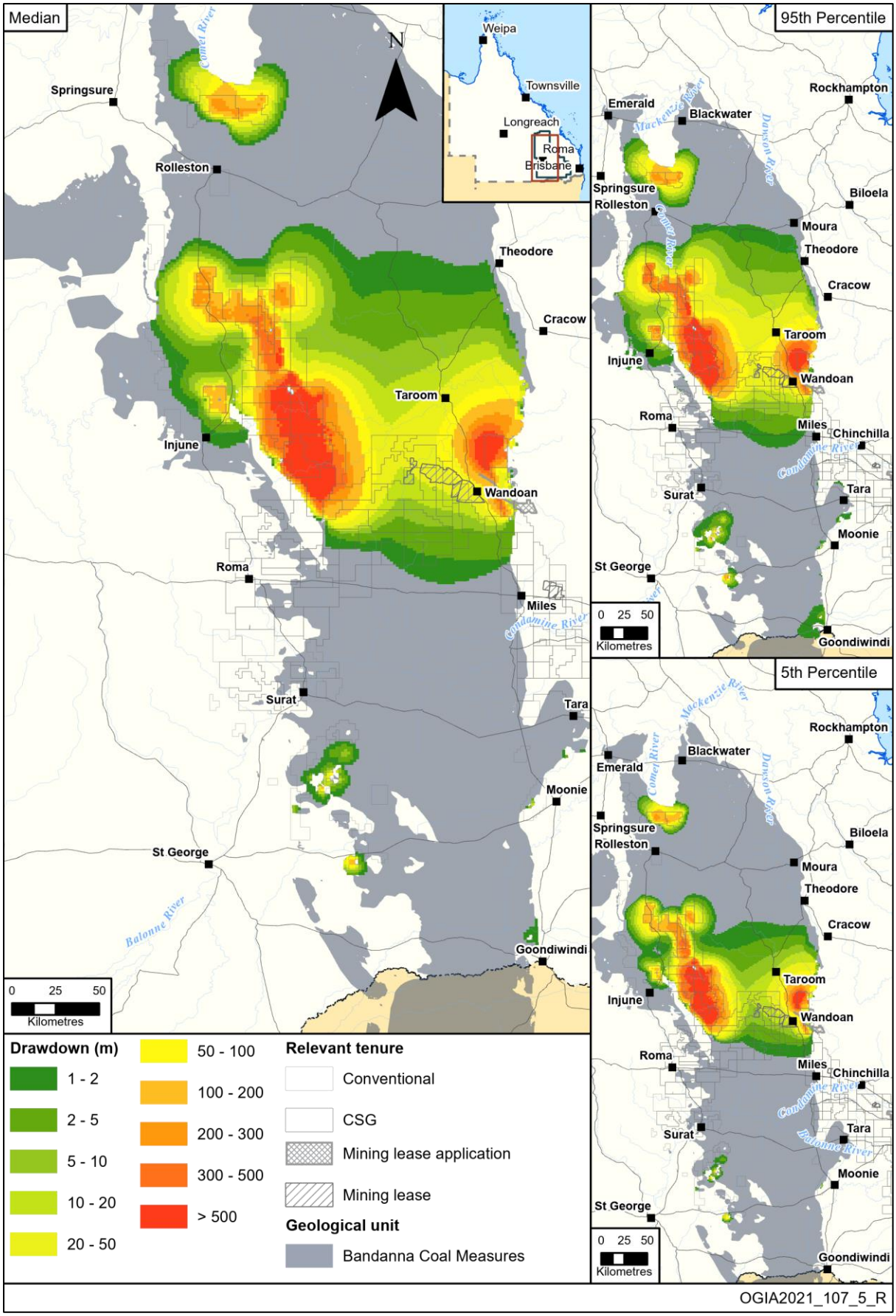

Figure E-10: Distribution of long-term impacts – Bandanna Formation

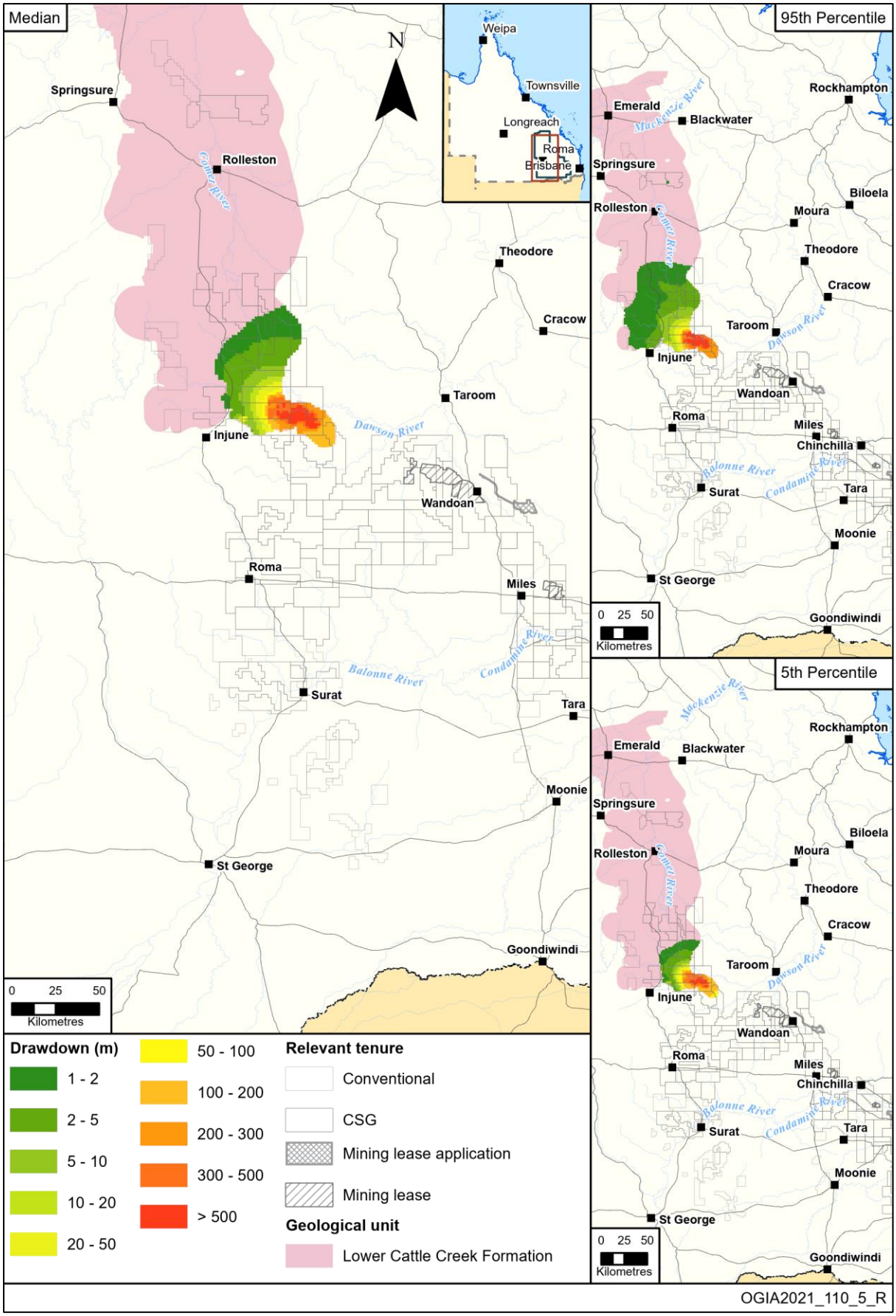

Figure E-11: Distribution of long-term impacts – Cattle Creek Formation

E.2 Impact pattern around coal mine areas

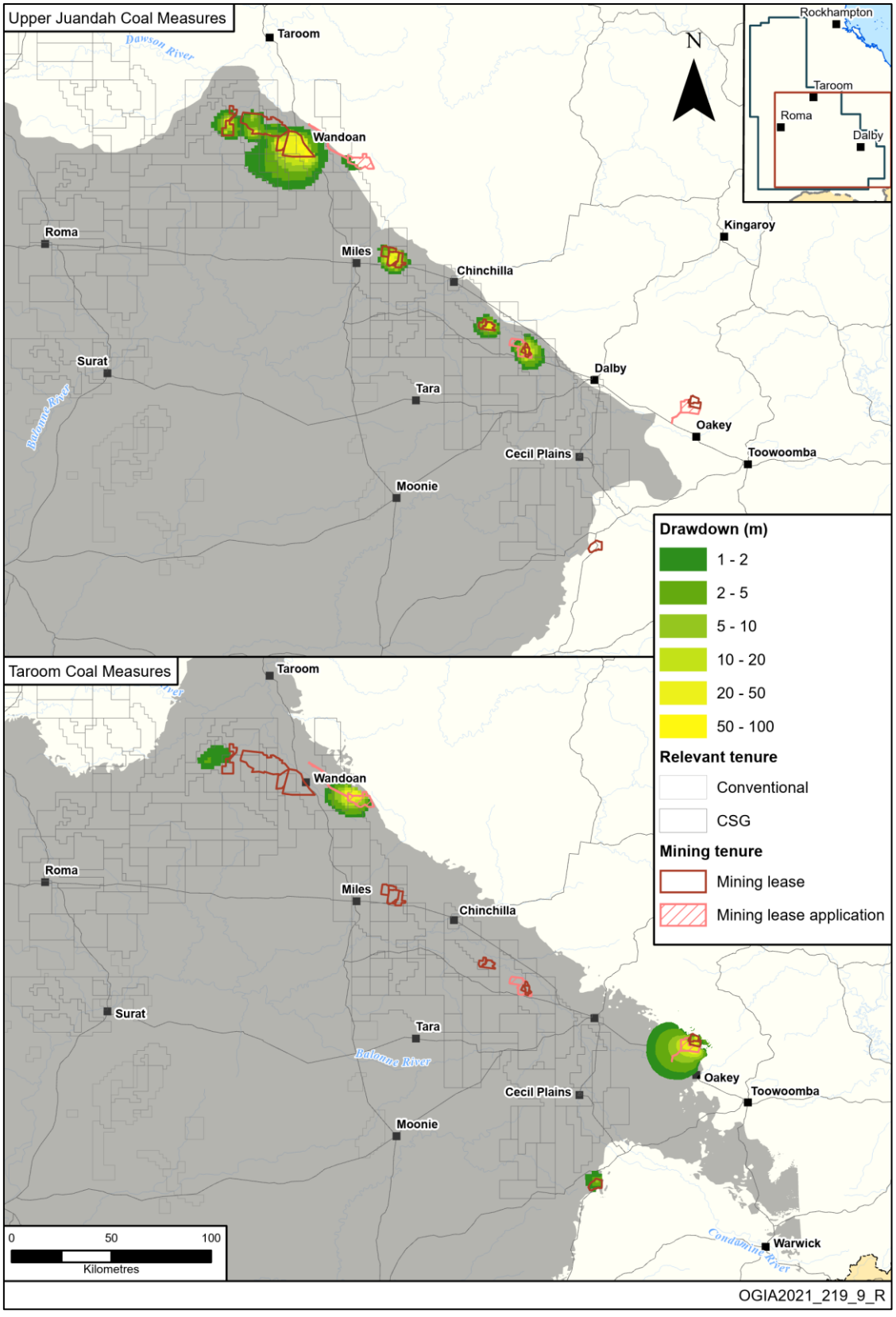

Figure E-12: Impact pattern around coal mines – showing proportion of cumulative impacts from coal mining alone (P50)

E.3 Time series of predicted impacts

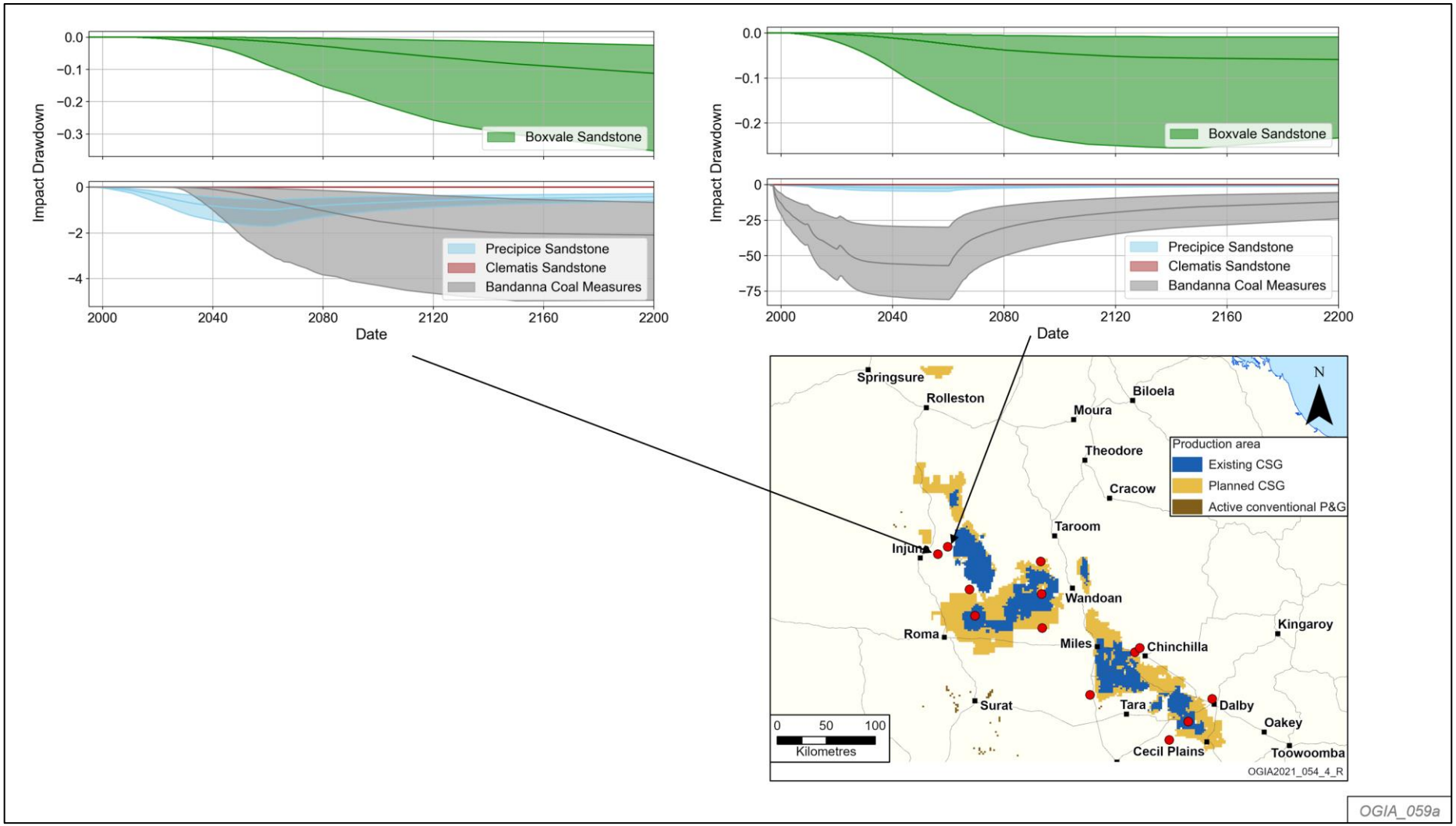

Figure E-13: Predicted drawdown time series, Bandanna Formation and Precipice Sandstone contact zones

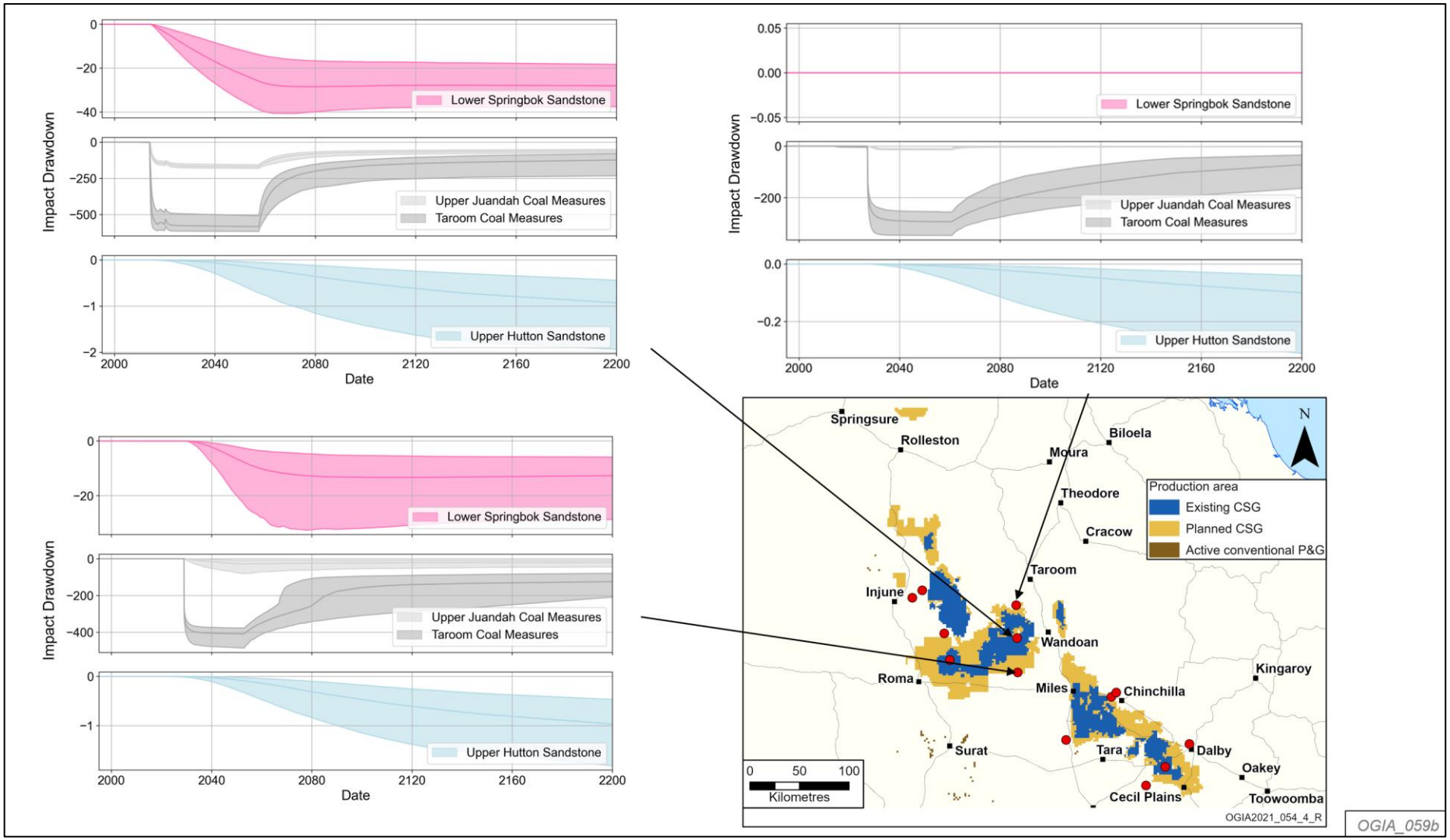

Figure E-14: Predicted drawdown time series, CSG development area west of Wandoan

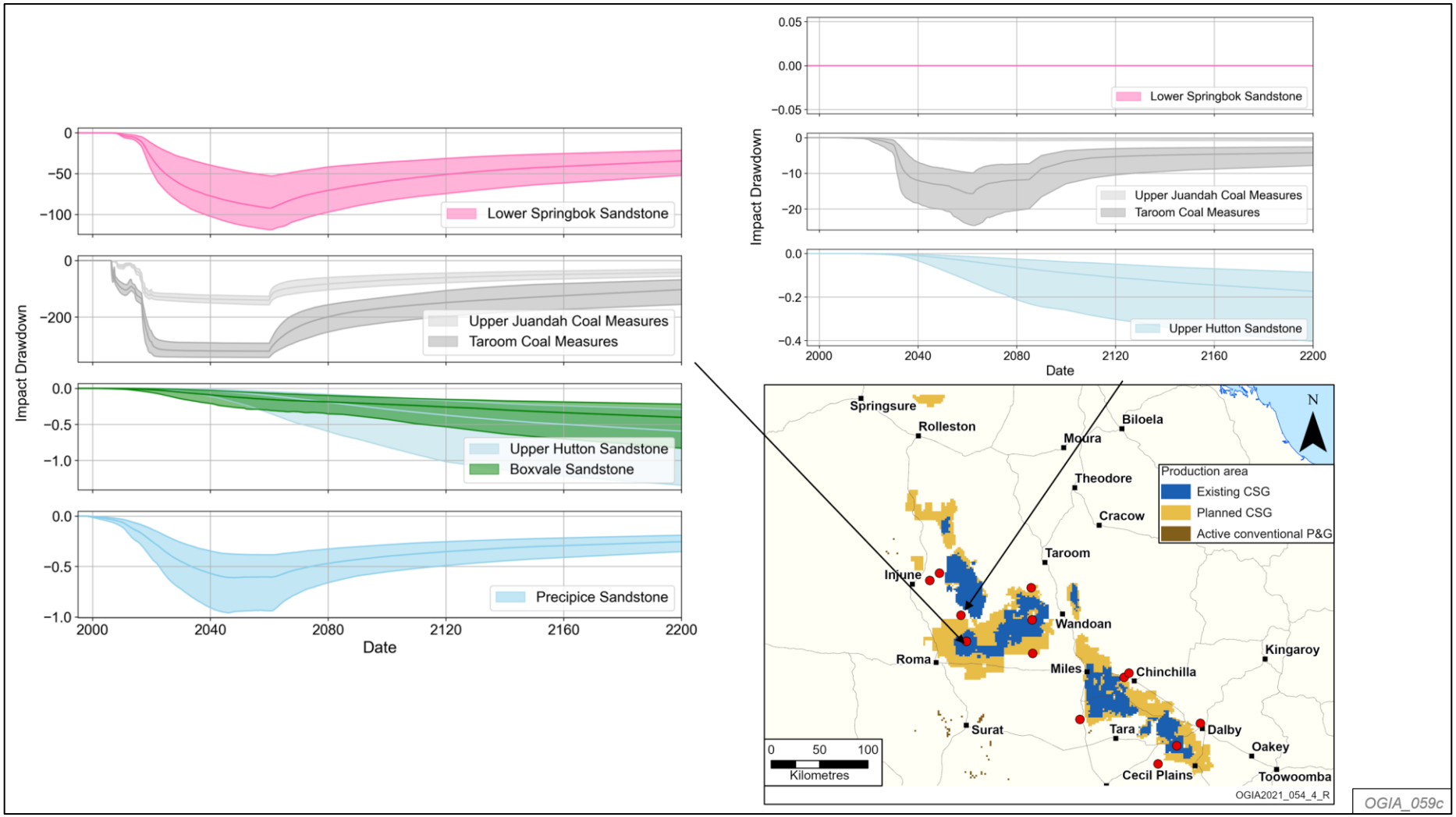

Figure E-15: Predicted drawdown time series, CSG development area north-east of Roma

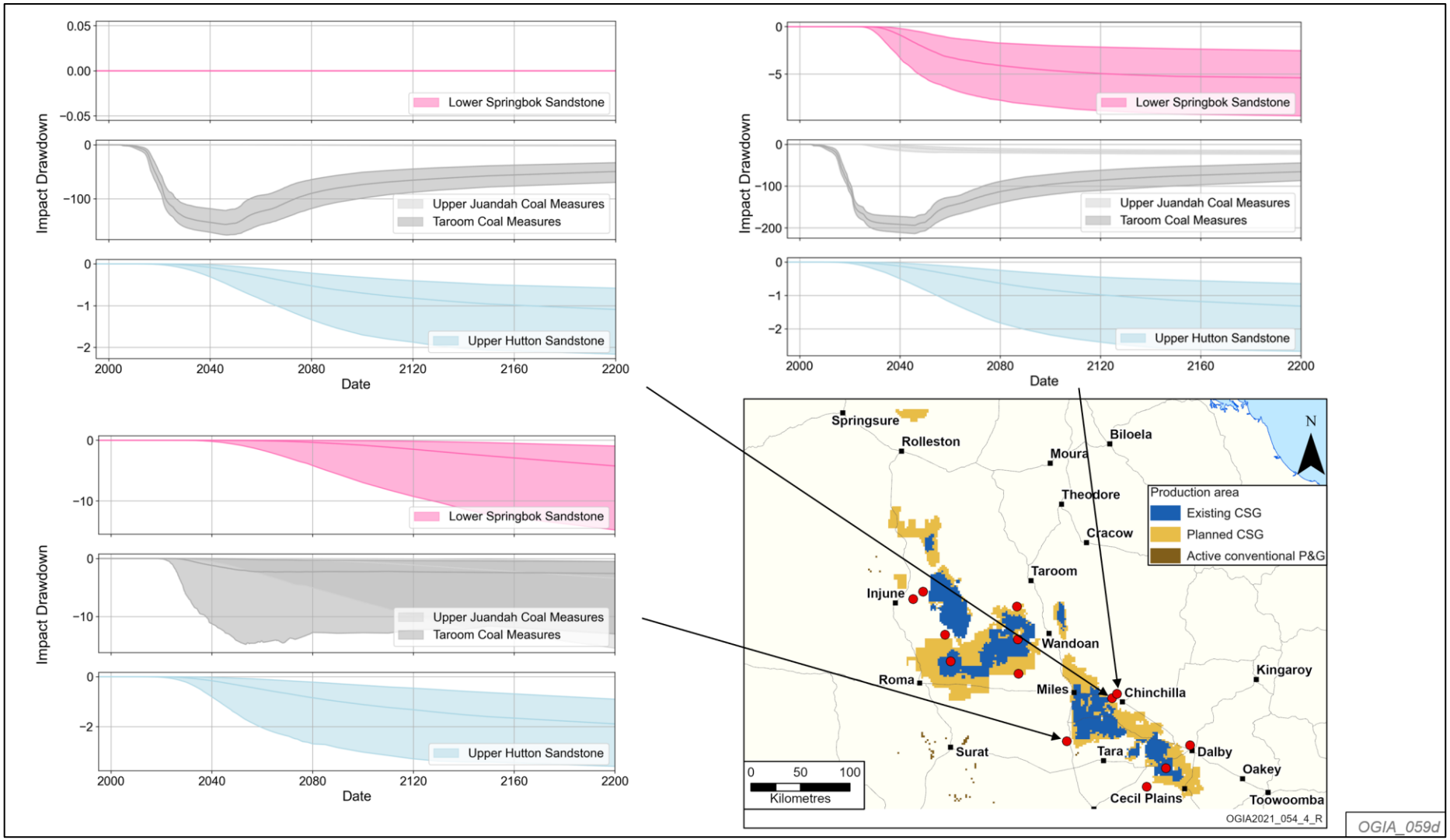

Figure E-16: Predicted drawdown time series, CSG development area south-west of Chinchilla

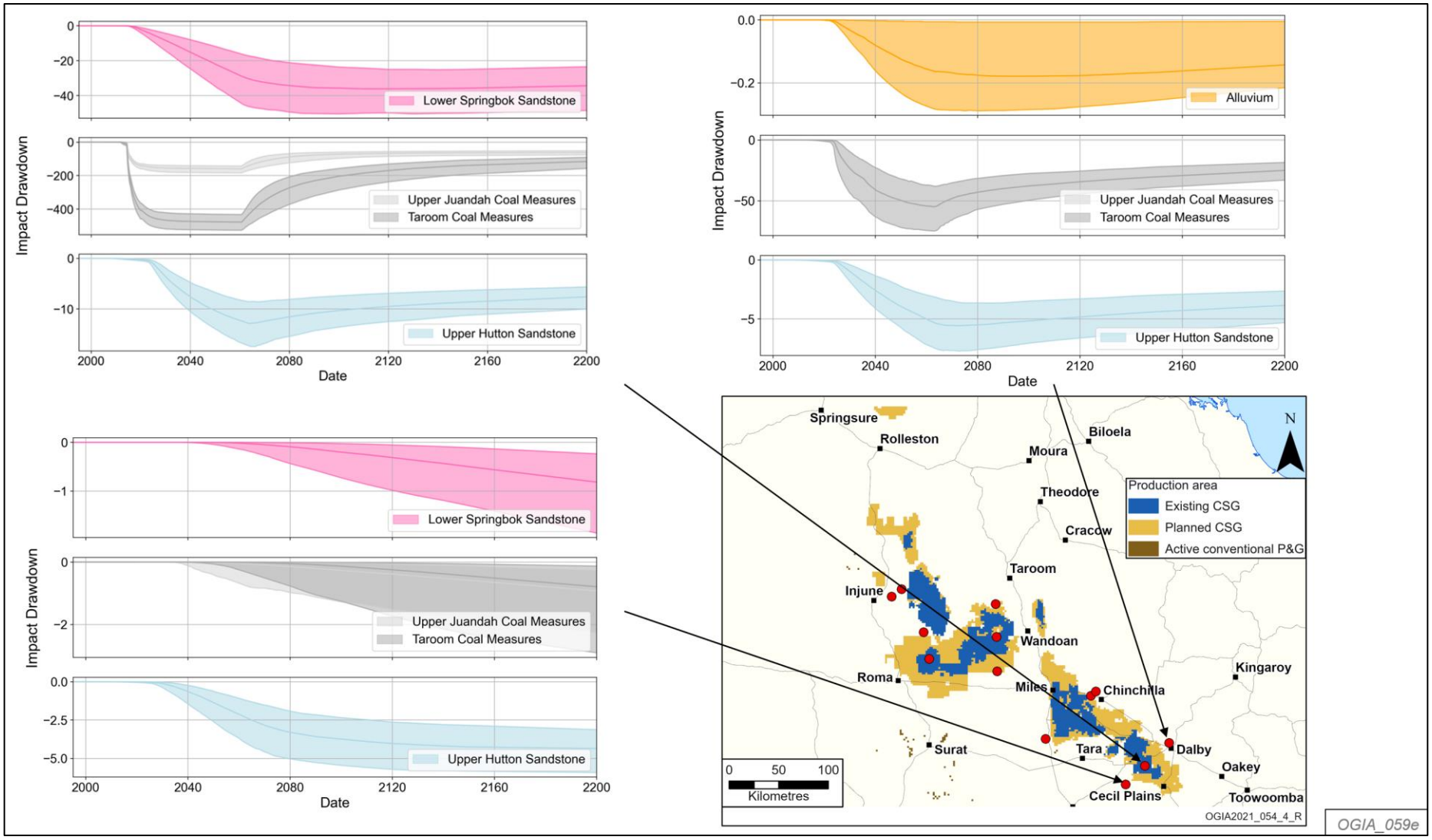

Figure E-17: Predicted drawdown time series, CSG development area south-west of Dalby

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Appendix F

Subsidence

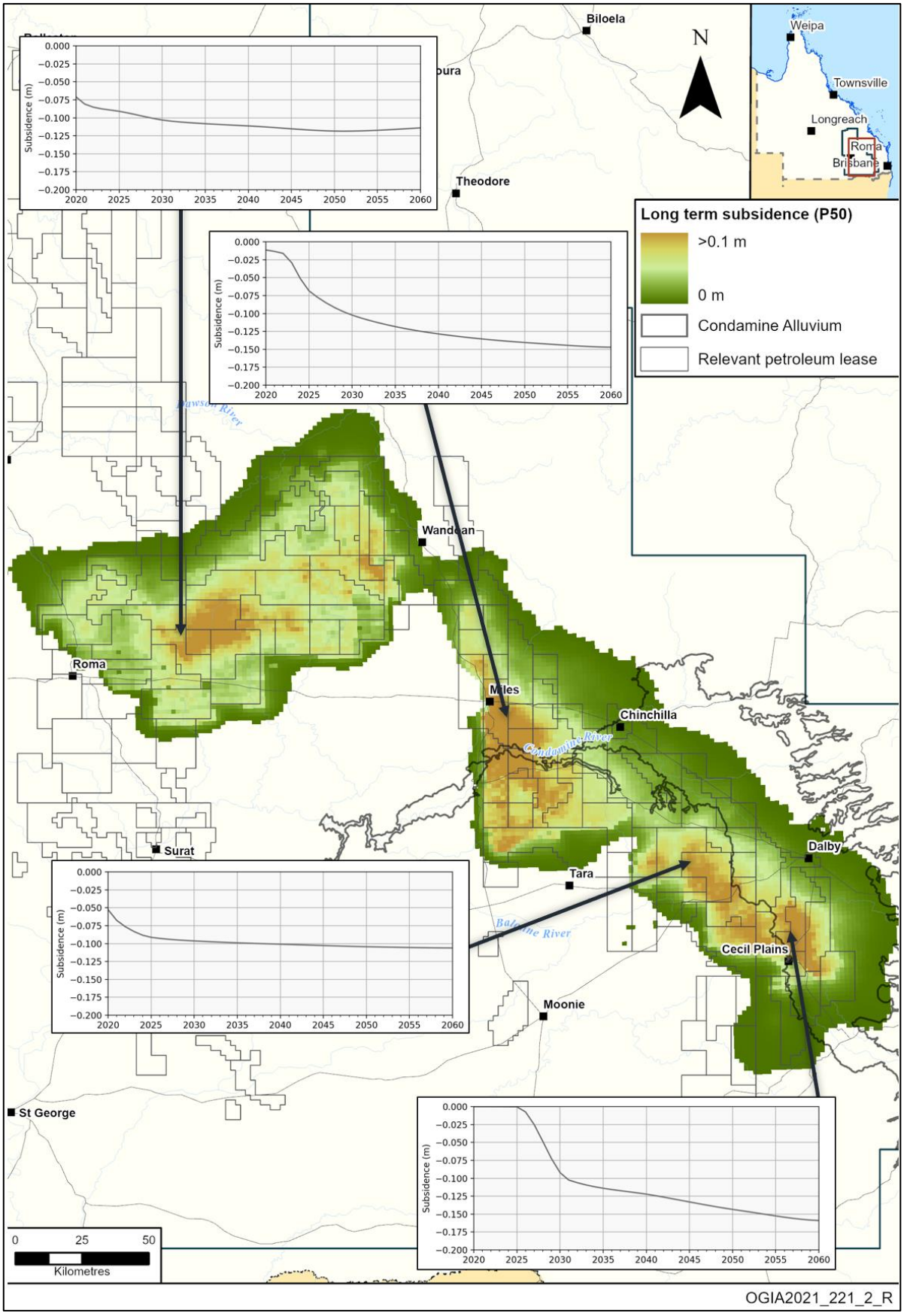

Figure F-1: Predicted long-term CSG-induced subsidence across the Surat Basin (P50)

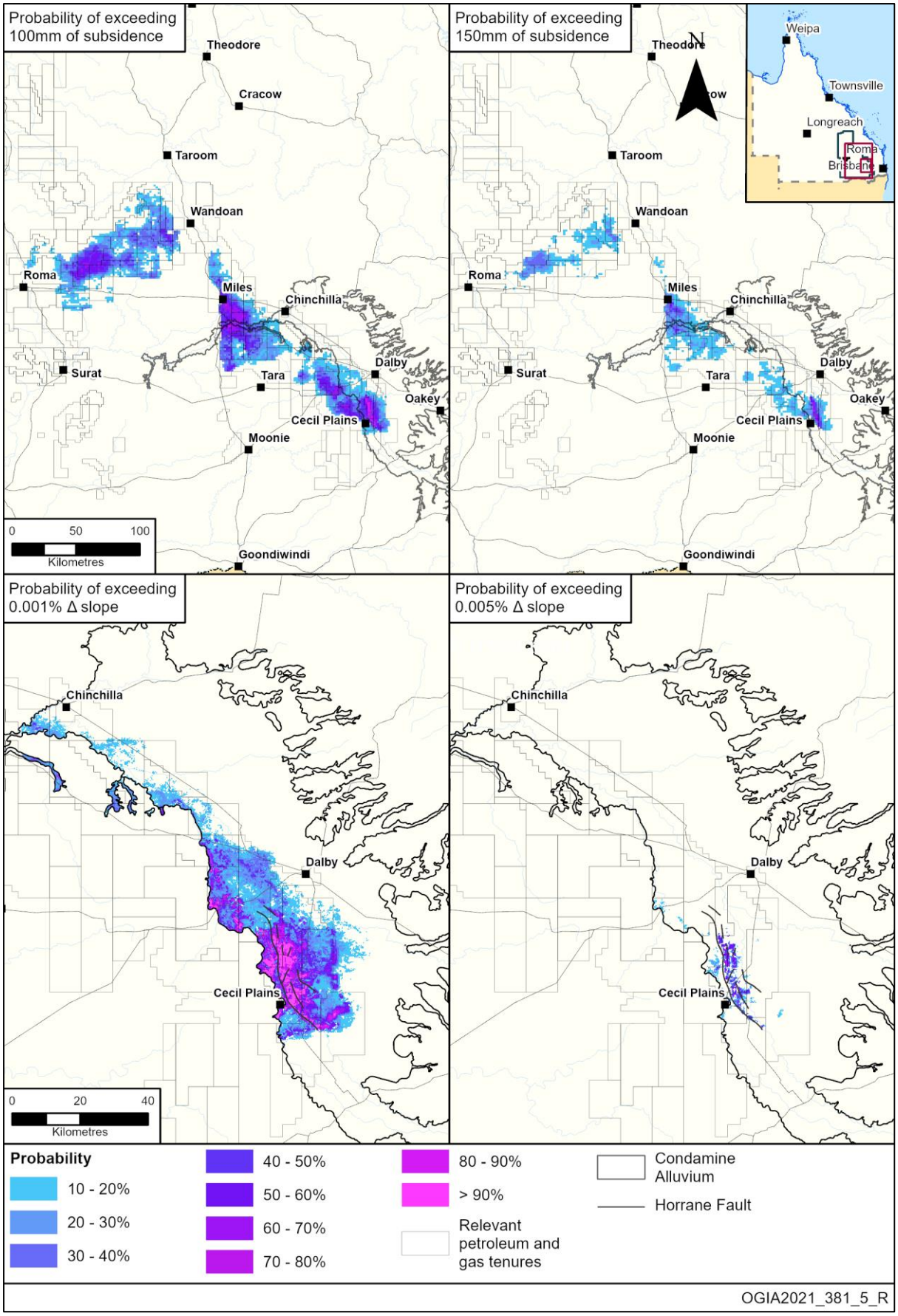

Figure F-2: Probabilities of predicted subsidence and resulting change in slope

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Appendix G

Impact on water bores

G.1 Make good – process flow diagram

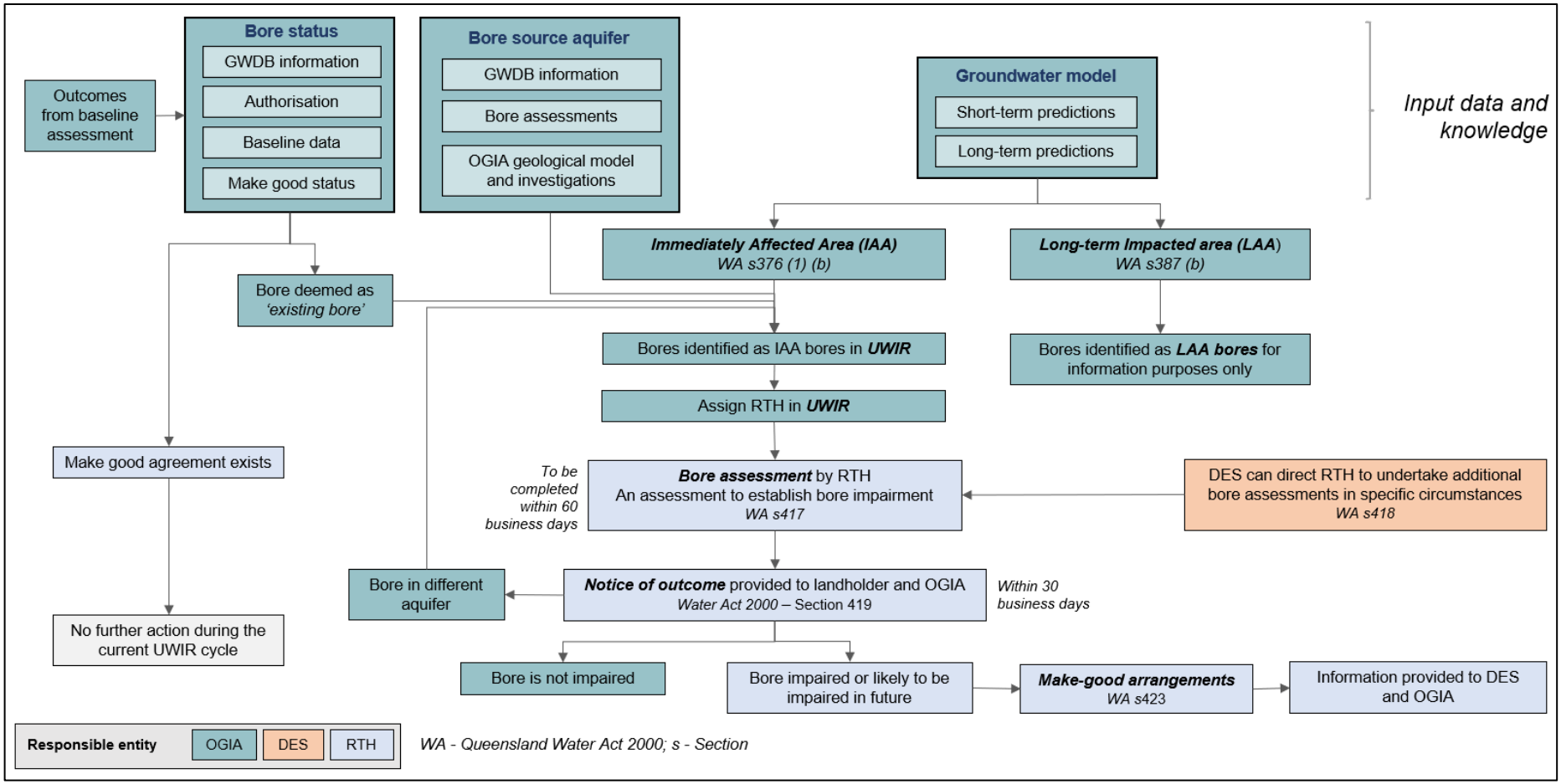

Figure G-1: Make good – process flow diagram

G.2 Details of IAA bores identified in the UWIR 2021

The table below lists 108 water bores that have been identified as IAA bores for the first time – i.e. water bores where predicted impacts by the end of 2024 are above the trigger thresholds.

Table G-1: Newly identified IAA bores in this UWIR

RN	Latitude	Longitude	Intersected formations	Maximum IAA impacted formation	Purpose	RTH
227	-26.50	148.89	WT, USBK, LSBK, UJCM, LJCM	LJCM	S&D	Santos
6777	-26.90	150.86	CA, LJCM	LJCM	S&D	Arrow
7659	-26.24	148.94	UJCM	UJCM	S&D	Senex
7724	-26.89	150.91	LJCM, TCM	LJCM	S&D	Arrow
7757	-26.77	150.79	LJCM	LJCM	S&D	Arrow
8642	-26.88	150.67	LJCM	LJCM	S&D	Arrow
8684	-26.81	150.75	CA, LJCM	LJCM	S&D	Arrow
9288	-26.25	148.95	UJCM, LSBK	UJCM	S&D	Senex
10460	-26.01	149.90	LJCM, TCM	LJCM	S&D	QGC
12058	-26.87	150.84	LJCM	LJCM	S&D	Arrow
13540	-27.21	151.21	UJCM	UJCM	S&D	Arrow
14063	-26.24	149.40	WT, USBK, LSBK	LSBK	S&D	Origin
14148	-27.00	150.96	UJCM	UJCM	S&D	Arrow
14746	-27.08	151.10	LJCM	LJCM	S&D	Arrow
15080	-26.84	150.67	LJCM	LJCM	S&D	Arrow*
16223	-26.80	150.75	LJCM	LJCM	S&D	Arrow
16580	-27.23	151.06	LSBK	LSBK	S&D	Arrow
17542	-26.70	150.66	TCM, LJCM	TCM	S&D	Arrow
18151	-27.05	151.02	UJCM	UJCM	S&D	Arrow
19947	-26.73	150.76	LJCM	LJCM	S&D	Arrow
19960	-26.71	150.74	LJCM	LJCM	S&D	Arrow
21021	-26.88	150.85	LJCM	LJCM	S&D	Arrow
21023	-26.76	150.76	LJCM, DUR, TCM	LJCM	S&D	Arrow
21063	-26.91	150.81	UJCM, LJCM	LJCM	S&D	Arrow
21064	-26.82	150.82	LJCM	LJCM	S&D	Arrow
21065	-26.89	150.85	LJCM	LJCM	S&D	Arrow
21067	-26.90	150.79	UJCM, LJCM	LJCM	S&D	Arrow
21649	-26.91	150.83	LJCM	LJCM	S&D	Arrow
21797	-26.92	150.90	LJCM	LJCM	S&D	Arrow
21798	-26.87	150.89	LJCM	LJCM	S&D	Arrow

RN	Latitude	Longitude	Intersected formations	Maximum IAA impacted formation	Purpose	RTH
21801	-26.85	150.89	LJCM	LJCM	S&D	Arrow
21819	-26.91	150.89	LJCM, TCM	LJCM	S&D	Arrow
21821	-26.97	150.94	UJCM	UJCM	S&D	Arrow
21832	-26.97	150.91	UJCM	UJCM	S&D	Arrow
22019	-26.83	150.77	LJCM	LJCM	S&D	Arrow
22723	-26.28	149.14	LJCM, USBK, LSBK, UJCM	UJCM	S&D	Senex*
24278	-27.34	151.15	USBK, LSBK, CA	LSBK	S&D	Arrow*
24479	-26.89	150.61	UJCM, LJCM, TCM,	LJCM	A	Arrow*
26465	-26.80	150.85	LJCM	LJCM	S&D	Arrow
32034	-26.21	149.12	LJCM, UJCM	LJCM	S&D	Origin
32628	-26.90	150.80	LJCM	LJCM	S&D	Arrow
33807	-26.02	149.75	UJCM, LJCM	LJCM	S&D	QGC
34951	-25.99	149.66	UJCM	UJCM	S&D	QGC
35141	-27.18	151.05	LSBK, UJCM, CA	LSBK	S&D	Arrow
35243	-26.95	150.86	LJCM	LJCM	S&D	Arrow*
37479	-26.18	149.64	LSBK, WT, USBK	LSBK	S&D	QGC
37649	-27.03	151.00	UJCM	UJCM	S&D	Arrow
61111	-27.09	150.84	LSBK, WT, USBK	LSBK	S&D	QGC
66546	-26.86	150.74	LJCM, UJCM	LJCM	S&D	Arrow
66553	-26.88	150.76	LJCM	LJCM	S&D	Arrow
71134	-26.82	150.85	LJCM	LJCM	S&D	Arrow
83068	-26.84	150.86	LJCM	LJCM	S&D	Arrow
83312	-26.86	150.85	LJCM	LJCM	S&D	Arrow
86622	-26.97	150.86	UJCM, LJCM	LJCM	S&D	Arrow
86984	-27.20	151.31	LJCM	LJCM	S&D	Arrow
87021	-27.30	151.69	TCM	TCM	TWS	NHG
87713	-27.20	151.32	LJCM, TCM	TCM	S&D	Arrow
87934	-26.84	150.86	LJCM	LJCM	S&D	Arrow
94430	-27.20	151.31	LJCM	LJCM	A	Arrow
94913	-27.17	151.36	TCM	TCM	S&D	Arrow
119000	-27.21	151.04	LSBK	LSBK	S&D	Arrow
119048	-27.05	150.99	LJCM, UJCM	UJCM	S&D	Arrow
119075	-26.95	150.86	LJCM	LJCM	A	Arrow*
137087	-27.29	150.96	USBK, LSBK	LSBK	S&D	QGC
137915	-27.32	151.14	USBK, LSBK	LSBK	S&D	Arrow

RN	Latitude	Longitude	Intersected formations	Maximum IAA impacted formation	Purpose	RTH
147127	-27.00	150.95	USBK, UJCM, LSBK	UJCM	S&D	Arrow
147314	-27.16	151.18	LJCM	LJCM	A	Arrow
147716	-27.19	151.23	LJCM	LJCM	S&D	Arrow
147717	-27.07	150.85	LSBK	LSBK	S&D	Arrow
147738	-27.21	151.27	LJCM	LJCM	S&D	Arrow
147750	-27.17	151.23	LJCM	LJCM	S&D	Arrow
147795	-27.22	151.26	LJCM	LJCM	S&D	Arrow
147815	-27.22	151.27	LJCM	LJCM	S&D	Arrow
147845	-27.17	151.23	LJCM	LJCM	S&D	Arrow
147882	-27.22	151.28	LJCM	LJCM	S&D	Arrow
147893	-27.22	151.26	LJCM	LJCM	S&D	Arrow
147894	-27.20	151.26	LJCM	LJCM	S&D	Arrow
147895	-27.22	151.28	LJCM	LJCM	S&D	Arrow
172004	-27.22	151.28	LJCM	LJCM	S&D	Arrow
172028	-27.30	151.14	LSBK	LSBK	S&D	Arrow*
172033	-27.18	151.23	LJCM	LJCM	S&D	Arrow
172272	-27.17	151.23	LJCM	LJCM	S&D	Arrow
172338	-27.20	151.26	LJCM	LJCM	S&D	Arrow
172342	-27.21	151.27	LJCM	LJCM	S&D	Arrow
172540	-27.17	151.23	LJCM	LJCM	S&D	Arrow
172628	-27.25	151.00	LSBK	LSBK	S&D	QGC
172681	-27.17	151.23	LJCM	LJCM	S&D	Arrow
172713	-26.67	150.63	TCM	TCM	S&D	Arrow
172746	-26.96	150.98	LJCM	LJCM	S&D	Arrow
172747	-27.28	151.13	UJCM	UJCM	S&D	Arrow*
172751	-27.26	151.08	UJCM	UJCM	S&D	Arrow
172896	-27.46	151.15	LSBK	LSBK	S&D	Arrow
172937	-27.01	150.98	UJCM	UJCM	S&D	Arrow
192012	-27.17	151.23	LJCM	LJCM	S&D	Arrow
192017	-27.17	151.23	LJCM	LJCM	S&D	Arrow
192060	-27.24	151.04	UJCM, LSBK	UJCM	S&D	Arrow
192085	-27.17	151.22	LJCM	LJCM	S&D	Arrow
192086	-27.21	151.25	LJCM	LJCM	S&D	Arrow
192148	-27.21	151.26	LJCM	LJCM	S&D	Arrow
1200001020^	-26.84	150.64	UJCM, LJCM	LJCM	S&D	Arrow*

RN	Latitude	Longitude	Intersected formations	Maximum IAA impacted formation	Purpose	RTH
1200001083^	-26.96	150.86	LJCM, UJCM	LJCM	S&D	Arrow
1200001084^	-26.96	150.86	LJCM, TCM, UJCM	LJCM	S&D	Arrow
1200001203^	-27.03	150.99	UJCM	UJCM	S&D	Arrow
1200001305^	-26.76	150.51	LSBK, UJCM	LSBK	S&D	Origin
1200001670^	-27.28	151.64	TCM	TCM	S&D	NHG
1200001704^	-27.33	151.73	TCM	TCM	S&D	NHG
1200001746^	-26.10	149.54	UJCM	UJCM	S&D	QGC
1200001761^	-26.06	149.60	UJCM	UJCM	S&D	QGC

Notes:

- **Formation:** CA = Condamine Alluvium. DUR = Durabilla Formation. LSBK = Lower Springbok Sandstone. LJCM = Lower Juandah Coal Measures. TCM = Taroom Coal Measures. UJCM = Upper Juandah Coal Measures. USBK = Upper Springbok Sandstone. WT = Westbourne Formation.
- **Purpose:** S&D = stock and domestic. A = Agricultural. TWS = Town Water Supply.
- **RN**: ^ = bore currently unregistered, temporary RN reference assigned by OGIA.
- **RTH**: * = a previous bore assessment has been undertaken which may require review in consideration of impacts predicted in the UWIR 2021.

G.3 Status of IAA bores from previous UWIRs

The table below lists the current status of IAA bores identified in the previous three UWIRs – 2012, 2016 and 2019.

Table G-2: Details of bores listed in IAA tables from previous UWIRs, including 233 effective IAA bores

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
226	-26.47	148.88	TCM, LJCM, UJCM, BGF, MSt, ORF, GUB, WT, USBK, LSBK	S&D	Santos	2012	Decommissioned
5390	-26.82	150.54	LJCM	S&D	Origin	2012	Decommissioned
6505	-27.09	151.02	CA, UJCM	S&D	Arrow	2016	Bore assessment pending
6778	-26.90	150.86	LJCM	S&D	NA	2019	Determined not to be an IAA bore post-2019
8425	-26.86	150.53	UJCM	S&D	Origin	2012	Decommissioned
8665	-26.84	150.50	LSBK, UJCM, UJCM	S&D	Origin	Post UWIR 2012	Decommissioned
9135	-26.74	150.42	TCM, UJCM, LJCM	S&D	QGC (Arrow)	2012	Decommissioned
9579	-26.85	150.93	LJCM	S&D	Arrow	2019	Bore assessment pending
10459	-26.15	149.81	USBK, UJCM, LSBK	S&D	QGC	2012	Decommissioned
10598	-26.90	150.88	LJCM	S&D	Arrow	2019	Finalised MGA
10697	-26.74	150.28	UJCM, LJCM	S&D	QGC	2012	Decommissioned
10725	-26.68	150.30	UJCM	S&D	QGC	2012	Decommissioned
10790	-26.91	150.66	UJCM	S&D	Arrow	2019	MGA negotiations ongoing*
10898	-26.83	150.64	LJCM, UJCM	S&D	Arrow	2019	Decommissioned
10939	-26.95	150.91	LJCM	S&D	Arrow	2019	MGA negotiations ongoing
11590	-26.08	149.53	UJCM	S&D	QGC	2016	Decommissioned
11637	-26.88	150.90	LJCM	S&D	Arrow	2019	MGA negotiations ongoing

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
12078	-26.62	150.24	LJCM, UJCM, LSBK	S&D	Origin	Post UWIR 2016	Decommissioned
12144	-26.65	150.22	UJCM	S&D	Origin	2012	Decommissioned
12340	-26.74	150.37	UJCM, TCM, LJCM	S&D	QGC	2012	Decommissioned
12341	-26.79	150.32	UJCM	S&D	QGC	2012	Decommissioned
12360	-26.96	151.17	TCM	S&D	Arrow	2019	Bore assessment pending*
12437	-26.97	151.13	UHUT, DUR, LJCM, TCM	S&D	Arrow	2019	Bore assessment pending*
12646	-27.07	150.86	TCM, UJCM, LJCM	S&D	Arrow	2012	Finalised MGA
13117	-26.19	149.29	USBK, LSBK, UJCM	S&D	Origin	2012	Finalised MGA
13316	-26.13	149.36	LJCM	S&D	Origin	2019	Finalised MGA
13322	-26.19	149.50	GUB	S&D	NA	2016	No longer IAA – aquifer not impacted
13600	-26.83	150.62	LJCM	S&D	Arrow	2019	MGA negotiations ongoing
13602	-26.63	150.31	LJCM	S&D	Arrow	2012	Decommissioned
14062	-26.22	149.40	WT, USBK, LSBK	S&D	NA	2019	Decommissioned
14219	-26.21	149.30	LJCM, UJCM, TCM	S&D	Origin	2012	Decommissioned
14255	-25.96	149.35	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
14308	-26.76	150.30	LJCM	S&D	QGC	2012	Decommissioned
14361	-25.92	149.47	TCM, LJCM, UJCM	S&D	QGC	2019	MGA negotiations ongoing*
14365	-25.85	149.45	TCM	S&D	QGC	2019	MGA negotiations ongoing*
14369	-25.79	149.64	LJCM	S&D	QGC	2019	Bore assessment pending*
14421	-25.79	149.70	TCM, LJCM, UJCM	S&D	QGC	2019	MGA negotiations ongoing*
14423	-25.93	149.41	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
14533	-26.09	149.48	UJCM, LJCM	S&D	Origin	2016	Decommissioned

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
14595	-25.98	149.65	UJCM	S&D	QGC	2016	Decommissioned
14596	-26.00	149.64	UJCM	S&D	QGC	2016	Decommissioned
14618	-25.96	149.54	LJCM, TCM, UJCM	S&D	QGC	2016	Decommissioned
14632	-26.05	149.61	UJCM	S&D	QGC	2016	Decommissioned
14648	-25.99	149.50	LJCM	S&D	QGC	2016	Uncertain authorisation status
14649	-26.00	149.47	LJCM	S&D	QGC	2019	MGA negotiations ongoing
14743	-26.11	149.59	LSBK, USBK	S&D	QGC	2019	Finalised MGA
14745	-26.13	149.58	LJCM, USBK, UJCM	S&D	QGC	2012	Decommissioned
14888	-25.88	149.75	LHUT	S&D	NA	2016	No longer IAA – aquifer not impacted
14891	-25.93	149.75	UJCM	S&D	QGC	2019	MGA negotiations ongoing
15079	-26.77	150.67	UJCM	S&D	Arrow	2019	Bore assessment submitted MGA pending*
15083	-26.81	150.55	UJCM	S&D	Origin	Post UWIR 2012	Decommissioned
15711	-25.98	149.84	LJCM	S&D	QGC	2019	MGA negotiations ongoing
15784	-26.78	150.58	UJCM	S&D	Origin	2016	Decommissioned
15789	-25.80	149.67	LJCM	S&D	QGC	2019	MGA negotiations ongoing*
15802	-26.04	149.93	LJCM	S&D	Origin	2019	MGA negotiations ongoing*
15810	-26.77	150.34	UJCM	S&D	Origin	2012	Decommissioned
15820	-25.86	149.70	LJCM	S&D	QGC	2016	Finalised MGA
15831	-25.98	149.81	LJCM	S&D	QGC	2016	Finalised MGA
15836	-25.99	149.87	LJCM	S&D	QGC	2019	MGA negotiations ongoing
15838	-25.99	149.72	LJCM	S&D	QGC	2019	Bore assessment submitted MGA pending
15848	-25.82	149.69	TCM, LJCM, LHUT, DUR, UHUT	S&D	QGC	2019	MGA negotiations ongoing*

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
15855	-26.07	149.83	TCM, UJCM, LJCM	S&D	QGC	2016	Decommissioned
15868	-26.91	150.67	UJCM, UJCM	S&D	Arrow	2019	MGA negotiations ongoing*
15892	-26.06	149.79	LJCM	S&D	QGC	2016	Decommissioned
15992	-25.87	149.66	UJCM, LJCM, TCM	S&D	QGC	2016	Uncertain authorisation status*
16022	-25.86	149.65	LJCM	S&D	QGC	2016	Uncertain authorisation status*
16040	-26.06	149.75	UJCM	S&D	QGC	2016	Decommissioned
16102	-26.19	149.54	UJCM	S&D	Origin	2012	Decommissioned
16119	-26.00	149.53	LJCM	S&D	QGC	2016	Decommissioned
16135	-26.15	149.65	UJCM, LJCM, TCM	S&D	QGC	2012	Decommissioned
16191	-26.02	149.75	UJCM	S&D	QGC	2016	Uncertain authorisation status
16211	-26.20	148.91	LJCM, LSBK, UJCM	S&D	Senex	2019	Finalised MGA
16400	-26.63	150.44	UHUT, DUR, TCM	S&D	QGC	2019	MGA negotiations ongoing*
16552	-27.10	151.02	UJCM, TCM, LJCM	S&D	Arrow	2016	MGA negotiations ongoing
16855	-27.14	151.02	UJCM, LSBK	S&D	Arrow	2016	Finalised MGA
16938	-26.13	149.45	LJCM	S&D	Origin	2012	Decommissioned
16939	-26.13	149.48	UJCM	S&D	Origin	2012	Decommissioned
16940	-26.15	149.45	LJCM	S&D	Origin	2012	Decommissioned
16941	-26.16	149.49	UJCM	S&D	Origin	2012	Decommissioned
16942	-26.14	149.50	LSBK, UJCM, LJCM, TCM	S&D	Origin	2012	Decommissioned
16943	-26.17	149.46	UJCM	S&D	Origin	2012	Finalised MGA
16944	-26.18	149.48	UJCM	S&D	Origin	2012	Decommissioned
16946	-26.17	149.45	UJCM	S&D	Origin	2012	Decommissioned

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
17005	-26.04	149.44	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
17301	-26.93	150.68	UJCM	S&D	Arrow	2019	Bore assessment pending*
17414	-27.14	150.99	TCM, UJCM, LJCM	S&D	Arrow	2012	Finalised MGA
17631	-27.32	151.15	USBK	S&D	NA	2012	No longer IAA – aquifer not impacted
17640	-26.04	149.29	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
17683	-26.97	151.18	LJCM, TCM, UJCM	S&D	Arrow	2019	MGA negotiations ongoing*
17753	-25.99	149.70	UJCM, LJCM	S&D	QGC	2019	Decommissioned
17799	-26.00	149.87	TCM, UJCM, LJCM	S&D	QGC	2019	MGA negotiations ongoing
17800	-26.01	149.86	LJCM	S&D	QGC	2019	MGA negotiations ongoing
18197	-25.93	149.79	LJCM	S&D	QGC	2016	MGA negotiations ongoing
18230	-26.50	149.50	UJCM	S&D	NA	2012	No longer IAA – aquifer not impacted
19964	-26.73	150.72	LJCM	S&D	Arrow	2019	Bore assessment pending
19995	-26.84	150.53	UJCM	S&D	Origin	2012	Decommissioned
21013	-26.77	150.85	LJCM	S&D	Arrow	2019	MGA negotiations ongoing
21061	-26.91	150.88	LJCM	S&D	Arrow	2019	MGA negotiations ongoing
21786	-26.98	150.95	UJCM	S&D	NA	2019	Determined not to be an IAA bore post-2019
21787	-26.90	150.89	LJCM	S&D	Arrow	2019	Bore assessment pending
21791	-26.89	150.94	LJCM	S&D	Arrow	2019	Bore assessment pending
21795	-26.88	150.97	CA	S&D	NA	2019	No longer IAA – aquifer not impacted
21796	-26.97	150.96	UJCM	S&D	NA	2019	Determined not to be an IAA bore post-2019
21799	-26.91	150.98	LJCM	S&D	Arrow	2019	Bore assessment pending*
21805	-26.95	150.90	LJCM	S&D	Arrow	2019	Bore assessment pending
21806	-26.95	150.90	LJCM	S&D	Arrow	2019	Bore assessment pending

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
21809	-26.89	150.92	LJCM	S&D	Arrow	2019	Bore assessment pending
21817	-26.98	150.97	UJCM	S&D	Arrow	2019	Bore assessment pending
21820	-26.95	150.95	CA	S&D	NA	2019	Determined not to be an IAA bore post-2019
21825	-26.85	150.93	LJCM	S&D	Arrow	2019	Bore assessment pending
21828	-26.91	150.93	LJCM	S&D	Arrow	2019	Bore assessment pending*
22031	-26.89	150.70	LJCM	S&D	Arrow	2019	Bore assessment pending
22123	-27.09	150.81	TCM	S&D	NA	2012	No longer IAA – not a water bore
22724	-26.40	149.31	DUR, UHUT, LJCM, LHUT	S&D	Origin	2016	Decommissioned
23053	-26.97	150.38	LHUT, DUR, ORF, LJCM, TCM	S&D	QGC	2019	Bore assessment submitted MGA pending
23060	-27.03	150.36	GUB, ORF, USBK, LSBK, UJCM, LJCM, TCM, WT	S&D	QGC	2016	Uncertain authorisation status
23150	-27.39	150.73	GUB, WT, LSBK, USBK, TCM, UJCM, LJCM	S&D	QGC	2019	Bore assessment submitted MGA pending
23386	-27.13	150.70	TCM	S&D	QGC	2012	Decommissioned
23424	-26.96	150.40	GUB, ORF, USBK, LSBK, UJCM, LJCM, TCM, WT	S&D	QGC	2016	Uncertain authorisation status
23460	-26.87	150.41	LJCM	P&G Ex.	NA	2012	No longer IAA – not a water bore
23469	-27.01	150.35	GUB, ORF, USBK, LSBK, UJCM, LJCM, TCM, WT	S&D	Origin (QGC)	2016	Uncertain authorisation status
23560	-27.29	150.69	GUB	S&D	NA	2012	No longer IAA – aquifer not impacted

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
24280	-27.47	151.18	UJCM, LJCM, TCM	S&D	Arrow	2012	DES advised on hold
24288	-27.43	151.19	LJCM, UJCM, TCM	S&D	Arrow	2012	DES advised on hold
24465	-26.87	150.55	UJCM, LJCM, TCM	S&D	Origin	Post UWIR 2012	Decommissioned
24466	-26.93	150.64	UJCM	S&D	Arrow	2019	Finalised MGA
24469	-26.86	150.60	LJCM, TCM, UJCM	S&D	Arrow	2016	Decommissioned
24472	-26.87	150.57	USBK, LSBK	S&D	Origin	2019	Decommissioned
24478	-26.82	150.56	TCM, LJCM, UJCM, LSBK, USBK, CS	S&D	Origin	2016	Decommissioned
24486	-26.77	150.68	LJCM, UJCM	S&D	Arrow	2019	Bore assessment pending
24487	-26.76	150.69	UJCM, LJCM	S&D	Arrow	2019	Bore assessment pending
24497	-26.67	150.63	LJCM	S&D	Arrow	2019	Bore assessment pending
24504	-26.88	150.64	UJCM, LJCM, TCM, UJCM	A	Arrow	2019	MGA negotiations ongoing
24910	-26.67	150.65	LJCM	S&D	Arrow	2019	Bore assessment submitted MGA pending
26063	-26.85	150.50	USBK	S&D	Origin	2012	Decommissioned
26429	-25.95	149.76	TCM, LJCM, UJCM, USBK, LSBK	S&D	QGC	2016	Decommissioned
26466	-26.80	150.86	LJCM	S&D	NA	2019	Determined not to be an IAA bore post-2019
30035	-27.19	151.03	LSBK	S&D	Arrow	2019	Bore assessment pending
30165	-26.04	149.33	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
30259	-25.95	149.35	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
30409	-26.77	150.45	LSBK, UJCM, LJCM, TCM, USBK	S&D	Origin	2012	Decommissioned
30553	-26.24	149.66	WT	S&D	NA	2019	Decommissioned

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
30564	-26.23	149.23	USBK, UJCM	S&D	Origin	2012	Decommissioned
30783	-26.09	149.18	LJCM	S&D	Origin	2019	Finalised MGA
30997	-27.21	151.02	LSBK	A	Arrow	2012	Finalised MGA
31331	-26.12	149.84	LSBK	S&D	Origin	2019	MGA negotiations ongoing*
31408	-26.29	149.37	GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
31995	-26.16	149.56	UJCM	S&D	QGC	2012	Decommissioned
32259	-26.14	149.57	USBK, UJCM	S&D	QGC	2012	Decommissioned
32314	-26.89	150.93	CA, LJCM	S&D	Arrow	2019	Bore assessment pending*
32507	-26.16	149.16	UHUT	S&D	Origin	2019	Finalised MGA
32939	-26.21	149.20	LJCM, UHUT, UJCM, TCM	S&D	Origin	Post UWIR 2012	Decommissioned
33286	-26.23	149.68	ORF, GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
33319	-27.06	150.79	LJCM, UJCM, LSBK	S&D	Origin (QGC)	2012	Decommissioned
33435	-26.15	149.61	LJCM, TCM, UJCM	S&D	Origin (QGC)	Post UWIR 2012	Decommissioned
33553	-26.92	150.64	USBK, LSBK	S&D	NA	2019	Determined not to be an IAA bore post-2019
33821	-26.12	149.58	UJCM	S&D	QGC	2012	Decommissioned
33830	-26.75	150.50	LSBK, UJCM	S&D	Origin	2016	Decommissioned
34708	-26.10	149.67	UJCM, TCM, LSBK, LJCM	S&D	QGC	2012	Decommissioned
34709	-26.11	149.66	UJCM	S&D	QGC	2016	Decommissioned
34718	-26.09	149.73	UJCM	S&D	QGC	2016	Uncertain authorisation status

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
34846	-26.83	150.55	LSBK, TCM, LJCM, USBK, UJCM	S&D	Origin	Post UWIR 2012	Decommissioned
34929	-26.09	149.69	LSBK, UJCM	S&D	QGC	2016	Uncertain authorisation status
35405	-27.03	150.97	UJCM, LJCM	S&D	Arrow	2019	Bore assessment pending
35623	-27.20	151.07	UJCM	S&D	Arrow	2019	Decommissioned
35754	-26.19	149.35	TCM, UJCM, LJCM, USBK, LSBK	S&D	Origin	2012	Decommissioned
35842	-26.21	149.64	WT, LJCM, TCM, UJCM, USBK	S&D	QGC	2012	Decommissioned
35966	-26.29	149.83	GUB	A	NA	2012	No longer IAA – aquifer not impacted
36143	-26.14	149.40	LJCM	S&D	Origin	2016	Decommissioned
37177	-27.01	150.84	LJCM, TCM, UJCM	S&D	Arrow	2019	Finalised MGA
37301	-26.18	149.33	LJCM, UJCM, USBK, LSBK	S&D	Origin	2012	Decommissioned
37838	-26.96	151.18	TCM, LJCM, UJCM	S&D	Arrow	2019	Bore assessment pending*
37949	-25.99	149.55	UJCM, LJCM	S&D	QGC	2016	Decommissioned
38191	-26.85	150.59	UJCM	S&D	Arrow	2016	Decommissioned
43380	-25.99	149.69	LJCM	S&D	QGC	2016	Uncertain authorisation status
43660	-26.18	149.41	UJCM, LSBK, UJCM	S&D	Origin	2012	Decommissioned
44006	-26.26	149.84	USBK	S&D	Origin	2012	Decommissioned
44246	-26.04	149.64	UJCM	S&D	QGC	2016	Decommissioned
44555	-26.24	149.10	LJCM	S&D	NA	2019	Decommissioned
44605	-26.08	149.66	UJCM	S&D	QGC	2012	Decommissioned
48523	-26.66	150.67	LJCM	S&D	Arrow	2019	MGA negotiations ongoing*

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
48803	-26.07	149.37	LJCM	S&D	Origin	2019	Decommissioned
48806	-26.22	149.66	UJCM, TCM, USBK, WT, LJCM	S&D	QGC	2012	Decommissioned
48811	-25.94	149.79	LJCM	S&D	QGC	2016	MGA negotiations ongoing
48824	-26.09	149.35	LJCM	S&D	Origin	2019	Finalised MGA
48841	-25.96	149.89	LJCM, TCM	S&D	QGC	2019	MGA negotiations ongoing*
48886	-26.23	149.35	UJCM	S&D	Origin	Post UWIR 2012	Decommissioned
48887	-25.97	149.38	TCM, UJCM, LJCM	S&D	QGC	2019	MGA negotiations ongoing*
48951	-26.17	148.98	UHUT	S&D	Senex	2019	Finalised MGA
48955	-26.28	149.04	LJCM	S&D	Senex	2019	Finalised MGA
48956	-26.25	149.05	UJCM, LJCM	S&D	Senex	2019	Finalised MGA
48965	-26.15	149.64	LSBK, UJCM	S&D	QGC	2012	Decommissioned
48966	-25.83	149.44	TCM	S&D	QGC	2019	Bore assessment submitted MGA pending*
48977	-25.92	149.38	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
48979	-25.94	149.39	UHUT	S&D	NA	2019	Determined not to be an IAA bore post-2019
48981	-26.15	149.45	UJCM	S&D	Origin	2012	Decommissioned
52763	-27.29	151.08	USBK	S&D	NA	2019	Determined not to be an IAA bore post-2019
55015	-27.33	151.13	LSBK	S&D	NA	2012	No longer IAA – aquifer not impacted
55365	-27.17	151.07	TCM, UJCM, LJCM	S&D	Arrow	2016	Decommissioned
56714	-26.79	150.72	LJCM	S&D	Arrow	2019	Bore assessment submitted MGA pending
58005	-25.92	149.78	LJCM	S&D	QGC	2016	MGA negotiations ongoing
58009	-26.19	149.76	WT	S&D	NA	2012	No longer IAA – aquifer not impacted
58064	-25.99	149.66	UJCM	S&D	QGC	2016	Decommissioned

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
58077	-26.00	149.58	UJCM, LJCM	S&D	QGC	2016	Decommissioned
58079	-26.05	149.68	UJCM, LSBK	S&D	QGC	2016	Decommissioned
58084	-26.07	149.26	LJCM, TCM	S&D	Origin	2019	Finalised MGA
58101	-25.91	149.50	LJCM	S&D	QGC	2019	Finalised MGA
58103	-26.19	148.89	LJCM, UJCM	S&D	Senex	2019	MGA negotiations ongoing*
58111	-26.19	149.05	UHUT	A	NA	2019	Determined not to be an IAA bore post-2019
58129	-26.11	149.84	USBK, UJCM	S&D	Origin	2019	Decommissioned
58253	-26.23	149.25	UJCM, LJCM, TCM	S&D	Origin	2012	Decommissioned
58288	-26.26	149.25	UJCM, LSBK, USBK, WT	S&D	Origin	2012	Decommissioned
58297	-26.07	149.69	UJCM	S&D	QGC	2012	Decommissioned
58301	-25.97	149.72	UJCM, LJCM	S&D	QGC	2016	Uncertain authorisation status
58302	-25.96	149.68	UJCM	S&D	QGC	2019	Finalised MGA
58304	-25.90	149.78	LJCM, TCM	S&D	QGC	2016	MGA negotiations ongoing
58307	-26.35	149.80	GUB, ORF	S&D	NA	2012	No longer IAA – aquifer not impacted
58371	-26.15	149.31	TCM, DUR, LJCM, UHUT	S&D	Origin	2019	Finalised MGA
58402	-26.27	149.23	WT	S&D	Origin	2012	Finalised MGA
58435	-26.18	149.22	UHUT, LJCM, TCM, DUR	S&D	Origin	Post UWIR 2012	Finalised MGA
58451	-26.12	149.33	UHUT	S&D	Origin	2019	Finalised MGA
58499	-27.27	149.18	UCF	S&D	NA	2012	No longer IAA – aquifer not impacted
58533	-26.16	148.93	UJCM, LJCM	S&D	Senex	2019	Finalised MGA
58537	-26.04	149.65	UJCM	S&D	QGC	2016	Decommissioned

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
58541	-25.99	149.59	LJCM, UJCM, UHUT, DUR, TCM	S&D	QGC	2016	Decommissioned
58600	-26.05	149.53	UJCM, LJCM	S&D	QGC	2016	Uncertain authorisation status
58609	-26.19	149.77	WT	S&D	NA	2012	No longer IAA – aquifer not impacted
58612	-25.99	149.55	LJCM	S&D	QGC	2016	Decommissioned
58646	-26.17	149.37	LJCM	S&D	Origin	2012	Decommissioned
58768	-26.09	149.63	LSBK, UJCM	S&D	QGC	2016	Decommissioned
58786	-26.26	149.84	WT	S&D	NA	2012	No longer IAA – aquifer not impacted
58810	-26.32	149.03	GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
58910	-26.18	149.87	UJCM	S&D	Origin	2019	MGA negotiations ongoing
61675	-26.75	150.68	CA	S&D	NA	2019	Determined not to be an IAA bore post-2019
66146	-26.99	150.86	LJCM, TCM, UJCM	S&D	Arrow	2019	Finalised MGA
66152	-26.93	150.68	LJCM, UJCM	S&D	Arrow	2019	Bore assessment pending
83486	-26.97	150.47	GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
83510	-27.08	150.53	ORF	S&D	NA	2012	No longer IAA – aquifer not impacted
83627	-26.85	150.52	LJCM, UJCM, TCM	S&D	Origin	2012	Decommissioned
87320	-26.98	150.88	UJCM	S&D	Arrow	2019	MGA negotiations ongoing
87471	-27.16	151.01	UJCM, LSBK	A	Arrow	2012	Finalised MGA
87505	-26.98	150.67	LSBK	S&D	Arrow	2019	MGA negotiations ongoing
87611	-26.76	150.49	UJCM, UJCM, USBK, LSBK	S&D	Origin	2012	Decommissioned
87718	-26.82	150.62	UJCM	S&D	Arrow	2019	Decommissioned
87777	-27.00	150.95	UJCM, LJCM	S&D	Arrow	2019	MGA negotiations ongoing

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
87897	-26.95	150.62	LSBK	A	Arrow	2019	Decommissioned
87912	-26.73	150.72	LJCM, DUR, TCM	S&D	Arrow	2019	MGA negotiations ongoing
94039	-27.00	150.85	UHUT, TCM, LHUT, UEVG, DUR	A	Arrow	2019	Finalised MGA
94052	-27.20	151.01	LSBK	S&D	NA	2012	No longer IAA – aquifer not impacted
94135	-27.04	150.97	UJCM	I	Arrow	2016	Finalised MGA
94143	-26.93	150.92	LJCM	TWS	Arrow	2019	Finalised MGA
94586	-27.01	150.98	UJCM	S&D	Arrow	2019	Bore assessment pending
94587	-27.01	150.98	UJCM	A	Arrow	2019	MGA negotiations ongoing
94678	-27.01	150.98	UJCM	S&D	Arrow	2019	Bore assessment submitted MGA pending
94831	-27.20	151.06	UJCM	S&D	Arrow	2019	Finalised MGA
107085	-27.02	150.98	UJCM	S&D	Arrow	2019	Finalised MGA
107222	-26.78	150.50	UJCM, TCM, LJCM	S&D	Origin	Post UWIR 2012	Decommissioned
107260	-26.63	150.46	UJCM	S&D	Origin	2019	Bore assessment pending*
107784	-26.73	150.54	LJCM, TCM, UJCM	S&D	Origin	2019	MGA negotiations ongoing
107873	-27.00	150.96	UJCM	A	Arrow	2019	MGA negotiations ongoing
107910	-27.09	150.92	UJCM, LSBK	S&D	Arrow	Post UWIR 2012	Decommissioned
119076	-26.95	150.86	LJCM	S&D	Arrow	2019	Bore assessment submitted MGA pending
119170	-26.92	150.49	USBK, LSBK, UJCM, TCM, LJCM	S&D	QGC	2012	Decommissioned
119267	-27.11	150.91	DUR, UJCM, LSBK, LJCM, TCM	I	QGC	2012	Decommissioned
119484	-26.83	150.60	LJCM	S&D	Arrow	2016	Finalised MGA
119859	-27.33	151.09	USBK, LSBK	S&D	NA	2012	No longer IAA – aquifer not impacted

RN	Latitude	Longitude	Intersected formations	Purpose	RTH	First identified	Current status
123196	-26.50	149.23	GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
123291	-26.56	148.62	BGF, MSt, ORF	S&D	NA	2012	No longer IAA – aquifer not impacted
123292	-26.52	148.82	ORF	S&D	NA	2012	No longer IAA – aquifer not impacted
123454	-26.21	149.75	USBK, LSBK	S&D	QGC	2019	Bore assessment submitted MGA pending*
123554	-26.24	149.66	GUB	S&D	NA	2019	Determined not to be an IAA bore post-2019
137140	-26.86	150.45	USBK	S&D	NA	2012	No longer IAA – aquifer not impacted
137175	-27.12	150.82	LSBK, UJCM, USBK	A	QGC	2012	Decommissioned
137552	-27.12	150.90	LHUT, UEVG, UHUT	I	NA	2012	No longer IAA – aquifer not impacted
147001	-26.86	150.66	LJCM	S&D	Arrow	2019	Decommissioned
147108	-26.75	150.52	UJCM	S&D	Origin	2016	Decommissioned
147156	-27.19	151.78	UHUT	S&D	NA	2012	No longer IAA – aquifer not impacted
147170	-26.92	150.52	WT	S&D	NA	2012	No longer IAA – aquifer not impacted
147264	-26.88	150.51	UJCM	S&D	Origin	2012	Decommissioned
147393	-26.81	150.52	UJCM, LJCM, TCM	S&D	Origin	2016	Decommissioned
147412	-27.02	150.98	UJCM	A	Arrow	2019	MGA negotiations ongoing
147599	-26.98	150.90	UJCM	S&D	Arrow	2019	MGA negotiations ongoing
147607	-26.93	150.66	UJCM	S&D	Arrow	2019	Decommissioned
147653	-27.01	150.61	LSBK	S&D	QGC	2019	MGA negotiations ongoing
147703	-27.00	150.66	LSBK, USBK	S&D	QGC	2019	Finalised MGA
147832	-26.81	150.56	UJCM	S&D	Origin	2016	Decommissioned
172144	-26.96	151.18	TCM	S&D	Arrow	2019	MGA negotiations ongoing*
172525	-26.97	150.91	LJCM, UJCM	S&D	Arrow	2019	MGA negotiations ongoing

Notes:

- **Formation:**. BGF = Bungil Formation. CA = Condamine Alluvium. CS = Clematis Sandstone. DUR = Durabilla Formation. GUB = Gubberamunda Sandstone. LHUT = Lower Hutton Sandstone. LJCM = Lower Juandah Coal Measures. LSBK = Lower Springbok Sandstone. MIB = Mesomorphic/igneous/old basement rocks. MSt = Mooga Sandstone. ORF = Orallo Formation. SSt = Springbok Sandstone. TCM = Taroom Coal Measures. UCF = Upper Cretaceous formations. UEVG = Upper Evergreen Formation. UHUT = Upper Hutton Sandstone. UJCM = Upper Juandah Coal Measures. USBK = Upper Springbok Sandstone. WCM = Walloon Coal Measures. WT = Westbourne Formation.
- **Purpose:** A = agriculture. I = industrial. Irr = irrigation. S&D = stock and domestic. P&G Ex = P&G exploration. SI = stock-intensive. TWS = town water supply.
- **Current status:** MGA = Make good agreement. * = the current predicted drawdown does not exceed the IAA trigger threshold prior to 2025.

G.4 Bores identified for baseline assessment

The table below lists off-tenure water bores identified for baseline assessment in the UWIR 2021.

Table G-3: Details of bores identified for baseline assessment (off tenure)

RN	Latitude	Longitude	Intersected formation/s	Purpose	RTH
5588	-27.08	151.28	UJCM, DUR, LJCM, TCM	S&D	Arrow
13622	-27.10	151.33	TCM	S&D	Arrow
17179	-27.37	151.69	TCM	S&D	New Hope
17473	-27.17	151.33	LJCM	S&D	Arrow
18941	-27.20	151.43	TCM	S&D	Arrow
18968	-27.21	151.44	TCM	S&D	Arrow
19410	-27.27	151.64	MRV	S&D	New Hope
19490	-27.28	151.64	TCM	S&D	New Hope
21849	-27.35	151.67	TCM	S&D	New Hope
31400	-27.10	151.35	UJCM, LJCM, TCM	S&D	Arrow
48018	-27.27	151.42	LJCM	S&D	Arrow
48110	-27.38	151.67	LJCM, TCM	S&D	New Hope
48198	-27.11	151.31	TCM	A	Arrow
48393	-27.16	151.39	UJCM, DUR, LJCM, TCM	S&D	Arrow
48394	-27.16	151.39	TCM	S&D	Arrow
52640	-27.16	151.37	TCM	S&D	Arrow
71247	-27.27	151.65	MRV	A	New Hope
83742	-27.37	151.66	LJCM, TCM	S&D	New Hope
86737	-27.27	151.41	LJCM	S&D	Arrow
86745	-27.28	151.39	LJCM	S&D	Arrow
94280	-27.18	151.35	LJCM	S&D	Arrow
137369	-27.08	151.26	TCM, DUR	S&D	Arrow
147262	-27.38	151.68	LJCM, TCM	S&D	New Hope
147377	-27.28	151.42	LJCM	S&D	Arrow
147491	-27.28	151.42	LJCM	S&D	Arrow
147539	-27.18	151.35	LJCM	A	Arrow
147662	-27.08	151.26	TCM	S&D	Arrow
147709	-27.08	151.26	TCM	S&D	Arrow
147755	-27.08	151.26	TCM	S&D	Arrow
147804	-27.30	151.38	LJCM	S&D	Arrow
147936	-27.16	151.39	TCM, DUR	S&D	Arrow
172268	-27.09	151.31	TCM	S&D	Arrow
172437	-27.07	151.26	TCM, DUR	S&D	Arrow

RN	Latitude	Longitude	Intersected formation/s	Purpose	RTH
172848	-27.32	151.45	LJCM, TCM	S&D	Arrow
192144	-27.08	151.26	TCM, DUR	S&D	Arrow
1200001212	-26.71	150.78	LJCM, TCM, DUR	S&D	Arrow
1200001725	-27.37	151.65	TCM	S&D	New Hope
1200001730	-27.37	151.67	TCM	S&D	New Hope

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Appendix H

Spring Impact Management Strategy

H.1 Spring process flow diagram

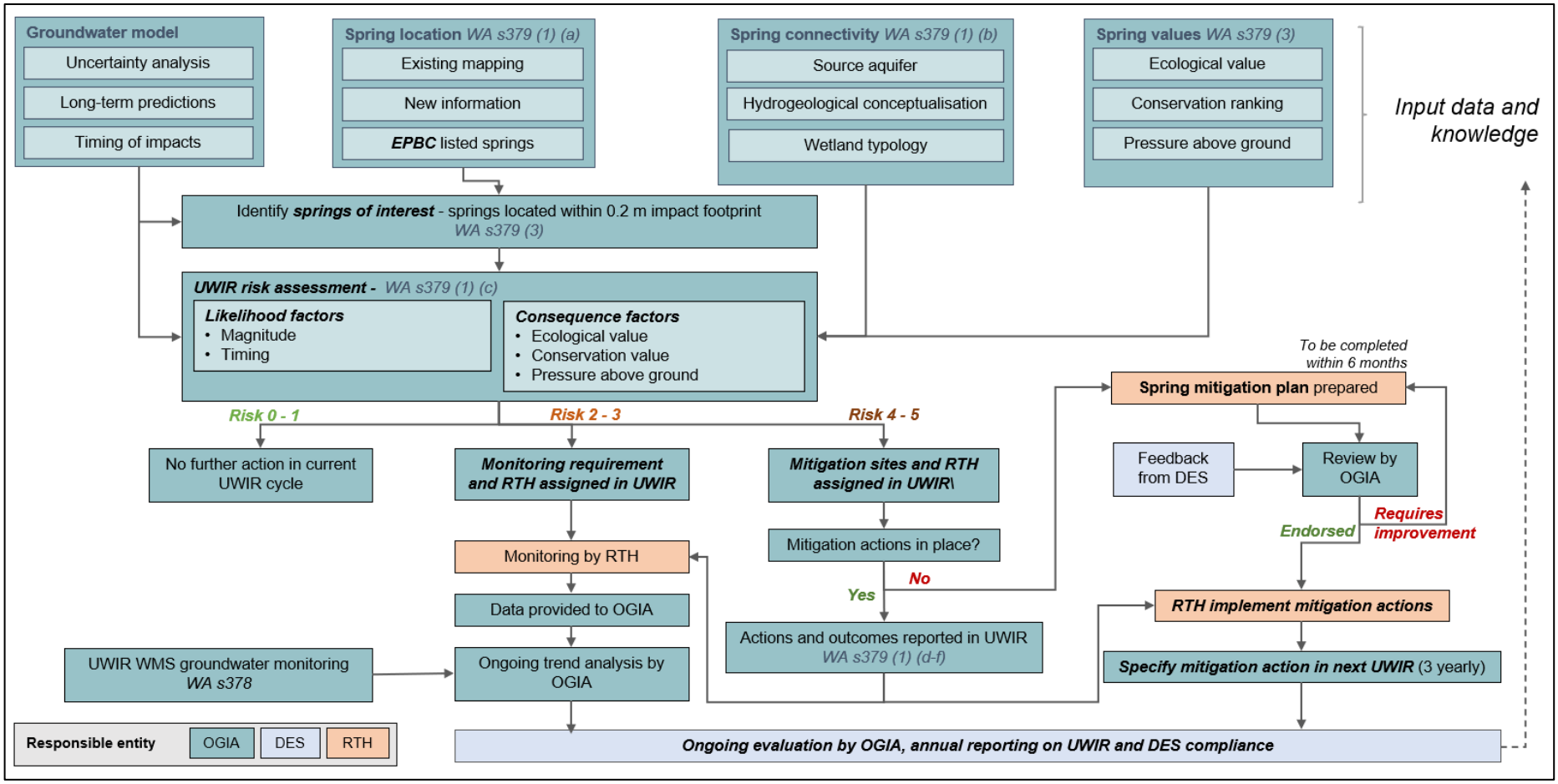

Figure H-1: Spring process flow diagram

H.2 Spring risk assessment

A risk assessment for all springs has been completed to guide the identification of sites for monitoring and mitigation actions in the UWIR 2021. Details of the assessment have been reported previously (OGIA 2016e, 2016a), with additional information available in the companion document to the UWIR (OGIA 2021g).

The outcomes from the risk assessment for each spring complex and watercourse spring are summarised in Table H-1. Only those sites where drawdown is currently or has been predicted in the spring's source aquifer are included. Responsible tenure holders are assigned where monitoring activities or mitigation plans are required under the UWIR 2021.

The following explanations apply to these tables:

- **Complex:** as defined by the Queensland Springs Dataset held by the Queensland Herbarium. Watercourse springs have a ***site number***.
- **Years before impact exceeds 0.2 metres (from 2021):** the time before predicted impact is to exceed 0.2 metres in the source aquifer at the location of the spring complex. These impacts are based on P&G development and coal mine development in the Surat Basin. Note, this does not include the influence of injection. This will significantly delay predicted impacts for springs which are fed from the Precipice Sandstone.
- **Maximum drawdown:** the magnitude and timing of the maximum impact predicted from the regional groundwater model in the source aquifer at the location of the spring complex. The range of values represents the range of uncertainty in the model predictions (P5 to P95).
- **Overall risk score:** the total risk score assigned to the spring in the current and previous iterations of the UWIR (i.e. 2012, 2016, 2019, 2021).
- **RTH and Action:** the tenure holder responsible and the required management action.
- **Residual risk:** the resulting risk in consideration of the actions established under a mitigation action plan and subsequent implementation. There are also two watercourse that require validation prior to assignment of any monitoring or mitigation actions.

Table H-1: Summary of predictions of impact and risk assessment for springs predicted to be impacted in the current and previous UWIRs

Spring group	Spring complex / watercourse spring	Source aquifer	Max impact*		Time until 0.2 m (years)	Overall risk score				RTH	Action	Residual risk
			Metres	Timing		2012	2016	2019	2021			
Springrock	Springrock Creek (561)	Precipice Sandstone	1.1 – 3.9	38 – 39	0	5	5	5	5	Santos	Implement SIMP	2
	Hutton Creek (W216)		1.1 – 4.2	38 – 39	0	NA	NA	5	4			2
	Hutton Creek (W217a_Upper)		1.3 – 4.9	38	0	NA	NA	5	4			2
311 / Yebna 2	311 (311)	Precipice Sandstone	0.2 – 0.7	38 – 39	0 – 12	4	5	5	5	Santos	Implement SIMP	2
	Yebna 2 (591)		0.2 – 0.6	25 – 39	0 – 18	4	5	5	5			2
	Dawson River (W40)		0.2 – 0.7	25 – 37	0 – 30	NA	3	4	3			2
	Hutton Creek (W81)		0.2 – 0.7	38 – 39	0	NA	3	5	3			2
	Hutton Creek (W217b_Lower)		0.5 – 1.7	24 – 38	0	NA	NA	5	5			2
	Boyd Creek (W179)		0.2 – 0.7	24 – 37	0 – 13	NA	NA	NA	3	Santos	Validation	3
Lucky Last	Lucky Last (230)	Boxvale Sandstone	0.3 – 1.1	42 – 49	0-19	5	3	5	5	Santos	Implement SIMP	2
	Injune Creek (W82B)		0.3 -1.1	42 – 49	0 – 19	NA	NA	NA	5			2
Lonely Eddie	Lonely Eddie (339)	Precipice Sandstone	< 0.2	-	-	NA	3	4	2	-	No action	2
Carnassier	Carnassier (722)	Precipice Sandstone	0.1 – 0.6	53 – 69	9 – 29		1	2	3	-	No action	3
Cockatoo	Cockatoo Creek (W28)	Precipice Sandstone	0.1 – 0.4	40 – 43	9 – 16	NA	2	4	3	-	No action	3
Cockatoo	Cockatoo (362)	Precipice Sandstone	0.1 – 0.4	40 – 43	9 – 16	NA	3	4	4	-	No action	4
Bowenville	Bowenville (585)	Basalt	0.2 – 0.4	98	33 – 40	NA	3	3	3	-	No action	3
Barton	Barton (283)	Gubberamunda Sandstone	0.8	> 100	> 50	4	5	2	3	Origin	Monitoring	3

Spring group	Spring complex / watercourse spring	Source aquifer	Max impact*		Time until 0.2 m (years)	Overall risk score				RTH	Action	Residual risk
			Metres	Timing		2012	2016	2019	2021			
Bell Creek	Bell Creek (W168)	Precipice Sandstone	0.1 – 0.4	> 40	10 – 34	NA	NA	NA	4	-	No action	4
Robinson Creek	Robinson Creek (254)	Precipice Sandstone	0.1 – 0.4	41 – 42	10 – 20	NA	NA	4	3	-	No action	3
Wilkie Creek	Wilkie Creek (W278)	Alluvium	0.3 – 1	> 100	0 – 52	NA	NA	NA	5	Peabody	Validation	5
Horse Creek	Horse Creek (W215)	Alluvium	NA	NA	NA	NA	NA	5	NA	-	No action	NA
Orana	Orana (765)	Cenozoic	< 0.2	-	-	NA	2	3	3	-	No action	3
Scotts Creek	Scotts Creek (260)	Hutton Sandstone				5	5	3	3	Origin	Monitoring	3

Notes:
SIMP = Santos spring impact management plan, NA = not assessed or included in assessment
* = The magnitude and timing of impact shown is for impact resulting from P&G and coal mining activities only – the Water Act requirement. The impacts presented exclude the influence of reinjection on groundwater levels, which will materially change the magnitude and timing of impacts presented in the Precipice Sandstone and the Boxvale Sandstone.

Table H-2: Summary of mitigation actions, triggers and reporting in the Santos SIMP

Spring group	Springrock	311/Yebna 2	Lucky Last
Spring complex / watercourse spring	Springrock Creek (561), Hutton Creek (W216), Hutton Creek (W217a)	Hutton Creek (W217b), Dawson River (W40), Hutton Creek (W81), 311 (311), Yebna 2 (591)	Lucky Last (230)
Source aquifer	Precipice Sandstone	Precipice Sandstone	Boxvale Sandstone Member
Action	Augment wetland flow (s3.6.2 of the Spring Impact Mitigation Plan Nov 2020).	Offset Origin Energy's forecast reinjection operations via retirement of applicable groundwater extraction licence (s3.6.1 of the Spring Impact Mitigation Plan Nov 2020).	Offset drawdown by retiring landholder extraction and/or stock control measures to improve wetland resilience to impact (s3.6.3 of the Spring Impact Mitigation Plan Nov 2020).
Trigger for action	Confirmation of CSG impacts at site VW0903P1 or SPRGWP02. Access to additional site RN 14837 is being evaluated for future trigger analysis.	Confirmation of CSG impacts at site MNHGWP02 or MW0903. The equipping of two additional sites OKSGWP05 and OKSGWP04 is being evaluated for future trigger analysis.	Confirmation of CSG impacts at site RN 13030882 or RN 123470.
Action implementation by	Santos		
Time to implement	Within two years of confirmation of trigger at VW0903P1, and within one year at SPRGWP02.	Within two years of confirmation of trigger at MNHGWP02 and within one year at MW0903.	Within two years of confirmation of trigger at RN 13030882 and within one year at or RN 123470.
Data reporting to OGIA by	Santos (six-monthly, in accordance with WMS (Chapter 9))		
Trigger reporting by	OGIA		
Trigger confirmation by	OGIA		
Trigger confirmation and/or reporting to	DES and Santos (six-monthly)		

Table H-3: Summary of trigger monitoring bores identified in the Santos SIMP

Spring group	RN	Monitoring point ID	Location		Formation	Trend (m/yr)	Interpretation
			Latitude	Longitude			
Lucky Last[1]	13030882A	-	-25.802848	148.772808	Precipice Sandstone	+ 0.02	Possible early response to reinjection. Relatively stable trends since then, with minor rise observed in the recent period. No CSG impacts observed in the available data.
	123470A	-	-25.793340	148.774538	Precipice Sandstone	+ 0.02	Possible early response to reinjection. Since then, a period of decline coinciding with lower rainfall period. Relatively stable trend with minor increasing trends in the recent period. No CSG impacts observed in the available data.
311 / Yebna 2[2]	160661A	MNHGWP02	-25.731034	148.845791	Precipice Sandstone	- 0.12	Significant initial response (~ 1 m) to the commencement of reinjection commencement. Since early 2017, a period of decline coinciding with lower rainfall period. Continued minor declines in the in the recent period. CSG impacts are unlikely from the available data.
	160650A	MW0903	-25.731047	148.981027	Precipice Sandstone	+ 0.18	Minor rising period for several years prior to reinjection commencing in 2015. A strong response (~1.5 m) and highly correlated response to reinjection volumes. Relatively stable since 2019. No CSG impacts observed at this time.
Springrock	160653B	VW0903P1	-25.753857	148.794845	Precipice Sandstone	- 0.11	The data indicates the groundwater level has a strong correlation with rainfall. No CSG impacts observed in the available data.
	123531A	SPRGWP02	-25.762813	148.771798	Precipice Sandstone	- 0.13	The data indicates the groundwater level has a strong correlation with rainfall. No CSG impacts observed in the available data.

Notes:

1. Access to an additional site RN14837 is being evaluated for future trigger analysis.
2. The equipping of two additional sites OKSGWP05 and OKSGWP04 is being evaluated to provide trigger sites for analysis.

H.3 Spring monitoring

The spring monitoring network is described in Chapter 10 of the UWIR. The details of springs to be monitored are identified in Table H-4 and Table H-5.

The following explanations apply to these tables:

- **Complex, name and vent ID:** a unique identifier for each spring vent or watercourse. For spring vents, these are as identified in the Queensland Springs Dataset held by the Queensland Herbarium.
- **Wetland discharge:** the reference to the method to be used as defined in Table H-6.
- **Water chemistry:** the reference to the chemistry suite as defined in Table H-7.
- **Discharge:** the reference to the methods for measuring discharge as defined in Table H-6.
- **Flora:** the reference to the methods for monitoring spring flora as defined in Table H-6.
- **Condition:** the requirement to assess spring condition as defined in Table H-6.

Table H-4: Spring vents – sites and methods

Complex	Name	Vent ID	Wetland discharge (extent)	Water chemistry	Discharge	Flora	Condition	Monitoring frequency	RTH
230	Lucky Last	287	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	340	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	686	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.1	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.2	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.3	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.4	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.5	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	687.6	-	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	688	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
230	Lucky Last	689	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
591	Yebna 2	534		A and B		Yes[1]	Yes	6 monthly (Apr and Nov)	Santos
311	311	693	A	A and B	A	-	Yes	6 monthly (Apr and Nov)	Santos
311	311	704	A	A and B	A	-			
561	561	285.1	See Table H-5				Yes	6 monthly (Apr and Nov)	Santos
592	Abyss	286	B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
592	Abyss	286.1	B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
592	Abyss	286.2	B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos
592	Abyss	286.3	B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Santos

Complex	Name	Vent ID	Wetland discharge (extent)	Water chemistry	Discharge	Flora	Condition	Monitoring frequency	RTH
260	Scotts Creek	189	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Origin
260	Scotts Creek	190	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Origin
260	Scotts Creek	191	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Origin
260	Scotts Creek	192	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Origin
260	Scotts Creek	192.1	A and B	-	-	Yes	Yes	6 monthly (Apr and Nov)	Origin
283	Barton	702	-	-	-		Yes	6 monthly (Apr and Nov)	Origin

Notes:

1. Quarterly for first 12 months

Table H-5: Watercourse springs monitoring sites and methods

Spring group	Spring complex / watercourse spring	Chemistry	Physical discharge	RTH
Springrock	Springrock Creek (561)	• Install salinity logger and measure salinity variability for a minimum of 12 months. • Once the baseline conditions are established, 6 monthly sampling.	• Annual low-flow sampling downstream of complex.	Santos
	Hutton Creek (W217a)	• Annual sampling at all sites on this watercourse – HC12 to HC17 (Suite A, Table H-7). • Six monthly sampling at HC16.	• Annual low-flow sampling at all sites on this watercourse – HC12 to HC17. • Six monthly low-flow sampling at HC16.	Santos
	Hutton Creek (W216)	• Annual sampling at all sites on this watercourse – HC1 to HC11 (Suite A, Table H-7). • Six monthly sampling at HC11.	• Annual low-flow sampling at all sites on this watercourse – HC1 to HC11. • Six monthly low-flow sampling at HC11.	Santos
311 / Yebna 2	Dawson River (W40)	• Annual sampling at all sites on this watercourse – DR1 to DR13 (Suite A, Table H-7). • Six monthly sampling at DR11.	• Annual low-flow sampling at all sites on this watercourse – DR1 to DR13. • Six monthly low-flow sampling at DR11.	Santos
	Hutton Creek (W81)	• Annual sampling at all sites on this watercourse – LHC3 to LHC6 (Suite A, Table H-7). • Six monthly quality sampling at LHC6.	• Annual low-flow sampling at all sites on this watercourse – LHC3 to LHC6. • Six monthly low-flow sampling at LHC6.	Santos
	Hutton Creek (W217b)	• Annual sampling at all sites on this watercourse – LHC1 to LHC2 (Suite A, Table H-7). • Six monthly sampling at LHC1.	• Annual low-flow sampling at all sites on this watercourse – LHC1 to LHC2. • Six monthly low-flow sampling at LHC1.	Santos

Table H-6: Attributes and methods

Attribute	Method and description	
Wetland discharge (extent)	Method A	The wetland discharge is monitored using the presence of known spring aquatic plants as a proxy of water discharge. A list of aquatic and terrestrial species for each spring complex is provided in Table H-8. These species are to inform the delineation of the aquatic vegetation extent. • For wetlands with an area greater than 1.5 m^2, use a DGPS to map the extent of aquatic vegetation, as described in Fensham and Fairfax (2009). • For wetlands with a total area of less than 1.5 m^2, estimate total area of aquatic vegetation and moist soil zone.
	Method B	
Water Chemistry (Table H-7)	Measure and sample water quality in accordance with 'Monitoring and Sampling Manual, Environmental Protection (Water) Policy' (DES 2018). Sampling and measurements must be taken as close as possible to the primary discharge areas – ideally where flowing conditions exist.	
	Suite A	Field water quality measurements.
	Suite B	Collect a water sample for laboratory analysis.
Discharge	Method A	Direct flow measurement using permanent stream gauging infrastructure, or a standard low-flow field hydrology method, is used at the monitoring location.
	Method B	
Flora	Presence or absence of species listed in Table H-8.	
Condition	Photograph the wetland from all aspects. For each photograph, record the photograph sequence number, time, date and orientation and describe the features in the photograph. Photograph and describe the following signs of water availability: • whether or not there has been recent rainfall • overall greenness and vigour of spring vegetation • extent of free water within the wetland • extent of discharge flows from the wetland • extent of surface water erosion at the periphery of the wetland • extent of soil moisture around the spring or the lack thereof • extent of salt scalding or iron staining at the periphery of the wetland • extent of shrinking or collapsing of mound structures • extent of woody emergent vegetation within and fringing the wetland • degree and recentness of pugging and animal disturbance • degree and recentness of anthropogenic disturbance at the wetland.	

Table H-7: Water chemistry suite

Suite A	**Parameter**
Field parameters	pH
	Electrical conductivity (µS/cm @ 25°C)
	Redox (Eh)
	Temperature (°C)
Suite B	**Parameter**
Laboratory analytes	Total dissolved solids
	Alkalinity Total alkalinity as $CaCO_3$ Bicarbonate as $CaCO_3$ Carbonate as $CaCO_3$ Hydroxide as $CaCO_3$
	Sulfate – SO_4 by ICPAES
	Chloride
	Major cations – calcium, magnesium, potassium, sodium
	Bromide, iodide, fluoride
	Total Nitrogen as N (including NOx and TKN)
	Total Phosphorus as P
	Total organic carbon (TOC)
	Dissolved organic carbon (DOC)
	Total and dissolved metals – strontium
Suite C	**Parameter**
Isotopes	Radon (^{222}Rn)
	Stable isotopes (^{18}O and ^{2}D)
	Strontium ($^{87}/^{86}Sr$)

Table H-8: Target species list

Target species name	Category	Species type	Listed species
Adenostemma lavenia	Disjunct	Aquatic	-
Aeschynomene indica	Invasive Native	Aquatic	-
Ammannia multiflora	Invasive Native	Aquatic	-
Ampelopteris prolifera	Disjunct	Aquatic	-
Arthraxon hispidus	Rare or Threatened	Aquatic	Y
Azolla pinnata	Invasive Native	Aquatic	-
Baccharis halimifolia	Invasive Exotic	Aquatic	-
Bacopa minima	Exotic	Aquatic	-
Baumea rubiginosa	Native	Aquatic	-
Carex appressa	Native	Aquatic	-
Cenchrus ciliaris	Exotic	Terrestrial	-
Cenchrus purpurascens	Disjunct	Aquatic	-
Centella asiatica	Exotic	Aquatic	-
Centipeda minima	Invasive Native	Aquatic	-
Chloris gayana	Invasive Exotic	Terrestrial	-
Cirsium vulgare	Native	Terrestrial	-
Cyclosorus interruptus	Disjunct	Aquatic	-
Cynodon dactylon	Invasive Native	Terrestrial	-
Cyperus difformis	Disjunct	Aquatic	-
Cyperus laevigatus	Disjunct	Aquatic	-
Cyperus polystachyos	Invasive Native	Aquatic	-
Duma florulenta	Native	Terrestrial	-
Eleocharis cylindricus	Native	Aquatic	-
Eleocharis sp.	Invasive Exotic	Aquatic	-
Eragrostis sp	Native	Terrestrial	-
Eriocaulon carsonii	Rare or Threatened	Aquatic	Y
Eriocaulon scariosum	Native	Aquatic	-
Fimbrisylis ssp.	Exotic	Aquatic	-
Isachne globosa	Disjunct	Aquatic	-
Leersia hexandra	Native	Aquatic	-
Livistona nitida	Rare or Threatened	Aquatic	Y
Ludwigia octovalvis	Invasive Native	Aquatic	-
Ludwigia peploides subsp. montevidensis	Invasive Native	Aquatic	-
Melaleuca viminalis	Native	Terrestrial	-
Monochoria cyanea	Invasive Native	Aquatic	-

Target species name	Category	Species type	Listed species
Myriophyllum artesium	Rare or Threatened	Aquatic	Y
Myriophyllum gracile	Native	Aquatic	-
Opuntia tomentosa	Invasive Exotic	Aquatic	-
Ottelia ovalifolia	Invasive Native	Aquatic	-
Paspalum distichum	Invasive Native	Aquatic	-
Phaius australis	Native	Aquatic	Y
Philydrum lanuginosum	Native	Aquatic	-
Phragmites australis	Invasive Native	Aquatic	-
Rhynchospora brownii	Disjunct	Aquatic	-
Rumex crispus	Exotic	Terrestrial	-
Sacciolepis indica	Disjunct	Aquatic	-
Sesbania cannabina	Invasive Native	Aquatic	-
Spirodela punctata	Invasive Native	Aquatic	-
Thelypteris confluens	Rare or Threatened	Aquatic	Y
Typha domingensis	Invasive Native	Aquatic	-
Typha orientalis	Invasive Exotic	Aquatic	-
Urochloa mutica	Invasive Exotic	Aquatic	-
Utricularia bifida disjunct	Disjunct	Aquatic	-
Utricularia dichotoma	Native	Aquatic	-

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Appendix I

Terrestrial groundwater-dependent ecosystems

I.1 TGDE process flow diagram

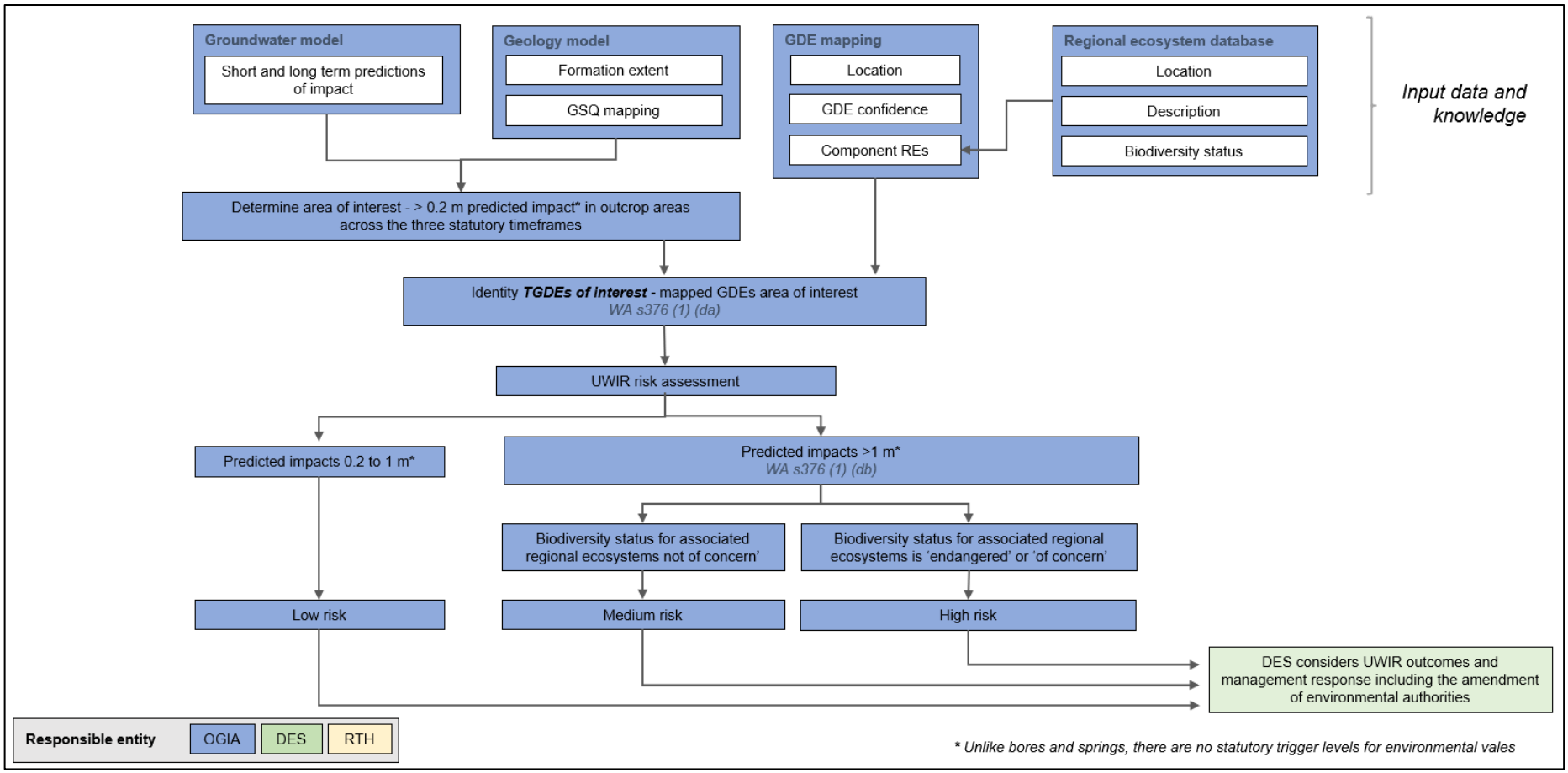

Figure I-1: TGDEs assessment flow diagram

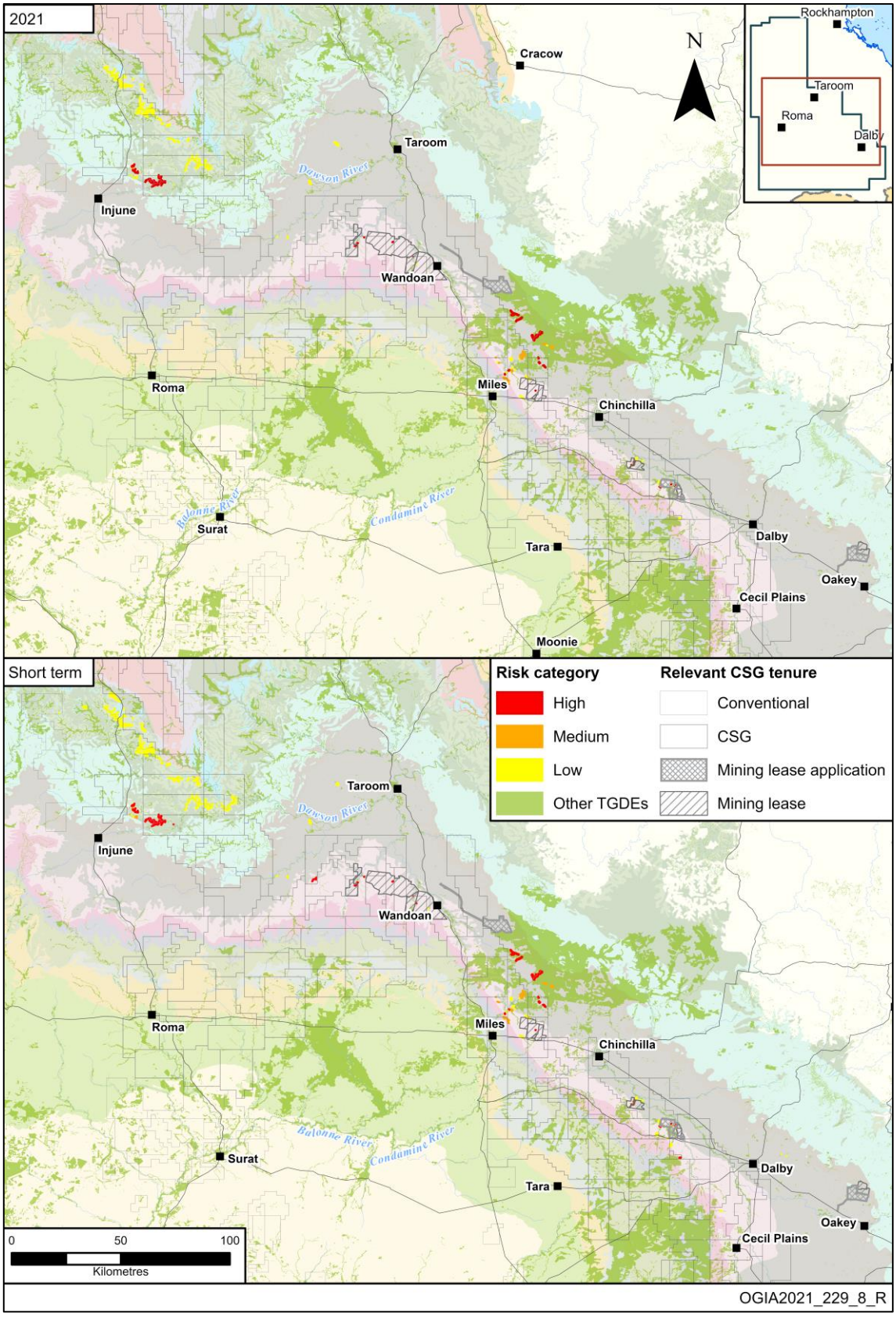

Figure I-2: TGDEs location and risk assessment (pre-2021 and short-term)

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Appendix J

Summary of responsible tenure holder obligations

Table J-1: Summary of responsible tenure holder obligations

Responsible tenure holder	Water bore obligations		Water Monitoring Strategy (Chapter 9)																			Subsidence (Chapter 7)	SIMS (Chapter 10)				
			Installation and maintenance of monitoring infrastructure and six-monthly provision of data to OGIA																				Monitoring and validation sites			Mitigation groups
			Integrate			New			Operational			Repair			Replace			Reschedule			GWX	Reinjection					
	BA	BB	GL	GC	PR	GL	GC	PR	GL	GC	PR	GL	GC	PR	GL	GC	PR	GL	GC	PR			LiDAR	V1	W	V2	
Arrow	88	28	2			9			114	12	12	7			1	1		16	1	1	Yes		Yes				
Origin	3								142	40	35	10			1	1		23	4	8	Yes	Yes		6			
QGC	9				1				95	20	47	22			5	1		14	2	1	Yes						
Santos	1		4			4			69	12	37	18			7		1	25	3	3	Yes			20	5	1	3
Senex	3								12		3							9		5	Yes						
Bridgeport												1						1			Yes						
Tri-Star									6	3		6									Yes						
AGL																					Yes						
Armour																					Yes						
CS Energy			15																								
Glencore			8			3																					
Intergen			14																								
New Hope	3	10	40			1																					
Peabody			2			1																				1	
Stanmore			3			1																					
Yancoal			13																								
Total	**108**	**38**	**101**	**0**	**1**	**19**	**0**	**0**	**438**	**87**	**134**	**64**	**0**	**0**	**14**	**3**	**1**	**88**	**10**	**18**	**–**	**–**	**–**	**26**	**5**	**2**	**3**

Notes:
BA = bore assessment bores (section 8.4.2)
BB = bore baseline (off tenure) bores (section 9.10)
GL = groundwater level monitoring point (section 9.5)
GC = groundwater chemistry monitoring point (section 9.6)
PR = production well groundwater chemistry point (section 9.7)
GWX = production well monthly volume reporting (section 9.7)
Reinjection = monthly reinjection volume reporting (section 9.12)
LiDAR = LiDAR capture and annual data provision (section 7.5)
V1 = spring vent monitoring site (section 10.8.1)
W = watercourse spring monitoring site (section 10.8.2)
V2 = watercourse validation site (section 10.8.3)

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