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EXPERT WITNESS REPORT - HYDROGEOLOGY  
Greater Geelong Planning Scheme Amendment C395  
Batesford Quarry Lake

Witness Name and address  
Anthony Patrick Lane  
SLR Consulting Australia Pty Ltd  
Suite 2, 2 Domville Avenue  
Hawthorn Vic 3122.

Qualifications, experience and area of expertise  
DipAppSc (Geol) RMIT 1976  
MSc (Hydrogeol) University College London 1981

Please see my Curriculum Vitae in Attachment 2.

Area of expertise relevant to this expert witness report – Hydrogeology.

Details of any other significant contributors to the statement (if there are any), and their expertise  
Nil

Details and qualifications of any person who carried out any tests or experiments upon which the expert has relied in preparing the statement. Nil

Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel. In preparing this report I have read and had regard to the PPV Expert Witness Practice Note dated April 2019.



.....  
Anthony P Lane  
6 November 2019

## Introduction

1. This Expert Witness Report by Anthony Lane is with regard to groundwater-related issues associated with the proposed conversion of the Batesford limestone quarry void to a lake, as set out in the briefing correspondence from Norton Rose Fulbright referred to in paragraphs 4 and 5.
2. To prepare this statement I have reviewed relevant documents and inspected the site on 30 October 2019.
3. My curriculum vitae is attached.

## Written instructions on the scope of the expert witness report

4. I received, on 24 October 2019, the following written instructions from Norton Rose Fulbright acting for Adelaide Brighton Cement Limited (ABCL).
  - (1) Review the exhibited documents and background documents relevant to your area of expertise, including:
    - (a) Northern & Western Geelong Growth Areas Framework Plan dated March 2019;
    - (b) The City of Greater Geelong Settlement Strategy;
    - (c) Rehabilitation Plans for the Batesford Quarry;
    - (d) Earth Tech Engineering – Batesford Quarry Rehabilitation Water Quality Study prepared by Nolan-ITU dated July 2005 (Nolan Report); and
    - (e) Adelaide Brighton's written submission prepared by Golders dated 29 July 2019.
  - (2) Confer with instructing solicitors and counsel as necessary;
  - (3) Prepare an expert report which:
    - (a) Reviews and comment on the Nolan Report including:
      - (i) The appropriateness and currency of the modelling; and
      - (ii) The appropriateness of the recommendations.
  - (4) Present your expert report at the Panel hearing to commence on 12 November 2019.
5. I also received instructions by email on 24 October 2019 that my review of the "Nolan Report" is to be limited to groundwater-related aspects.

## Documents Reviewed

6. I have reviewed the following documents:
  - a) Batesford Quarry Rehabilitation Water Quality Study prepared by Nolan-ITU for Earth Tech Engineering, July 2005 (Nolan Report) (Nolan-ITU, 2005);
  - b) Batesford Quarry Groundwater Level Recovery Investigation prepared by Nolan-ITU for Geelong Cement Limited, January 2002 (Nolan-ITU, 2002)
  - c) Western Geelong Growth Area Quarry to Lake Conversion, version 2.1, 14 January 2019
7. I have also briefly examined the following documents for context:

- a) Northern & Western Geelong Growth Areas Framework Plan, March 2019;
- b) City of Greater Geelong Settlement Strategy, October 2018;
- c) Rehabilitation Plan for the Batesford Quarry, Golder Associates Figure 1;
- d) Adelaide Brighton Cement Limited written submission, Golder Associates 29 July 2019.

## Site Inspection

8. I inspected the site on 30 October 2019 and observed the following:
  - a) The quarry was operational with limestone extraction occurring in a small area (approximately 100 m long) in the western part of the quarry void.
  - b) Approximately 75% of the quarry batters had been laid back and rehabilitated with permanent stormwater drains and erosion control.
  - c) The quarry sump was evident as a small water body in the base of the quarry.
  - d) The overburden dumps had been rehabilitated and sown to pasture grass.
  - e) The old quarry north of the Moorabool River remains unrehabilitated.
  - f) The "old river diversion" adjacent and downstream of the old quarry was observed to consist of a natural looking excavated trapezoid section gully with an irregular section concrete lining in the base and forming the river bank.
  - g) The "new river diversion", to the east of the old diversion has a concrete box drain in its bed.
  - h) The river diversion was flowing at a rate and level that covered the base but to a depth well below the top of the box drain.
  - i) A pump discharge pipe was noted between the river and the former natural course of the river east of the quarry.
9. I was advised by a representative of ABCL that:
  - a) The dewatering pumps remain operational and discharge from the quarry sump to the Moorabool River under EPA licence.
  - b) The old quarry rehabilitation plans are well advanced in order to start works in coming months.
  - c) The river diversion flow is currently supplemented by regulated releases from the upstream Lal Lal Reservoir.
  - d) ABCL performs periodic monitoring of the quality of the dewatering discharge to the river as required by the EPA licence.
  - e) ABCL replenishes the former natural river course to make the area safe and as a water source for livestock.

## Facts and Assumptions

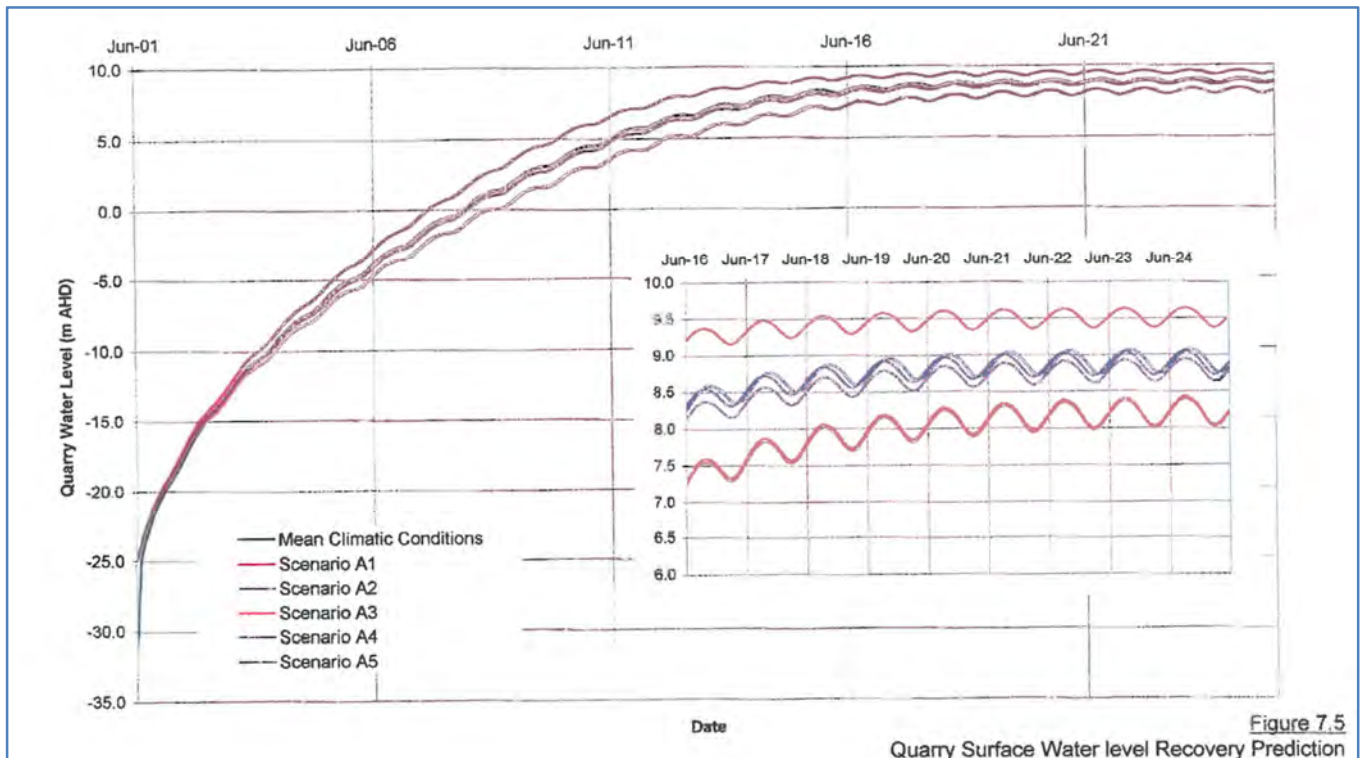
10. I have taken the background and context information included in and appended to the Norton Rose Fulbright briefing letter of 24 October 2019 to be the facts pertaining to the subject to my report.
11. I have assumed that the only technical reports relevant to the matters addressed in my report are those listed in paragraph 6 above.
12. During the site inspection of 30 October 2019, I was provided a copy of a document titled Quarry to Lake Conversion referenced in paragraph 6.

### Comments on Nolan groundwater modelling report 2002

13. The key aim of the investigation described in the report was to predict the ultimate quarry water level in the 20 years following cessation of dewatering. This was based on an assessment of site conditions to arrive at a conceptual hydrogeological model (CHM) as a basis of the numerical and analytical models. The report available for review does not include Appendices, and therefore my comments are limited to the text and figures in the main body of the report.
14. The numerical model using MODFLOW software is based on an updated CHM drawing on previous studies and site investigations and testing undertaken as part of the study. The CHM in Nolan-ITU (2002) appears well-considered and a sound basis for the numerical modelling and in summary includes:
  - a) The quarry is within the Batesford Limestone. The limestone is variably overlain by Fyansford Formation, Moorabool Viaduct Sands, and alluvial sediments. These geological units are aquifers, except the Fyansford Formation, which in this area is an aquitard. Immediately north west of the site, granite of the Dog Rocks marks the northern extent of the limestone.
  - b) Dewatering of the limestone, through shafts and drives has locally lowered the groundwater level in the limestone to approximately -29 mAHD at the quarry void, far below the level of the bed of the Moorabool River.
  - c) Previous studies have indicated seepage from the Moorabool River adjacent to the quarry, has contributed to the groundwater which has been removed by dewatering.
  - d) Based on the hydrogeological setting, it is likely that the historic groundwater flow direction is to the east and south east.
15. The modelling described in Nolan-ITU (2002) appropriately reflects the CHM. The model uses industry-standard software (MODFLOW) and is constructed, tested and reported reflecting the methods and practice at the time. Under the current Australian Groundwater Modelling Guidelines<sup>1</sup>, the model would be considered at least Class 2, and suitable for the purpose. Accordingly, the output from the model is appropriate for use as input to the spreadsheet model presented in the Nolan-ITU (2005) report.
16. Historically groundwater has been extracted at the site to allow for quarrying. When dewatering ceases, the groundwater level will rise at the quarry void and nearby, and groundwater will enter the quarry void creating a lake. The rate of lake level rise has been modelled and is represented in a graphic plot of level against time in Figure 7.5 (p34) of Nolan-ITU (2002) and shown below.

<sup>1</sup> National Water Commission (2012). Australian Groundwater Modelling Guidelines. Waterlines Report No. 82.

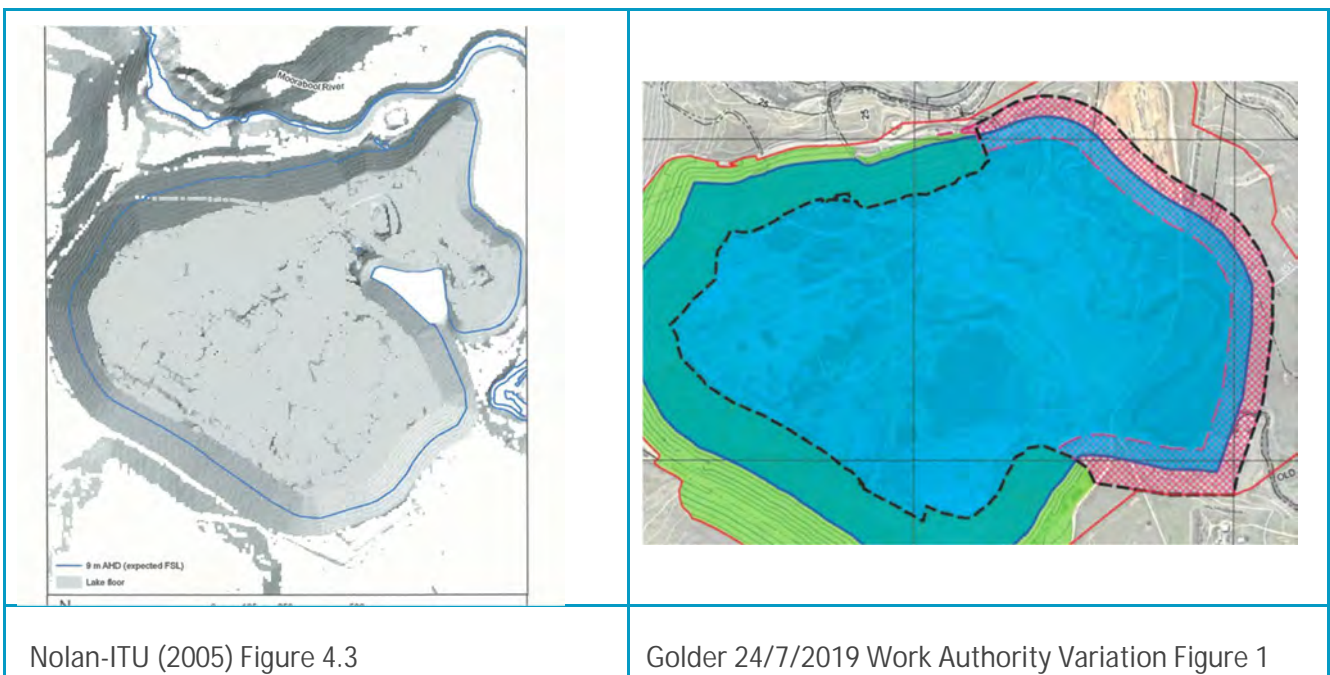
The figure shows a rise in water level of approximately 15 m within three years, and this would create a large lake.



Source: Nolan-ITU (2002) Figure 7.5

17. The Moorabool River interaction with groundwater is represented in the numerical model as a General Head Boundary with different hydraulic conductance values for lined and unlined sections of the river. Although the modelled leakage is sensitive to this conductance value, this does not appear to have been tested in the model sensitivity analysis (report section 7.2). First principles indicate that cessation of dewatering and recovery of groundwater levels will reduce the seepage losses from the Moorabool River from 102 ML/an to near zero. However, 102 ML/an seems at the low end of the range of inflow based on first principles and the estimates implied to be attributed by Blake (1986) due to the effects of fault related fractures intersecting the river. However, I estimate this to be only 2% of the site water balance and only 0.2% of the average annual flow in the river (Nolan-ITU, 2002; p 29). River leakage does not appear to be a critical component in the modelling to the extent that current site conditions might differ from those assumed in the 2002 model.
18. The model includes surface water runoff from quarry slopes, calculated using a spreadsheet model and estimated on a monthly timestep. It is likely that due to the site rehabilitation, the runoff will be different to the modelled amount, and in my opinion the runoff could be more than modelled due to a larger catchment area. Nevertheless, in the model report the contribution from runoff is not reported and is assumed not to be significant in the water balance due to the small area occupied by the batter slopes as a proportion of the lake area.

19. Due to the lack of historic groundwater level data, model calibration was achieved by adjusting aquifer hydraulic parameters and comparing the modelled and reported discharge volume. The modelled dewatering rate over 20 years provided a good correlation with seasonal trends in reported dewatering, providing confidence in the model.
20. The numerical model was combined with a spreadsheet water balance model, to assess inflow contribution from each geological unit at each stage level as the water level rises. This is a suitably rigorous approach that allows for the evaluation of water quality as reported in the water quality report of Nolan-ITU (2005).
21. The baseline model, for the 20<sup>th</sup> year simulated, estimated the groundwater inflow of approximately 4,157 ML/an less net evaporation of 512 ML/an would take 15 to 20 years to fill the lake from current base of -29 m AHD (Nolan-ITU, 2002; p 29). While a final lake level of 9.6 m AHD has been adopted in subsequent documents including Quarry to Lake Conversion, the modelled scenarios estimated final level in the range 8.3 to 9.3 m AHD. In addition, the sensitivity analysis on key parameters (rainfall and evaporation; runoff and groundwater inflows) provided estimates of between 8 to 9.6 m AHD. I would adopt the latter range as the future estimated lake level range rather than the single value of 9.6 m AHD.
22. The following figures show the areal extent of the modelled quarry void is smaller than the current void extent and therefore the ultimate area of the quarry lake. The current/final quarry area shown in the Work Authority Variation seems to be approximately 30% larger than the lake area modelled.



The likely implications for the modelled estimates of water budget and also lake water level due to this difference, in my opinion, are:

- a) The net evaporation would be approximately 30% greater than modelled or approximately an additional 154 ML/an of net evaporative loss.

- b) The larger circumference of the quarry would provide more groundwater inflow than modelled and given the water budget in the model (4,157 ML/an of groundwater inflow) this additional inflow section potentially more than offsets the additional evaporation.
- c) The ultimate recovered level is unlikely to be significantly different from the estimated 8 to 9.6 mAHD and will ultimately tend towards the regional groundwater level.

#### Comments on Nolan water quality modelling report 2005

- 23. Nolan-ITU (2005). The purpose of the study was to determine whether the water quality at the rehabilitated quarry will present unacceptable risks to humans and / or wildlife from exposure or consumption.
- 24. The groundwater quality as assessed by sampling and testing samples from bores and the discharge from dewatering pumps indicates the water is brackish having a weighted average salinity of 4,055 mg/L TDS (Nolan-ITU, 2005; p6).
- 25. Modelling using a spreadsheet model based on a water balance spreadsheet model used to derive a relationship between quarry lake stage (lake level) and resultant water quality based on measured quality of groundwater inflow, surface water runoff from batters and rainfall. The spreadsheet model was not available for inspection, and reportedly allows modelling of salt and nutrient loads, and groundwater inflow and outflow for each aquifer unit to account for different sources and salinities.
- 26. The lake water quality model estimates the final salinity of the lake after 30 years of filling at approximately 7,300 mg/L TDS (Nolan-ITU, 2005; p7). This salinity would continue to rise slowly over decades unless some groundwater outflow was established to remove salts.
- 27. Water quality aspects, namely nitrogen and phosphorous nutrients as well as arsenic and zinc as eco-toxicants have been assessed in the Nolan report for effects on lake water quality and ecosystem effects, however commentary on these ecosystem aspects is outside my area of expertise.
- 28. The assumed lake surface area in Nolan-ITU (2005) appears to be smaller than presented in the Work Authority Variation which assumes a water level 9mAHD over the final quarry area. The current and projected final area of the quarry floor are greater than the area modelled in 2002 and 2005.
- 29. My opinion with regard to the appropriateness and currency of the modelling, focussing on groundwater-related aspects, in Nolan-ITU (2005) is as follows:
  - a) The modelling as presented appears to be appropriate and thorough with clearly listed assumptions and uses output from the numerical model (Nolan-ITU, 2002).
  - b) This is a sound approach, using on-site data of salt and nitrogen concentration, and refinement to account for inputs from different aquifers with different volumes and water chemistry.
  - c) If surface water inflows from the Moorabool River or other sources to augment lake level, then the modelling could be updated to incorporate such flows, however if inflow occurred during periods of high flow it is likely that this would be lower salinity and potentially higher nutrient content than the water in the lake. Introduction of river flood flows to the lake should only be permitted after a separate assessment of the suitability of such inflows and water quality.

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- d) This difference between the lake surface area modelled and that likely to occur at completion of quarry operation and rehabilitation, due the larger area of the latter, should not significantly affect the modelled lake level in the long term as the ultimate level is closely related to the groundwater level in the vicinity.
- e) The lake water quality in terms of salinity, arsenic, zinc, nitrogen and phosphorus compounds is unlikely, on the basis of water quality criteria, to make the water hazardous to the health of person engaged in primary contact (swimming) or secondary contact (boating) recreational activity in the lake. While the water is not potable (drinkable) on solely on the basis of its salinity, a water quality management plan should be implemented to ensure water quality and in particular blue-green algal blooms in the first 3 years of the lake does not make the water unsuitable for recreational purposes.
30. With regard to the appropriateness of the recommendations in the Nolan-ITU 2005 report, I note there is no section headed "recommendations" however section 6 "conclusions" includes some conclusions that can be taken to be recommendations. These are for:
- a) Development of a lake water quality management plan based on an adaptive management approach and includes a water quality and biological monitoring program to assess performance of lake management. In my opinion this recommendation is appropriate.
- b) Undertake a detailed biogeochemical assessment of the likely behaviour of arsenic and zinc in the lake ecosystem. I do not have an opinion on this as it is beyond my brief.
- c) Undertake a detailed hydrological and nutrient modelling study of their effects on the aquatic ecosystem. This recommendation appears appropriate based on the projected changes over time in lake salinity and nutrient concentration.

## ATTACHMENT 1

Briefing letter from Norton Rose Fulbright (24 October 2019)



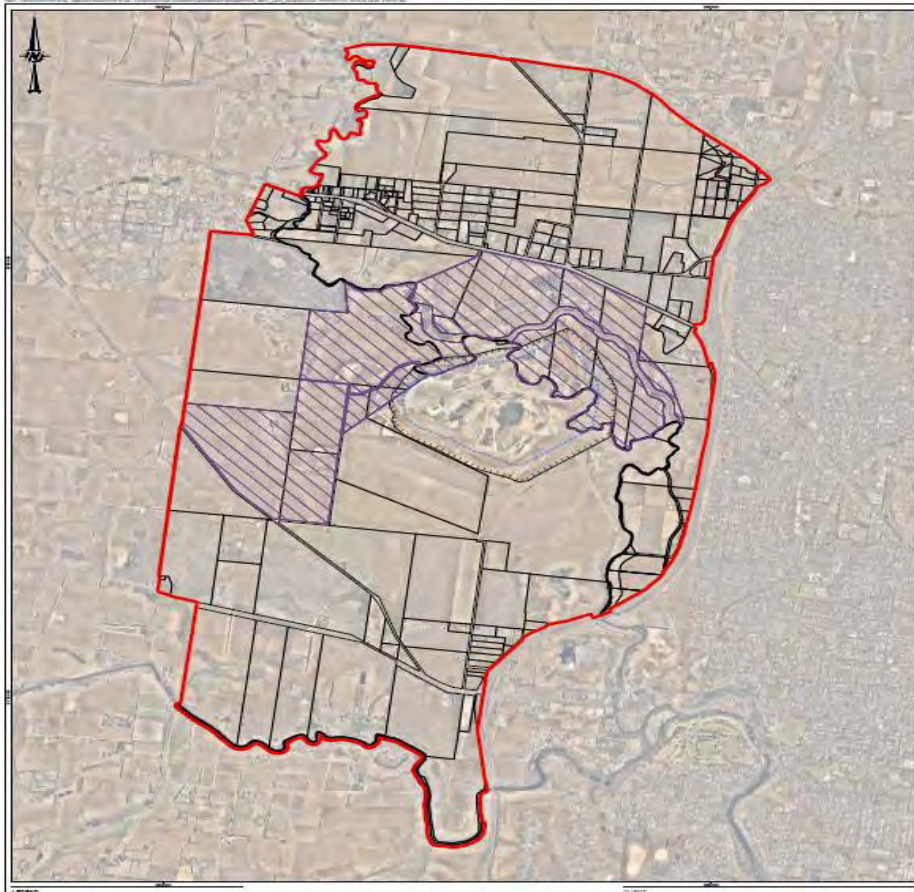
## 2 Your engagement

- (1) Review the exhibited documents and background documents relevant to your area of expertise, including:
  - (a) Northern & Western Geelong Growth Areas Framework Plan dated March 2019;
  - (b) The City of Greater Geelong Settlement Strategy;
  - (c) Rehabilitation Plans for the Batesford Quarry;
  - (d) Earth Tech Engineering – Batesford Quarry Rehabilitation Water Quality Study prepared by Nolan-ITU dated July 2005 (**Nolan Report**); and
  - (e) Adelaide Brighton's written submission prepared by Golders dated 29 July 2019.
- (2) Confer with instructing solicitors and counsel as necessary;
- (3) Prepare an expert report which:
  - (a) Reviews and comments on the Nolan Report including:
    - (i) The appropriateness and currency of the modelling; and
    - (ii) The appropriateness of the recommendations.
- (4) Present your expert report at the Panel hearing to commence on 12 November 2019.

## 3 The Land

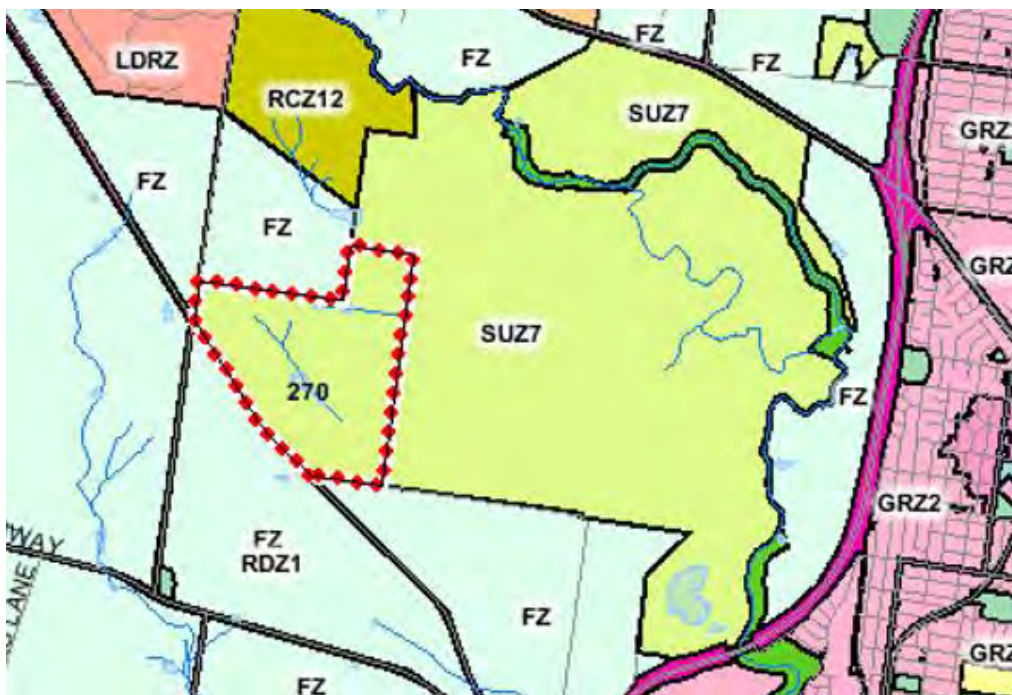
### 3.1 The Land is:

- (1) a collection of several titles that comprise a large area of land south of Midland Highway, within the WGGA. The Land is shown in Image 1 below and is hatched purple. The area outlined in red is the Western Geelong Growth Area;



**Image 1: Western Geelong Growth Study Area and ABCL Land Ownership**

(2) in the Special Use Zone (Schedule 7) (SUZ);



**Image 2: Map showing land subject to Special Use Zone (SUZ)**

- (3) subject to (in part) the Bushfire Management Overlay (**BMO**); and



**Image 3: Map showing land (in part) subject to BMO**

- (4) currently utilised under a Work Authority for the operation of the Batesford Quarry.

3.2 The land can be divided into four areas:

- (1) the southern section of the Land, which fronts Fyansford-Gheringhap Road, comprised of 3 parcels of land (270 Fyansford-Gheringhap Road, Fyansford) being:
  - (a) Certificate of Title Volume 03616 Folio 049;
  - (b) Certificate of Title Volume 01324 Folio 713; and
  - (c) Certificate of Title 11641 Folio 972;
- (2) the lower-mid-section of land (280 Fyansford-Gheringhap Road, Fyansford), being:
  - (a) Lots 1 and 2 on TP344847 on Certificate of Title 04518 Folio 539; and
  - (b) Lots 1, 2 and 3 on TP572132B on Certificate of Title 02714 Folio 668;
- (3) the upper-mid-section of the land (Fyansford-Gheringhap Road, Batesford) being Lot 3 on TP344847 on Certificate of Title Volume 04518 Folio 539; and
- (4) the northern section of the Land, which fronts Ballarat Road, comprised of 9 parcels of land (380-530 Ballarat Road, Batesford) being:
  - (a) Certificate of Title Volume 10178 Folio 514;
  - (b) Certificate of Title Volume 10178 Folio 515;
  - (c) Certificate of Title Volume 10178 Folio 517;
  - (d) Certificate of Title Volume 10178 Folio 518;
  - (e) Certificate of Title Volume 10178 Folio 519;

- (f) Certificate of Title Volume 10178 Folio 520;
- (g) Certificate of Title Volume 10315 Folio 080; and
- (h) Certificate of Title Volume 10315 Folio 081.

#### 4 **Amendment C395**

- 4.1 The Amendment proposes to implement the Settlement Strategy and the Framework Plan.
- 4.2 The Amendment includes policy changes to the Municipal Strategic Statement and rezones land in the Northern and Western Geelong Growth Areas to the Urban Growth Zone.
- 4.3 The policy components of the Amendment affect all land in the municipality with specific policy affecting the Northern and Western Geelong Growth Areas. The rezoning affects selected properties in Batesford, Bell Post Hill, Fyansford, Hamlyn Heights, Lara, Lovely Banks and Moorabool in the proposed Northern and Western Geelong Growth Areas as shown on the exhibited planning scheme maps.
- 4.4 Specifically, the Amendment seeks to:
  - (1) Amend Clause 21.03 Objectives - Strategies - Implementation to include reference to 21.18 Corio Norlane and 21.20 Northern and Western Geelong Growth Areas;
  - (2) Replace Clause 21.04 Municipal Framework Plan with a new Clause 21.04 to implement the Settlement Strategy through a new Municipal Framework Plan;
  - (3) Replace Clause 21.06 Settlement and Housing with a new clause including objectives, strategies and references to implement the Settlement Strategy;
  - (4) Amend Clause 21.08 Development and Community Infrastructure to update strategies on Transport and Development Contributions to implement the Settlement Strategy;
  - (5) Amend Clause 21.11 Armstrong Creek Urban Growth Area to reflect the role of the Northern and Western Geelong Growth Areas;
  - (6) Amend Clause 21.14 The Bellarine Peninsula to update objectives, strategies, further work and references to implement the Settlement Strategy;
  - (7) Amend Clause 21.16 Anakie to implement the Settlement Strategy by amending objectives and strategies, deleting reference to the *Anakie Structure Plan 1996* and replacing the map;
  - (8) Insert a new Clause 21.20 Northern and Western Geelong Growth Areas including new objectives, strategies, references and plans to implement the Northern and Western Geelong Growth Areas Framework Plan;
  - (9) Replace the Schedule to Clause 72.08 Background Documents with a new Schedule that includes the Settlement Strategy and Framework Plan; and
  - (10) Rezone areas of land in the Northern and Western Geelong Growth Areas from Rural Living Zone, Farming Zone, Public Park and Recreation Zone and Industrial 1 Zone to Urban Growth Zone.

#### 5 **ABCL and McCann**

- 5.1 ABCL (including its predecessors) and McCann have operated the Batesford Quarry for over 100 years under a joint venture arrangement that will continue until the extractive industry operations cease and any outstanding rehabilitation obligations under extractive industry Work Authority 3 are completed. It is currently expected that extractive operations will cease around 2025, although there is potentially flexibility in relation to this timing.

5.2 ABCL and McCann are the largest landowners in the WGGA. The WGGA Framework Plan provides for the integration of a lake that will be formed in the rehabilitated quarry pit.

5.3 ABCL and McCann have a close relationship in relation to the operation of the quarry and the long term aspirations for their respective landholdings but have determined that each party should make its own submission to the Amendment.

## 6 ABCL's position in relation to the Amendment

6.1 ABCL generally supports the adoption of the Settlement Strategy, Framework Plan and Amendment C395, however, ABCL has identified in its submission a number of matters that require further consideration.

6.2 In its submission, ABCL expressed its support for the Settlement Strategy and Framework Plan, subject to certain amendments including, among other things:

(1) that the land between the top of the Moorabool River escarpment and Midland Highway (as depicted on Maps 31 and 32) should be:

(a) rezoned to the Urban Growth Zone; and

(b) included in the Creamery Road PSP;

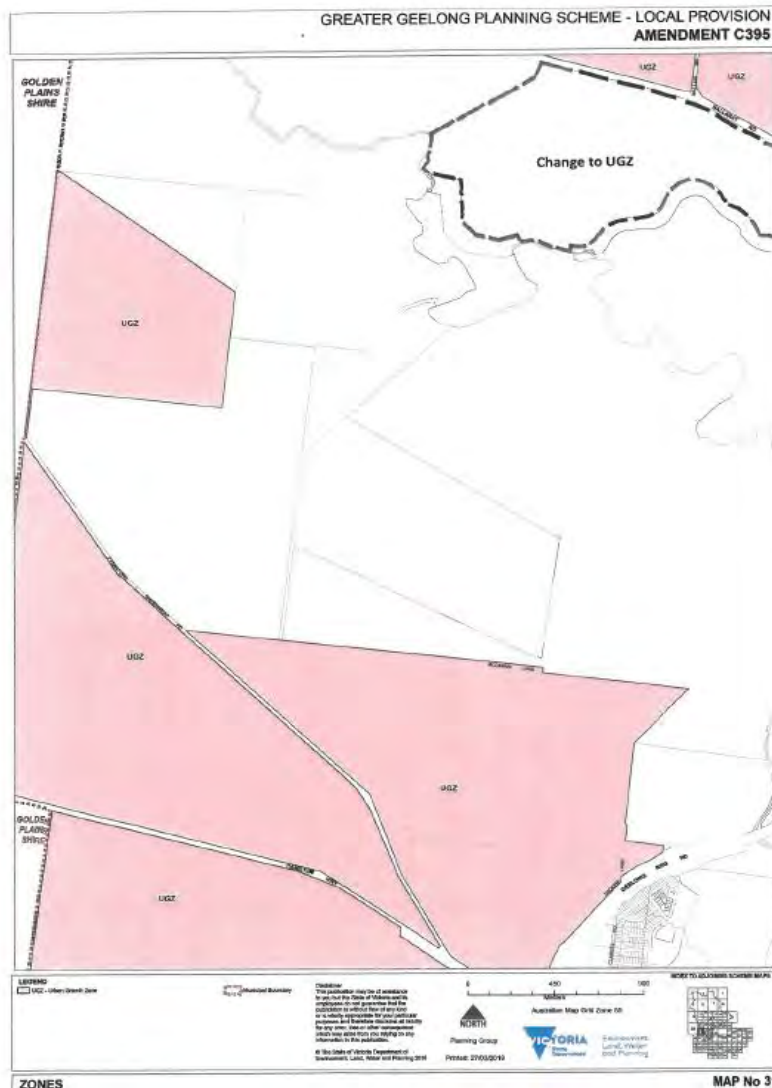


Image 4: Map 31 showing rezoning to Urban Growth Zone



Image 5: Map 32 showing rezoning to Urban Growth Zone

- (2) that the Batesford South PSP area should be reduced in size and the balance land be included in other PSP areas;

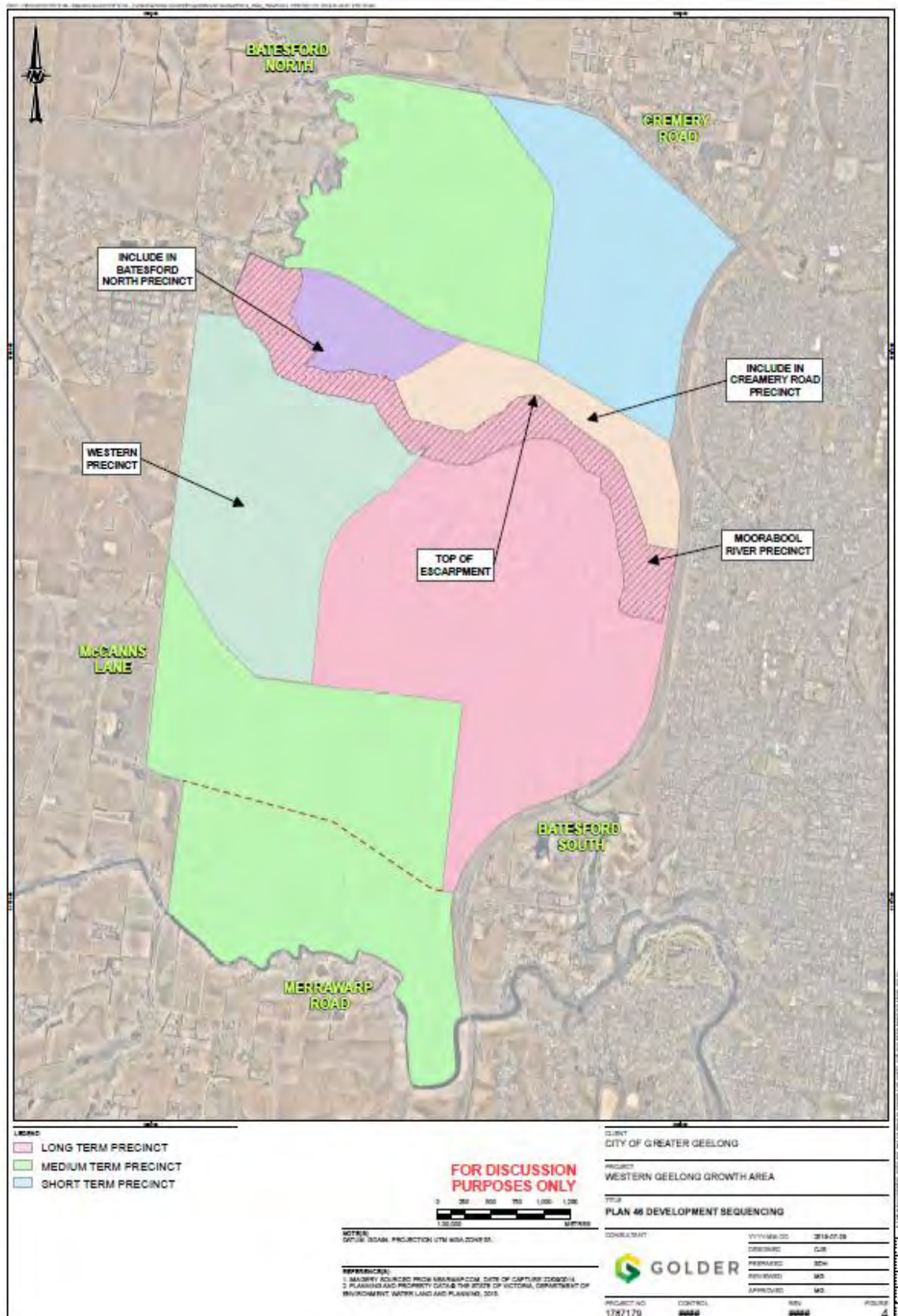
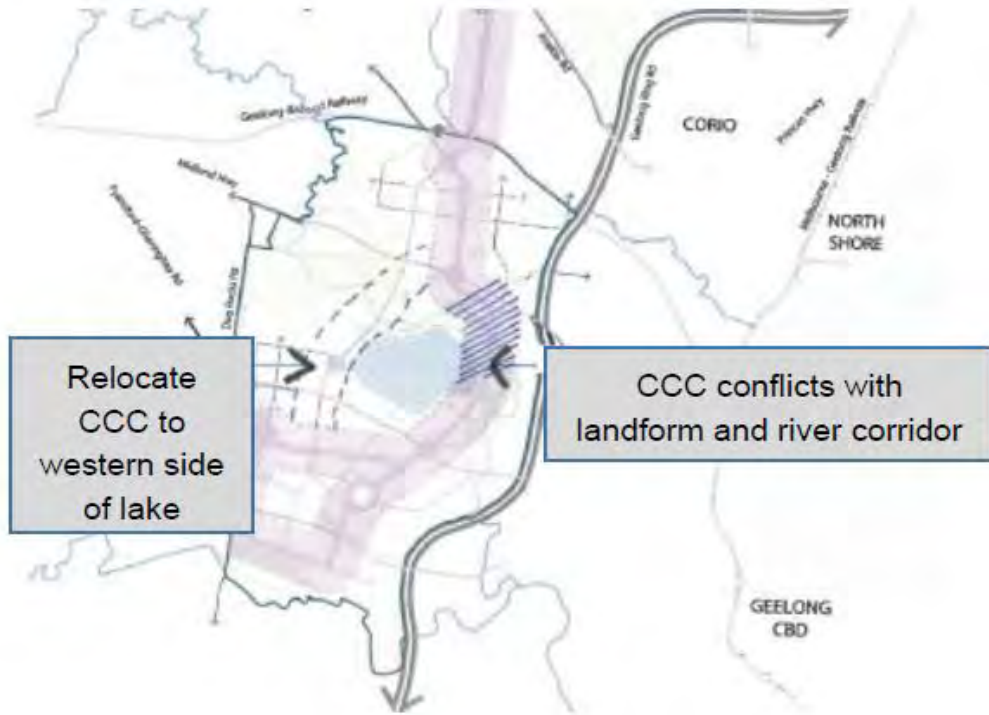


Image 6: Map showing revised Precincts and Development Sequencing

- (3) that the Moorabool River corridor be defined as a separate special PSP area which addresses its distinct landform and function as an asset for the whole WGA (refer to Image 6 above). We are instructed our client no longer wishes to pursue this part of its submission;
- (4) that the Clever and Creative Corridor be amended where it conflicts with the function of the Moorabool River special PSP area (as proposed by ABCL);



**Image 7: Map showing relocation of Clever and Creative Corridor to western side of lake**

- (5) that the Western Arterial Road alignment be altered and shifted westward to maximise developable land (Image 8). ABCL consider an alternate option (Option 3) could result in less visual impact and less cost than the current proposal in the Framework Plan (Option 1). Refer to Image 9;



**Image 8: Map showing Western Arterial Road alignment**

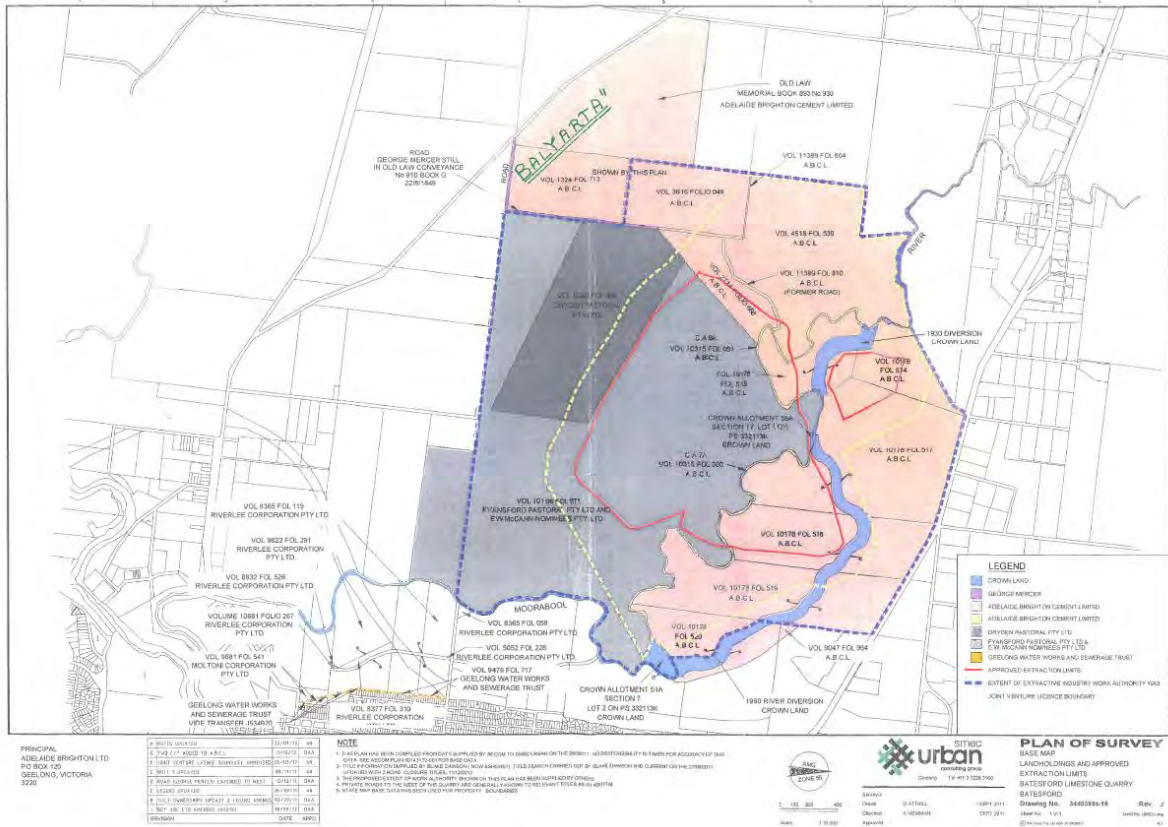
<p>Option 3. Cheaper and less visual impact.</p>	<p>Option 1 (Framework Plan) Most expensive option and would not meet grade requirement.</p>	<p>Land sterilised by Option 1 but available for development with Option 3</p>

**Image 9: Alternate options for alignment of Western Arterial Road**

- (6) that an equitable universal infrastructure contribution rate be applied (including standard and supplementary levies and an equalising mechanism) to all PSP areas and that projects of large scale and importance are prioritised; and
- (7) changes to the definition of Quarry Work Authority Area in the Framework Plan to better reflect the status of the rehabilitation works.

6.3 Since the lodgement of its submission, ABCL has also raised the following additional issues in relation to the Amendment:

- (1) Rezone the land within the ABCL landholding that is currently zoned 'Farming Zone' to Urban Growth Zone; and
- (2) Include the land known as 'Balyarta' shown in the plan below be:
  - (a) Included in the Batesford North Precinct; and
  - (b) Rezoning from Special Use Zone to Urban Growth Zone.



**Image 10: Map showing land known as 'Balyarta';**

**7 Enclosed documents**

7.1 Enclosed is a folder of background documents for your consideration. Please contact us if there are any further documents that you require.

**8 Client details**

8.1 Please arrange for your fee estimate to be provided to us and our mutual client at the following address:

Attention: John Oakes  
 Adelaide Brighton Cement Limited  
 1/157 Grenfell Street  
 Adelaide SA 5000  
 Email: [John.Oakes@adbri.com.au](mailto:John.Oakes@adbri.com.au)  
 Phone: (08) 8223 8063 or 0418 821585

8.2 Accounts should be provided directly to ABCL.

**9 Confidentiality**

9.1 This letter and enclosed documents and all future communications between us and between you are confidential (**Confidential Information**), and are subject to a claim for privilege and must not be disclosed without our consent or the consent of our client.

9.2 The duty of confidentiality will continue beyond the conclusion of your instructions.

9.3 If you are obliged by law to disclose Confidential Information, it is not a breach of this engagement if you first give written notice to us of that obligation, if you can do so without breach of any law.

9.4 You must return all documents and other media, including copies, which contain Confidential Information to us. You must delete all electronically stored material immediately when requested to do so by us.

9.5 You must take all steps necessary to maintain Confidential Information and notes in strictest confidence.

**10 Change of opinion**

10.1 If for some reason, you change your opinion after delivering your report, please advise us as soon as possible. If that change is material, a supplementary report will need to be prepared, which explains the reasons for the change in your opinion.

Should you require any further information, please call Bradley Montag on 8686 6602 or Jessica Kaczmarek on 8686 6837.

Dated: 24 October 2019

A handwritten signature in black ink, appearing to read 'Kaczmarek', is written over a light blue rectangular background.

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Norton Rose Fulbright Australia  
Solicitors for the submitter

Cc – Jon Bartley ([jbartley@slrconsulting.com](mailto:jbartley@slrconsulting.com))

## Index to brief

### Planning Scheme Controls

No	Document	Date
1.	Planning Property Reports and planning scheme extracts	

### Tile Search Documents

No	Document	Date
2.	The southern section of the Land, which fronts Fyansford-Gheringhap Road, comprised of 3 parcels of land (270 Fyansford-Gheringhap Road, Fyansford) being: a) Certificate of Title Volume 03616 Folio 049; b) Certificate of Title Volume 01324 Folio 713; and c) Certificate of Title 11641 Folio 972.	
3.	The lower-mid-section of land (280 Fyansford-Gheringhap Road, Fyansford) being: a) Lots 1 and 2 on TP344847 on Certificate of Title 04518 Folio 539; and b) Lots 1, 2 and 3 on TP572132B on Certificate of Title 02714 Folio 668.	
4.	The upper-mid-section of the land (Fyansford-Gheringhap Road, Batesford) being: a) Lot 3 on TP344847 on Certificate of Title Volume 04518 Folio 539.	
5.	The northern section of the Land, which fronts Ballarat Road, comprised of 9 parcels of land (380-530 Ballarat Road, Batesford) being: a) Certificate of Title Volume 10178 Folio 514; b) Certificate of Title Volume 10178 Folio 515; c) Certificate of Title Volume 10178 Folio 517; d) Certificate of Title Volume 10178 Folio 518; e) Certificate of Title Volume 10178 Folio 519; f) Certificate of Title Volume 10178 Folio 520; g) Plan of Subdivision 332100U (for Certificates of Title 5(a) – (f)); h) Certificate of Title Volume 10315 Folio 080; and i) Certificate of Title Volume 10315 Folio 081.	

## Exhibition Documents

No	Document	Date
<b>Key documents</b>		
6.	Explanatory Report	April 2018
7.	Instruction Sheet	April 2018
8.	City of Greater Geelong's Settlement Strategy	October 2018
9.	Northern and Western Geelong Growth Areas Framework Plan	March 2019
<b>Clauses and schedules (Greater Geelong Planning Scheme)</b>		
10.	Clause 21.03 Objectives, Strategies, Implementation	
11.	Clause 21.04 Municipal Framework Plan	
12.	Clause 21.06 Settlement and Housing	
13.	Clause 21.08 Development and Community Infrastructure	
14.	Clause 21.11 Armstrong Creek Urban Growth Area	
15.	Clause 21.16 Anakie	
16.	Clause 21.20 Northern and Western Geelong Growth Areas	
17.	Schedule to Clause 72.08 Background Documents	
<b>Map sheets (Greater Geelong Planning Scheme)</b>		
18.	Map Number 16	27 March 2019
19.	Map Number 17	27 March 2019
20.	Map Number 23	27 March 2019
21.	Map Number 24	27 March 2019
22.	Map Number 25	12 April 2019
23.	Map Number 31	27 March 2019
24.	Map Number 32	12 April 2019
25.	Map Number 36	27 March 2019
26.	Map Number 47	27 March 2019
<b>Supporting documents, clauses and schedules in track changes format</b>		
27.	Clause 21.03 Objectives, Strategies, Implementation	
28.	Clause 21.04 Municipal Framework Plan	

No	Document	Date
29.	Clause 21.06 Settlement and Housing	
30.	Clause 21.08 Development and Community Infrastructure	
31.	Clause 21.11 Armstrong Creek Urban Growth Area	
32.	Clause 21.14 The Bellarine Peninsula	
33.	Clause 21.16 Anakie	
34.	Background document – Greater Geelong Council Minutes – Settlement Strategy	9 October 2018
35.	Background document – Greater Geelong Council Minutes – Northern & Western Growth Areas Framework Plan	26 March 2019
<b>Additional documents (obtained from City of Greater Geelong Website)</b>		
36.	City of Greater Geelong Settlement Strategy – Amendment C395 – Settlement Strategy & Northern and Western Geelong Growth Areas Framework Plan	Undated
37.	City of Greater Geelong – Frequently Asked Questions – Settlement Strategy and Distinctive Areas Landscape Program	Undated
38.	Bushfire Planning Assessment – Greater Geelong Amendment C395 (Part)	29 May 2019

#### Background documents to the Settlement Strategy

No	Document	Date
39.	Discussion Paper 1 - Growth Scenarios	June 2017
40.	Discussion Paper 2 - Background to Projections	June 2017
41.	Discussion Paper 3 - Population Trends and Drivers of Housing Demand	June 2017
42.	Discussion Paper 4 - Residential Dwelling Stock - Part 1	June 2017
43.	Discussion Paper 4 - Residential Dwelling Stock - Part 2	June 2017
44.	Discussion Paper 4 - Residential Dwelling Stock - Part 3	June 2017
45.	Discussion Paper 5 - Residential Land Supply and Development	June 2017
46.	Discussion Paper 6 - Land Supply and Housing Affordability	June 2017
47.	City of Greater Geelong Settlement Strategy Issues Paper	July 2017
48.	City of Greater Geelong Settlement Strategy Issues Paper - Summary	July 2017
49.	Settlement Strategy Summary Paper	October 2018

## Background documents to the Framework Plan

No	Document	Date
50.	Aboriginal Heritage Assessment (Western Geelong Growth Area) prepared by Ecology and Heritage Partners	21 November 2016
51.	Post Contact Heritage Assessment (Western Geelong Growth Area) prepared by Ecology and Heritage Partners	20 December 2016
52.	ESD Opportunities Report prepared by Hip v Hype	17 March 2017
53.	Geotechnical, Hydrogeological and Preliminary Environmental Assessment (Western Geelong Growth Area) prepared by Douglas Partners	9 May 2017
54.	Retail and Activity Centre Technical Report (Western Geelong Growth Area) prepared by Urban Enterprise	June 2017
55.	Flora and Fauna Technical Report (Western Geelong Growth Area) prepared by Ecology and Heritage Partners	August 2017
56.	Planning and Design Principles for Promoting Active Transport in the Northern and Western Geelong Growth Areas prepared by Movendo	24 August 2017
57.	Consolidated Activity Centre Assessment prepared by Tim Nott	September 2017
58.	Road and Rail Planning Investigations Report prepared by AECOM	5 September 2017
59.	Employment Land Report prepared by SGS Economics & Planning	December 2017
60.	Social Infrastructure Report prepared by Tap Consulting	November 2018
61.	Integrated Water Cycle Management Position Paper prepared by Barwon Water and the City of Greater Geelong	November 2018
62.	Clever and Creative Corridor prepared by AECOM	November 2018
63.	Stormwater Management Strategy and Flood Impact Assessment: Volume 1 Existing Conditions (Western Geelong Growth Area) prepared by Water Technology	January 2019
64.	Movement and Access Strategy Report (draft) prepared by GTA Consultants	14 March 2019
65.	Stormwater Management Strategy and Flood Impact Assessment: Volume 2 Developed Conditions (Western Geelong Growth Area) prepared by Water Technology	May 2019
66.	Utilities Servicing Strategy Report prepared by GHD	May 2019
67.	ESD Sustainability Action Plan prepared by Hip v Hype	7 June 2019

## Briefing material provided by Client

No	Document	Date
<b>Key Submission Documents</b>		
68.	McCann Family submission prepared by Tract Consultants	26 July 2019
69.	Letter from Golder Associates Pty Ltd to City of Greater Geelong submitting application	29 July 2019
70.	Amendment C395 Report – Submission by Adelaide Brighton Cement Ltd prepared by Golder Associates Pty Ltd	29 July 2019
71.	Submissions to the Amendment	various
<b>Background Documents</b>		
72.	Plan prepared by Urban Consulting Group Landholdings and Approved Extraction Limits Batesford Limestone Quarry	September 2011
73.	Plan prepared by Golder Associates Western Geelong Growth Area - Figure 6 – Land Management and Ownership	10 February 2017
74.	Work Authority Variation Plan prepared by Golder Associates for McCann Group and Adelaide Brighton Ltd Batesford Quarry Rehabilitation	Undated
75.	Quarry to Lake Conversion Overview Document	Undated
<b>Documents provided by Golder Associates relating to Rehabilitation</b>		
<b>a) General documents</b>		
76.	2010 ICD 0015 GF Masterplan	Undated
77.	Presentation by Michael Gerner - Batesford South Masterplan	Undated
78.	Nolan-ITU Batesford Quarry Rehabilitation Water Quality Study prepared by Nolan-ITU	July 2005
78A.	Rehabilitation Plan for the Batesford Quarry prepared by Earth Tech (to be provided)	December 2005
79.	Salinity Risk Assessment of Groundwater Discharge from Fyansford Quarry (Draft Report) prepared by Corangamite CMA	10 January 2006
80.	Archaeological Review Batesford South prepared by Golder Associates	19 October 2010
81.	Batesford South RLUS Preliminary Transport Impact Feasibility Assessment prepared by GTA Consultants	20 October 2010
82.	Batesford South Master Plan	November 2010

No	Document	Date
83.	Green Corridor Opportunity Plan prepared by Spiire Innovation in Infrastructure	2 August 2013
<b>b) Breeze Pit Dixon Files (2010)</b>		
84.	Batesford South Infrastructure Report prepared by Breese Pitt Dixon (a) Appendix A	25 October 2010
<b>c) Essential Economics Reports (2010)</b>		
85.	Batesford South Economic Assessment Report #1 – Analysis of Potential Requirement for Urban Development Fronts in Geelong prepared by Essential Economics Pty Ltd	October 2010
86.	Batesford South Economic Assessment Report #2 – Assessment of Future Land Use and Employment prepared by Essential Economics Pty Ltd	October 2010
<b>d) 2010 Pace Reports (2010)</b>		
87.	Batesford South Submission to the G21 Regional Growth Plan	December 2011
88.	Batesford South Draft G21 Regional Growth Plan Submission	16 May 2012
89.	Batesford South G21 Regional Growth Plan Submission	16 May 2012
90.	Letter of from Adelaide Brighton Cement Ltd to City of Greater Geelong (Submission on the G21 Regional Growth Plan)	18 May 2012
91.	Advertisement – Geelong’s Future: Closer than you think	Undated
92.	Geelong’s Place to Grow – Council Presentation Draft Outline	Undated
93.	Geelong’s Place to Grow – Council Presentation Map	Undated
<b>e) Specialist Consultant Reports (2016)</b>		
94.	Western Greater Geelong Growth Area - Phase 1 Aboriginal Heritage Assessment prepared by Ecology & Heritage Partners	21 November 2016
95.	Western Greater Geelong Growth Area – Phase 1 Post-Contact Heritage Assessment prepared by Ecology & Heritage Partners Report	20 December 2016
96.	Geotechnical, Hydrogeological & Preliminary Environmental Study Report (Phase 1 – Western Geelong Growth Area Project Fyansford & Batesford) prepared by Douglas Partners	9 May 2017
97.	Western Greater Geelong Growth Area - Retail and Activity Centre Technical Report (Final)	June 2017
98.	Framework Plan Background Report Non-Technical Summary for Geotechnical, Hydrogeological & Preliminary Environmental Study prepared by Douglas Partners	8 June 2017
99.	Western Geelong Growth Area - Designated Waterway Buffers Plan	Undated

### Planning Panel Documents

No	Document	Date
100.	Letter from Planning Panels Victoria to Submitter (Panel Notification Letter)	26 September 2019
101.	Panel directions – to be provided	
102.	Planning Panels Victoria - Expert Witness Practice Note	April 2019

## ATTACHMENT 2

### Curriculum Vitae – Anthony Lane

# CURRICULUM VITAE



## ANTHONY LANE

### TECHNICAL DIRECTOR

Land Quality & Remediation / Hydrogeology, Asia Pacific

### QUALIFICATIONS

1976

Diploma Applied Science (Geology), RMIT

1981

Masters Science (Hydrogeology), UCL London

### EXPERTISE

- Contaminated Land Management & Auditing
- Environmental Risk Management & Auditing
- Waste and Landfill Life Cycle Management
- Hydrogeology & Groundwater Development

Anthony's expertise and experience is as a technical advisor in the fields of contaminated land (including ground gas) assessment and remediation; groundwater resources and development; waste landfill "life cycle" and landfill gas management; chemical risk assessment and communication; as well as environmental approvals and compliance.

He has worked on projects across all states in Australia as well as in New Zealand, Oman, Pakistan, Papua New Guinea, Philippines, Thailand and Vietnam. His clients have included local, state and federal government organisations as well as businesses in the road, rail, ports and airports sectors; mining and mineral processing; others include manufacturers, petrochemical and major oil companies; property owners, developers, investors, financiers and insurers; as well as waste management and landfill companies.

Anthony is a Certified Environmental Practitioner and Contaminated Land Specialist; he is an accredited contaminated sites auditor in Vic, NSW, ACT, WA and SA and has completed over 300 audits, including "risk of harm" audits in Victoria, since 1994.

Anthony is active in developing and contributing to hydrogeological and environmental engineering and science programs at RMIT University, Melbourne. He has been active in the key industry and relevant learned societies in Australia (see Affiliations).

### PROJECTS

#### *Contaminated Land Management and Auditing*

#### **Land Contamination Site Audits - Victoria, NSW, SA & ACT**

#### **Contaminated Land Audits – EPA Vic**

- Acting as the EPA appointed Environmental Auditor (Contaminated Land) completed Audits under the Environment Protection Act 1970 (Vic) at more than 200 sites across Victoria since 1995, including the major developments at:
  - Defence Explosives Factory, Maribyrnong, Vic (130 ha) - 2001 to present
  - Orica chemical & explosives factory, Deer Park, Vic (147 ha) - 2004 to present
  - "Williams Landing" – former RAAF Williams Airbase, Laverton (200 ha) - 2005
  - Former RAN Armaments depot Somerton, Vic (208 ha) - 2002 – 2017

<p><b>Site Audits, NSW &amp; ACT</b></p>	<ul style="list-style-type: none"> <li>• Completion of Site Audits under the Contaminated Land Management Act (1997) NSW at more than 30 sites across NSW since 1998, including:             <ul style="list-style-type: none"> <li>• RAAF Williamstown, Newcastle, NSW</li> <li>• Former landfill Kendall Reserve, San Souci</li> <li>• Alignment of the proposed NE Distributor arterial road, Wollongong</li> <li>• West Belconnen Sewerage Treatment Plant (ACT).</li> </ul> </li> </ul>
<p><b>Site Contamination Audits, SA</b></p>	<ul style="list-style-type: none"> <li>• Completion of over 25 Site audits under SA EPA guidelines and since 2009 under the Environment Protection Act 1983 for contaminated sites including:             <ul style="list-style-type: none"> <li>• Former Mitsubishi car plant &amp; offsite area, Tonsley</li> <li>• Marina canal estate &amp; school, Port Lincoln</li> <li>• Former gasworks site, Glenelg Nth</li> <li>• Closed landfill site in coastal wetland, Whyalla</li> <li>• Former pesticide manufacturing plant site, Parafield Gardens.</li> <li>• Former copper smelter and fertilizer works &amp; canal estate, Wallaroo</li> </ul> </li> </ul>
<p><b>Land Contamination Due Diligence and Risk Assessment</b></p>	
<p><b>Project Director for “due diligence” and site contamination liability advice</b></p>	<ul style="list-style-type: none"> <li>• Environmental "Due Diligence" studies and advice for land purchase, transfers, redevelopment or financing of potentially contaminated industrial sites (over 80) - Melbourne, Brisbane, Adelaide, Sydney, Perth, Launceston and country Victoria.</li> <li>• Project Director for the investigation of the CFA Fiskville, Vic fire training complex for the Country Fire Authority. Strategic advice on contamination risks due to PFAS chemicals from fire-fighting foams - an extensive assessment of soil, surface water, sediment, surface water, biota, fill stockpiles, waste landfills and former buried drum trenches. A detailed assessment of human health (occupational and community exposures) and ecological risks was also performed.</li> <li>• Assessment of contamination risks on public open space developments on former landfill sites at Williamstown, Laverton and Glen Iris, Vic</li> <li>• Review of property portfolio contamination risks and management strategies:             <ul style="list-style-type: none"> <li>• Assessments of all fire brigade sites (80) across Melbourne</li> <li>• Advice on residual groundwater contamination, Docklands, Vic.</li> <li>• Review of underground storage tanks (USTs) at 165 school sites in SA.</li> <li>• Review of over 30 surplus Telstra sites Vic &amp; SA.</li> </ul> </li> </ul>
<p><b>Land and Groundwater Contamination Investigations</b></p>	
<p><b>Project Director for land and groundwater contamination investigations</b></p>	<ul style="list-style-type: none"> <li>• Melbourne &amp; Launceston Airports</li> <li>• Major petroleum processing facility, Longford, Vic</li> <li>• Petrol station/depot, Launceston, Tas</li> <li>• Coatings manufacture plant, Riverstone, NSW</li> <li>• Former tannery and petrol station, Hopkins St, Footscray</li> <li>• Dyeworks, Noone St, Clifton Hill &amp; Richmond</li> <li>• Former landfill site for development, Queenscliff, Vic</li> <li>• Paint Factory, Ho Chi Minh City, Vietnam</li> <li>• Oil tank farm, Darwin</li> <li>• Inveresk Railyards, Launceston</li> <li>• Groundwater at lead smelter, Port Pirie, SA</li> <li>• Pigments factory, Laverton</li> <li>• Acid drainage at former Tioxide site, Burnie, Tas.</li> </ul>

	<p><b>Contamination Remediation and Management</b></p>
<p><b>Project Director or Manager for design and/or implementation of land and groundwater remediation projects</b></p>	<ul style="list-style-type: none"> <li>• Sand washing design concept, Barry Beach, Vic</li> <li>• Remediation feasibility for PFAS at CFA Fiskville</li> <li>• Refinery land, Altona, Vic (pilot trial of "Air Sweep" remediation)</li> <li>• Former tannery, Hopkins St, Footscray (USTs, soil remediation, MPVE &amp; ISCO)</li> <li>• Dyeworks, Noone St, Clifton Hill (USTs, soil bio-piling, MPVE &amp; ISCO)</li> <li>• Aircraft maintenance base, Essendon (remediation at heritage building)</li> <li>• Particle board plant, Tumut, NSW (groundwater pump &amp; treat)</li> <li>• "Bayside/Beacon Cove Project", Port Melbourne (bulk excavation &amp; soil washing)</li> <li>• Rehabilitation of lead contaminated houses (60 no.) – Ardeer, Vic</li> </ul>
<p><b>Auditor review/verification of Remediation Action Plans (RAPs)</b></p>	<ul style="list-style-type: none"> <li>• Gasworks Bacchus Marsh, Vic (Surfactant enhanced ISCO)</li> <li>• Major petroleum terminals, Yarraville &amp; Newport, Vic (MPE, SVE)</li> <li>• Gold mine tailings dam groundwater plume, Stawell, Vic (Hydraulic control)</li> <li>• Major petroleum pipeline release site, Newport, Vic (Pump &amp; treat)</li> <li>• Service station, Napier, NZ (MNA)</li> <li>• Printing plant, Hawthorn (Pump and Treat with biofilter)</li> <li>• Treatment of PCB contaminated soil, Moe, Vic (TD &amp; BCD)</li> </ul>
	<p><b>Land &amp; Groundwater Contamination – Expert Witness</b></p>
<p><b>Expert Witness</b></p>	<ul style="list-style-type: none"> <li>• High St, Thomastown, Vic (Douglas v King in Supreme Court of Victoria)</li> <li>• Barkley Street, Brunswick, Vic (Spotless Case in Supreme Court Vic)</li> <li>• Hutt Street, Osborne Park, WA (Kleenheet Gas Case in Supreme Court WA)</li> <li>• Service station, Springvale Rd (Masha Nominees v Mobil, Supreme Court Vic)</li> <li>• Service Station, Ferntree Gully Rd, Scoresby (Supreme Court, Vic)</li> <li>• Filled Site with refinery waste, Sydenham, Vic (Supreme Court, Vic)</li> <li>• Pollution from effluent lagoon, Tumut, NSW (Land &amp; Env Court NSW)</li> </ul>
	<p><b>Environmental Risk Management and Auditing</b></p>
	<p><b>Statutory Environmental Audits of Risk of Harm</b></p>
<p><b>Statutory Audits of Environmental Risk s53V Environment Protection Act 1970 (Vic)</b></p>	<ul style="list-style-type: none"> <li>• Gold Mine Tailings Dam, Stawell, Vic (thiocyanate)</li> <li>• Explosives and chemical factory, Deer Park, Vic (TCE, PCE, CNB, N &amp; PFAS)</li> <li>• Petroleum pipeline release, Champion Rd, Newport (PHC)</li> <li>• Petroleum terminals remediation, Newport &amp; Spotswood (PHC)</li> <li>• Contaminated soil encapsulation structure, Spotswood Railyards (arsenic &amp; PAH)</li> <li>• MFB Headquarters project; and adjacent former Asphalt Plant, and former Landfill, Burnley (PAH)</li> <li>• Mine water evaporation basins, Woodvale (metals)</li> <li>• Hazelwood Mine, Thickened Ash Retention Area, Morwell (metals, Sulphate)</li> <li>• Power Station, Ash storage sites, Loy Yang</li> <li>• Capped gasworks waste site, North Geelong (PAH)</li> <li>• Former gasworks, Sale (PAH)</li> </ul>

	<p><b>Environmental Risk Consulting</b></p>
<p><b>Project Director Environmental Risk Management Consulting</b></p>	<ul style="list-style-type: none"> <li>• Environmental due diligence studies for mergers and acquisitions: Renison Tin Mine, Zeehan, Tas (Murchison United); Melbourne tram and train systems (Serco); Australian National Railways (Great Southern Rail); Airports at Adelaide, Parafield &amp; Coolangatta (Adelaide Airports &amp; Queensland Airports Ltd)</li> <li>• Environmental Management Plans, Audit systems or EMS (ISO 14001): SEMP for Port of Melbourne; EMPs for Edwardes Lake Rehabilitation; EMS Port of Geelong; EH&amp;S Management Program and EMPs for 27 former gas manufacturing plants, Victoria</li> <li>• Strategic study on state-wide monitoring and reporting of groundwater quality by EPA Vic.</li> <li>• Groundwater pollution risk desk studies; Vulnerability map of Melbourne for Melbourne Water; Proposed wastewater reuse schemes at Ballarat, Maryborough, Creswick, Waubra, Vic.</li> <li>• Team leader and joint author, Groundwater Protection Guidelines - ARMCANZ (1995)</li> </ul>
<p><b>Principal specialist for Environmental Impact and Effects Statements</b></p>	<ul style="list-style-type: none"> <li>• Environmental Impact/Effects Statements documentation preparation / peer review groundwater resources and risk assessments: “Stockman Project”, Copper mine Benambra, Vic; Stuart Oil Shale Stage 2, Gladstone, Qld; Bayview Development, Noosa, Qld; Airtrain Project, Brisbane; Titanium dioxide plant, Whyalla; Very Fast Train Project, Vic &amp; NSW; Palau Airport; Melbourne Airport Strategy (1992 &amp; 2017); Koongarra Uranium Project, Kakadu, NT</li> </ul>
	<p><b>Waste and Landfill Life Cycle Management</b></p>
	<p><b>Waste Stream Management &amp; Auditing</b></p>
<p><b>Lead investigator Waste Stream &amp; Facility Audits</b></p>	<ul style="list-style-type: none"> <li>• Wingfield Landfill, SA: Audit for EPA to assess the classification of waste for recycling and effectiveness of C&amp;D waste processing facility.</li> <li>• Tuerong, Vic: Incorporation of a C&amp;D recycling facility into a proposed landfill (Solid inert waste) development.</li> <li>• Esso Aust, Victoria: Revision of the Esso procedures for waste management auditing; auditing of all waste contractors used by the company in its SE Australian operations for all waste streams, including landfills (Lyndhurst &amp; Lithgow), waste treaters (Cleanaway) and waste transport companies.</li> <li>• Port of Geelong, Vic: Quarantine waste audit and incinerator appraisal and upgrade study</li> </ul>
	<p><b>Landfill Design, Construction &amp; Auditing</b></p>
<p><b>Project Director for Landfill Cell and Cap Design</b></p>	<ul style="list-style-type: none"> <li>• Alcoa, Anglesea, Vic; Power station decommissioning, asbestos disposal cell; GPR of old cells; design of new cell and final capping</li> <li>• Willawong, Qld; Design concept review, landfill capping &amp; rehabilitation</li> <li>• Proposed Landfill, Dromana, Vic; EPA Works Approval application documentation, landfill cell design, address community meeting</li> </ul>

<p><b>Team Leader or principal specialist Landfill approvals and compliance</b></p>	<ul style="list-style-type: none"> <li>• Western Landfill (Boral) Expansion, Ravenhall, Vic; EPA Works Approval application documentation, landfill &amp; quarrying sequence, hydrological &amp; landfill gas modelling</li> <li>• Defence Site Maribyrnong, Vic; Auditor's assessment of a proposed engineered containment facility to contain waste. Involved auditor's geotechnical engineer to review the design of a multiple composite liner cell.</li> <li>• Stevenson's Rd MSW Landfill, Cranbourne: Quarterly auditing (non-statutory) over several years for the SERWMG of compliance and major environmental risks including LFG and groundwater contamination (1996 – 2002).</li> <li>• Wingfield Landfill, SA: Audit for EPA of the compliance of landfill capping works with license requirements.</li> <li>• Gilmore Landfill Tumut NSW: Development of an auditing protocol and regular auditing of compliance and environmental performance at a private trench and cover landfill receiving commercial waste, and a recycling facility for commercial and C&amp;D waste (1999- 2017).</li> <li>• Inkerman Landfill, SA: Audit for EPA as part of a court order to assess the compliance of a leachate drainage system with license requirements.</li> <li>• Whyalla Landfill, SA: statutory audit of the rehabilitation of the landfill, groundwater contamination, landfill gas and environmental management of a closed landfill in a coastal mangrove and samphire environment.</li> <li>• Rockleigh, Tuerong, Vic: Hydrogeological investigation and preliminary design preparatory to EPA Work Approval Application, for a Solid inert Waste landfill and C&amp;D recycling facility proposal.</li> <li>• Simpsons Rd Landfill, Vic: Advice to Stonnington council on compliance with closure requirements of EPA notice for a baled MSW landfill; Design of a landfill capping system for site closures.</li> <li>• Spring Valley Landfill, Springvale, Vic: Quarterly auditing over several years for the SERWMG of compliance and major environmental risks including LFG and leachate burst.</li> <li>• Clayton Rd Regional Land Landfill, Vic: Quarterly auditing over several years for the SERWMG of compliance and major environmental risks including "slimes curtain" placement, leachate, LFG and groundwater.</li> <li>• Tioxide Landfill, Burnie, Tas: design and supervision of construction of a composite lined and capped landfill for containment of mixed industrial waste as part of the plant decommissioning project.</li> <li>• Browns Rd Landfill, Rye, Vic: Development of construction QA Plan, identification of clay liner source, provision of Level 1 supervision of compacted clay liner (CCL) for a new cell at a MSW landfill</li> </ul>
<p><b>Environmental Auditor of LFG Risks (prior to commencement of Landfill Closure Audits in 2011)</b></p>	<p><b>Landfill Gas (LFG) Risk Audits (2002 - 2010)</b></p> <ul style="list-style-type: none"> <li>• Fritsch Holzer Reserve, Camberwell, Vic; Audit of a complex investigation of LFG occurrence and management at a 30m deep MSW closed landfill with residential and commercial land adjoining</li> <li>• Stevensons Rd Landfill, Cranbourne, Vic: Environmental Audit of LFG risks arising from closed landfill (2010); Audit review of LFG remediation at an adjacent house lot.</li> <li>• Bruce Street landfill, Colac, Vic; LFG Risk at site (2010)</li> </ul>

	<ul style="list-style-type: none"> <li>• Talbot Ave, Landfill, Oakleigh, Vic: As part of a statutory audit of a former sand quarry and landfill, reviewed the assessments of LFG risk and management options for the site.</li> <li>• Lakes Entrance: s53X environmental audits of two residential subdivisions adjacent or nearby an active MSW landfill.</li> <li>• Portland, Vic: s53V environmental audit of LFG risks at a landfill with closed and operational cells.</li> </ul>
<p><b>Team Leader or principal specialist on LFG Hazard &amp; Energy projects</b></p>	<p><b>Landfill Gas Hazard &amp; Energy Developments</b></p> <ul style="list-style-type: none"> <li>• Doug Nichols Reserve, Thornbury; Investigation and monitoring of LFG (indoor and in-ground) and assessment of risks (Auditor P.Clarke)</li> <li>• Bosworth Street Landfill, Bairnsdale: Investigated LFG distribution &amp; continuous LFG monitoring (Auditor P.Clarke)</li> <li>• St Agnes, SA: Assessment of landfill gas risks at a school built partly on reclaimed landfill site. Used an in-house risk assessment tool based on AS4360 "Risk Management".</li> <li>• Clayton Sth &amp; Springvale LFG Power Study: A feasibility study for electrical power generation from 30 closed landfills in the "Sand Belt" landfills of SE Melbourne. Resulted in development of two power Stations totaling 20 MW at its peak.</li> <li>• Broadmeadows, Vic: A feasibility study for electrical power generation from 2 closed and an active landfill in the Northern suburbs of Melbourne. Resulted in development of a 5 MW power Station.</li> <li>• Bald Hill Reserve (former Bunney Rd Landfill), Cheltenham, Vic: Investigation of LFG hazards near houses at a closed landfill, and development of a qualitative risk assessment.</li> <li>• Spring Rd Landfill, Springvale, Vic: Investigation of LFG hazards near a retirement village proposed adjacent to a closed landfill.</li> <li>• Mordialloc, Vic: Investigation of a spontaneous landfill gas explosion involving decomposing nitrocellulose plastics wastes and hydrogen and camphor off-gas at Walter Galt Reserve.</li> <li>• West Rd Landfill, Werribee: Preliminary feasibility assessment of an LFG energy project at a MSW landfill.</li> </ul>
<p><b>Environmental Auditor of Groundwater Risks (prior to commencement of Landfill Operations or Closure Audits)</b></p>	<p><b>Landfill Groundwater Protection Auditing (2002 - 2010)</b></p> <ul style="list-style-type: none"> <li>• Cleanaway Tullamarine Landfill (2004 – present)</li> <li>• SITA Taylors Rd, Dandenong Sth, (2006 – 2010)</li> <li>• Stevensons Rd, Cranbourne (2003 – 2011)</li> <li>• Portland, Vic (2009 – 2010)</li> <li>• Green Gully, Keilor (2003 – 2009)</li> <li>• Hanson Wollert, Vic (2004-2010)</li> <li>• Bulla (Hi Quality) Landfill (2007 to 2010)</li> <li>• Maryvale paper Mill Landfill (2004 – 2009)</li> <li>• Clayton Rd, Clayton (2002 – 2004)</li> <li>• Healesville &amp; Coldstream(2004)</li> <li>• "Northern" Cooper St, Epping (2004 – 2006 &amp; 2010)</li> <li>• Plus several others</li> </ul>

	<p><b>Landfill Closure Assessments &amp; Audits (Post-2010)</b></p>
<p><b>Hydrogeological Assessments or Audits of groundwater and LFG impacts for EPA site closure notice</b></p>	<ul style="list-style-type: none"> <li>• Cleanaway Clayton Road Landfill, Calyton South, Vic (Hydrogeologist)</li> <li>• Cleanaway Henry Street Landfill (Hydrogeologist)</li> <li>• Cleanaway Deals Road (Hydrogeologist)</li> <li>• Cleanaway Ryans Road (Hydrogeologist)</li> <li>• Cleanaway Victory Road Landfill, Clayton South, Vic (Auditor)</li> <li>• Yarra Ranges Landfills, Coldstream &amp; Healesville, Vic (Auditor)</li> </ul>
	<p><b>Expert Witness– Landfills</b></p>
<p><b>Expert Witness</b></p>	<ul style="list-style-type: none"> <li>• Proposed residential development in a "Landfill LFG Risk Buffer", Castlemaine, Vic (VCAT appeal)</li> <li>• Waste classification for recycling and capping compliance, Wingfield Landfill, SA (Supreme Court SA)</li> <li>• Expert Report on as-constructed leachate drainage system, Inkerman, SA (EPA enforcement)</li> <li>• Proposed Cooper St No3 Landfill – compulsory acquisition claim (Supreme Court Vic)</li> <li>• Proposed trench &amp; cover MSW landfill, Wangarratta, Vic (VCAT appeal)</li> <li>• Proposed contaminated soil landfill Niddrie, Vic (VCAT appeal)</li> <li>• Proposed MSW landfill, Browns Rd Rye (VCAT appeal)</li> </ul>
	<p><b>Hydrogeology &amp; Groundwater Development</b></p>
	<p><b>Groundwater Resource Development &amp; Management</b></p>
<p><b>Project Director or principal hydrogeologist</b></p>	<ul style="list-style-type: none"> <li>• Hydrogeological investigations for planning and developments of groundwater supplies: “Stockman Project” mineral development, Benambra, vic; Baguio City Water Supply Project, Luzon, Philippines; Resource assessments (Desk Studies) Subic Bay; Puerto Princesa, Philippines</li> <li>• Regional groundwater resources study, Ballarat, Victoria - for Vic government</li> <li>• Groundwater resource and land salinisation review - Batinah Coast, Oman</li> <li>• Groundwater resource mapping project (AusAID) , Northeast Village Water Supply Project, Thailand</li> </ul>
	<p><b>Groundwater Supply Wellfield Design and Installation</b></p>
<p><b>Project Director or principal hydrogeologist</b></p>	<ul style="list-style-type: none"> <li>• Industrial water supply well, Kwinana, WA</li> <li>• Water supply for ornamental lakes from 70m bore in basalt aquifer, Craigieburn</li> <li>• Longford Gas Plant Water Supply; Wellfield performance review; Design, documentation, installation and commissioning of two 700 m deep water bores (each yielding 100 L/s)</li> <li>• Implementation of village-level irrigation supply systems - Tung; Kula Ronghai Project, NE Thailand</li> <li>• Groundwater supply exploration and implementation; Gove, town &amp; mine, NT; Jabiru township, Kakadu, NT. Ok Tedi/ Kiunga construction site, PNG</li> <li>• Install and test 22 water supply bores along the Alice Springs – Darwin railway (NT)</li> <li>• Design and construct high yield bores for more than 20 agribusinesses including irrigators, dairies and salt production(SE Australian)</li> </ul>

	<p><b>Hydrogeological Studies &amp; Peer Reviews</b></p>
<p><b>Project Director or principal hydrogeologist</b></p>	<ul style="list-style-type: none"> <li>• Project leader &amp; joint author "Guidelines for Hydrogeological Assessment (Water</li> <li>• Review of State groundwater information systems (1985) - Dept of Water Resources, Victoria</li> <li>• Specialist advisor to Hepburn Springs Bathhouse redevelopment project (2005)</li> <li>• Facilitator of multidisciplinary interdepartmental team to develop Salinity Manag</li> </ul>
	<p><b>Mine, Quarry &amp; Construction Groundwater Control/Dewatering</b></p>
<p><b>Project Director of principal hydrogeologist</b></p>	<ul style="list-style-type: none"> <li>• Mine dewatering investigation, modelling and design: proposed uranium mine, Koongarra, NT; proposed gold mine, Bendigo underground coal mine, Gordonstone, Qld</li> <li>• Quarry dewatering design studies and modelling: Proposed extension to basalt quarry, Wollert; Stone quarry, Little River; Proposed stone quarry, Donnybrook</li> </ul>
	<p><b>Expert Witness - Hydrogeological &amp; Groundwater</b></p>
<p><b>Principal Hydrogeologist and Expert Witness</b></p>	<ul style="list-style-type: none"> <li>• Geothermal Deep Well Injection, Fingal, Vic (VCAT Hearing)</li> <li>• Quarry dewatering impact assessment, Birregurra, Vic (Planning Panels Vic)</li> <li>• Mineral water extraction licence litigation, Peats Ridge (Land &amp; Env Court NSW)</li> <li>• Mineral water extraction licence litigation, Bundanoon, NSW (Land &amp; Env Court NSW)</li> <li>• Litigation over leaking effluent lagoons, Echuca (Supreme Court Vic)</li> <li>• Alleged dam leakage, Moonambel, Vic (VCAT Hearing)</li> <li>• Eco-tourism resort, Daintree, Qld (Supreme Court Qld)</li> </ul>
	<p><b>Environmental &amp; Hydrogeological Education &amp; Training</b></p>

<p><b>Lecturer in hydrogeology and contaminated land management</b></p>	<ul style="list-style-type: none"> <li>• Part time lecturer in land contamination, hydrogeology &amp; environmental engineering - RMIT (1983 - Present)</li> <li>• "Contaminated Land Management " Lecture in Environmental Science &amp; Engineering, Monash University (2005 - 2011)</li> <li>• "Introduction to Groundwater" and "Introduction to Risk Assessment" 1st Landfills and Contaminated Lands, Risk Assessment and Groundwater Management, Centre for Groundwater Studies, Melbourne, March 2009</li> <li>• Co-author and presenter of CPD courses in contaminated land assessment, remediation and auditing ACLCA-Vic &amp; SA (2002 – 2009)</li> <li>• Chair, Program Advisory Committee - Bachelor of Environmental Engineering RMIT (1994 - 2014)</li> <li>• Lectures in Contaminant Hydrogeology, University of Melbourne (1993 &amp; 1996) .</li> <li>• Environmental Auditing &amp; Management Systems - Cert. Urban Development - RMIT/VPELA (1996 &amp; 1999)</li> </ul>
<p><b>Lecturer in hydrogeology and contaminated land management</b></p>	<ul style="list-style-type: none"> <li>• Short course in Environmental Management for Mine Managers - University of Ballarat (1995)</li> <li>• Delivered training program in stiff foam drilling methods - Baluchistan, Pakistan (1985); Baguio, Philippines (1999)</li> <li>• Delivered training program in regional groundwater resource assessment and village scale development, Thailand (1987)</li> </ul>
<p><b>ACCREDITATIONS</b></p>	<ul style="list-style-type: none"> <li>• Environmental Auditor (Contaminated Land), EPA Victoria, 1995</li> <li>• Site Auditor, EPA NSW, (No 9804, 1998)</li> <li>• Site Contamination Auditor, EAP SA (No 2009010, 2009)</li> <li>• Site Auditor, DER WA (MR047, 2014)</li> </ul>
<p><b>AFFILIATIONS</b></p>	<ul style="list-style-type: none"> <li>• Environment Institute of Australia; Certified Environmental Practitioner (No 020, 2005); Contaminated Sites Specialist (No 1030, 2017)</li> <li>• Australian Contaminated Land Consultants Association, Vic – President 2005 Australasian Land &amp; Groundwater Association – member since 2010</li> <li>• International Association of Hydrogeologists – Member since 1979; V.Pres Vic Branch (2007/8)</li> <li>• National Ground Water Association USA – member since 1977</li> <li>• Waste Management Association of Australia – member</li> </ul>

## PUBLICATIONS

"Assessing planning proposals within the buffer of a landfill" EPA Vic Publication 1642, Oct 2017 - based on a draft by A. Lane & C. Stapleton

"Perfluorinated Compounds (PFCs): Emerging, Persistent and Prevalent Environmental Contaminants", ALGA Land Contamination Conference, Auckland, NZ, May 2015

"Stevenson's Road Cranbourne Landfill - Lessons Learned and Pragmatic Methodology for Landfill Gas Assessment and Management in Australia ", Piper, J. Gringinger, P. Bull, A & Lane A, 7th Int Environmental Geotechnics Congress, Melbourne, Nov 2014

"Cranbourne Landfill - Some Insights from an Intensely Monitored Landfill Gas Case", Clean-Up 13 Conference, Melbourne, Sept 2013

"Observations on the Random Approaches to Remediation Planning in Australia" P.Gringer, A. Lane & W. Morrison CleanUp 11, 4th International Contaminated Site Remediation Conference, Adelaide, September 2011

"Landfill & Ground Gases, VOCs and Vapour Intrusion – The Assessment & Management of Gas Contamination in Australia" P. Gringinger & A. Lane EcoForum Sydney Feb 2010

"Remediation, Clean-up and other non-NEPM concepts" Lane, A.P. & Gringinger, P. (2006) in Proceedings of Environ06 Conference, Melbourne, May 2006

"Guidelines for Hydrogeological Assessment (Water Quality)" EPA Pub 668 (2006) – principal author

"Towards a Sustainable Water Supply for Baguio City, Luzon, Philippines" A. Lane, T. Pascual & A. Alvarez (1998) International Groundwater Conference - Groundwater Sustainable Solutions, Melbourne University

"Draft Guidelines for Groundwater Protection" Australian Water Resource Council - August 1992 (principal author of this documents, published as final by ARM CANZ in 1995)

Hydrogeology of the Melbourne Region" A Lane, R Lakey & J Leonard and "Land Contamination Hazards" A Lane, N Withers - In Engineering Geology of the Melbourne Region" - Ed J Neilson 1992

"The Status of Groundwater Contamination and Regulation in Australia" Occasional Paper No.1 Australian Water Resources Council July 1990

"Groundwater Pollution - Problems, Policies & Challenges", Water Journal, Australian Water & Wastewater Association Vol 17 No 3 June 1990