



ORDINARY COUNCIL MEETING

NOTICE OF MEETING

To: Mayor Jan-Claire Wisdom

Councillor Ian Bailey
Councillor Kirilee Boyd
Councillor Nathan Daniell
Councillor Pauline Gill
Councillor Chris Grant
Councillor Linda Green
Councillor Malcolm Herrmann
Councillor John Kemp
Councillor Leith Mudge
Councillor Mark Osterstock
Councillor Kirsty Parkin
Councillor Andrew Stratford

Notice is given pursuant to the provisions under Section 83 of the *Local Government Act 1999* that the next meeting of the Council will be held on:

Tuesday 24 September 2019
6.30pm
63 Mt Barker Road Stirling

A copy of the Agenda for this meeting is supplied under Section 83 of the Act.

Meetings of the Council are open to the public and members of the community are welcome to attend. Public notice of the Agenda for this meeting is supplied under Section 84 of the Act.

Andrew Aitken
Chief Executive Officer



ORDINARY COUNCIL MEETING

AGENDA FOR MEETING
Tuesday 24 September 2019
6.30pm
63 Mt Barker Road Stirling

ORDER OF BUSINESS

1. COMMENCEMENT

2. OPENING STATEMENT

“Council acknowledges that we meet on the traditional lands of the Peramangk and Kurna people and we recognise their connection with the land.

We understand that we do not inherit the land from our ancestors but borrow it from our children and in this context the decisions we make should be guided by the principle that nothing we do should decrease our children’s ability to live on this land.”

3. APOLOGIES/LEAVE OF ABSENCE

3.1. Apology
Apologies were received from

3.2. Leave of Absence
Cr Andrew Stratford (17 September to 4 October 2019) approved 27 August 2019

3.3. Absent

4. MINUTES OF PREVIOUS MEETINGS

Council Meeting – 27 August 2019

That the minutes of the ordinary meeting held on 27 August 2019 as supplied, be confirmed as an accurate record of the proceedings of that meeting.

Special Council Meeting – 17 September 2019

That the minutes of the special meeting held on 17 September 2019 as supplied, be confirmed as an accurate record of the proceedings of that meeting.

5. DECLARATION OF CONFLICT OF INTEREST BY MEMBERS OF COUNCIL

6. PRESIDING MEMBER'S OPENING REMARKS

7. QUESTIONS ADJOURNED/LYING ON THE TABLE

- 7.1. Questions Adjourned
Nil
- 7.2. Questions Lying on the Table
Nil

8. PETITIONS / DEPUTATIONS / PUBLIC FORUM

- 8.1. Petitions
 - 8.1.1. Wireless Telecommunication Infrastructure
- 8.2. Deputations
Mr Joe Frank – Human Rights and Road Closures
- 8.3. Public Forum

9. PRESENTATIONS (by exception)

- 9.1. Adelaide Hills Tourism – Helen Edwards

10. QUESTIONS ON NOTICE

- 10.1. Telecommunications Installation – Low Impact Facilities

11. MOTIONS ON NOTICE

- 11.1. Boundary Reform Proposal Engagement
 - 1. *Continue to engage with the affected residents and ratepayers of Rostrevor and Woodforde to keep them informed on the progress of the Campbelltown City Council Boundary Realignment Proposal*
 - 2. *Request Campbelltown City Council to provide Adelaide Hills Council with their project plan and their engagement plans (or equivalents) for the development and lodgement of the Stage 2 Boundary Realignment Proposal*
 - 3. *Defer the provision of further assistance to Campbelltown City Council regarding the Stage 2 Boundary Realignment Proposal pending the receipt of the requested project plan and engagement plan*

11.2. Boundary Reform Proposal - Survey of Residents in Rostrevor & Woodforde

- 1. The CEO conducts a survey of the residents and ratepayers of the areas of Rostrevor and Woodforde affected by the Campbelltown City Council boundary change proposal to determine the level of support for the proposal in that community.*
- 2. Distribution of the survey is accompanied by a short summary of the proposal, the boundary change process and 'for' and 'against' arguments for the proposal (with approximately equal space given to each argument).*
- 3. The survey asks whether the participant supports, opposes or is undecided with respect to the proposal.*
- 4. Space is provided in the survey for an explanation of reasons or general comments.*
- 5. The CEO be authorised to expend up to \$10,000 on the survey.*
- 6. A report be presented on the results of the survey to the October 2019 Ordinary Council Meeting or as soon as practicable after that.*
- 7. In the spirit of cooperation, Campbelltown City Council be approached to share in the costs of the survey.*

12. OFFICER REPORTS – DECISION ITEMS

12.1. Bird in Hand Mine Proposal

- 1. That the report be received and noted.*
- 2. That the Council makes a submission to the Department for Energy and Mining as part of the consultation process for the Terramin Bird in Hand mining lease proposal.*
- 3. That the Council's submission be as contained in Appendix 1 and Appendix 2 to this report.*
- 4. To authorise the Chief Executive to make minor content changes to the submission to reflect matters raised in consideration of the agenda item prior to submission.*

12.2. Submission re Genetically Modified Crops

- 1. That the report be received and noted.*
- 2. To endorse the submission on the State's proposed lifting of the Moratorium on Genetically Modified Food Crops as contained in Appendix 3 of this report.*
- 3. That the Council's current Genetically Modified Crops Policy be reviewed should the Moratorium be lifted.*

12.3. Biodiversity Strategy Final Report

- 1. That the report be received and noted.*
- 2. That the final draft AHC Biodiversity Strategy be approved for implementation, as contained in Appendix 1.*
- 3. The public consultation outcomes report be accepted (in compliance with the provisions of Council's Public Consultation Policy).*
- 4. That the CEO be authorised to make any formatting, nomenclature or other minor changes to the final draft Strategy document prior to being implemented.*

12.4. Community Land Management Plan Review

- 1. That the report be received and noted.*
- 2. That the current community land management plans be revoked in accordance with section 198 of the Local Government Act 1999.*
- 3. That the draft community land management plans as presented in Appendix 1 and draft register presented as Appendix 2 be adopted in accordance with section 196 of the Local Government Act 1999.*

12.5. Kenton Valley War Memorial Park

- 1. That the report be received and noted*
- 2. That no further action be taken at this time to progress the revocation of community land classification for the land located at the intersection of Kenton Valley and Burfords Hill Roads known as the Kenton Valley War Memorial Park, being Allotment 64 in Filed Plan No. 155479 contained in Certificate of Title Volume 5718 Folio 775 ("Land")*
- 3. That Council staff provide assistance to the proposed community group to form plans for the use and maintenance of the Land within existing budget and resources, including assistance to identify grant opportunities that may be available to the group*
- 4. A review be undertaken with the community working group in 12 months and an update report be provided to Council by 31 December 2020.*

12.6. Oakbank Soldiers Memorial Hall

1. *That the report be received and noted*
2. *That the Council provides financial and administrative assistance to the Oakbank Soldiers Memorial Hall Inc (“Association”) to make an application to the Supreme Court for a trust variation scheme to vary the charitable trust that exists over the Oakbank Soldiers Memorial Hall (“OSM Hall”) located at 210 Onkaparinga Valley Road Oakbank contained in Certificate of Title Volume 5846 Folio 513.*
3. *That the Council and the Association enter into a binding agreement regarding the level of financial and administrative support being provided, to a maximum of \$40,000, to undertake the trust variation scheme, and land division if deemed financially viable, with all agreed financial and administrative support to be reimbursed to Council upon sale of the OSM Hall.*
4. *That the Council agree to enter into a trust variation scheme that would result in the trust being varied from the OSM Hall to the Council owned Balhannah Soldiers Memorial Hall (“BSM Hall”) that would bind the BSM Hall to be held in perpetuity as a Memorial Hall in memory of the residents of the township and district of Oakbank who enlisted for and made the supreme sacrifice in the Great War 1914 - 1918 and preserve the same upon trust for the general benefit of the residents of the township of Oakbank and district, and including the Balhannah township and district, and accept monies from the Association to be held on trust for that purpose.*
5. *That the Mayor and CEO be authorised to sign all necessary documents, including affixing the common seal, to give effect to this resolution*

12.7. Independent Audit Committee Member Selection Panel

1. *That the report be received and noted*
2. *That the Audit Committee Independent Member Selection Panel consists of three members.*
3. *To appoint Cr Herrmann, Cr Mudge and the CEO (or delegate) as members of the Audit Committee Independent Member Selection Panel.*

12.8. Status Report – Council Resolutions Update
Refer to Agenda

12.9. Delegations Review
Refer to Agenda

13. OFFICER REPORTS – INFORMATION ITEMS

- 13.1. Southern & Hills Local Government Association Key Outcomes Summary
- 13.2. Boundary Reform Proposal – Rostrevor/Woodforde Community Meeting Outcomes
- 13.3. Risk Management Update

14. MISCELLANEOUS ITEMS

- 14.1. Signing & Sealing Black Spot Program Funding Deed

15. QUESTIONS WITHOUT NOTICE

16. MOTIONS WITHOUT NOTICE

17. REPORTS

- 17.1. Council Member Reports
17.2. Reports of Members as Council/Committee Representatives on External Organisations
17.3. CEO Report

18. REPORTS OF COMMITTEES

- 18.1. Council Assessment Panel
Nil
- 18.2. Strategic Planning & Development Policy Committee
Nil
- 18.3. Audit Committee
Nil
- 18.4. CEO Performance Review Panel
Nil

19. CONFIDENTIAL ITEMS

Nil

20. NEXT MEETING

Tuesday 22 October 2019, 6.30pm, 63 Mt Barker Road, Stirling

21. CLOSE MEETING

Council Meeting/Workshop Venues 2019

DATE	TYPE	LOCATION	MINUTE TAKER
OCTOBER 2019			
Tues 8 October	Workshop	Woodside	N/A
Wed 9 October	Council Assessment Panel	TBA	Karen Savage
Mon 14 October	Audit Committee	Stirling	TBA
Tues 15 October	Professional Development	Stirling	N/A
Tues 22 October	Council	Stirling	Pam Williams
NOVEMBER 2019			
Thurs 7 November	CEO Performance Review	Stirling	TBA
Mon 11 November	Audit Committee	Stirling	TBA
Tues 12 November	Workshop	Woodside	N/A
Wed 13 November	Council Assessment Panel	TBA	Karen Savage
Tues 19 November	Professional Development	Stirling	N/A
Tues 26 November	Council	Stirling	Pam Williams
DECEMBER 2019			
Wed 11 December	Council Assessment Panel	TBA	Karen Savage
Tues 17 December	Council	Stirling	Pam Williams

Meetings are subject to change, please check agendas for times and venues. All meetings (except Elected Member Professional Development) are open to the public.

Community Forums 2019

6.00 for 6.30pm

DATE	LOCATION
Tuesday 29 October 2019	Norton Summit

Conflict of Interest Disclosure Form

CONFLICTS MUST BE DECLARED VERBALLY DURING MEETINGS

Councillor:

Date:

Meeting name:

Agenda item no:

1. I have identified a conflict of interest as:

MATERIAL ACTUAL PERCEIVED

MATERIAL: Conflict arises when a council member or a nominated person will gain a benefit or suffer a loss (whether directly or indirectly and whether pecuniary or personal) if the matter is decided in a particular manner. If declaring a material conflict of interest, Councillors must declare the conflict and leave the meeting at any time the item is discussed.

ACTUAL: Conflict arises when there is a conflict between a council member's interests (whether direct or indirect, personal or pecuniary) and the public interest, which might lead to decision that, is contrary to the public interest.

PERCEIVED: Conflict arises in relation to a matter to be discussed at a meeting of council, if a council member could reasonably be taken, from the perspective of an impartial, fair-minded person, to have a conflict of interest in the matter – whether or not this is in fact the case.

2. The nature of my conflict of interest is as follows:

(Describe the nature of the interest, including whether the interest is direct or indirect and personal or pecuniary)

3. I intend to deal with my conflict of interest in the following transparent and accountable way:

I intend to **leave** the meeting (*mandatory if you intend to declare a Material conflict of interest*)

OR

I intend to **stay** in the meeting (**complete part 4**) (*only applicable if you intend to declare a Perceived (Actual conflict of interest)*)

4. The reason I intend to stay in the meeting and consider this matter is as follows:

(This section must be filled in. Ensure sufficient detail is recorded of the specific circumstances of your interest.)

and that I will receive no benefit or detriment direct or indirect, personal or pecuniary from considering and voting on this matter.

CONFLICTS MUST ALSO BE DECLARED VERBALLY DURING MEETINGS

Governance use only: Member voted FOR/AGAINST the motion.

Ordinary Business Matters

A **material, actual or perceived** Conflict of Interest does not apply to a matter of ordinary business of the council of a kind prescribed by regulation.

The following ordinary business matters are prescribed under Regulation 8AAA of the Local Government (General) Regulations 2013.

- (a) the preparation, discussion, conduct, consideration or determination of a review under section 12 of the Act
 - (b) the preparation, discussion, adoption or revision of a policy relating to allowances and benefits payable to members if the policy relates to allowances and benefits payable equally to each member (rather than allowances and benefits payable to particular members or particular office holders)
 - (c) the preparation, discussion, adoption or alteration of a training and development policy under section 80A of the Act
 - (d) the preparation, discussion, adoption or amendment of a strategic management plan under section 122 of the Act
 - (e) the adoption or revision of an annual business plan
 - (f) the adoption or revision of a budget
 - (g) the declaration of rates (other than a separate rate) or a charge with the character of a rate, and any preparation or discussion in relation to such a declaration
 - (h) a discussion or decision of a matter at a meeting of a council if the matter—
 - (i) relates to a matter that was discussed before a meeting of a subsidiary or committee of the council
 - (ii) the relevant interest in the matter is the interest of the council that established the committee or which appointed, or nominated for appointment, a member of the board of management of the council subsidiary or regional subsidiary.
- (2) For the purposes of section 75(3)(b) of the Act, a member of a council who is a member, officer or employee of an agency or instrumentality of the Crown (within the meaning of section 73(4) of the Act) will not be regarded as having an interest in a matter before the council by virtue of being a member, officer or employee.

Engagement and membership with groups and organisations exemption

A member will not be regarded as having a conflict of interest **actual or perceived** in a matter to be discussed at a meeting of council by reason only of:

- an engagement with a community group, sporting club or similar organisation undertaken by the member in his or her capacity as a member; or membership of a political party
- membership of a community group, sporting club or similar organisation (as long as the member **is not** an office holder for the group, club or organisation)
- the member having been a student of a particular school or his or her involvement with a school as parent of a student at the school
- a nomination or appointment as a member of a board of a corporation or other association, if the member was nominated for appointment by a Council.

However, the member will still be required to give careful consideration to the nature of their association with the above bodies. Refer Conflict of Interest Guidelines.

For example: If your **only** involvement with a group is in your role as a Council appointed liaison as outlined in the Council appointed liaison policy, you will not be regarded as having a conflict of interest actual or perceived in a matter, and are **NOT** required to declare your interest.

8. DEPUTATIONS

For full details, see Code of Practice for Meeting Procedures on www.ahc.sa.gov.au

1. A request to make a deputation should be made by submitting a Deputation Request Form, (available on Council's website and at Service and Community Centres) to the CEO seven clear days prior to the Council meeting for inclusion in the agenda.
2. Each deputation is to be no longer than ten (10) minutes in duration, excluding questions from Members.
3. Deputations will be limited to a maximum of two per meeting.
4. In determining whether a deputation is allowed the following considerations will be taken into account:
 - the subject matter of the proposed deputation;
 - whether it is within the powers of the Council;
 - relevance to the Council agenda nominated – and if not, relevance to the Council's powers or purpose;
 - the integrity of the request; and
 - the size and extent of the agenda for the particular meeting.

8.3 PUBLIC FORUM

For full details, see Code of Practice for Meeting Procedures on www.ahc.sa.gov.au

1. The public may be permitted to address or ask questions of the Council on a relevant and/or timely topic.
2. The Presiding Member will determine if an answer is to be provided.
3. People wishing to speak in the public forum must advise the Presiding Member of their intention at the beginning of this section of the meeting.
4. Each presentation in the Public Forum is to be no longer than five (5) minutes (including questions), except with leave from the Council.
5. The total time allocation for the Public Forum will be ten (10) minutes, except with leave from the Council.
6. If a large number of presentations have been requested, with leave from the Council, the time allocation of five (5) minutes may be reduced.
7. Any comments that may amount to a criticism of individual Council Members or staff must not be made. As identified in the Deputation Conduct section above, the normal laws of defamation will apply to statements made during the Public Forum.
8. Members may ask questions of all persons appearing relating to the subject of their presentation.

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
Tuesday 24 September 2019
AGENDA BUSINESS ITEM**

Item: 8.1.1

Originating Officer: Lachlan Miller, Executive Manager Governance & Performance

Responsible Director: Andrew Aitken, CEO

Subject: Petition – Opposing new wireless telecommunication infrastructure

For: Decision

SUMMARY

A petition has been received with 131 signatories stating:

We, the concerned community members, parents and residents of Adelaide Hills Council, petition to halt the installation of new wireless telecommunication infrastructure, including, but not limited to 5th generation wireless technologies. We urge Council to refuse all Development Applications (DA) for new towers, upgrades to existing towers and ‘small cell installations’ in the Adelaide Hills Council.

RECOMMENDATION

Council resolves that the petition signed by 131 signatories, opposing new wireless telecommunication infrastructure be received and noted.

Council has received a petition organised by Ms Shae Elliss and signed by 131 signatories.

Following Council’s consideration, the head petitioner will be advised of Council’s noting of the petition and of any other resolutions arising from the matter.

The Petition states:

We, the concerned community members, parents and residents of Adelaide Hills Council, petition to halt the installation of new wireless telecommunication infrastructure, including, but not limited to 5th generation wireless technologies. We urge Council to refuse all Development Applications (DA) for new towers, upgrades to existing towers and ‘small cell installations’ in the Adelaide Hills Council.

Background from the Petitioner

Specifically:

- 5154001: 163 Old Mt Barker Rd, ALDGATE, SA, 5154: Optus 5G (proposed), Telstra 5G (proposed) & Vodafone 4G (proposed)
- 5152005: 32 Sturt Valley Rd, STIRLING, SA, 5152: Vodafone 2G & 3G (proposed)
- 5242001: 6 Bridge St, BALHANNAH, SA, 5242: Telstra 4G & 4Gx (proposed)
- 5245001: Lot 9 Plan 129463 Ambulance Rd, VERDUN, SA, 5245: Telstra 4G (proposed)
- 5156001: 187 Upper Sturt Rd, UPPER STURT, SA, 5156: Optus 3G, 4G & 4G+ (proposed) & Vodafone 3G & 4G (proposed)
- 5152006: CFS Site, The Knoll Conservation Park lot 612 Plan 105100 Upper Sturt Rd, CRAFTERS WEST, SA, 5152: Telstra 4G (proposed)
- 5152001: 404 Mt Loft Summit Rd, CLELAND, SA, 5152: Telstra 4G (proposed) & Vodafone 3G & 4G (proposed)
- 5150002: Mt Barker Road, CRAFTERS WEST, SA, 5152: Optus 4G (proposed) & Telstra 4G (proposed)
- 5137004: 258 Lobethal Rd, ASHTON, SA, 5137: Optus 2G, 3G, 4G, 4G+ (proposed) & Vodafone 3G & 4G (proposed)
- 5231001: Lot 483 Levett Rd, KERSBROOK, SA, 5231: Optus 4G+ & Telstra 4G (proposed)
- 5134004: 1293 Montacute Rd, CHERRYVILLE, SA, 5134: Telstra 3G & 4Gx (proposed)
- 5241003: 61 Berry Hill Rd, CUDLEE CREEK, SA, 5232: NBN Co 4G (proposed)
- 5136004: 4 Colonial Drive, NORTON SUMMIT, SA, 5136: Telstra 4G (proposed)
- 5244003: Lot 560 Plan 105600 Bennetts Rd, MT TORRENS, SA, 5244: Telstra 4G (proposed)
- 5240001: Lot 72 Plan 130126 Lobethal Rd, LENSWOOD, SA, 5240: Telstra 4G (proposed)
- 5153001 & 5153012: Arlington Farm off Whitehead Road, MYLOR, SA, 5153: Telstra 4G & NBN 4G (proposed)

Please refer to the RFNSA website at <https://rfnsa.com.au> for further information regarding existing and proposed cell tower locations.

If the above installations do not require a DA, we urge Council to utilize the following to halt the deployment of any new or proposed upgrades to cell towers and 'small cell installations' within the community on the basis of:

- The "Precautionary Principle" at Law
- *Local Government Act (1999)*
- *Environment Protection Act (1993)*
- *Public Health Act (2011)*
- *Workplace Health & Safety Act (2012)*
- *Mobile Phone Base Station Deployment Industry Code (2018)*

The Health Effects

There is an abundance on scientific literature that documents the adverse health effects associated with exposure to microwave radio frequency (RF) radiation emissions from cell towers and other related technological infrastructure.

- Wireless RF radiation is classified as Human Carcinogen (group 2B), (World Health Organization International Agency for Research on Cancer (IARC, (commissioned by the W.H.O)), 2011).
- There are links between RF radiation exposure and cancer, mitochondria and DNA damage, neurological disorders, hormonal changes, infertility, learning, attention and memory deficits, anxiety, depression, heart irregularities and more.

For some peer reviewed scientific literature, please refer to **Attachment 1**.

5G technologies, unlike 3G or 4G, will involve vastly higher frequencies, higher voltages, and more pulsing of EM Radiation signals than that we are currently exposed to. 5G will also require multiple antenna elements acting together to produce increased penetration. Consequently, 5G is predicted to be particularly dangerous due to the extraordinarily high numbers of 'small cell installations' that are planned, the very high energy outputs which will be used to ensure penetration and the extraordinarily high pulsation levels which have much greater biological penetration. This has the potential to have devastating consequences.

Proximity to Schools

Many scientists throughout the world are appealing to governments and legislative bodies to take greater precaution when granting permissions to the installation of telecommunication infrastructure, especially those that are in close proximity to schools and early learning centers. Full body low level RF radiation exposures, for significant periods of time such as while at school, can have a cumulative effect on the developing body of a child.

It is imperative that our leaders protect the quality of life experienced by the next generation and those that follow.

- Studies show that children are more vulnerable to harmful effects from wireless radiation than adults. Children have thinner skulls (deeper penetration), more water in brain (conductor), smaller size, absorb ten times more radiation in bone marrow than an adult, and immune and neurological systems are not fully developed until early twenties.
- Cancers can have long latency periods (time from first exposure until diagnosis) and it will take decades before we know the full extent of health impacts from this radiation. However, from 2015-2017 the 3rd leading cause of death in Australian children between the ages of 1-14 was brain cancer. Clearly, we, as a community, need to take greater precaution when exposing children to W.H.O-admitted carcinogens, such as wireless RF emissions.

" Low intensity microwaves disturb and damage living cells in our bodies and lead to adverse health effects. This can be a whole host of ailments – from mental disease, to cancer. Most concerning are the effects on the developing brains of children." -Dr. Priyanka (Pri) Bandara (Consultant/Researcher in Environmental Health)



Tower 5154001 is in very close proximity to:

- Stirling East Primary School (668m)
- The Hills Montessori School (1.08km)
- Stirling East Kindergarten (1.26km)
- Bridgewater Primary School (1.88km)

Tower 5242001 proposals are in very close proximity to:

- Oakbank Area School (731m)
- Hills Christian Community School (736m)

Tower 5152005 proposals in very close proximity to:

- St Catherines Primary School (563m)
- Stirling District Kindergarten (1.08km)

Tower 5156001 proposals in very close proximity to:

- Upper Sturt Primary School (1.35km)

Tower 5153001 & 5153012 proposals are in very close proximity to:

- Mylor Primary School (584m)

With this letter, the concerned parents and guardians of children attending the aforementioned schools and kindergartens, urge Council members to invoke the Precautionary Principle and protect our children by contesting the deployment of any new or proposed upgrades to cell towers and 'small cell installations' within the community, especially those close to educational institutions.

According to Section 37 of the South Australian *Public Health Act (2011)*, that specifies the functions of Councils as a local public health authority for its area. The functions that are conferred on a Council, include:

- To take action to preserve, protect and promote public health within its area;
- Insofar as is reasonably practicable, to have adequate measures in place within its area to ensure that activities do not adversely affect public health;
- To identify risks to public health within its area;
- As necessary, to ensure that remedial action is taken to reduce or eliminate adverse impacts or risks to public health;
- To assess development, or proposed development, within its area in order to determine and respond to public health impacts (or potential public health impacts); and
- To provide, or support the provision of, educational information about public health and to provide or support activities within its area to preserve, protect or promote public health.

The *Public Health Act*, also extends the definition of “public health”, to protect, maintain or promote the health of the community at large, including where one or more persons may be the focus of any safeguards, action or response; or, to prevent or reduce the incidence of disease, injury or disability within the community.

For the purposes of the Act, “harm” includes physical or psychological harm, or potential harm, to individuals, whether of long term or immediate impact or effect. Similarly, the Act states that a person may “cause” harm if he or she “contributes” to something happening, or ... “allows or permits” something to happen.

Other jurisdictions:

- Brussels and Florence have refused permissions for 5G.
- Glastonbury council in the UK has for now opposed the 5G roll out.
- At least 21 US cities have passed ordinances restricting small cell installation, and many are charging ‘recertification fees’ to make it unprofitable for the wireless industry.
- Byron Shire Council, NSW has famously rejected the Wilson's Creek 4G tower upgrade.

ATTACHMENT 1 – FURTHER INFORMATION, STUDIES AND RESEARCH MATERIAL

- **BioInitiative Report 2012**
 - (Updated 2017) The report (1,557 pages) was prepared by 29 authors from ten countries, ten holding medical degrees (MDs), 21 PhDs, and three MsC, MA or MPHs. Among the authors are three former presidents of the Bioelectromagnetics Society, and five full members of BEMS [Start at the Table of Contents]
<https://bioinitiative.org/>
 - **BioInitiative (Colour Charts)** The RF Colour Charts [of above Report] summarize many studies that report biological effects and adverse health effects relevant for cell towers and similar wireless installations
<https://bioinitiative.org/wpcontent/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf>, and
 - **BioInitiative Summaries.** https://bioinitiative.org/wp-content/uploads/pdfs/sec01_2012_summary_for_public.pdf

- **Physicians for Safe Technology** for Digital Technology and Public Health
<https://mdsafetech.org/> Advisory Board Members <https://mdsafetech.org/advisory-board/>
Scientific Literature <https://mdsafetech.org/5g-telecommunications-science/>
- **World Health Organisation** / IARC Classifies Radiofrequency Electromagnetic Fields As Possibly Carcinogenic To Humans https://www.iarc.fr/wp-content/uploads/2018/07/pr208_E.pdf
- **What is 5G Animation** (Short Video 1.39 minutes)
<https://www.youtube.com/watch?v=ESmIKsTOFto>
- **Australian Communications and Media Authority (ACMA)** <https://www.acma.gov.au/>
ACMA is the regulator for the radiocommunication industry that the spectrum licences for the roll-out of 5G. ACMA refers to the safety standards and guidelines published by ARPANSA when considering applications for licensing and implementation of new technology. 5G is currently being rolled out on existing and proposed cell towers by telcos based on the 3.5 GHz frequency band (3500 MHz) range. ACMA have recently drafted recommendation to the Minister Communications to relocate the next round of spectrum licences to the telcos in the 26 GHz frequency band. Refer to Draft spectrum reallocation recommendations for the 26 GHz frequency band consultation paper. Available for download at <https://www.acma.gov.au/theACMA/draft-spectrum-reallocation-recommendationfor-the-26-ghz-band>.

The proposed frequency range 24.25–27.5 GHz (the wider 26 GHz band) has been identified internationally and by the ACMA for delivery of millimetre wave (mmWave) 5th generation (5G) wireless broadband services. mmWaves span 30 to 300 GHz (i.e. a wavelength of 1 cm to 1 mm), however, in the current 5G context, mmWave bands in consideration span from around 24 GHz up to 86 GHz.

- **ARPANSA Disclaimer** <https://www.arpansa.gov.au/about-us/disclaimer> The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Safety Standard (3KHz to 300 GHz) sets limits for exposure to RF Electromagnetic Energy (EME). ARPANSA safety standards are based on studies undertaken 20 years ago and are thus *outdated*.
- **Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)** on Electromagnetic hypersensitivity <https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electromagnetic-hypersensitivity>
- **South Australian Public Health Act 2011**
<https://www.legislation.sa.gov.au/LZ/C/A/SOUTH%20AUSTRALIAN%20PUBLIC%20HEALTH%20ACT%202011.aspx>
- **South Australian Environmental Protection Act 1993**
<https://www.legislation.sa.gov.au/LZ/C/A/ENVIRONMENT%20PROTECTION%20ACT%201993/CURRENT/1993.76.AUTH.PDF>
- **Criminal Code Criminal Law Consolidation Act 1935**
<https://www.legislation.sa.gov.au/LZ/C/A/CRIMINAL%20LAW%20CONSOLIDATION%20ACT%201935.aspx>

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
24 September 2019
AGENDA BUSINESS ITEM**

Item: 10.1 Question on Notice

Originating from: Cr Mark Osterstock

Subject: Question on Notice - Telecommunications Installation [Low Impact Facilities]

QUESTION(s)

1. What are Low Impact Facilities?
2. Is the proposed roll out of 5G infrastructure considered to be low impact?
3. Can Low Impact Facilities be installed on public and private land?
4. Do telecommunication providers require development approval, from either the State Government or Local Council, prior to installing Low Impact Facilities?
5. In the event that no such approval is required, what legislation [law] enables this to occur?
6. Would any of the following South Australian legislative instruments enable a Local Council to prevent the installation of Low Impact Facilities?
 - a. *Local Government Act 1999*
 - b. *Environment Protection Act 1993*
 - c. *South Australian Public Health Act 2011*
 - d. *Work Health and Safety Act 2012*
 - e. *Development Act 1993*
 - f. *Planning, Development & Infrastructure Act 2016*
7. Are there any legislative instruments, State or Local that a Council could employ in order to prevent the installation of Low Impact Facilities? If not, why not?
8. Which sphere of government in Australia is responsible for the regulation, management and control of low impact Telecommunication Facilities?

OFFICER'S RESPONSE – Marc Salver, Director Development & Regulatory Services

The following responses are provided to each of the questions below:

1. What are Low Impact Facilities?

The Telecommunications (Low-impact Facilities) Determination 2018 is a piece of Federal legislation (originally enacted in 1997) which specifies the types of facilities that qualify as low-impact. In essence, low-impact facilities are those which, because of their size and location, are considered to have a low visual impact and be less likely to raise significant planning, heritage or environmental concerns. The aforementioned Determination lists types of low-impact facilities, such as:

- small radio or satellite communications dishes (e.g. 1.2m diameter) and antennae (including omnidirectional antennae)
- radio facilities, underground/above-ground housings, underground/above-ground facilities (for fixed-line networks)
- Panel, yagi or other like antenna (generally used by mobile phone providers)
- emergency and co-located facilities
- above or below ground housings underground cabling and cable pits, and
- public payphones.

Further, the Determination states that a low impact facility is also dependent on the type of area the facility is proposed to be installed in namely, a residential, commercial, industrial or rural area. That is, the size and type of low impact facility (e.g. antennae, dishes) as well as the structure these are mounted on changes from area to area as outlined in the Schedule (Facilities and areas) contained in the Determination.

Facilities such as overhead cabling and freestanding mobile phone towers are not classified as low-impact facilities and their installation requires Council approval. However, the Determination identifies certain equipment as low impact when it is mounted on existing structures such as buildings, poles or towers. It also classifies an extension of up to five metres on an existing tower as low impact, provided the tower has not previously been extended.

If a facility is to be installed in an environmentally significant area such as a World Heritage Site or an area identified to be of significance to Aboriginal persons or Torres Strait Islanders, then it cannot be designated as a low-impact facility. The Low-impact Facilities Determination lists the types of areas that are considered environmentally significant.

2. Is the proposed roll out of 5G infrastructure considered to be low impact?

Yes, as long as the roll out of 5G antennae and associated infrastructure complies with the low impact Determination – that is, the new antennae are placed on existing poles, towers or buildings and are not within a World Heritage Site or an area identified to be of significance to Aboriginal persons or Torres Strait Islanders.

3. Can Low Impact Facilities be installed on public and private land?

The Determination identifies that low impact facilities can be installed on existing structures such as buildings, poles or towers, whether they are on public or private land. However, where the pole, tower or building is privately owned, then a separate agreement (e.g. lease agreement) has to be entered into with the private owner of the aforementioned infrastructure before they can be installed.

4. Do telecommunication providers require development approval, from either the State Government or Local Council, prior to installing Low Impact Facilities?

No approval from State Government or a local council is required for installing low impact facilities defined as such in the *Telecommunications (Low-impact Facilities) Determination 2018*, unless they are being installed on State Government or local council owned infrastructure.

5. In the event that no such approval is required, what legislation [law] enables this to occur?

The *Telecommunications (Low-impact Facilities) Determination 2018* and the Federal *Telecommunications Act 1997* enable this to occur.

6. Would any of the following South Australian legislative instruments enable a Local Council to prevent the installation of Low Impact Facilities?

- a. *Local Government Act 1999*
- b. *Environment Protection Act 1993*
- c. *South Australian Public Health Act 2011*
- d. *Work Health and Safety Act 2012*
- e. *Development Act 1993*
- f. *Planning, Development & Infrastructure Act 2016*

None of the above pieces of legislation enable a local council to prevent the installation of low impact telecommunications facilities that comply with the requirements of the *Telecommunications (Low-impact Facilities) Determination 2018*. However, the contractors undertaking the installations of such facilities will be required to comply with the *Work Health and Safety Act 2012*.

7. Are there any legislative instruments, State or Local that a Council could employ in order to prevent the installation of Low Impact Facilities? If not, why not?

As these low impact facilities are covered by the Federal legislation, no State legislation is applicable. A local council therefore has no ability to prevent the installation of these low impact facilities unless they are to be installed on facilities within an environmentally significant area such as a World Heritage Site or an area identified to be of significance to Aboriginal persons or Torres Strait Islanders.

8. Which sphere of government in Australia is responsible for the regulation, management and control of low impact Telecommunication Facilities?

The Federal Government has jurisdiction over the *Telecommunications (Low-impact Facilities) Determination 2018* and the *Telecommunications Act 1997*. These are the two key pieces of Federal legislation that govern the installation of low impact facilities.

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
Tuesday 24 September 2019
AGENDA BUSINESS ITEM**

Item: 11.1 Motion on Notice

Originating from: Cr Pauline Gill

Subject: Boundary Reform Proposal Engagement

1. MOTION

I move that Council resolves to:

1. Continue to engage with the affected residents and ratepayers of Rostrevor and Woodforde to keep them informed on the progress of the Campbelltown City Council Boundary Realignment Proposal
2. Request Campbelltown City Council to provide Adelaide Hills Council with their project plan and their engagement plans (or equivalents) for the development and lodgement of the Stage 2 Boundary Realignment Proposal
3. Defer the provision of further assistance to Campbelltown City Council regarding the Stage 2 Boundary Realignment Proposal pending the receipt of the requested project plan and engagement plan

2. BACKGROUND

I believe it is Adelaide Hills Council's role to inform the affected residents of Woodforde and Rostrevor on the boundary reform proposal as best we can. I understand that Council is using staff resources to provide information and cooperate with Campbelltown City Council (CCC), however, I am reluctant for AHC to resource any further action on boundary reform without seeing evidence that CCC is preparing a basic Project Plan or Engagement Plan.

3. OFFICER'S RESPONSE – Lachlan Miller, Executive Manager Governance & Performance

In January 2019, Campbelltown City Council (CCC) resolved to commence a boundary reform project to move the council boundary eastwards so that the suburbs of Rostrevor and Woodforde are entirely within the CCC area.

Under the boundary reform legislative provisions, CCC is responsible for the development and lodgement of information to the Boundaries Commission to support their proposal. Some of the information required is in the possession of Adelaide Hills Council (AHC) and has been requested to assist CCC to prepare their submission including engaging with the affected residents and ratepayers. Preparing and providing this information will have a resource impact for AHC.

While AHC does not have a formal role in relation to the current stage (Stage 2) of the process it does have an obligation to keep the residents and ratepayers who are affected by the proposal informed as to the progress of the project.

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
Tuesday 24 September 2019
AGENDA BUSINESS ITEM**

Item: 11.2 Motion on Notice

Originating from: Cr Leith Mudge

Subject: Survey of Residents in Woodforde & Rostrevor on Boundary Change

1. MOTION

I move that:

- 1. The CEO conducts a survey of the residents and ratepayers of the areas of Rostrevor and Woodforde affected by the Campbelltown City Council boundary change proposal to determine the level of support for the proposal in that community.**
- 2. Distribution of the survey is accompanied by a short summary of the proposal, the boundary change process and ‘for’ and ‘against’ arguments for the proposal (with approximately equal space given to each argument).**
- 3. The survey asks whether the participant supports, opposes or is undecided with respect to the proposal.**
- 4. Space is provided in the survey for an explanation of reasons or general comments.**
- 5. The CEO be authorised to expend up to \$10,000 on the survey.**
- 6. A report be presented on the results of the survey to the October 2019 Ordinary Council Meeting or as soon as practicable after that.**
- 7. In the spirit of cooperation, Campbelltown City Council be approached to share in the costs of the survey.**

2. BACKGROUND

Since the initial boundary change proposal by Campbelltown in January 2019 there has been a missing element in the debate - what is the consolidated opinion of the residents and ratepayers of the affected areas of Rostrevor and Woodforde?

It was clear in the recent community meeting at Rostrevor College that there is a significant group who oppose the proposal (including the Morialta Residents Association) and many who are also ambivalent about the proposal. Written feedback from some attendees also indicates that there are also pockets of support. It is hard to gauge what the overall feeling is from a meeting like that as there are many residents who are not able to attend for various reasons or are unwilling to speak up.

What this motion aims to do is get a somewhat independent quantitative gauge of the opinions of residents and ratepayers of the area as a contribution to the deliberations of both the Adelaide Hills Council and potentially the Boundaries Commission.

3. OFFICER'S RESPONSE – Lachlan Miller, Executive Manager Governance & Performance

Understanding community perception and obtaining community input in shaping a Council policy position is important. There are a number of ways in which this can be done to ensure anyone with an interest is given the opportunity to have their say.

A survey is one useful method for gaining information on the sentiment of the respondents. The type and utility of the information collected is a product of the survey design. For example, where the survey consists of closed response questions it elicits good quantitative information but gives little information on the reasons for the response, conversely a survey with open response fields elicits useful qualitative information but it can be difficult to classify responses to determine quantitative results. The survey as proposed would contain both types of responses which should assist in mitigating the negatives of each type.

Public consultations in local government (including the ultimate public consultation, elections) have historically had low participation rates from the target audience. This can create difficulties in extrapolating the results to approximate the views of the (large) majority that did not participate.

The development of accompanying 'for and against' information with the survey could be of assistance to potential respondents who are unfamiliar with the boundary change process and/or have not contemplated the potential impacts. The production of the 'for and against' information is inherently subject to bias which, in itself, had the potential to affect the validity of the survey result. As such, particular care would be needed to prepare this information. Alternatively rather than 'for and against' the accompanying information could be structured as a description of the 'impacts' of the boundary change in areas such as planning, rating, service provision, representation, etc. The information sheet should be written in easy to understand, jargon free language.

Allied to the above, the method of communicating the survey to the target audience is important; surveys administered directly by a surveyor (i.e. door to door) increase the potential for bias (particularly if they are public officers of the Council) compared to a survey that is administered by independent surveyors or electronically and/or in hard copy form through the post. Online surveys enable multiple people within one house to complete the survey, this is important when there are different views within the household.

The form of administration of the survey will also significantly affect the costs associated. For example, use of Council's YourSay website is relatively low cost whereas administering the survey via post (thereby incurring printing costs, postage, reply-paid envelopes and manual handling and data entry) is significantly more costly. By having the survey feedback in electronic format, via our YourSay page, we are able to use the new digital comment analysis tool which saves significant analysis time.

Defining the target audience is important. The proposed motion identifies residents and ratepayers. Regarding residents, the assumption is that this means residents at or above

the age of majority. Council does not hold records of all of the potential respondents that meet this criteria. The House of Assembly role would contain the vast majority assuming that any new residents to the area have changed their details.

Regarding ratepayers, Council's Supplementary Roll contains non-citizens who reside in the area and those ratepayers with a property franchise for a property in the Council area as at the time of the November 2018 Local Government election who applied to be on Supplementary Roll prior to the close of enrolment. Given the very low numbers on this Roll and that a number of properties have become available in the affected area since the election, it is highly likely that some of the above types of residents and ratepayers are not on that Roll. Details on the latter may be able to be obtained from the rates database.

An allied consideration is the degree of importance placed on receiving only one response for each person entitled to be a respondent (i.e. avoiding multiple submissions from the same person). The YourSay website has the functionality (for on-line responses) to require respondents to register however this registration is not verified against any listing of potential participants nor is there adequate controls to prevent identify fraud.

From a hardcopy perspective, a 'vote' integrity management system utilised in postal voting (such as the local government elections) would need to be employed, this is costly. As such the proposed budget of \$10,000 may not be sufficient.

If however taking the above discussion into consideration, Council is content to accept responses from any respondent (who may or may not be in the affected area), it could progress with a survey placed on the YourSay site and/or mailed to residents and/or advertised in local newspapers in the affected area. However it must be acknowledged that it may not necessarily reach every resident and ratepayer in the affected area and/or respondents may not be from the affected area. Copies of the survey could also be made available in all customer service centres.

Due consideration also needs to be given to the unintended outcome of creating divides within the community on this issue. Consistent with Council's goals for a connected community inadvertently creating a 'them and us' scenario could create tension and disharmony between neighbours.

Offering Campbelltown City Council (CCC) the opportunity to contribute to the survey would, if this offer was accepted, be highly likely to be contingent on CCC contributing to the design and content of the survey, if not actually having a role in approving the survey.

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
Tuesday 24 September 2019
AGENDA BUSINESS ITEM**

Item: 12.1

Originating Officer: Melissa Bright, Manager Economic Development

Responsible Director: David Waters, Director Community Capacity

Subject: Draft submission to Bird in Hand Mining Lease application

For: Decision

SUMMARY

On 21 June 2019, Terramin Australia Ltd (Terramin), the owners of the Bird in Hand Gold mine located on Pfeiffer Road, Woodside, applied to the Department for Energy and Mining (DEM) pursuant to Sections 35 and 53 of the *Mining Act 1971* to obtain a Mining Lease Licence. On 5 July 2019, Council received a formal invitation from DEM to provide comments on the proposed mine as part of a broader consultation process.

Applications for mining operations are approved under the *Mining Act, 1971* by the Minister. Council has no role or involvement in the mine approval process other than to provide comments to the Minister for Energy and Mining.

Terramin will be given an opportunity to respond to the public submissions, which will also be assessed by the Government's technical experts. The Minister will then make a decision with regard to the mining lease application. If approved, Terramin intends to commence mining operations within the next 12 to 24 months.

The purpose of this report is to enable the Council to consider and determine an appropriate submission. A draft submission is contained in **Appendix 1** (cover letter) and **Appendix 2** (detailed submission) for the Council's consideration.

RECOMMENDATION

Council resolves:

1. That the report be received and noted.
 2. That the Council makes a submission to the Department for Energy and Mining as part of the consultation process for the Terramin Bird in Hand mining lease proposal.
 3. That the Council's submission be as contained in Appendix 1 and Appendix 2 to this report.
 4. To authorise the Chief Executive to make minor content changes to the submission to reflect matters raised in consideration of the agenda item prior to submission.
-

1. GOVERNANCE

➤ Strategic Management Plan/Council Policy

Goal 3 Places for People & Nature
Strategy 3.1 We will work with our community to encourage sustainable living and commercial practices.

The Adelaide Hills Council district is a scenic area with a diversity of primary production activities and tourism offerings. The assessment of any proposed mining activity needs to be considered within this context. Any potential socio-economic benefits and potential negative impacts on both the environment and nearby tourism and primary production activities need to be mitigated or addressed as part of the assessment process.

➤ Legal Implications

Relevant legislation includes:

- *Mining Act 1971*
- *Development Act 1993 and associated Development Regulations 2008*
- *Planning, Development and Infrastructure Act 2016*

The Minister for Mineral Resources and Energy, as the relevant authority via the Department for Energy and Mines (DEM), considers and approves applications for mining operations pursuant to the *Mining Act 1971*. Councils have no role or involvement in the mine approval process other than having the opportunity to provide comments to the Minister.

The Minister pursuant to Section 75 (2) of the *Development Act 1993* and Regulation 84(1)(b) of the *Development Regulations 2008*, is required to refer the application for mining to the Minister for Planning where the mining operation is proposed within a council area listed in Schedule 20 of the Development Regulations. The Adelaide Hills Council is listed in Schedule 20 and therefore DEM will refer the application to the Minister for Planning, who will then refer the application to the Extractive Industries Committee of SCAP for comment. The planning consent approvals are issued by DEM under the *Mining Act 1971*.

Building Rules Consent is required under Regulation 84(2) for all housing, offices and work areas or other amenities which are not directly associated with the mining operations (e.g., staff canteen).

➤ Risk Management Implications

The lodgement of a submission to DEM will assist in mitigating the risk of:

Council not taking the opportunity to assess and comment on the possible impacts of the proposed mine on its infrastructure, the environment and the community, leading to a range of impacts potentially going unaddressed.

Inherent Risk	Residual Risk	Target Risk
Medium (3C)	Low (2D)	Low

➤ **Financial and Resource Implications**

There are no financial implications as a result of this information report. However, any impacts (including financial impacts) on Council's infrastructure (e.g., our roads) will be considered as part of the review of the application.

➤ **Customer Service and Community/Cultural Implications**

The community has been invited to provide comments/submission to the Minister for Energy and Mining and have been notified of the proposal via adverts in:

- The South Australian Government Gazette
- The Advertiser
- The Courier (Mount Barker)
- The Adelaide Hills Weekender Herald
- Southern Argus (Strathalbyn)
- The Times (Victor Harbor)

It is noted that all submissions received will be forwarded to Terramin for consideration and response, and will be made public, unless respondents request this not to occur.

Council Members will be aware of the public interest in this matter. While a community consultation process has been carried out by Terramin in the lead up to the formal proposal consideration, there have also been other community-initiated activities and campaigns. The Council has received direct representation from community, including recently in a public forum from representatives of the Inverbrackie Creek Catchment Group and the Chair of Adelaide Hills Tourism.

➤ **Environmental Implications**

There have been general concerns expressed by the adjoining landowners/businesses, the community and the Inverbrackie Creek Catchment Group regarding the potential groundwater and other impacts on neighbouring farmers and businesses as a result of the proposed mining operations.

It is noted that Terramin has identified and undertaken research into a broad range of issues, including ground and surface water impacts, soil and land impacts, air quality, noise, native fauna, geotechnical hazards, etc. These matters are detailed in the Mining Lease Application which can be viewed on the Department for Energy and Mining website www.energymining.sa.gov.au/bird_in_hand_gold_project_consultation or Terramin's website at www.terramin.com.au.

The Minister for Energy and Mining will review the project elements during the assessment to ensure:

- there is a reasonable prospect that a mineral resource can be 'effectively and efficiently mined'
- all potential environmental impacts have been identified
- the proposed level of impact (environmental outcome) is acceptable given the economic and social benefits

- the proposed control strategies will achieve an acceptable level of impact
- there is a control mechanism at all stages during the development of the Bird in Hand Gold Project, and
- work with Terramin to ensure the regulatory requirements and expectations are met.

The proposed submission from the Council in relation to the environmental areas are largely self-explanatory (see **Appendices 1 and 2**). It is considered that the Council should seek the highest practicable levels of mitigations as part of the mining lease consideration, and the draft submission reflects this.

➤ **Engagement/Consultation conducted with Council Committee, Regional Subsidiary, Advisory Group, the Administration and Community**

Consultation on the development of this report was as follows:

Council Committees: Not Applicable

Council Workshops: Workshopped on 10 September 2019

Advisory Groups: Not Applicable

Administration: Chief Executive Officer
Director Community Capacity
Director Development and Regulatory Services
Manager Economic Development
Manager Sustainable Assets
Senior Strategic and Policy Planner
Sustainability Officer
Community Cultural Development Officer

Community: Not Applicable

2. BACKGROUND

The proposed Bird in Hand Gold Mine is located on a 37 hectare site on Pfeiffer Road, Woodside between the Bird in Hand and Petaluma Wineries and Cellar Doors, and is over the road from the Artwine Cellar door. Terramin purchased the mining rights from the previous owners, Maximus Resources, in 2014.

If approved, the Mine will be developed utilising conventional drill and blast mining methods to make a tunnel down to the ore body. Any excavated material will be taken to the surface and the gold ore will be transported to Strathalbyn using twelve 40 tonne truckloads daily. Any rock without gold (called mullock) will be stored on the surface at the Bird in Hand Mine site before being progressively returned to the mine to fill in the excavated voids after the ore body has been removed. This mullock will be stored temporarily on a part of site behind existing vegetated earth bunds in order to minimise the visual impacts to surrounding properties.

The underground mine will go down to a depth of approximately 450m, with blasting occurring twice a day for less than 30 seconds. The mine will operate 24/7 and will have a

life of around 5 years. There will be no external lighting at night other than around the entrance to the site.

Terramin has estimated that the mine will generate 252,000 ounces (7,144 tonnes) of gold at 13.3 grams per tonne, which equates to \$468 million at current gold prices.

On 21 June 2019, Terramin lodged their Mining Lease Application with the Minister for Energy and Mining who will now process the Application in accordance with the legislated process as detailed in the *Mining Act 1971*. On 5 July 2019, Council received a formal invitation from DEM to provide comments to the Minister by no later than 20 September 2019. An extension to 25 September 2019 has been granted by DEM to align with Council's scheduled meeting date.

The Minister for Energy and Mining is required to consult with State Government Agencies, Council, landowners and the general public regarding the proposed mine. Submissions need to be made to the Minister by 20 September 2019 although a deadline of 25 September 2019 has been arranged to accommodate this council's meeting schedule. It is also noted that there has been extensive public consultation undertaken by Terramin over the years, including the establishment of the Woodside Community Consultative Committee (WCCC) on 5 June 2017. The WCCC has met on numerous occasions since then. Most recently a public meeting, organised by the Inverbrackie Creek Catchment Group was held in Woodside on 19 August 2019 attended by both Terramin and the Minister.

3. ANALYSIS

The mine proposal has been met with opposition from the Inverbrackie Creek Catchment Group representing farmers in the locality, who are mainly concerned about the potential groundwater impacts on neighbouring farmers as a result of the proposed mining operations. Further, the neighbouring wineries and cellar doors have also expressed their opposition to the proposed mine as has been noted from recent media coverage in this regard. Among other things, they hold concern for potential negative impacts on tourism to the region should it have a mine.

It is noted that Council has no role or involvement in the mine approval process other than to provide comments to DEM regarding the proposal. Applications for mining operations are approved under the *Mining Act 1971* by the Minister. Now that the application for the mining lease licence has been lodged, Council and other relevant stakeholders, including State Government Agencies, landowners and the general public are being invited to provide comments to the Minister on the proposed mine. **Appendix 1** is the draft letter to DEM summarising the Council's position on several of the issues raised in the application and **Appendix 2** provides a more detailed response and proposed attachment to the letter.

The content of the draft submission is largely self-explanatory. The administration has sought to identify and focus on the key issues, particularly where there are known impacts or risks. Rather than indicate a position of support or opposition to the proposal, the draft submission seeks to align with the process put in place by DEM for the consultation – that is, to address each issue, offering comments around what could be done to address concerns. It takes an evidence based, rather than speculative, approach. As such, there are some matters where the administration feels more information is required and some matters where the administration feels that more monitoring and mitigation initiatives should be put in place.

These comments/submissions will be made public and Terramin will be given an opportunity to respond. The Minister will then make a decision with regard to the mining lease application. If approved, Terramin intend to commence mining operations within the next 12 to 24 months.

4. OPTIONS

Council has the following options:

- I. To approve the drafted letter (**Appendix 1**) and submission (**Appendix 2**) for forwarding to DEM with or without amendments (Recommended).
- II. To determine not to provide input into the consultation process of the Bird in Hand Mining Lease application (Not Recommended).

5. APPENDICES

- (1) Draft cover letter to Bird in Hand Mining Lease application
- (2) Draft detailed information to Bird in Hand Mining Lease application

Appendix 1

*Draft cover letter to Bird in Hand Mining Lease
application*



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File Ref: 10.85.3
IC19/15284 OC19/

25 September 2019

Public Submissions
Mining Regulation Branch
Department for Energy and Mining
GPO Box 320
ADELAIDE SA 5001

Email: DEM.MiningRegRehab@sa.gov.au

Dear Sir/Madam,

Adelaide Hills Council Submission on the Mining Proposal for the Bird in Hand Gold Mine

Adelaide Hills Council welcomes the opportunity to respond to Terramin Australia's application to obtain a Mining Lease Licence for the Bird in Hand mine located on Pfeiffer Road, Woodside and would like to acknowledge the effort that has gone into progressing the application, and the community consultation that has been undertaken to date.

In broad terms, when making the decision the Council strongly encourages the Minister and the Department for Energy and Mining to ensure that all matters have been expertly and robustly considered and addressed in order to minimise the possible impacts on the renowned character, amenity and general viability of the Adelaide Hills.

At its meeting on 24 September 2019, the Council resolved to provide comments on the content of the application. The key points are summarised in this letter and further detail is provided in the attachment to this correspondence. These comments relate only to the Mining Lease Application and not to the Miscellaneous Purposes Licence Application.

Key points in relation to the proposed mine include the following:

1. **Groundwater impact concerns:** The potential impact of the mining activity on groundwater is of significant concern to surrounding landholders and the broader community. Council strongly supports the position that there must be no adverse impact to the supply of water caused by the mining operators to existing users and water dependant ecosystems.
2. **Economic impact:** The potential impact of the mining operation on both the region's tourism and local wine industry continues to be of significant concern for the local community. Economic impact analysis was used to assess the economic benefits to the region of the mining development. This type of analysis will always produce a positive result and is not a

good decision making tool for whether or not the project should proceed. Council considers that Benefit Cost Analysis would be the preferred approach as it takes into account the negative (loss) repercussions of the proposal and provides a better indication of whether or not the project is desirable from a public or social viewpoint.

3. **Impact on other industries:** Council agrees with the reviewer's observation that the assessment provided on the impact of the mining operations on surrounding businesses is "unavoidably speculative." The ongoing concern suggests there is a need for improved information of the impact on other activities (in this case agriculture and tourism) and that post project evaluations to inform future development decisions are required.
4. **Aboriginal heritage:** Peramangk culture is a living culture and there are traditional custodians who are connected to this country. Heritage and cultural history is often passed as oral history through generations and local knowledge may not always be gleaned through the standard research methods undertaken in Chapter 20. It is considered essential that traditional custodians be consulted in relation to the local heritage of this site and the possible impact of this project in relation to Peramangk heritage.
5. **Intersection of Pfeiffer and Nairne Roads:** Chapter 8 notes that the current intersection has been identified as not having sufficient width for general access vehicles, including the 19m truck and dog trailer combination proposed, to be able to negotiate the left turns without crossing the road centreline. This needs to be addressed. The site access point and proposed access junction treatments are considered to be appropriate for vehicles entering and exiting the site.

The report has indicated that Terramin is prepared to work with the relevant road authority on a cost share basis to upgrade the junction for the benefit of all general access vehicles. The report identifies Adelaide Hills Council as the relevant road authority however the intersection is the responsibility of the State Government (i.e. DPTI) as Nairne Road is a DPTI road. Hence any reference to cost share be between Terramin and DPTI.

6. **Condition of Pfeiffer Road:** Chapter 8 indicates that the additional heavy vehicle traffic loading will likely result in some accelerated deterioration and increased maintenance of Pfeiffer Road. The existing road segment between the proposed mine access and Drummond Road is currently ageing and in relatively poor condition. There is evidence of significant road patching works and also evidence of stressed road pavement.

Council supports the proposal to undertake a detailed route assessment to determine the impact and will seek to negotiate a funding agreement with Terramin for the repair and maintenance of Pfeiffer Road over the life of the mine, should the proposal go ahead.

7. **Reduction in the speed limit on Pfeiffer Road:** Terramin's management strategies include lowering the speed limit to reduce the likelihood and severity of the potential for deterioration of Pfeiffer Road, as well as reducing and/or limiting heavy vehicle access to and from the site during weather which is more likely to accelerate road deterioration (such as in hot or stormy weather). Council is open to consideration of a reduction in the speed limit for the section of Pfeiffer Road from the proposed entrance to the mine and its junction with Nairne Road, noting that this will also have traffic safety benefits.
8. **Installation of truck warning signs:** Council supports Terramin's proposal to install truck warning signs along Pfeiffer Road and in the vicinity of the mine site access point.

9. **Visual assessment:** Chapter 9 limits the assessment of the visual amenity to just seven viewpoints. The information provided would also benefit from a general visual impact overview from users of the surrounding road network. In addition, within the visual assessment there is no reference to the height of the mullock pile and the specific visual impact from lighting. These issues require further clarification and assessment.
10. **Vegetation establishment:** Reduction of the visual impact is very reliant on the successful germination and establishment of vegetation on the bunds. Best horticultural methods and extensive ongoing maintenance, including plant replacement, is therefore considered crucial. Council seeks further information on the possibility of including a mixture of advanced, tubestock and seed planting to enable an immediate contribution to the reduction of the visual impact and that the vegetation is regularly maintained, replaced and monitored.
11. **Air quality monitoring:** In addition to appropriate mitigation measures stipulated by the Air Quality Management Plan, Blast Management Plan and Trigger Action Response Plan, Council considers that any licensing approval must be subject to conditions for air quality monitoring program requirements to ensure the amenity of adjoining sensitive receptors are maintained.
12. **Abnormal dust levels:** Council considers that adjoining properties should be protected from adverse events that result in an abnormal deposit of dust or particulate matter on adjoining properties as a direct result of the Bird in Hand mining activities.
13. **Noise impact:** Council considers that assumptions in the modelling outlined in Chapter 16 do not fully capture the extent and nature of sensitive receptors within the locality. It is noted that the modelling should consider the more nuanced ways in which adjoining land is used for a number of outdoor activities (outside the existing building footprints). For example the wineries often host outdoor weddings (including ceremonies) and concerts, and for the adjacent Polo Club this would include outdoor competitions. There appears to be a disregard to how noise would impact the full range of existing and envisaged uses across the adjoining sites. This is particularly concerning given the investment in such events and the associated longstanding reputational impacts. In this regard the modelling appears to apply a general technical methodology and is not considered comprehensive enough for what is a nuanced set of circumstances. Further modelling should be conducted in collaboration with adjoining landowners for Terramin and their consultants to better understand the potential impacts of noise.
14. **Noise emission monitoring:** Council considers that any licensing approval must be subject to conditions for noise emission monitoring program requirements, in addition to appropriate mitigation measures stipulated by the ROM Silo Management Plan, and Noise Trigger Action Response Plan. Council would also encourage that a condition be imposed that requires Terramin to consistently meet the leading indicator criteria for day time and night time operation for the ore production phase.
15. **Noise emissions from blasting:** Council seeks clarification regarding what level of noise emissions will result from the surface and underground blasting. It was not clear from Terramin's report whether this would impact the noise assessment modelling and ability of the mine to achieve its adopted project objective noise criteria.

16. **Blast firing times:** Council considers that any licensing approval be subject to Terramin developing a notification system that informs neighbouring sensitive receptors of blast firing times, where a blast is anticipated to materially affect the amenity of nearby sensitive receptors and their associated activities.
17. **Air-overpressure and vibration:** Council considers that were blasting activity likely to cause vibration and air-overpressure exceeding the compliance limits, that any licensing approval is subject to a condition that requires appropriate mitigation measures to be implemented to protect the amenity of surrounding sensitive receptors and their activities.
18. **Constant noise impacts:** Clarity is sought regarding the impact on sensitive receptors from these high frequency and constant noise impacts, as the report appears largely silent on these issues. Council considers that no construction or other activity should result in constant noise impacts at any time during the establishment and life of the mine which would negatively impact on adjoining businesses and residents. If this were to occur, it could have a significant impact on the amenity of the area. Therefore appropriate conditions and monitoring measures need to be in place to ensure this does not occur.

If you have any queries regarding this submission, please do not hesitate to contact the Council's Manager Economic Development, Melissa Bright, on 8408 0400.

Yours sincerely

Andrew Aitken
Chief Executive Officer

Enclosed: Detailed information statement

Appendix 2

*Draft detailed information to Bird in Hand Mining Lease
application*

Terramin Bird in Hand Mining Lease Application

Adelaide Hills Council submission – detailed information

The following comments relate only to the Mining Lease Application and not the Miscellaneous Purposes Licence Application and the information, tables, diagrams and plans in this report have been sourced from the Mining Lease Application Report.

Chapter 8: Traffic

It is noted from Chapter 8 of the Mining Lease Application Report that Tonkin Consulting were engaged to undertake a Traffic Impact Assessment. Their assessment covered the impacts on the relevant arterial routes which will provide access to and from the site.

The site will be accessed with one entry/exit point onto Pfeiffer Road (refer to the plan below) which Tonkin states meets the Department of Planning, Transport and Infrastructure (DPTI) standards for sight distances.

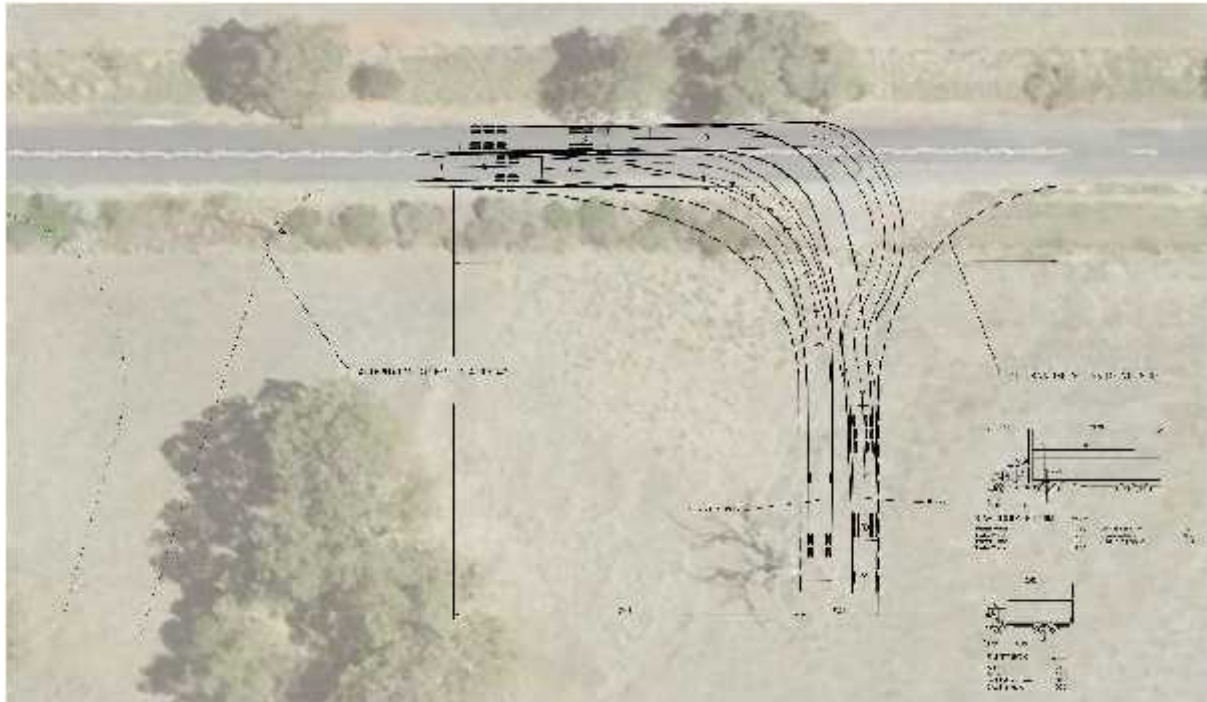


The Tonkin (2017) report recommends that the most suitable ore haulage truck against the objectives set is a 19m truck and dog trailer. This vehicle combination is a General Access Vehicle (GAV) and is permitted to travel on any public road without any specific gazettal notice or permit.

Haulage vehicles will be required to conduct a right turn from Pfeiffer Road into the mine site. In order to improve safety on Pfeiffer Road, the site access has been designed as a basic right-turn treatment (BAR), which is adopted in accordance with the Austroads Guidelines. A BAR treatment features a widened shoulder on a major road which assists turning vehicles to move further off the through carriageway making it easier for through vehicles to pass. The diagram below shows the proposed BAR treatment layout for the site access on Pfeiffer Road.

The minimum length from the edge of the BAR treatment to the centreline of the side road as required by Austroads Guidelines for an 80km/h road and with shoulder widening of 1-2m, is approximately 60m to 75m. This would have no impact on operation of the Polo Club access point.

This access point and proposed access junction treatment are considered to be appropriate for vehicles entering and exiting the site.



The current Pfeiffer Road/Nairne Road intersection has been identified as not having sufficient width for GAV, including the proposed 19m truck and dog trailer combination, to be able to negotiate the left turns without crossing the road centreline. This is an existing deficiency of the junction and Council has no objection to the intersection being upgraded as indicated in Chapter 8.

Chapter 8 also indicates that Terramin is prepared to work with the relevant road authority on a cost share basis to upgrade the junction for the benefit of all GAV's. delaide Hills Council is identified as the relevant road authority. However, the intersection is the responsibility of the State Government and any cost share arrangement should be between Terramin and the State Government.

Chapter 8 indicates that the additional heavy vehicle traffic loading will likely result in some accelerated deterioration of the road and increased maintenance. The existing road segment between the proposed mine access and Drummond Road is currently ageing and in relatively poor condition. There is evidence of significant road patching works and also evidence of stressed road pavement. The report indicates that a detailed route assessment will be undertaken to determine the impact and Council welcomes this proposal. There is currently no mechanism in place to recover maintenance and asset renewal costs for Pfeiffer Road and Council would welcome further discussions with Terramin regarding funding to assist Council manage the potential additional maintenance from the accelerated deterioration identified.

Council will also look to negotiate a funding agreement for Pfeiffer Road to protect against any damages that may be incurred during the mine operation.

Council is open to consideration of the other management strategies proposed in Chapter 8 including:

- lowering the speed limit to reduce the likelihood and severity of the potential for deterioration

- reducing and/or limiting heavy vehicle access to and from the site during weather which is more likely to accelerate road deterioration (such as in hot or stormy weather).

Terramin also proposes to install truck warning signs along Pfeiffer Road and in the vicinity of the mine site access point and this is supported by Council, should the proposal go ahead.

It is noted that the average ore truck movements will be 24 per day as Terramin intend to have twelve 40 tonne truckloads of ore sent to the Angus Mine processing facility daily. The existing heavy vehicle count on Pfeiffer Road is currently 134 vehicles per day and this mining operation is expected to add, on average, 24 additional heavy vehicle movements to the road section. This is a 17.9% increase in daily heavy vehicle traffic. The existing heavy vehicle traffic on average pass along this section of road every 4.5 minutes, and with the addition of the 24 heavy vehicles from the mine site this would increase to every 3.8 minutes.

The table below indicates the current traffic volumes on Pfeiffer Road and shows the split in the counts between cars and heavy vehicles:

Existing Traffic Volumes on Pfeiffer Road	April '14	November '14	February '15	November-December '17
24 Hours	1036	958	945	944
Cars	867	762	857	879
Heavy vehicles	170	190	98	64
AM Peak (hour)	86	77	68	78
PM Peak (hour)	92	90	79	94

As far as the vehicle crash results for the various roads, the table below is provided in the Report, and indicates that for the roads within our Council area, there have been 13 crashes at the Nairne/Pfeiffer Road intersection with 9 injuries but no fatalities. Note this is the total number of crashes recorded over the years and that DPTI have upgraded this intersection with street lighting and signage to warn motorists of the junction. The Report indicates that Terramin will continue discussions with the relevant stakeholders (including DPTI) regarding the Pfeiffer Road/Nairne Road intersection if further upgrades to this intersection are considered necessary.

Road Section	Total Crashes	No. of fatalities	No. of injuries
Nairne Road / Pfeiffer Road intersection	13	none	9
Nairne Road / Woodside Barracks junction	1	none	none
Nairne Road, from North Road to Old Princes Highway	15	1	8
Nairne Road / Old Princes Highway junction	4	none	none
Old Princes Highway, from Nairne Road to Callington Road	64	1	25
Hartman Road / Simms Road / Paech Road intersection	2	none	none
Paech Road / Wellington Road junction	13	none	9
Wellington Road, from Paech Road to Callington Road	19	1	9

School buses for Oakbank Area School, Heathfield High School, and Lobethal Lutheran School frequent Bird in Hand Road on weekdays between 7.30am and 8.30am, and between 3.45pm and 4.30pm, as well as Nairne Road. There are a number of private schools located in the city which operate bus services along Onkaparinga Valley Road, however, this road is outside the study area and proposed transport routes.

It is noted that in order to reduce potential conflict between the haulage trucks and local traffic that management measures are proposed, which includes limiting their operating hours to outside of commuter and school drop off time (6am – 9am) and school pick up and school bus time (3pm – 4.30pm), as well as no overnight haulage to Strathalbyn (between 10pm – 6am). It is noted that ore haulage to the Angus Mine Processing Facility (APF) will also be limited on occasions when community events are planned.

Potential dragout from the mine site will be controlled by a wheel wash for all trucks leaving the site. Terramin will have a complaints hotline for any complaints regarding the haulage vehicles and will investigate these. Council welcomes these initiatives, should the proposal be approved.

Chapter 8 states that “predominantly negligible impacts” are expected as a result of traffic and transport associated with the proposed mine. The report concludes that “impacts to traffic movement, level of service, the safety of both local road users and Terramin employees, are all negligible impacts with the utilisation of the proposed control measures, or as low as reasonably practical.” The deterioration of Pfeiffer Road was the only identified risk considered low, rather than negligible.

Overall, with the implementation of all control measures, through both design and management strategies, Council considers that all traffic impact risks associated appear to have been adequately considered as part of the assessment.

Chapter 9: Visual Amenity

Terramin engaged Oxigen Landscape Architects to prepare a Strategic Visual Amenity Plan to identify the visual effects of the proposed mine operations and minimisation of the overall visual impact and integration with the surrounding landscape.

Views into the site were identified with owners or tenants based on the relative level of visual exposure to the site's operations. Seven key viewpoints (sensitive receptors) were identified. Potential impacting events resulting from the construction, operations, closure and post closure were identified for each of the key viewpoints. Numerous control measures were then identified to reduce the visual impacts. These included landform and proportion, colours and materials, vegetation type and density and built structures.

Chapter 9 concludes that with the appropriate design and management strategies in place, visual impacts can be mitigated to a point where the visual impact of the mine operations at the mine site from the seven key viewpoints is reduced.

Chapter 9 also states that there is generally a consistent low visual impact catchment. However, one of the seven viewpoints is considered to have a high visual impact due to its elevation above the operations site and exposure to the greatest amount of visual change within the landscape (reference on page 9-36, Section 9.7 Impact Assessment and 9-49, Section 9.9 Findings and Conclusion). This one viewpoint is not mentioned as having a high visual impact in the preceding sections Operations Viewpoints and Construction Viewpoints and therefore requires clarification as to specific impact and amelioration. On page 9-47 a Viewpoint 8 is identified which should be changed to Viewpoint 7.

The visual assessment was limited to the seven viewpoints and the information provided would benefit from a general visual impact overview from users of the surrounding road network. In addition within the visual assessment there appears to be no reference or assessment of the impact from the height of the mullock pile and the specific visual impact from lighting.

Reduction of the visual impact is very reliant on the successful germination and establishment of vegetation on the bunds and therefore best horticultural methods and extensive ongoing maintenance including plant replacement is considered crucial. Council seeks further information on the possibility of including a mixture of advanced plant species, tubestock and seed planting to enable an immediate contribution to the reduction of the visual impact and that the vegetation is regularly maintained, replaced and monitored.

It is extremely important that there is no negative visual impact on surrounding businesses and residents and as such Council considers that further clarification and assessment is required.

Chapter 10: Groundwater and Chapter 11: Surface Water

The potential impact of the mining activity on groundwater is of significant concern to surrounding farmers and the broader community. Council supports the position that there must be no adverse impact to the supply of water caused by the mining operation to existing users and water dependant ecosystems and that the level of protection proposed by Terramin provides a guarantee for this.

The report indicates that Terramin commissioned a groundwater study in 2013 which began with a review of all current, historical and anecdotal information relating to the regional groundwater

system. This was followed by a groundwater and bore census in co-operation with 37 local landowners. A comprehensive assessment of these impacts is detailed in Chapters 10 and 11 of the report. Significant concern remains within the community however, and despite the modelling undertaken to date, a significant number remain unconvinced that the potential threat will be effectively mitigated.

It is acknowledged that Council has no in-house hydrological expertise but is seeking to ensure that the assessment of the potential impacts of the proposed mine activity on groundwater is thoroughly assessed by the Department for Energy and Mining (DEM). Further, it is considered that if the mine is granted approval, then DEM must ensure that constant independent monitoring of groundwater quality and quantity is undertaken in order to address any impacts that may arise in a timely manner.

Chapter 15: Air Quality

Terramin engaged AECOM to undertake an Air Quality Impact Assessment which modelled the project's predicted particulate matter (PM) levels during construction and operation. This assessment forms the basis of Chapter 15. To inform the assessment specific air quality objectives for the Bird in Hand mine were developed based on legislated limits set by the South Australian Environment Protection (Air Quality) Policy 2016.

The impacting events can be grouped into three specific impacts – health impacts, nuisance impacts and impacts to vegetation and agricultural productivity, with sensitive receptors identified as the local community, surrounding vineyards and surrounding agricultural land.

To achieve compliance with the air quality objectives, a broad range of design measures have been proposed, the most significant of these include the sealing of the vast majority of internal roads (excluding fire access tracks), the location of the primary vent rise and the enclosed ROM silo system rather than ROM pad.

In addition, a monitoring program is proposed to be developed and a broad range of mitigation strategies have been identified to ensure the Bird in Hand mine achieves the air quality objectives.

A thorough air quality monitoring program has not yet been undertaken but is proposed that such a program will be developed at subsequent phases of the approval process. It is considered that live air quality monitoring, particularly near sensitive receptors, is critical throughout the entire lifecycle of the Bird in Hand mine to ensure compliance with air quality objectives and to inform any necessary construction or operational responses via the Trigger Action Response Plan.

Chapter 16: Noise

Terramin have engaged AECOM to undertake an acoustic assessment of the effect of construction and operational noise from the proposed Bird in Hand mine upon neighbouring noise sensitive receptors, this assessment forms the basis of Chapter 16.

The EPA's Environment Protection (Noise) Policy 2007 sets noise criteria for Watershed (Primary Production) Zones at the following level for day and night time operations:

Receptor zone	Noise level at noise-sensitive receptors	
	Day ⁽¹⁾	Night ⁽²⁾
Watershed (Primary Production)	L _{day} 57 dB(A)	L _{night} 50 dB(A)

Note:

- The Noise EPP defines day time as between 7.00 am and 10.00 pm on the same day and night time as between 10.00 pm on one day and 7.00 am on the following day.

Terramin have nominated to further reduce the criteria to 52 dB(A) during the day and 45 dB(A) during the night (10pm to 7am) for the ore production phase (year 2-7) of the mine. This criteria forms the basis of the proposed control measures and the adopted project objective noise criteria.

In total 18 sensitive receptors were identified in proximity to the mine site. Terramin have stated that with mitigation, no sensitive receptors are expected to experience noise louder than the proposed outcome criteria however, there appears to be an assumption in the modelling that the sensitive receptors are static or enclosed within a building. Further, the modelling does not appear to recognise the relative quietness of a rural living environment, especially in the evenings, and the potential disruptive noise impact that the mining activities will have on this valued character of the area. There appears to be little recognition as to how noise would impact the full range of existing and envisaged uses across the adjoining sites. For example the wineries have outdoor dining areas and often host outdoor weddings (including ceremonies) and concerts, in addition the adjacent Polo Club often host outdoor competitions. This is particularly concerning given the investment in such events and the associated longstanding reputational impacts. In this regard the modelling appears to apply a general technical methodology and is not considered comprehensive enough for what is a nuanced set of circumstances. Further modelling should be conducted in collaboration with adjoining landowners for Terramin and their consultants to better understand the potential impacts of noise.

With respect to the additional noise mitigation measures including the wall and berm and the shed Council would be supportive of such additional measures to mitigate noise impacts at nearby sensitive receptors. However, should these measures create additional visual impacts to adjoining sites then a balanced solution would need to be achieved.

Terramin have conceded that despite the predicted mine noise levels meeting the noise criteria and being assessed as low impact, that the mine noise will at times be audible. As such Council is seeking assurance that Terramin will manage the impacts and risks associated with noise to a level which is within the proposed limits and is as low as reasonably practicable and consistently achieves the leading indicator criteria to protect the amenity of adjoining sites. Further, Council considers that no construction or other activity should result in constant noise impacts at any time during the establishment and life of the mine which would negatively impact on adjoining businesses and residents and the valued ambience of the locality. If this were to occur, it could have a significant impact on the amenity of the area.

Chapter 17: Air-Overpressure and Vibration

Terramin have engaged Saros to undertake a blasting impact assessment from the construction, development and operational phases of the proposed Bird in Hand mine, in particular how this may impact upon neighbouring sensitive receptors, this assessment forms the basis of Chapter 17.

Council considers that where blasting activity is likely to cause vibration and air-overpressure exceeding the compliance limits, that any licensing approval is subject to a condition that requires appropriate mitigation measures to be implemented as soon as possible to protect the amenity of surrounding sensitive receptors and their activities.

Chapter 20: Aboriginal Heritage/Native Title and non-Aboriginal Heritage

In relation to Peramangk heritage we would acknowledge that Terramin have undertaken significant research, including a heritage assessment as undertaken by a consultant anthropologist Dr Phillip Clarke and a cultural heritage risk assessment as undertaken by EBS Heritage. The land in question is also not subject to native title. Consideration has also been given to the South Australian Aboriginal Heritage Act 1988 as administered by the South Australian Department Aboriginal Affairs and Reconciliation (DSD-AAR)

Terramin conducted a search of the DSD-AAR register in February of 2014 and found that no sites are registered in the current project area.

Peramangk culture, however, is a living culture and there are traditional custodians who are connected to this country. Heritage and cultural history is often passed as oral history through generations and local knowledge may not always be gleaned through standard research methods. It is considered essential that the traditional custodians be consulted in relation to the local heritage of this site and the possible impact of this project in relation to Peramangk heritage.

Council could assist in facilitating connection between Terramin and the traditional custodians for the purpose of this consultation.

Chapter 24: Economic

The potential impact of the mining operation on both the region's tourism and local wine industry continue to be of significant concern to the local community. Economic impact analysis was used to assess the economic benefits to the region of the mining development.

Whilst the legislation specifies that the economic impact of the proposed mining activity be estimated, it is considered that Benefit Cost Analysis (BCA) be the preferred tool for assessing these types of activities. Whereas the economic impact analysis provided in Chapter 24 has helped to quantify the relative contributions of the proposed mine to the State economy, there is also a need to quantify the net social benefits (benefits less costs) of the mining activity.

The goal of BCA is to provide the final decision maker with as much information about a project proposal as is relevant in informing the decision. Where possible, all the benefits and costs of the project are expressed in money terms so that they can be compared to one another and viewed from a wider economy perspective rather than that of a particular individual, organisation or group. It provides an objective framework for weighing up different impacts and impacts that occur in different periods. This objectivity is supported by converting all impacts into present value dollar terms. However, even when full quantification of impacts is not possible, BCA can still be useful in providing a clear decision-making framework.

On the other hand, the purpose of economic impact analysis (as undertaken in Chapter 24) is to quantify and describe the pertinent impacts, such as the number of jobs created or the amount of income generated. This type of analysis will always produce a positive result as any cost (such as expenditure on infrastructure) is viewed as a benefit. That is, the larger the expenditure on a project, the bigger the predicted impact and therefore estimated benefit of the project. As such, economic impact analysis is not a good decision making tool for whether or not the project should proceed.

Council therefore requests that a BCA be undertaken in order to fully understand the potential impacts of the project and whether or not the project is desirable from a public or social viewpoint.

Council agrees with the reviewer's observation that the assessment provided on the impact of the mining operations on surrounding businesses is "unavoidably speculative". The ongoing concern expressed within the community suggests there is a need for improved information of the impact on other activities (in this case agriculture and tourism) and that post project evaluations to inform future development decisions are required.

**ADELAIDE HILLS COUNCIL
ORDINARY COUNCIL MEETING
Tuesday 24 September 2019
AGENDA BUSINESS ITEM**

Item:	12.2
Originating Officer:	James Szabo, Senior Strategic and Policy Planner
Responsible Director:	Marc Salver, Director Development & Regulatory Services
Subject:	Submission on the State's proposed lifting of the Moratorium on Genetically Modified Food Crops
For:	Decision

SUMMARY

The purpose of this report is to advise the Council of the Primary Industries and Regions SA (PIRSA) led review into the Genetically Modified (GM) Food Crop Moratorium. In particular, following the release of the independent review of the GM Crop Moratorium in South Australia (refer to **Appendix 1**), the Minister for Primary Industries announced on the 19 August 2019 the State Government plans to lift the Moratorium. However, the Moratorium will remain in force on Kangaroo Island. The changes to the *Genetically Modified Crops Management Act 2004*, will give South Australian producers on the mainland the opportunity to choose to grow GM food crops as part of their farming practice. A statutory six-week consultation is currently open on the proposed amendment to the Regulations needed to implement this proposal, and a copy of the draft Regulations are contained in **Appendix 2**. A draft submission on the proposed changes has been provided for the Council's consideration (refer to **Appendix 3**). Administration seeks Council's approval of the submission for forwarding to PIRSA by the 30 October 2019 deadline.

In addition, previous comments provided by Council in relation to the enquiry areas put forward in the independent review's Terms of Reference have been provided for context (refer to **Appendix 4**).

With the above in mind, Administration have also reviewed Section 6 of the Council's *Genetically Modified Crops Policy* and considers that a review of the Policy will be required should the Moratorium be lifted. This will be reported to Council at a later date for its consideration and possible community consultation.

RECOMMENDATION

Council resolves:

- 1. That the report be received and noted.**
 - 2. To endorse the submission on the State's proposed lifting of the Moratorium on Genetically Modified Food Crops as contained in *Appendix 3* of this report.**
 - 3. That the Council's current *Genetically Modified Crops Policy* be reviewed should the Moratorium be lifted.**
-

1. GOVERNANCE

➤ Strategic Management Plan/Council Policy

- Goal 1. Business and People Prosper
Goal 3. Places for People and Nature

Agriculture is one of the Adelaide Hills' key economic development drivers. Encouraging food and drink producing agricultural industries in a manner which is safe for final consumers and consistent with Council's Strategic Plan is an important aspect of Council's core business.

It is noted that controlling legislation exists at the Commonwealth and State levels for regulating GM food crops, and Council has no jurisdiction or delegations at the local government level in this regard. However, Council's current GM Crops Policy provides a basis for lobbying other levels of government, the private sector, and land owners within its jurisdiction in relation to GM crops.

➤ Legal Implications

Genetically Modified Crops Management Act 2004
Genetically Modified Crops Management Regulations 2008

It is noted that the draft *Genetically Modified Crops Management Regulations 2008*, would include variations to allow the lifting of the GM food crop ban in all parts of mainland South Australia. These changes are earmarked to come into operation on 1 December 2019.

➤ Risk Management Implications

The Council's submission regarding the proposal to lift the GM Free Crop Moratorium will assist in mitigating the risk of:

Obviating Council's ability to lobby other levels of government or the private sector in relation to protecting the environment, the primary production sector and its associated economy from any potential negative impacts arising from lifting the GM Food Crop Moratorium.

Inherent Risk	Residual Risk	Target Risk
Medium (3C)	Low (2D)	Low

➤ Financial and Resource Implications

There are no financial or resource implications to Council by endorsing the proposed submission.

➤ Customer Service and Community/Cultural Implications

Having a position in relation to GM Crops provides a basis for Council to lobby other levels of government, the private sector, and land owners within its jurisdiction in relation to GM crops on behalf of its community, if required.

➤ **Environmental Implications**

Staff have conducted a further review of papers on the GM Crops issue available on the internet since the adoption of the 2018 GM Crops Policy and established that the research to date provides no conclusive evidence of the impacts of GM Crops on the environment with scientists arguing for both sides.

➤ **Engagement/Consultation conducted with Council Committee, Regional Subsidiary, Advisory Group, the Administration and Community**

The issue was tabled at a recent Rural Land Management Advisory Group meeting on 28 August 2019.

Council Committees: Not Applicable

Council Workshops: Not Applicable

Advisory Groups: Rural Land Management and Advisory Group

Administration: Director Development & Regulatory Services
Manager Economic Development

Community: Not Applicable

2. BACKGROUND

In 2009 a ratepayer indicated that Council should not permit the growing of genetically modified crops within its District. The matter was referred to Council's Rural Land Management Advisory Group (RLMAG) as the issue would primarily affect the District's primary producers/farmers.

The RLMAG prepared a draft Genetically Modified Crops policy, which was considered by Council on 12 June 2012 (Item 10.7). Public consultation was then undertaken for a period of 6 weeks. In response 30 submissions were received and relevant comments were incorporated into a revised Draft which was considered and adopted by Council at its meeting on 25 September 2012 (Item 10.3), where it resolved:

10.3 Genetically Modified Crops Policy for Adoption
Mike Flehr

Moved Cr Simon Jones
S/- Cr Jan Loveday

Carried Unanimously
242

That:

1. Council Adopts the Genetically Modified Crops Policy as detailed in this report.
2. The CEO informs the wider community of its adoption of this policy by notifying:
 - the State Government that it does not support the use of GM organisms, crops or products within its District;
 - the State Minister responsible for the *Gene Technology Act 2001*;
 - the Commonwealth Minister responsible for the *Gene Technology Act 2000* and the *Gene Technology (Licence Changes) Act 2000*;
 - the Gene Technology Regulator;
 - the Premier of South Australia;
 - the Leader of the Opposition;
 - the Shadow Minister for Agriculture;
 - other members of the House of Representatives and the Legislative Council;
 - all adjoining Councils;
 - the Local Government Association of SA.

As part of the periodic review Council considered the Policy again at its 9 December 2014 (Item 14.5) and 18 December 2018 (Item 12.8) where it resolved, respectively:

14.5. Review of Genetically Modified Crops Policy

Moved Cr John Kemp
S/- Cr Nathan Daniell

271

That Council resolves that:

1. the report be received and noted
2. the Genetically Modified Crops Policy dated 25 September 2012 be readopted for 4 years or earlier if there are changes in State or Federal Government policies or legislation in this regard, or there is a compelling scientific justification for a further review.

Carried Unanimously

12.8 Review of Genetically Modified Crops Policy

10.44pm Cr Bailey left the Chamber

10.47pm Cr Bailey returned to the Chamber

Moved Cr Pauline Gill

S/- Cr Leith Mudge

333/18

Council resolves:

- 1. That the report be received and noted**
- 2. With an effective date of 7 January 2019, to revoke the 9 December 2014 Genetically Modified Crops Policy and to adopt the revised 18 December 2018 Genetically Modified Crops Policy**
- 3. That the Policy be reviewed no later than December 2022 or earlier if there are changes in State or Federal Government policies or legislation in this regard, or if there is a compelling scientific justification for a further review.**

Carried Unanimously

It is noted that Council's Genetically Modified Crops Policy is a cautious response to the current lack of scientific consensus regarding Genetically Modified crops, in particular whether they are safe for human consumption and sustainable ecosystem function and aligned it with the previous State Government's policy position.

On the 14 September 2018 PIRSA announced their intention to undertake a high level independent review of the Genetically Modified Crop Moratorium in South Australia. In particular, PIRSA requested comments in relation to the enquiry areas put forward in the review's Terms of Reference. Council's response (refer to **Appendix 4**) amongst other things expressed concern for the human and environmental impacts of GM Crops and that the Terms of Reference of the review should be expanded to consider such issues to ensure a true cost/benefit analysis was undertaken to inform any future direction.

In early March 2019 PIRSA released the findings of the independent review of the GM Crop Moratorium in South Australia, and regrettably the findings dismissed any concerns regarding human health and environmental impacts, deflecting this as a matter dealt with by Commonwealth agencies and therefore outside the terms of reference of the Review. For reference the Commonwealth agency responsible for administering the *Gene Technology Act 2000* (the Act) and corresponding State laws is the Office of the Gene Technology Regulator (OGTR).

Notwithstanding the ongoing concerns regarding the human health and environmental impacts, the review highlighted that the strongest support for lifting the ban came from those directly affected by it namely the growers and food producers:

"Six of the strongest 'removal' submissions are from key South Australian organizations representing most of South Australia's 9400 farm businesses. They include the following: Grain Producers SA (the peak industry body representing around 3000 grain farmers), Livestock SA (the peak industry body representing around 3500 graziers), SA Dairy Farmers (the peak industry body representing around 800 dairy farmers and another 800 in closely associated businesses), Primary

Producers SA (an umbrella organization including the Horticultural Coalition of SA and the SA Wine Grape Growers Association in addition to the just-mentioned bodies covering grain, livestock and dairy producers), the Crop Science Society of SA (representing around 400 members from rural and metropolitan regions of the state), and the SA Independent Agricultural Consultants Group (13 firms that together provide management advise to many hundreds of SA farm businesses)”.

This position was echoed at Council's recent RLMAG meeting on 28 August 2019, where local farmers on the Advisory Group expressed support for the technology and a lifting of the ban, subject to conditions.

3. ANALYSIS

As mentioned above, this matter was discussed at Council's recent RLMAG meeting, where local farmers on the advisory group generally expressed support for the GM technology and a lifting of the ban, subject to the State Government's consideration of the following issues:

- That adequate buffer zones are put in place between GM and non-GM growers, and
- That appropriate food labelling to identify products with GM Food content is put in place to give consumers a choice in this regard.

The RLMAG was essentially of the view that lifting the ban would provide farmers with flexibility to choose whether or not to grow GM crops (such as drought or pest resistant varieties), but that mechanisms such as buffers should be put in place to protect non-GM farmers.

Further, a concern raised by the RLMAG was that farmers who grow GM crops may lose their autonomy as they would essentially be under the control of Corporate Organisations who own the patents for the GM crop they are growing and who may wish to control the volume of produce that goes to market, as well as the price achieved in this instance. It is acknowledged that intellectual property laws associated with patenting are dealt with at a Federal level and that there may be limited authority at the State level to address this concern.

In contrast to the views expressed by the current RLMAG, Council's current policy position does not support the growing of genetically modified crops within its District. However, it is emphasised that the controlling legislation only exists at the Commonwealth and State levels and Council has no legislative jurisdiction or ability to actually enforce such a position. Council's GM Crops Policy therefore at best provides a basis for lobbying other levels of government, the private sector, and land owners within its jurisdiction in relation to GM crops.

The relevance or potency of Council's GM Crop Policy is therefore brought into question by the findings of the independent review of the GM Crop Moratorium in South Australia and Council's RLMAG, where broad support within the agricultural sector for a lifting of the Moratorium (on economic grounds) has been expressed.

Notably, outside Kangaroo Island no evidence was submitted as part of the review that substantiated any economic benefit for the Adelaide Hills or the wider State from claiming GM free status. Notwithstanding this, the Kangaroo island example demonstrates that there may still be a benefit (i.e. earning premium prices) that GM free status affords.

In addition to premium pricing opportunities there is also the consideration of branding. Regrettably, the implication of lifting the GM Crop Moratorium for the 'clean and premium' image that underpins the AHC Region's branding was not fully quantified in the independent review. Rather the reviewer stated that the 'unmeasured benefits' (of GM free branding), should be measured against the regulatory cost of maintaining the moratorium and benefits foregone by producers who would profit from the moratorium being lifted.

The unquantified benefits of GM free branding in South Australia point to a potential shortcoming in the review findings, and a failure to truly factor in the economic advantage of maintaining the GM Crop Moratorium. This is somewhat pertinent, particularly based on the Tasmanian Government's recent decision to extend the GM food Crop ban until 2029 hinging largely on the so called benefit to branding.

Based solely on the findings of the independent review, it stands to reason that the lifting of the GM Crop Moratorium is a suitable economic outcome in South Australia. However, due to a lack of scientific consensus on the potential human health and environmental impacts, and a potential gap in the understanding of the economic benefits to branding, a more robust review appears to be required (i.e. cost/benefit analysis). However, due to what appears to be broad support from the agricultural industry, it seems that the lifting of the GM Food Crop Moratorium is in train and well on track to allow farmers to grow GM Food Crops in South Australia before the end of the year.

The administration has sought to identify and focus on the key issues in its submission (refer to **Appendix 3**), particularly where there are known impacts or risks to primary producers in the Council area. As such the submission continues to express Council's concern with regard to the potential human and environmental impacts, and suggests that the Regulations should allow for regional flexibility to provide additional time to explore the potential branding implications of GM free status. A regional approach would allow whole regions to opt in to receiving GM Free status should it be demonstrated that it is good for their brand, much like has occurred for Kangaroo Island. The submission also expresses Council's support for growers in the region and understands that flexibility to utilise GM crops could improve crop resilience in a changing climate (e.g. drought resistant varieties) or following adverse impacts, and as such supports a measured approach to GM food crop introduction in South Australia, as opposed to a wholesale lifting for all GM Food Crop varieties that are approved by the OGTR.

It is noted in the Council's current policy position on this issue identifies that any change to the State legislation would trigger a review of Council's GM Crops Policy, where a decision to continue to apply the precautionary principle; limit or reverse the precautionary principle; or to abolish the Policy, citing the independent review and the views of the agricultural sector, can be further explored. If the State Government lifts the GM Food Crops Moratorium, Administration will then undertake a review of the current Policy and report back on this to Council.

4. OPTIONS

Council has the following options:

- I. To adopt the submission on the State's proposed lifting of the moratorium on Genetically Modified Crops for forwarding to PIRSA (Recommended).
- II. To determine not to provide input into the consultation process on the State's proposed lifting of the moratorium on Genetically Modified Crops (Not Recommended).

5. APPENDICES

- (1) Independent Review of the SA GM Food Crop Moratorium
- (2) Genetically Modified Crops Management (Designation of Area) Variation Regulations 2019
- (3) Draft AHC Submission on the State's proposed lifting of the Moratorium on Genetically Modified Crops
- (4) AHC's Submission on the PIRSA Independent Review Moratorium GM Crops - Terms of Reference

Appendix 1

*Independent Review of the SA GM Food Crop
Moratorium*

Independent Review of the South Australian GM Food Crop Moratorium

Prepared by
Kym Anderson

Report to the SA Minister for Primary Industries and Regional Development

February 2019

6 February 2019

Hon. Tim Whetstone MP
Minister for Primary Industries and Regional Development
1 King William Street, Level 10
GPO Box 1671
Adelaide 5001

Dear Minister,

I am pleased to submit to you the requested *Independent Review of the South Australian GM Food Crop Moratorium*.

I would like to thank all those who have taken part in the Review so far by providing submissions or other pertinent information. I am very grateful also for the excellent Secretariat support provided by your department's staff in PIRSA offices at 25 Grenfell Street and on the Waite campus.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Kym Anderson', written in dark ink.

Kym Anderson
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Terms of reference

South Australia currently has a moratorium on the commercial cultivation of GM food crops which is scheduled to continue until 2025. This Independent Review is to investigate the benefits and costs of the moratorium to the state of South Australia and to the state's agricultural and food production industries, and to consider whether it is in the interests of maximising the state's economy and of maximising returns for the state's agricultural and food production industries for the moratorium to continue, and if so, under what conditions.

The Review will:

1. Assess available evidence on the market benefits of South Australia's moratorium on the commercial cultivation of GM crops.
2. Assess the degree of awareness of South Australia's moratorium by key trading partners and food production businesses operating in South Australia and other Australian states.
3. Where there is evidence of market benefits resulting from the moratorium, examine whether it is possible to retain such benefits for industry through the use of systems of segregation in the supply chain, having regard to segregation protocols adopted in other jurisdictions.
4. Consider evidence from South Australian businesses and industry, market and trade data, the experience in other Australian and international jurisdictions and other relevant evidence to inform the analysis.
5. Explore whether there are potential innovations likely to be available for commercial adoption by South Australia's agricultural industries prior to 2025 that would justify a reconsideration of the moratorium on grounds of economic benefit to the state.
6. Quantify where possible the economic costs and benefits of maintaining, modifying or removing the moratorium, not limited to but including on-farm impacts, food manufacturing, supply chain costs and impacts on research and development investment in South Australia.

Under a policy principle established within the *Gene Technology Act 2000*, the current SA moratorium exists for trade and market access purposes.

Outside the scope of this review are matters that are the responsibility of regulatory agencies in other jurisdictions, such as matters relating to the human health, safety and environmental impacts of GM crops.

Acknowledgments

The reviewer is very grateful for all those organizations and people who made submissions following the call for them on 14 September 2018. Thanks also go to those contacted for data, research papers and other information needed to assess potential consequences of alternative policies. A special thanks to members of the Minister's GM Crop Advisory Committee, Professor Ross Kingwell (University of Western Australia and AEGIC), Dr Tony Gregson (farmer in western Victoria), Dr Stuart Smyth (University of Saskatchewan), Scott Biden (University of Guelph), numerous PIRSA and DTTI staff, and University of Adelaide food crop researchers at the Waite Campus.

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List of abbreviations and acronyms

APVMA	Australian Pesticides and Veterinary Medicines Authority
AQIS	Australian Quarantine and Inspection Service
CRISPR/Cas9	Clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9 (a family of DNA sequences found within the genomes of prokaryotic organisms such as bacteria and archaea and derived from DNA fragments from viruses that have previously infected the prokaryote and are used to detect and destroy DNA from similar viruses during subsequent infections)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWR	(Commonwealth) Department of Agriculture and Water Resources
DNA	Deoxyribonucleic acid
DTTI	(South Australian) Department of Trade, Tourism and Investment
EU	European Union
FSANZ	Food Standards Australia New Zealand
GDP	Gross domestic product
GM	Genetically modified
GMO	Genetically modified organism
GM food	Food produced from or using GMOs
GM-free	Contains no GM material (novel DNA or novel protein), and has no altered characteristics, hence stricter requirements than for non-GM food
GRDC	(Commonwealth) Grains Research & Development Corporation
IGTA	Intergovernmental Gene Technology Agreement
KIPG	Kangaroo Island Pure Grain
LLP	Low Level Presence (of grain contamination by another product)
NICNAS	National Industrial Chemicals Notification and Assessment Scheme

Non-GM food	Food with no more than a small fraction per ingredient (1% in Australia) of GM material unintentionally present, hence a less strict requirement than for GM-free food. Non-GM food need not be labelled as ‘genetically modified’.
OGTR	Office of the Gene Technology Regulator
PIRSA	(Department of) Primary Industries and Regions South Australia
RARMP	Risk assessment and risk management plan (issued by the OGTR)
R&D	Research and development
RR	Roundup Ready ®
TAF	Technology access fee
TGA	(Commonwealth) Therapeutic Goods Administration
TT	Triazine tolerant (canola varieties)

Executive summary

There has been a moratorium on GM crop production in and transportation of GM crop products through South Australia since 2003. The key objective of the moratorium, following the approval in 2003 by Commonwealth authorities of commercial production of GM canola in Australia, has been to provide time to assess the risks that GM food crops might impose, in terms of access to markets and trade, for the state's conventional and organic growers and consumers/users of non-GM crop varieties.

In the fifteen years that have elapsed since the moratorium was first imposed, the policy has been re-considered and renewed three times (in 2008, 2014 and 2017) by the state's previous Labor Government. As currently legislated, the moratorium is to apply through to 2025. Meanwhile, all other mainland states have allowed their farmers to grow GM crops, most recently Western Australia in 2009; and in 23 other countries the area sown to GM crop varieties has grown from zero in 1995 to 13% of the world's total cropland.

A nationally consistent legislative scheme for gene technology was introduced with the Commonwealth's *Gene Technology Act 2000* and corresponding State and Territory legislation, including South Australia's *Gene Technology Act 2001*. The federal Act was enacted to protect the health and safety of people and the environment. It regulates all dealings with genetically modified organisms (GMOs) in Australia, including research, manufacture, import, production, propagation, transport and disposal of GMOs. That Act is administered by the Office of the Gene Technology Regulator (OGTR) within the Australian Department of Health, which decides whether to approve field trials and then the commercial release of a GMO. Before issuing each such national licence, the Regulator prepares a risk assessment and risk management plan that identifies any potential risks, based on credible evidence, and the means of managing those risks. As well, GM food products are regulated by Food Standards Australia New Zealand. FSANZ sets standards for the safety, content and labelling of all foods sold in Australia, both domestically produced and imported. Each GM food or ingredient is subjected to a mandatory pre-market safety assessment to ensure it is safe for human consumption; and any GM final-product food with novel DNA or protein present must be labelled as such, according to FSANZ specifications. Labelling is also required for GM foods that have an altered characteristic when compared to a counterpart non-GM food.

However, the Commonwealth regulatory agencies do not take into account trade or marketing considerations, which are at the discretion of each State or Territory government. It is those (and only those) considerations that are the subject of this Review (as promised by the Liberal Opposition in the lead-up to South Australia's March 2018 election, which the Opposition won).

The current status of GM approval by Australian states and territories is as follows:

- **No restrictions** on GM crop production of varieties approved by OGTR: Northern Territory, Queensland, Victoria and Western Australia;
- **Partial restrictions** on GM crop production: New South Wales (currently allows GM varieties of only cotton and canola);

- **Moratorium** on GM crop production: South Australia, Tasmania and the Australian Capital Territory (although exemptions are granted for trials in SA and the ACT).

This suggests three options available to South Australia today: to maintain its moratorium through to 2025 as currently legislated, to partially de-restrict GM food crop production in the state, or to remove all restrictions on the production and transportation of GM food (and possibly other) crop products.

Technological change is one of the main drivers of overall economic growth, and especially of agricultural output growth. Indeed, *farm productivity growth has contributed strongly to growth in Australia's farm output since the 1950s, and has outpaced productivity growth in other market sectors of the Australian economy by a considerable margin until recently (Finding 1.1).*

However, *productivity growth has slowed in the past decade or so in Australia's farm sector relative to its non-farm sectors and to farm sectors in countries that have fully embraced GM crop technologies such as the United States and Brazil (Finding 1.2).*

The introduction of almost every new technology has losers as well as winners though, as does almost every policy or regulatory change, even if the community would be better off overall from the new technology or policy reform. In the case under review, the direct beneficiaries of the GM crop moratorium are those producers and consumers/users of non-GM crops grown in South Australia who wish the State to retain its non-GM status and perceive a risk that GM crop production or transportation might lower the value of those non-GM crop products. Those who lose include farmers who believe the freedom to sow GM crop varieties would boost their net income and hence land value, as well as life science firms and public research institutions that would gain from developing or adapting GM varieties for South Australian crop-growing conditions.

To date, no assessment has been made to the current Government's satisfaction to see (a) whether perceived gains to non-GM farmers in South Australia exceed the losses to those who, in the absence of the moratorium, would take advantage of current and future Commonwealth approvals to use GM technology and, if so, (b) whether there are cost-effective segregation mechanisms available to allow GM and non-GM food crop varieties to co-exist in South Australia such that the identity and thus value of non-GM crop products could be preserved.

Now is an appropriate time to undertake such an assessment because there is a substantial accumulation of empirical evidence in other jurisdictions of the market and trade consequences of allowing GM food crops to be grown alongside non-GM crops.

Australia approved the production of GM cotton in 1996, and since then pesticide use by its cotton farmers has fallen dramatically, yields per hectare have risen by two-fifths, and cotton output has more than doubled (with GM varieties now accounting for 99% of Australia's cotton area). That has kept the Australian cotton industry internationally competitive in the wake of a trend decline in the international price of cotton due to widespread adoption of GM cotton varieties globally.

Canada experienced a similar speed and extent of adoption of GM canola from 1996; and both the United States and Brazil now have average adoption rates of 94% for soybean, maize and canola.

In Australia, where commercial production of GM canola was allowed after 2003, the extent of adoption has been much lower, averaging no more than 20% in aggregate for the three states currently growing it (NSW, Victoria and WA). This fact has an important bearing on both attitudes toward and the estimated economic effects of South Australia's GM crop moratorium.

Community attitudes to the moratorium were captured in the 216 submissions received by the Reviewer. Most submissions argued strongly either to retain or to immediately remove the moratorium, with only a few containing qualifications or nuances. Of those 216, 150 were virtually identical half-page generic statements in opposition to GMOs in general, copied from <https://dogooder.co>. Of the remaining 66, 29% favoured retaining the moratorium until 2025, and 12% had a nuanced or more ambivalent view. Six of the strongest 'removal' submissions came from key South Australian organizations representing most of South Australia's 9400 farms. That is, ***the majority of submissions, including those from organizations representing most of South Australia's farmers, favour the immediate removal of South Australia's moratorium on GM crop production and transport (Finding 2.3).***

Most of those wishing to see the moratorium remain until 2025 suggested the GM moratorium adds a premium to the price of non-GM food produced in the state and/or greater access to domestic and foreign markets. It was clear that ***there is awareness and appreciation of South Australia's GM food crop moratorium by at least one foreign firm (in Japan) and by several food processing businesses operating in South Australia (Finding 2.1).***

However, apart from one qualified exception, no evidence is provided in those pro-moratorium submissions that would support a view that any current price premium or market access for non-GM South Australian crops would be diminished if GM food crops were allowed to be grown in the state on condition of careful segregation. A qualified exception has to do with Kangaroo Island. Submissions from there claimed that the island's GM-free status has enabled them to access a lucrative GM-free market segment in Japan. They further claimed that even ***if GM food crop production were to be allowed in the rest of South Australia, Kangaroo Island would be able to preserve its unique identity so as to retain access to Japan's high-priced market for GM-free grain provided the island remained a GM-free zone (Finding 2.2).***

A number of submissions also stressed the importance of the state government automatically adopting into law any future amendments to Commonwealth legislation on gene technology, and avoiding duplicating the efforts of the federal bodies authorised and equipped to test the environmental, health and safety attributes of each new GM crop application. Some also emphasized that having common national and state legislation in this area reduces the uncertainty that hampers investment in GM crop and related agricultural biotech R&D. Several submissions stressed that, because the GM moratorium restricted research-to-market pathways, fewer research dollars, scientists and post-graduate students have been coming to (or remained in) South Australia. This suggests ***bringing South Australian legislation into line with other mainland states and the Commonwealth will***

benefit the state by attracting/retaining research dollars, scientists and post-graduate students in South Australia (Finding 2.4).

In the absence of much other hard evidence in submissions, further empirical evidence on market access was assembled for this Review by looking at the bilateral trade pattern of Australia's non-GM canola exports, particularly to the European Union (EU) and Japan. During 2012-17, the shares of canola exports to the EU from the two main exporting states, Western Australia and New South Wales, were only 1 and 3 percentage points lower than South Australia's average of 72%. Evidently, segregation and identity preservation are sufficiently robust that the EU does not discriminate between Australian states in sourcing non-GM canola. That is, ***data on canola exports from Australian states to the European Union do not support the view that South Australians enjoy better access in EU non-GM grain markets (Finding 3.1).***

There is evidence that non-GM canola receives a premium price over that for GM canola varieties currently available. That premium averaged \$32/tonne or 6% during 2011/12 to 2017/18, based on sales of both types of canola at Kwinana in Western Australia. Further evidence of a non-GM price premium was assembled by looking at export prices for canola from both Canada (which is GM because Canada does not segregate) and Australia (which presumably is selling non-GM canola to that market). Over the period 2010-17, the Australian export price of canola averaged 4.0% higher than Canada's.

Also pertinent for this Review is whether South Australia's other crop products receive a price premium for being produced in a non-GM state. A recent study submitted to the Review found average prices of wheat, barley and canola in South Australia were no higher than those in Victoria or Western Australia where GM crops are allowed. That is, ***the only data provided in submissions on prices of grain in South Australia versus grain in neighbouring states suggest that since 2012 there has been no premium for grain from South Australia despite it being the only mainland state with a GM crop moratorium. (Finding 3.2).***

Even if a price premium had been found for grain from non-GM South Australia, one needs to ask whether such a price premium would continue in the absence of the GM crop moratorium. That depends on how effective the segregation process would be if the moratorium were to be dropped. Prior to the approval of GM crop production in the eastern states, much was done to establish segregation and identity preservation protocols and codes of practice to ensure that GM and non-GM crops can coexist. Single Vision Grains Australia set up a quality assurance process along the entire supply chain including sampling and testing when needed to verify that the integrity of the processes from planting seed through to grain presented for sale accords with customer specifications and government regulations. The principles and processes have been taken up and managed by the Australian Oilseeds Federation, which maintains and oversees the delivery of market requirements for domestic and export trade. The biggest handler of GM grain, Western Australia's Co-operative Bulk Handling Group, has successfully segregated GM and non-GM canola to internationally acceptable levels such that there have been no contamination issues since the GM crop's introduction in that state in 2010. That is, ***the experience of GM canola production and marketing in other mainland states over the past decade reveals that segregation and identity preservation protocols and practice codes can and do ensure the successful coexistence of GM and non-GM crops in Australia (Finding 3.3).***

While ever there is a moratorium on GM crop production, there of no local path to market for research aimed at developing new varieties suited to that jurisdiction. Without a path to market, even public research funders such as the Grains Research and Development Corporation will not invest in pre-commercial research. Thus an important consequence of South Australia's GM crop moratorium has been not only the withdrawal of private R&D investment by life science companies but also less public sector funding for the state's research institutions. The moratorium also leads young scientists interested in a career in frontier biotech research to move elsewhere or not come to South Australia when there are less-constrained research environments interstate and overseas. With less dollars being spent on R&D and fewer scientists working at the frontier in South Australia, there is also less "spill-in" to the state from the outcomes of crop R&D investments interstate and abroad. In other words, ***the persistence of a GM crop moratorium in South Australia, especially in the face of the removal of moratoria a decade ago in neighbouring states, has discouraged both public and private agricultural R&D investments in this state (Finding 3.4).***

Many of the pro-moratorium submissions claim that there are fewer environmental costs, and in particular there is less chemical use, on South Australian farms because of the moratorium. This claim is denied by those favouring its removal. The reality is that growers of GM crops tend to use less farm chemicals overall than do producers of conventional crop varieties using no-till agriculture. A lower use of weedicide – especially glyphosate – is important following the widespread adoption of no-till cropping, because there is a risk of weeds becoming tolerant to such chemicals. To lower that risk of glyphosate resistance in key weeds, GM growers are advised to alternate Roundup Ready canola with other canola cultivars attuned to herbicide components other than glyphosate. In short, ***the adoption of GM crops typically leads to less rather than more use of farm chemicals, and the risk of herbicide resistance in key weeds can be reduced by alternating between different crop varieties (Finding 3.5).***

To examine the economics of retaining versus removing the GM moratorium in South Australia, the Review initially focused on canola as an illustration. There has been a much slower uptake of GM canola varieties in Australia than in Canada. One reason is that Australia has had access to non-GM hybrid varieties that were developed partly because of the moratoria in this country. Since some of those hybrid varieties fit a no-till farming system, they have reduced the current net economic and environmental benefits of switching to a GM canola variety, as compared with the net benefits that existed back in the mid-1990s in Canada. As well, prices have been slightly lower for GM than non-GM canola varieties, yields currently are not much above the best of non-GM varieties, the technology access fee for GM seed is considered by some farmers to be high, and growers are wary of too much dependence on Roundup and so prefer not to plant Roundup Ready canola in every rotation.

The benefit-cost analysis requires comparing gross margins of non-GM versus GM varieties. The 'counterfactual' used as a comparator is the gross margin for the variety that is currently most common in South Australia, namely triazine-tolerant (TT) canola, for which a gross margin spreadsheet for 2018 is available from PIRSA. The variables likely to affect the comparison of gross margins most are the product price, crop yield per hectare, variable costs (most notably of chemicals and the technology access fee), and the speed and maximum rate of adoption of GM varieties.

The results suggest there would be a small gain today of \$38/hectare by allowing the production of Roundup Ready (RR) GM canola in South Australia, based on the current yield

gap of 10% in favour of the GM crop and a price premium of 5.2% in favour of non-GM canola. Were the omega-3 variety of GM canola to become available for 2019 planting and to attract a higher price, the estimated gross margin difference may become considerably greater: it rises to about \$95/hectare if the O3 price were to match that for non-GM canola, and to \$134/hectare if O3 attracted a price premium of 5% over non-GM canola. These comparisons illustrate the *sensitivity of the gross margin differences to price assumptions*.

Gross margin differences are also sensitive to assumptions about the gap in yields per hectare. The gap in yields between TT and RR canola in the Wimmera region of Victoria during 2013-17 was 10% (1.35 vs 1.50 tonnes per hectare). However, in South Australia the average yield for non-GM canola over the period since the moratorium was imposed in 2003 is just 1.20 tonnes/hectare, making the gap between it and RR 20%. When that is assumed, the difference between the gross margins for TT and RR becomes \$113/hectare, or three times the base case of \$38. These comparisons illustrate the *sensitivity of the gross margin differences to yield gap assumptions*.

In terms of aggregate dollars for South Australia, the differences between GM and TT gross margins apply only to that fraction of the state's canola crop that would switch from a non-GM to a GM variety. Two sets of calculations are presented, assuming the fraction would rise evenly over the first 5 years and then plateau. The first is an historical one, involving estimates for the period 2004-18 of the cost of having a moratorium in the state so far following OGTR approval in 2003. The second set of calculations involves projections from 2019 to 2025, to estimate net benefits foregone by canola farmers should the moratorium remain in place for that period, as currently legislated. The average canola crop area of the state during 2004-16 is used in the historic case (225,000 ha), while the average for just 2011-16 is used in the prospective case (265,000 ha). With these assumptions, *the cumulative cost to canola farmers of South Australia's GM crop moratorium is estimated to be up to \$33 million over 2004-18, and will be at least another \$5 million if the moratorium is kept until 2025 – and possibly much more if Omega 3 canola proves to be higher priced and more profitable than current Roundup Ready canola (Finding 4.1)*.

That gain foregone by farmers is net of the technology access fee paid to the producer of RR canola seed. Over the 2004-18 period the estimated fee accumulates to \$5.4 million, and during 2019-25 to \$3 million, plus \$424,000 per year thereafter. In so far as a fraction of that \$8+ million technology fee revenue is invested by the life science corporation in extra crop R&D in South Australia to provide even more suitable GM varieties in the future, it (plus any extra matching funding attracted from, e.g., GRDC) would be an additional gain to the state. That is, *gross revenue for the producers of GM canola seed would have been an estimated \$5.4m higher during 2004-18 without the SA crop moratorium, and \$3m higher during 2019-25 if the current technology access fee is unchanged – at least some of which would have been allocated to new crop R&D investments in South Australia (Finding 4.2)*.

Not captured in these calculations are the producer benefits in the crop rotation the season following a GM canola crop, in the form of reduced weed control costs and increased yields. Based on GRDC findings, PIRSA estimates they could amount to between \$12 and \$36 per hectare. That adds an extra \$0.3-0.9 million to the annual benefits of withdrawing from the moratorium even if the GM adoption rate is only 10%. Offsetting this additional benefit might be higher segregation costs if it is more expensive to preserve the identity of GM versus non-GM food crops than it is to do so between different non-GM crops. The above analysis assumes that there would be no extra segregation costs for either non-GM or

GM growers, but some earlier analysts have assumed they could amount to as much as \$11.50 per hectare of GM area. With 10% adoption, such a cost would subtract \$0.3 million from the annual direct benefits of dropping the GM moratorium. So ***while the above findings ignore farmers' reduced weed control costs and increased yields for the crop that follows GM canola the next season (worth up to \$0.9 million per year), they also ignore possible additional segregation costs (up to \$0.3 million per year) if the GM moratorium is dropped (Finding 4.3).***

Also not captured in the above calculations are the benefits of having an enhanced number of crop varieties to choose from to best suit each season's weather anomalies and each region's local climatic, agronomic, etc. environment. Those benefits include reductions in the variability across seasons in yields and net farm incomes – something that farmers are valuing more and more as climate changes keep adding to the volatility of their earnings.

Nor do the above calculations show (as they are outside the Review's terms of reference) the environmental benefits of GM versus non-GM canola production from reduced farm chemical use, and any further reduction in tillage and thus in the greenhouse gas emissions associated with that activity. Those environmental benefits have been shown by others to be potentially very large.

In addition to potentially higher gross margins and hence annual farm revenues that would flow from being able to adopt GM varieties, their enhancement of farm productivity also is likely to boost the value of farm land in the state. Any such wealth enhancement would be enjoyed by all farm landowners, including those who chose not to adopt GM varieties (assuming coexistence protocols and codes of practice work as well in South Australia as they have in the other mainland states).

Together these unquantified ***additional farmer benefits from being allowed to grow GM crops, not included in the above calculus, are (a) having more varieties to choose from to best suit specific environments and seasonal weather anomalies, (b) environmental and health benefits from reduced farm chemical applications, and (c) a likely boost to the value of farm land whose productivity and profitability is raised (Finding 4.4).***

Yet another direct economic benefit to South Australia that would result from removing its GM moratorium that is not captured in the above calculations relates to the transporting of GM crop products. Such movements are banned under the current moratorium. If relaxed, there would be a stronger demand for South Australian transit services, should there be a wish to move grain or seed between the eastern states and Western Australia to smooth out seasonal anomalies. South Australian GM growers and GM seed suppliers would be in a stronger position than those in neighbouring states to supply such demands, as they would have less intra-national distance to transport their product east or west than would their more-distant neighbours. That is, ***removing the moratorium on the transport of GM crop products in South Australia would expand the demand for transport services and lead to more interstate shipments of canola (Finding 4.5).***

Should it be decided to remove the GM crop moratorium in the mainland part of the state but not on Kangaroo Island, the ***benefits of allowing GM canola production in South Australia would be reduced by less than 2% if the GM moratorium were to be retained for Kangaroo Island (Finding 4.6).***

The above calculus focuses on canola because that is considered by most commentators to be the only significant GM crop currently of relevance to South Australia should its GM crop moratorium be removed. Canola is a relatively minor crop in this state, however. More significant economically are wheat, barley, pulses and even hay, not to mention grasses for pasture grazing, horticultural crops, and winegrapes. Hence *the benefits of removing the state's GM moratorium may be far greater than just those from canola as new GM varieties of other crops (and pasture grasses) of relevance to South Australia are developed and approved by the OGTR (Finding 4.7).*

Meanwhile, several exciting new plant breeding avenues are evolving, perhaps the most relevant to this Review being gene editing. Regulations relating to these new techniques are still evolving in Australia and elsewhere. The European Court of Justice ruled in July 2018 that gene editing be regulated in the same way as GMOs, even though gene editing is not transgenic. The OGTR released a guide in October 2018 that outlines how it expects to regulate this new technology in Australia. The guide suggests that, across the spectrum of gene editing interventions, the least invasive applications will be regulated like conventional breeding but the most invasive will be treated like GMOs. Thus while *new crop breeding techniques such as gene editing offer further benefits to farmers, some of the new varieties may be regulated as if they are GMOs and thus would be unavailable in South Australia while ever the state's GM moratorium remains (Finding 4.8).*

To summarize, the three policy options this Review has considered are (a) maintaining, or (b) modifying, or (c) removing South Australia's moratorium on GM food crop production and transport that is currently scheduled to remain in place until 2025. Most of the submissions to the Review clearly favoured either the 'maintain' option or the 'remove' option. A small number favoured the 'modify' option, most with the specific proposal that the moratorium be maintained for Kangaroo Island even if the government chooses to remove it for the state's mainland regions. The net economic (and environmental) benefits to the state's canola farmers and to providers of GM seed of adopting the 'remove' option would be very considerable, and would be at most only 2% lower if the GM moratorium were to be maintained for Kangaroo Island.

Those favouring the 'maintain' option include people who may have ethical, philosophical or spiritual objections to GM technology, or they worry about as-yet-unknown risks that GM crops may bring in terms of food safety and farmer and environmental health. Those are matters dealt with by Commonwealth agencies and therefore are outside the terms of reference of this Review. Most of the other pro-moratorium submissions suggest the GM crop moratorium provides greater access to domestic and foreign markets and/or a premium price for non-GM food produced in the state. Those favouring the 'remove' option, by contrast, argue the state would be a net beneficiary if the moratorium was dropped because they see little if any evidence of marketing and trade advantages of staying GM-free. The evidence examined in this Review supports the latter view, while recognizing that there are numerous issues affecting both 'maintain' and 'remove' options that are difficult to quantify.

Introduction

The purpose of this Review is to provide the government and people of South Australia with an independent assessment of the economic costs and benefits of maintaining, modifying or removing the South Australian moratorium (which is currently scheduled to continue until 2025) on the production or transport of genetically modified (GM) crops. An independent review is a common step in best-practice assessment of regulatory policies (OBPR 2015), and benefit-cost analysis is a standard way to contribute clarity and transparency to that process, by providing decision makers with quantitative and qualitative information about the likely effects, under various explicit assumptions, of a particular regulation compared with feasible alternatives (OBPR 2016).

The original objective in 2003 of South Australia's moratorium on GM crops was to provide time to assess the risks for the state's conventional and organic growers and consumers/users of non-GM crop varieties that GM crop production in or transportation through South Australia might impose in terms of access to markets and trade. Fifteen years have elapsed since the moratorium was first imposed, and during that time all other mainland states have availed themselves of GM technology (most recently Western Australia in 2009). Hence a considerable body of evidence is now available to make such a reassessment.

This first section of the Review briefly summarizes the legislative history leading to the current regulatory environment, explains why the issue is important for South Australia and worthy of reassessment in 2019, and describes the present review process.

1.1 Background: the current regulatory environment

In 1996, GM crop products appeared on world food markets for the first time. Commercial GM crop production began with corn, soybean, cotton and canola, initially in North America and then South America.¹ By 2017 there were 190 million hectares of cropland (13% of the world's total) sown to GM varieties in 24 countries (Appendix 1). A further 43 countries import GM products. GM varieties accounted in 2017 for 50% of the global area sown to soybean, 31% for maize, 13% for cotton and 5.4% for canola. In just those countries where GM crop production is allowed, adoption rates average 80% for cotton and 77% for soybeans (ISAAA 2017). India is a striking example: it belatedly approved GM cotton in 2002 but 75% adoption was reached within six years. So large were the gains in India, such as doubling or more the incomes of farmers and almost halving their pesticide use, that adoption has been above 90% since 2012 (Qaim 2016, pp. 72-78).

Australia approved the production of GM cotton in 1996, and since then pesticide use by cotton farmers has fallen by up to one-third and growers' incomes between 1996 and 2015 have been boosted by \$287 per hectare from insecticide-resistant traits and by \$37 per hectare for herbicide-tolerant traits (Brookes 2016). As a result, yields per hectare have risen by two-fifths and cotton output has more than doubled, with GM varieties now accounting for 99% of Australia's cotton area (Cotton Australia 2018). That has kept the Australian cotton

¹ A GM tomato variety, Flavr Savr, was introduced into California in 1994, but it was not a commercial success and so was withdrawn from the market in 1997.

industry internationally competitive in the wake of a trend decline in the international price of cotton due to widespread adoption of this biotechnology (Anderson, Valenzuela and Jackson 2008).

In 2000/01 a nationally consistent legislative scheme for gene technology was introduced with the Commonwealth *Gene Technology Act 2000* and corresponding State and Territory legislation, including South Australia's *Gene Technology Act 2001*.²

The federal Act, which came into force on 21 June 2001, was enacted to protect the health and safety of people and the environment. It regulates all dealings with live and viable genetically modified organisms (GMOs) in Australia, including research, manufacture, import, production, propagation, transport and disposal of GMOs. That Act is administered by the Office of the Gene Technology Regulator (OGTR) within the federal Department of Health, which decides whether to approve field trials and then the commercial release of a GMO. Before issuing each such national licence, the Regulator must consult with all relevant local, state and federal government agencies and the public, and prepare a risk assessment and risk management plan (RARMP) that identifies any potential risks, based on credible evidence, and the means of managing those risks.

The OGTR regulates GMOs, as distinct from GM products.³ The latter are regulated by four other national bodies with specific areas of responsibilities that include GM as well as non-GM products. Each of those bodies must notify the OGTR of any GM product approvals. One is Food Standards Australia New Zealand (FSANZ).⁴ It sets standards for the safety, content and labelling of all foods sold in Australia, both domestically produced and imported. Each GM food or ingredient is subjected to a mandatory pre-market safety assessment to ensure it is safe for human consumption; and any GM final-product food with novel DNA or protein present must be labelled as such, according to FSANZ specifications. Labelling is also required for GM foods that have an altered characteristic (e.g., an altered nutritional profile) when compared to a counterpart non-GM food. An example is soybean with increased oleic acid content.

The OGTR maintains a comprehensive record of all GMO and GM product dealings. The list is freely accessible to the public on its website (<http://www.ogtr.gov.au>). In addition to cotton, GM food crop varieties have been approved for commercial release of canola, beginning in June 2003, and of safflower in June 2018.⁵

² See also South Australia's *Genetically Modified Crops Management Act 2004* and its *Genetically Modified Crops Management Regulation 2008*. The 2004 Act established a GM Crop Advisory Committee that the Minister draws on periodically. On 1 August 2018 the Legislative Council of South Australia established a Select Committee on the Moratorium on the Cultivation of GM Crops in South Australia, and called for written submissions by 19 October 2018.

³ Genetically modified organisms (GMOs) are defined as organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that has not occurred naturally by mating and/or natural recombination. The technology is called "modern biotechnology" or "gene technology", or "recombinant DNA technology" or "genetic engineering". It allows selected individual genes to be transferred from one organism into another, and also between unrelated species. Foods produced from or using GMOs are referred to as GM foods (WHO 2014).

⁴ One of the other three is the Australian Pesticide and Veterinary Medicines Authority (APVMA), which is responsible for the registration, quality assurance and compliance of all pesticide and veterinary medicines up to the point of sale, including those created by or used on GM crops. Another is the Therapeutic Goods Administration (TGA), which ensures the quality, safety and efficacy of medicines, blood and tissues including GM and GM-derived therapeutic products. And the third one is the National Industrial Chemicals Notification and Assessment Scheme (NICNAS), which assesses industrial chemicals including GM products for their effects on human health and the environment.

⁵ The OGTR has approved three GM canola varieties: Monsanto's 'Roundup Ready' (glyphosate tolerant), BASF's 'Liberty Link' (glufosinate tolerant), and Bayer's 'In-Vigor' (GM based hybrid system). Also approved are GM varieties of two flowers: blue carnation (in June 2003) and rose (in June 2009) but, since they are not

The Commonwealth's *Gene Technology Act 2000* and its regulatory agencies do not take into account trade or marketing considerations, which are at the discretion of each State or Territory Government. Those governments have responded in a variety of ways over the past two decades. New South Wales and Queensland allowed GM cotton to be grown from the outset (1996), as did Western Australia from December 2008; but during 2003/04 the ACT and most states including South Australia (but not the Northern Territory or Queensland) imposed a moratorium on the growing of GM food crops in general or canola in particular.

The initial objective of those state moratoria was to provide time to assess the risks for conventional and organic growers and consumers/users of non-GM crop varieties that GM crop production or transportation might impose in terms of their access to markets and trade.

Subsequent independent reviews of the moratoria in New South Wales (Armstrong, Adams and Reeves 2007), Victoria (Nossal, Forster and Curnow 2007) and Western Australia (Calcutt 2009) have been followed by policy reforms to allow limited commercial production of GM canola in early 2008 in Victoria and New South Wales and in 2009 in Western Australia, and unlimited production a year later in all three states. In October 2016 Western Australia followed Victoria in broadening its legislation to allow the growing of all GM crops that may be subsequently approved by the OGTR. Meanwhile, a governmental review in Tasmania (TDPIPWE 2013) led to a decision to retain that state's moratorium, despite the government's regularity impact statement finding that an extension of the moratorium to 2019 would have a net cost of \$1.5 million, 70% of which would be regulatory costs borne by the state government (TDPIPWE 2014).

The South Australian government first reviewed its moratorium in 2008. It decided to ignore the advice and findings of its Genetically Modified Crop Advisory Committee, which had recommended the lifting of the current moratorium in all regions of South Australia except Kangaroo Island (SA Genetically Modified Crop Advisory Committee 2007). The government again reviewed the legislation in 2014, and decided that its moratorium on GM food crop cultivation and transport would continue until at least 2019. In November 2017 that same Labor Government extended the South Australian moratorium to 2025. The present review was promised by the Liberal Opposition in the lead-up to the March 2018 election, which the Opposition won.

In summary, the current status of GM crop approval by Australian states and territories is as follows:

- **No restrictions** on GM crop production of varieties approved by OGTR: Northern Territory, Queensland, Victoria⁶ and Western Australia;
- **Partial restrictions** on GM crop production: New South Wales (currently allows GM varieties of only cotton and canola);
- **Moratorium** on GM crop production: Australian Capital Territory, South Australia and Tasmania (although exemptions are granted for trials in the ACT and SA).

This suggests three options available to South Australia today: to maintain its moratorium through to 2025 as currently legislated, to partially de-restrict GM crop production in the state, or to remove all restrictions on the production and transportation of GM food (and possibly other) crops.

1.2 Why this issue is important and worthy of reassessment now

food crops, they are not subject to moratoria. See the full list of nationally approved GM varieties at <http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/cr-1>

⁶ Victoria's Minister for Agriculture still retains legislative control over the planting of GM crops in that state.

Technological change is one of the main drivers of overall economic growth, and especially of agricultural output growth. In Australia it has been important for more than two centuries, but especially post-World War II when public investment in agricultural research and extension expanded and more recently with the growth of private sector R&D investment and public-private partnerships (Alston and Pardey 2016).

However, the introduction of almost every new technology has losers as well as winners, as does almost every policy or regulatory change. One of the elements of good governance is to ensure any major policy or regulatory change would generate (economic/social/environmental) benefits net of adaptation and adjustment costs sufficient to be able to compensate the losers (again net of adaptation and adjustment costs).

In the case under review, the direct beneficiaries of the moratorium are those producers and consumers/users of non-GM crops grown in South Australia who wish the State to retain its non-GM status and perceive a risk that GM crop production or transportation might lower the value of those non-GM crop products.⁷ Those who lose include farmers who believe the freedom to sow GM crop varieties would boost their net income and hence land value, as well as life science firms and public research institutions that would gain from developing or adapting GM varieties for South Australian crop-growing conditions.

To date, no assessment has been made to the current Government's satisfaction to see (a) whether perceived gains to non-GM farmers in South Australia exceed the losses to those who, in the absence of the moratorium, would take advantage of current and future Commonwealth approvals to use this biotechnology and, if so, (b) whether there are cost-effective segregation mechanisms available to allow GM and non-GM crop varieties to co-exist in South Australia such that the identity of non-GM crop products could be preserved.

Now is an appropriate time to undertake such an assessment because there is a substantial accumulation of empirical evidence in other jurisdictions of the market and trade consequences of allowing GM crops to be grown. Specifically, 23 years have elapsed since GM crops entered Australian and global markets, it is 15 years since canola was approved by the OGTR for production in Australia, and it is ten years since GM canola was first produced in New South Wales and Victoria and nine years in Western Australia. There is thus a great deal of experience and empirical evidence to draw on of relevance to South Australia.

How important have new technologies been to agricultural development in Australia? Australian farmers have a well-deserved reputation, built up over the past two centuries, of being innovative. That has enabled them to remain competitive in domestic and overseas markets despite relatively little irrigable land, very high wage rates, declining real prices for farm products through most of the twentieth century, occasional natural disasters, and periodic mining booms that cause the Australian dollar to appreciate against key currencies (Anderson 2017). Those same challenges are expected to continue to be in play during the present century, together with a rise in average temperatures and in the frequency and intensity of extreme weather events thanks to climate change. As well, there are ever-stronger community expectations that farmers will be good stewards of the environment, as part of

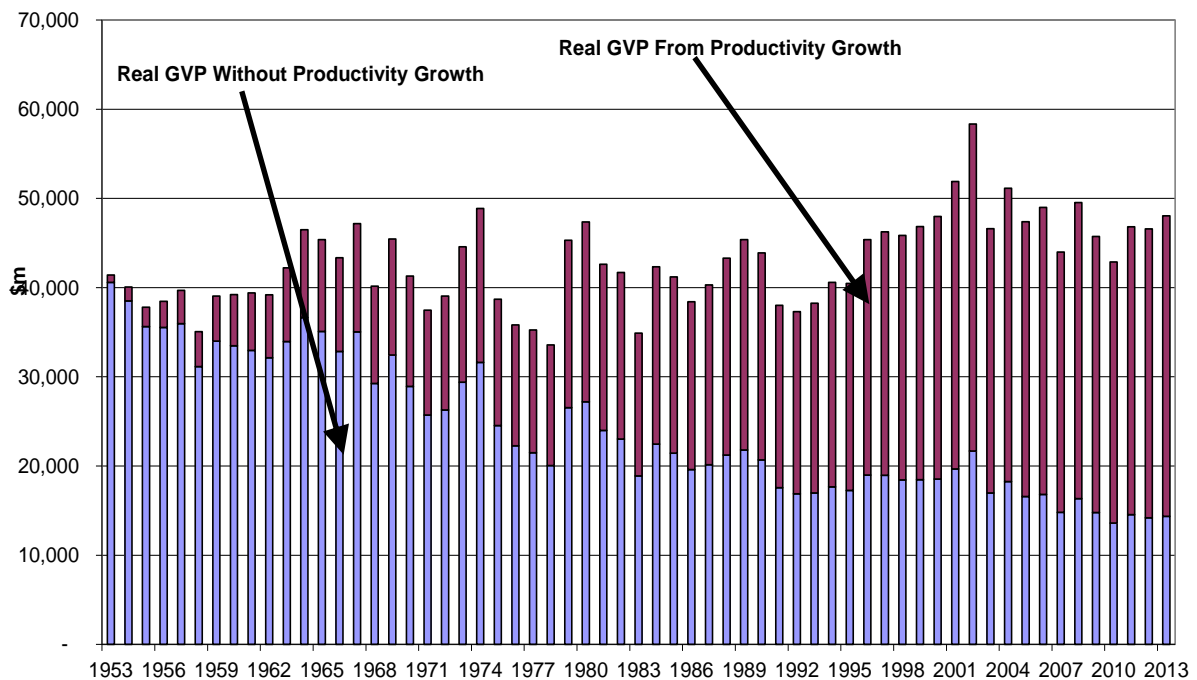
⁷ Others in the community who support the moratorium include people who believe GM crops to be unsafe for human and environmental health or who have ethical or philosophical or spiritual objections to GM technology *per se* that perhaps no level of compensation would appease. While such concerns are given due weight in government policymaking (for example, via the periodic reviews of the National Gene Technology Scheme), they are beyond the prescribed scope of this review. The latest such review recommends, among other things, that states give on-going consideration to the economic effects, value and scope of their GM moratoria and that regulation is commensurate with the level of risk to avoid unnecessary regulatory burden (Department of Health 2018, p. 11).

their ‘social licence to operate’. Meeting these challenges will be easier, the more new crop varieties can be developed that are more profitable and environmentally friendly not just in ‘normal’ seasonal weather but also in the face of extreme weather events.

During the first century of European settlement, much of the innovation in Australian agriculture was due to the inventiveness of farmers themselves. Increasingly since then it has been assisted by formal investment in agricultural research and extension, including in the public sector (state departments of agriculture, agricultural colleges, universities and CSIRO). The resulting productivity growth has contributed strongly to growth in farm output since the 1950s (Figure 1). Indeed productivity growth on farms had been outpacing that in other market sectors of the Australian economy, and by a considerable margin until recently (Figure 2).

Finding 1.1: Farm productivity growth has contributed strongly to growth in Australia’s farm output since the 1950s, and has outpaced productivity growth in other market sectors of the Australian economy by a considerable margin until recently.

Figure 1: Gross value of agricultural production and the contribution of multifactor productivity growth, Australia, 1953 to 2013 (in 2013 A\$million)

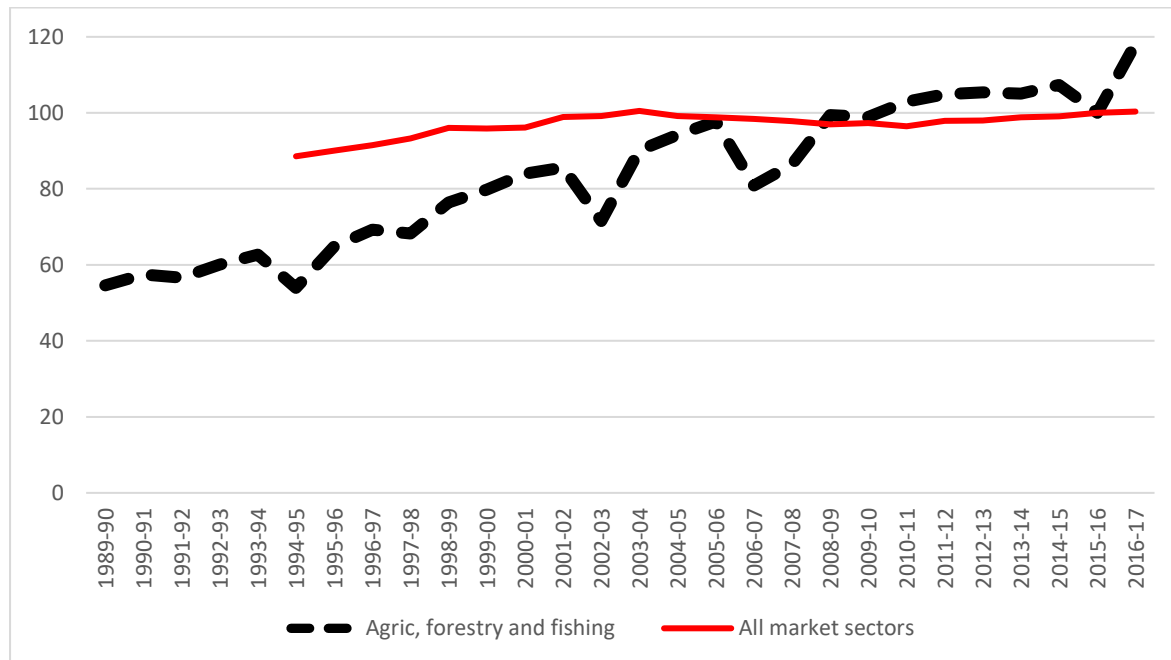


Source: Grafton, Mullen and Williams (2015), derived from ABARES data.

However, that sectoral productivity difference shown in Figure 2 has been much narrower during the past decade or so. Meanwhile in the United States, where GM varieties have been grown increasingly since 1996, productivity growth explains almost all of that country’s farm output growth (Wang et al. 2015). Total factor productivity in agriculture during 1991-2010 grew at 1.9% per year in the United States, while in Brazil it grew at a massive 3.2% per year thanks largely to GM adoption, compared with just 1.2% in Australia (Fuglie, Wang and Ball 2012).

Finding 1.2: Productivity growth has slowed in the past decade or so in Australia’s farm sector relative to its non-farm sectors and to farm sectors in countries that have fully embraced GM crop technologies such as the United States and Brazil.

Figure 2: Multifactor productivity in agriculture and in all market sectors, Australia, 1990 to 2017 (2015-16 = 100)



Source: Compiled by the author from ABS Cat. No. 5260.0.55.002, accessed 2 October 2018.

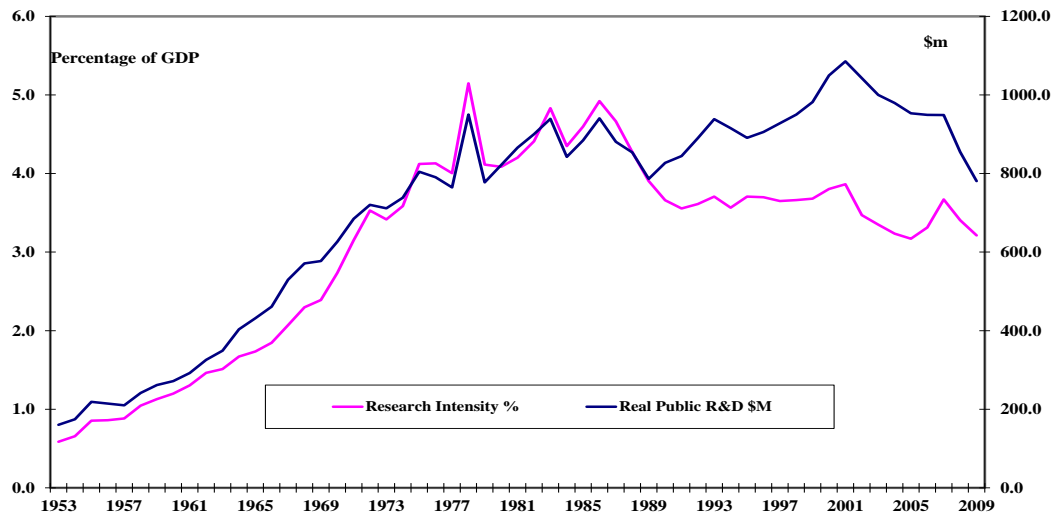
As in other sectors, an increasing proportion of agricultural R&D is being undertaken in the private sector (Fuglie 2016). For high-income countries as a whole, the private share of agricultural and food R&D has risen from 40% to 53% between 2000 and 2011 – and even in middle-income countries it had reached 36% by 2011, at which time those emerging economies accounted for 43% of global agricultural and food R&D, up from 29% in 1980 (Pardey et al. 2016, 2018).⁸

If Australian farmers are to retain their international competitiveness not only against North American farmers but also those in rapidly emerging economies, new technologies will need to be explored, adapted to local conditions, and integrated into producers' farming systems at least as rapidly as in the rest of the world. Yet Figure 3 reveals that public investment in agricultural R&D in Australia has not been growing in real terms, and has been falling since 1985 as a percentage of agricultural value added (GDP). Meanwhile, private investment in agricultural R&D appears to have not been growing as fast in Australia as elsewhere in the world.

One reason for the slowdown in Australia's intensity of agricultural R&D has been the reluctance of the community to allow production of genetically modified foods. GM cotton was approved in 1996 and adopted rapidly, but it took until late 2003 for the next crop (canola) to be approved by the OGTR for commercial production in Australia. Then because state governments wanted time to assess the market and trade implications of allowing GM food production in their state, and so placed temporary moratoria on the planting of GM varieties, there has been a slowdown in agricultural R&D investment. That slowdown has been prolonged in South Australia, it being the last mainland state to have retained its moratorium.

⁸ On the growth and concentration of life science firms in global seed markets, see OECD (2018).

Figure 3: Real public investment in and research intensity of Australian agricultural R&D, 1953 to 2009 (A\$million and % of agricultural GDP)



Source: Grafton, Mullen and Williams (2015), derived from ABS and ABARES data.

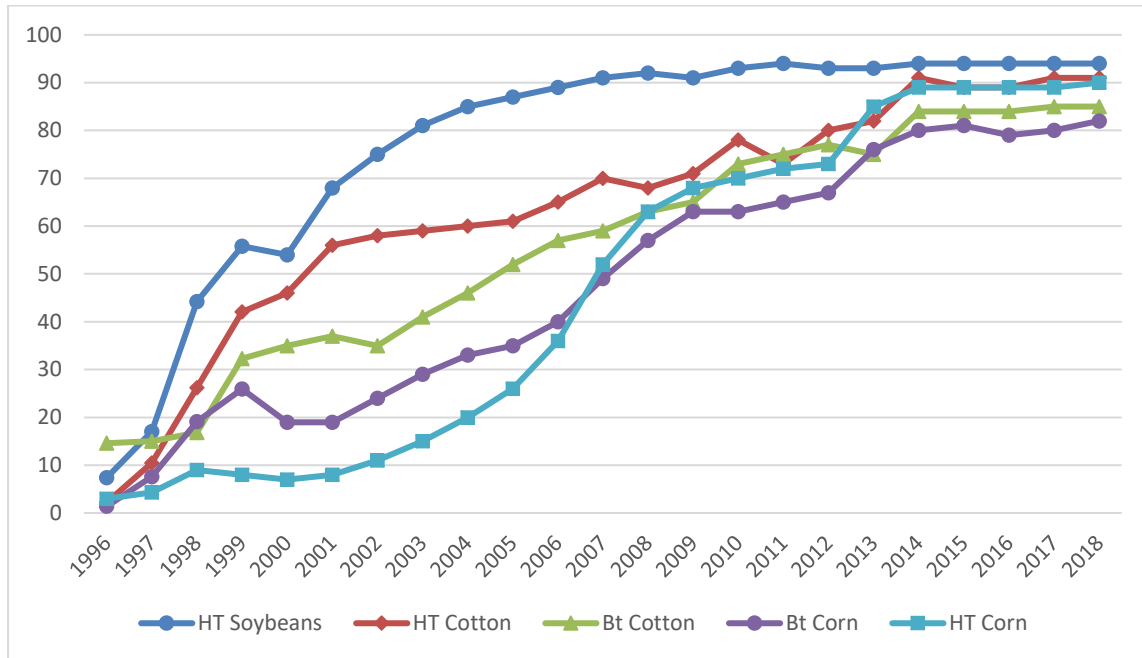
Are the benefits of retaining the moratorium on GM food crop production in South Australia greater than the costs of its retention in terms of opportunities postponed or foregone, bearing in mind any risk-reducing opportunities to mitigate some of those downsides? The costs include foregone expansion in or profitability of production in South Australia of canola (approved in December 2003) and safflower (approved in June 2018) and potentially of other crops the OGTR may approve in the future. Field trials are currently underway in Australia for GM banana, barley, grapevines, Indian mustard, maize, papaya, perennial ryegrass, pineapple, sugarcane, tall fescue, wheat and white clover (ABCA 2017); and FSANZ has already approved the following GM food ingredients for human consumption and for livestock feed: canola, corn, cottonseed and soybean from 2000, potato from 2001, sugar beet from 2002, rice from 2008, and safflower and Omega-3 canola from 2018.

The experience of the United States reveals that, in the absence of bans on GM crop production, adoption of new varieties can be very fast and can approach 90% of national coverage in just 10-15 years (Figure 4).

Canada's experience with GM canola and India's with Bt cotton are even more dramatic, with almost 100% adoption reached within a dozen or so years – and with yields per hectare trending upward considerably faster than before the adoption of GM varieties (Figure 5).

Both the United States and Brazil now have average adoption rates of 94% for soybean, maize and canola (ISAAA 2017). By contrast, Australia's adoption of GM canola not only began later but also has had to date a much slower uptake relative to Canada's (Figure 6).

Figure 4: Share of total area planted to GM varieties, various crops, United States, 1996 to 2018 (%)



Source: Compiled by the author from data at <https://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption/>, accessed 8 October 2018

Figure 5: Yields per hectare and share of total area planted to GM varieties, canola in Canada and cotton in India and Australia, 1988 to 2017 (3-year average yields to year shown, and annual %)

(a) Canola in Canada (not including herbicide-tolerant but non-GM Clearview canola)

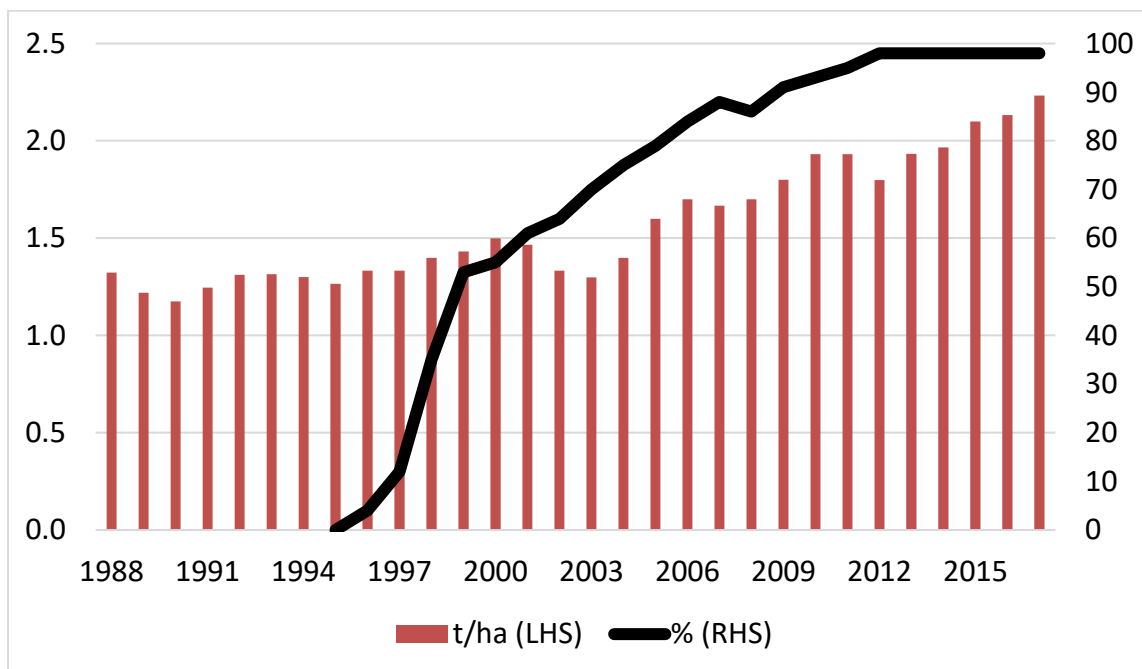
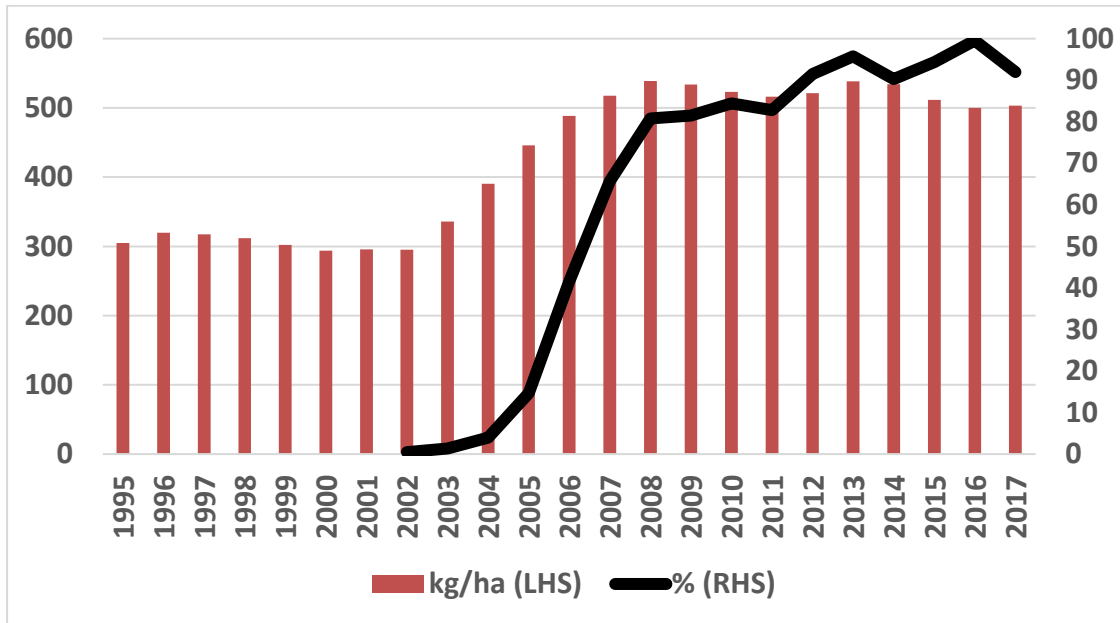
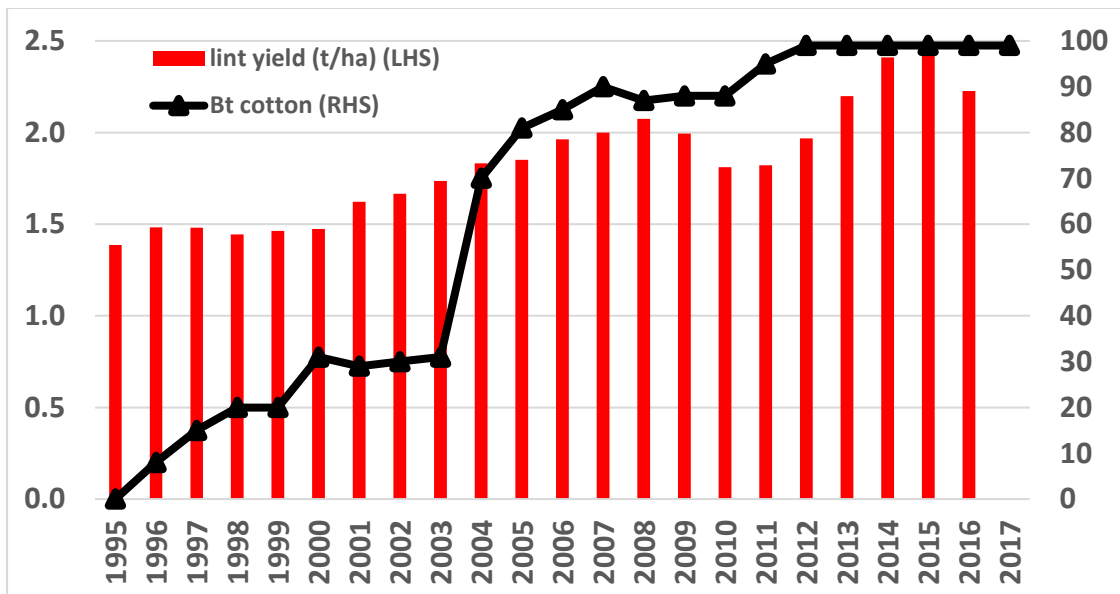


Figure 5 (continued): Yields per hectare and share of total area planted to GM varieties, canola in Canada and cotton in India and Australia, 1988 to 2017 (3-year average yields to year shown, and annual %)

(b) Cotton in India

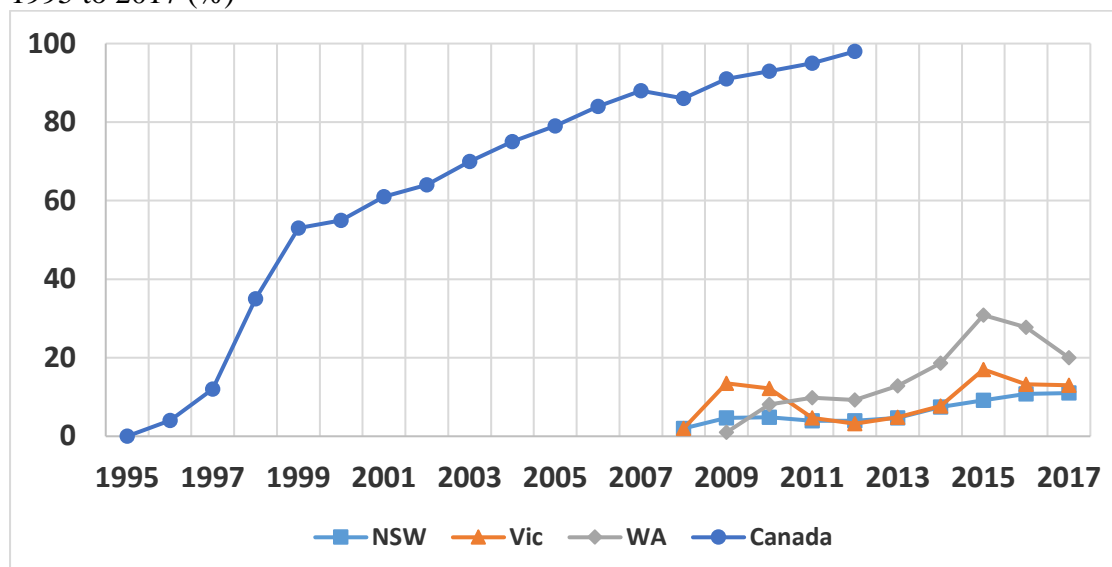


(c) Cotton in Australia



Sources: Compiled by the author from Canola Council of Canada data at <https://www.canolacouncil.org/markets-stats/statistics/>, and accessed 8 October 2018; for India, (Qaim (2016) and <https://apps.fas.usda.gov/psdonline/app/index.html#/app/downloads>, accessed 12 October 2018; and for Australia, Cotton Australia (personal communication).

Figure 6: Share of total canola area planted to GM canola, Australian States and Canada, 1995 to 2017 (%)



Source: Figure 5 above, ABARES (2017) for total area and, for GM planted area, www.abca.com.au/materials/statistics

Elsewhere in the world, GM varieties of alfalfa, apples, eggplant, papaya, potatoes, squash and sugar beet are already in the market. Other GM crops being researched by public sector institutions include bean, cabbage, cassava, chickpea, cowpea, groundnut, mustard, pigeon pea, rice, sorghum, tomato and sweet potato (Appendices 2-4 and ISAAA 2017). These efforts will lead to varieties with not only better agronomic traits of direct benefit to farmers (resistance to insect damage or viral infections, or tolerance towards certain herbicides or to drought, heat, frost, hail or salt) but also attributes of direct benefit to consumers (Barrows, Sexton and Zilberman 2014). The latter include improved shelf life, decreased allergenicity, and functional foods with boosted levels of phytochemicals, carotenoids, antioxidants and essential fatty acids, as well as nutrient-enriched banana, canola, maize, nuts, potato, rice and soybean (ABCA 2017).

1.3 The current review process

The Minister for Primary Industries and Regional Development, the Hon. Tim Whetstone, announced on 14 September 2018 the establishment of an independent review of the moratorium on genetically modified food crop production in South Australia, thus delivering on a pledge to do so within six months of forming government.

Media notices and advertisements the following week called for written submissions from any interested parties up to 26 October 2018. The terms of reference of the review (see page iii) were included in that call for submissions. In particular, it was made clear that the focus is on trade and marketing considerations, and that matters relating to the human health, safety and environmental impacts of GM crops, which are the responsibility of the above-mentioned national regulatory agencies,⁹ are outside the scope of this review.

⁹ The Commonwealth agencies with those broader responsibilities review the National Gene Technology Scheme periodically to ensure it remains fit for purpose. The most-recent review, in October 2018, is published by the Department of Health (2018). See also FSANZ (2018). Those reviews, like those of other countries,

Primary Industries and Regions South Australia (PIRSA) assisted the Reviewer by receiving written submissions and providing information and technical support at his request. However, in all other respects the Reviewer performed his functions completely independently of the Department, and of the office of the Minister for Primary Industries and Regional Development.

Most submissions argued strongly either to retain or to remove the moratorium, although some contained qualifications or nuances. The next Section summarises those various arguments and associated qualifications.

continue to conclude that the risks associated with GM crops are no greater than with conventional crops. See, e.g., EASAC (2013) and House of Commons (2015). An eminent scientist's view of how genetic engineering is seen as part of the 10,000-year evolution of plant breeding can be found in Federoff (2004). On the political economy of GMOs and the role of non-government organizations and the news media in influencing policy choices, see, e.g., Herring and Paarlberg (2016), McCluskey, Kalaitzandonakes and Swinnen (2016), Smyth, Kerr and Phillips (2017) and Lynas (2018). Trends in community attitudes in Australia to gene technology are traced by the OGTR, see Cormick and Mercer (2017). A very comprehensive overview of the evolution of global seed markets, including the role of genetic modification in that evolution, is provided in OECD (2018).

2

Overview of written submissions

There were 216 written submissions received in the six weeks following a call for them in mid-September 2018 plus the following week to 5 November 2018. Of those 216, 150 are almost identical half-page generic statements in opposition to GMOs in general, copied from <https://dogooder.co> (most of which arrived, the majority from interstate, after the submission deadline). Of the remaining 66, 29% favour retaining the moratorium until 2025, 59% (several of which represented large numbers of South Australian farmers) favour complete removal of the moratorium, and the remaining 12% have a nuanced or more ambivalent view.¹⁰ Submissions for which consent to publish was granted are available at http://pir.sa.gov.au/primary_industry/genetically_modified_gm_crops/gm_review/public_submissions_to_the_gm_independent_review. This section summarizes the key points raised in the submissions, beginning with those in favour of the current policy.

2.1 Favouring retention of the moratorium to 2025

The duplicated campaign letter from dogooder.co claims that GM crops would deprive other farmers, food processors and consumers of clean, green non-GM food produced with fewer chemicals, would reduce the financial contributions of farms and the food industry to the state, and would involve more agrichemical spraying and so further hurt the environment and add more unwanted residues to our food. These claims were not supported by any evidence, however, and several are inconsistent with the evidence provided above, with evidence reported in submissions favouring removal of the moratorium, and with further evidence presented in subsequent sections of this Review.

Of the other 19 submissions wishing to see the moratorium remain until 2025, four mention as-yet-unknown risks that GM crops may bring in terms of food safety and farmer and environmental health.¹¹ Those matters are dealt with by federal agencies and so were not

¹⁰ These submissions are thus more supportive of removing the moratorium than the responses by 4341 respondents to a YourSay SA survey on the state's GM moratorium, as reported in the *Sunday Mail* newspaper on 7 October 2018: not quite half of those surveyed (47.4%) were in favour of bringing South Australia into line with other mainland states by allowing GM crop production, while the remaining 52.6% felt such a policy change would have a negative impact on the state's agricultural and food reputation.

¹¹ The psychology literature (see the survey by Lusk, Roosen and Bieberstein 2014) suggests that a new food technology is perceived as riskier, and is less likely to be accepted, when:

- there are potential risks with adoption, even low-probability risks deemed inconsequential by experts, because of biases in probability assessment;
- adoption of the new product is perceived as a loss relative to the status quo;
- people are risk averse over low-probability losses such as those associated with food technologies;
- people do not perceive that they have control over whether they consume the new product;
- the new characteristic is perceived as unfamiliar or unusual;
- early names given to and discussions of the technology are emotional and negative and are more available to consumers;
- consumers do not associate appreciable benefits with the new technology; and
- moral judgments are evoked, and a food technology is perceived as unnatural or impure.

Empirical evidence exists for most of these hypotheses. Some issues (e.g., the issue of naturalness) have been extensively researched. Other issues (e.g., the role of emotions) have received less attention in the food

included in the terms of reference for this Review. Most of the other 15 pro-moratorium submissions suggest the GM crop moratorium adds a premium to the price of non-GM food produced in the state and/or greater access to domestic and foreign markets. Those submissions indicate there is awareness and appreciation of South Australia's moratorium by at least one trading partner (Japan) and by several food processing businesses operating in South Australia. However, no evidence is provided in those submissions that would support a view that any current price premium or market access for non-GM South Australian crops would be diminished if GM food crops were allowed to be grown in the state on condition of segregation (apart from one qualified exception mentioned in the next sub-section).

Finding 2.1: There is awareness and appreciation of South Australia's GM food crop moratorium by at least one foreign firm (in Japan) and by several food processing businesses operating in South Australia.

2.2 Favours partial removal of the moratorium

Eight nuanced submissions claim there are both pros and cons associated with this issue. The strongest ones in terms of providing evidence have to do with Kangaroo Island. Those submissions claim that the island's GM-free status has enabled access to a lucrative GM-free market segment in Japan. They further claim that if the rest of South Australia were to allow GM food crop production, the island would be able to retain access to that high-priced market provided it remained a GM-free zone within South Australia and continued to employ its strict segregation regime in getting grain from the island to Port Adelaide and onward to Japan.

Finding 2.2: If GM food crop production were to be allowed in the rest of South Australia, Kangaroo Island would be able to preserve its unique identity so as to retain access to Japan's high-priced market for GM-free grain provided the island remained a GM-free zone.

Other nuanced submissions focused on a region or an industry. One that came from the Adelaide Hills states that its producers' clean, green image has been enhanced by the South Australia's current non-GM status, but some of its producers (e.g., apple and pear growers) also realize they could benefit from future GM crop varieties that were more resilient to climate change or that required fewer chemicals. A similar nuanced submission came from a wine industry organization: it believes the image of South Australian wine is enhanced by the state's non-GM status, while also recognizing that the heavy dependence of most of its grapegrowers on chemical sprays might be able to be reduced in future by the adoption of GM varieties yet to be developed. Neither of these submissions placed a monetary value on the perceived benefit of (a) prospective GM fruit tree or vine varieties or (b) the state's current non-GM status as compared with a situation in which GM food crops are allowed to coexist via segregation and identity preservation.

economics field. Trust is an important factor driving consumer acceptance of new technologies and uptake of information. However, media coverage adheres to its own incentives, triggering heuristic uptake of information and influencing benefit-risk perception. Other factors such as cultural cognitions and worldviews can go a long way in explaining consumers' disparate assessments of new food technologies; individualistic and hierarchical worldviews focus more on benefits, whereas egalitarian ones favour a concentration on risks.

2.3 Favouring full removal of the moratorium

Most of the 39 submissions favouring the removal of the current moratorium on GM crop production and transport in the state have a common set of claims, and many provide evidence to support them. Many also request an immediate policy change rather than one that is phased in, given the positive experiences following reform in the other mainland states a decade ago and the protocols and practices that have established and proven over that period.

Six of the strongest ‘removal’ submissions are from key South Australian organizations representing most of South Australia’s 9400 farm businesses. They include the following: Grain Producers SA (the peak industry body representing around 3000 grain farmers), Livestock SA (the peak industry body representing around 3500 graziers), SA Dairy Farmers (the peak industry body representing around 800 dairy farmers and another 800 in closely associated businesses), Primary Producers SA (an umbrella organization including the Horticultural Coalition of SA and the SA Wine Grape Growers Association in addition to the just-mentioned bodies covering grain, livestock and dairy producers), the Crop Science Society of SA (representing around 400 members from rural and metropolitan regions of the state), and the SA Independent Agricultural Consultants Group (13 firms that together provide management advice to many hundreds of SA farm businesses).

Finding 2.3: The majority of submissions, including those from organizations representing most of South Australia’s farmers, favour the immediate removal of South Australia’s moratorium on GM crop production and transport.

A number of submissions also stress the importance of the state government automatically adopting into law any future amendments to Commonwealth legislation on gene technology, and avoiding duplicating the efforts of the federal bodies authorised and equipped to test the environmental, health and safety attributes of each new GM crop application. Some also emphasize that having common national and state legislation in this area reduces the uncertainty that hampers investment in GM crop and related agricultural biotech R&D. Several submissions stress that, because the GM moratorium has restricted research-to-market pathways, fewer research dollars, scientists and post-graduate students have been coming to (or have remained in) South Australia.

Finding 2.4: Bringing South Australian legislation into line with other mainland states and the Commonwealth will benefit the state by attracting/retaining research dollars, scientists and post-graduate students in South Australia.

Since many of the claims in the submissions of those favouring the removal of the moratorium contradict those in the pro-moratorium submissions (including the campaign submissions duplicated from dogooder.co), the next section evaluates them in the light of available evidence.

3

Key issues with GM food crops, as raised in submissions

The key claim within this Review's terms of reference of those in favour of retaining South Australia's moratorium on GM crop production and transport is that the current policy provides greater market access and/or price premiums for South Australian crop products and processed foods. This claim is addressed in Section 3.1.

An associated claim is that markets for non-GM and organic food are growing more rapidly than markets for GM food and feed products. Most of those claimants ignore or downplay the role of segregation and identity preservation protocols and codes of practice aimed at ensuring that GM and non-GM food crops can profitably coexist in a region, a claim made by many of those arguing for the moratorium to be removed. This claim and counter-claim are addressed in Section 3.2.

Ignored by most of the pro-moratorium submissions is the claim by some seeking its removal that investment in agricultural R&D and thus farm productivity in South Australia would have been, and in future would be, greater without the moratorium. Since this affects the potential for new GM varieties of relevance to South Australian farmers to come on stream by 2025 (one of this Review's terms of reference), this claim is addressed in Section 3.3.

Many pro-moratorium submissions, including all the dogooder.co duplicated campaign letters, claim that there are fewer environmental costs, and in particular there is less chemical use, on South Australian farms because the moratorium has been in place than there would be without it. Many of those favouring removal of the moratorium make the opposite claim, while acknowledging the importance of ensuring weeds do not become resistant to particular herbicides. These conflicting views are examined in Section 3.4.

Some submissions raise questions about liabilities in the case of unintended presence of GM content in non-GM crops or their products, and how any such disputes would be resolved. These issues are examined in Section 3.5.

3.1 Market access and price premiums

The Review's terms of reference ask for evidence on the market benefits of South Australia's GM crop moratorium for non-GM crops. These could be in the form of greater access to, or a premium price for, non-GM crop products and processed foods and beverages, relative to what would prevail in the presence of GM food crop production in South Australia.

Since this state, and the rest of Australia, exports about three-quarters of its farm production, including canola, the conditions in those markets abroad are what matter most for both non-GM and GM farm products from South Australia. Indeed being a small supplier to international markets, prices for its exports in those markets will be reflected closely in prices in the domestic market.

The only evidence in submissions on market access is presented by both the Japanese buyers and the South Australian sellers of Kangaroo Island Pure Grain. They make it clear that access to that high-priced market in Japan is strictly conditional on such grain being not

just non-GM (which has a small tolerance for GM presence) but entirely GM-free. However, Kangaroo Island Pure Grain also make it clear that it can deliver GM-free grain to that market even if the crop moratorium were to be removed for mainland South Australia. That is supported by its homepage, which says:

“Kangaroo Island Pure Grain specialises in the production of premium quality grains. Our grain is completely free of any genetically modified content. We grow our products on Kangaroo Island, ... , land internationally renowned as one of the most pristine natural environments in the world. All our grain is fully traceable back to the individual farm. We provide a full service from the management of growing our grain, through harvest, to cleaning, storage and shipping to ensure our product arrives at destination in premium condition. We offer grain testing and independent certification on request.” (www.kipuregrain.com, accessed 23 November 2018)

In the absence of much other hard evidence in submissions, further empirical evidence on market access was assembled for this Review by looking at the bilateral trade pattern of Australia’s canola exports, particularly to the European Union (EU). The EU has some of the strictest regulations regarding genetically modified imports and labelling, even though more than 50 GM crops are approved for use in the EU as food and feed (see http://ec.europa.eu/food/dyna/gm_register/index_en.cfm). Those export data do not support the view that South Australia is able to export more easily to markets that seek to remain GM-free. During 2012-17, the shares of canola exports to the EU from the two main exporting states, Western Australia and New South Wales, were only 1 and 3 percentage points lower than South Australia’s average of 72% (Table 1).¹² In Table 2, which provides a more-detailed picture of the destination of South Australia’s canola exports, it is clear that during the most-recent two years, the four biggest markets have been European Union countries, with Japan in fifth place. Evidently, segregation and identity preservation are sufficiently robust that the EU does not discriminate between Australian states in sourcing non-GM canola.

Finding 3.1: Data on canola exports from Australian states to the European Union do not support the view that South Australians enjoy better access in EU non-GM grain markets.

Table 1: Shares of volume of canola exports destined to the European Union from Australia and its main canola-exporting States, 2012 to 2017 (% of state total)

	2012	2013	2014	2015	2016	2017	6-yr av	% of Aust exports
AUSTRALIA	84	54	47	43	91	86	69	100
WA	87	61	58	44	92	82	71	44
NSW	83	83	27	34	91	97	69	29
Vic	75	34	31	30	76	90	56	17
SA	94	46	42	64	96	89	72	10

Source: Global Trade Atlas, compiled by PIRSA in October 2018.

¹² Similar evidence is provided in Whitelaw, Dalglish and Agar (2018, p. 10).

Table 2: Value of canola exports from South Australia and Australia, 2012 to 2017 (A\$million)

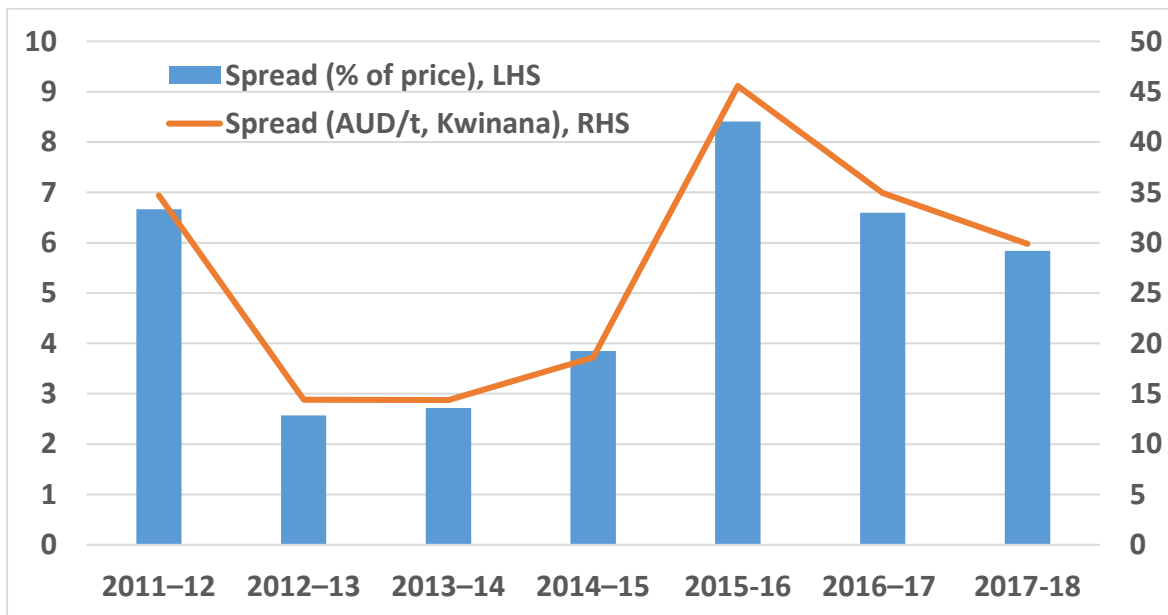
	2012	2013	2014	2015	2016	2017
South Australia						
Bangladesh	0.0	9.7	0.0	0.8	0.0	0.0
Belgium	125.9	68.7	69.6	102.3	37.9	78.0
Canada	0.5	2.0	2.5	2.1	2.5	1.3
China	0.1	0.0	95.2	0.0	0.5	1.1
France	0.0	0.0	17.7	12.3	32.1	32.3
Germany	17.2	0.0	33.9	0.0	56.8	77.8
Indonesia	0.0	0.1	0.0	0.0	0.0	0.0
Japan	15.7	32.4	52.5	33.1	6.7	23.2
Korea, South	0.0	0.0	0.4	0.0	0.0	0.0
Malaysia	0.0	1.6	0.8	0.0	0.0	0.5
Netherlands	49.0	30.0	0.0	0.0	21.3	0.0
New Zealand	0.0	0.0	0.0	0.1	0.1	0.0
Pakistan	0.0	33.6	0.0	0.0	0.3	0.0
Taiwan	0.0	0.0	0.0	0.1	0.1	0.0
UAE	0.0	48.7	24.5	32.9	0.0	0.0
United States	0.0	0.0	0.0	0.4	0.0	0.0
Vietnam	0.2	0.2	3.8	0.3	0.0	0.0
TOTAL	209	227	301	185	158	214
AUSTRALIA	1600	2371	2217	1631	1406	2445
<i>SA % of Aust</i>	<i>13.0</i>	<i>9.6</i>	<i>13.6</i>	<i>11.3</i>	<i>11.3</i>	<i>8.8</i>

Source: Compiled by PIRSA, October 2018.

There is evidence in Australia that non-GM canola receives a premium price over that for GM canola varieties currently available. During the first three years of GM canola adoption in New South Wales and Victoria, for example, non-GM grain was offered a premium of \$10-15/tonne (around 2%) above that for GM grain, according to a survey of 512 canola farmers (Hudson and Richards 2013). A more-recent price compilation by Whitelaw (2018) suggests that premium averaged \$32/tonne or 6% during 2011/12 to 2017/18, based on sales of both types of canola at Kwinana in Western Australia in the busiest three trading months (Figure 7).

Further evidence of a non-GM price premium was assembled for this Review by looking at export prices for canola from both Canada (which is GM because Canada does not segregate) and Australia (which presumably is non-GM to that market). Over the period 2010-17, the Australian export price of canola averaged 4.0% higher than Canada's. This was checked by calculating Japan's average price of canola imports from those two source countries over the same eight years: again the Australian price averaged 4% above that of GM canola from Canada (COMTRADE 2018).

Figure 7: Difference between the prices of GM and non-GM canola at Kwinana, Western Australia, 2011-12 to 2017-18 (\$/tonne November-January, and % of average price per tonne delivered to Melbourne)



Sources: Average monthly spread (for November-January) is from monthly data provided by Whitelaw (2018); average annual price delivered to Melbourne is from ABARES (2018).

Also pertinent for this Review is whether South Australia's other crop products receive a price premium for being produced in a non-GM state. The only evidence provided in submissions on the extent of any price premiums for non-GM crop products from South Australia was already in the public domain (Whitelaw, Dalgleish and Agar 2018). That study found average prices of key crop products received by farmers on delivery to the main port in South Australia were no higher than those received by farmers at their main port in Victoria or Western Australia; if anything, they found grain prices in South Australia to be slightly lower and to have declined since 2012 relative to those in states where GM crops are allowed (Figure 8).

Finding 3.2: The only data provided in submissions on prices of grain in South Australia versus grain in neighbouring states suggest that since 2012 there has been no premium for grain from South Australia despite it being the only mainland state with a GM crop moratorium.

Even if a price premium had been found for grain from non-GM South Australia, one would need to ask whether such a price premium would continue in the absence of the GM crop moratorium. That would depend on how effective the segregation process would be if the moratorium were to be dropped (see next sub-section).

A related issue is whether food processors in South Australia or elsewhere benefit from accessing the state's non-GM crops. A recent study commissioned by PIRSA (GFAR 2016) surveyed Australian food companies that currently have non-GMO or GM-free claims on their labels. That study found that, of the 20 South Australian firms examined, nine had non-GM claims on their labels. It also found that few Australian food businesses were aware

of export market opportunities in non-GMO foods. It suggested that was most likely because Australian consumers are not currently asking for transparency through labelling. They found the firms most aware of and responding to future opportunities were producers of biodynamic dairy products, carob products and specialty flours and pre-mixes.

Figure 8: Difference between grain prices received by farmers on delivery to main port in South Australia and those in Victoria and Western Australia, 2012 to 2017 (%)

(a) Wheat

Figure 9: Percentage premium or discount in APW price to Adelaide from Geelong



Figure 10: Percentage premium or discount in APW price to Adelaide from Kwinana

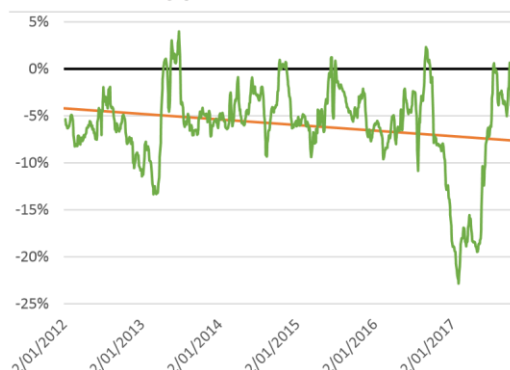


(b) Barley

Figure 15: Percentage premium or discount in F1 Barley price to Adelaide from Geelong



Figure 16: Percentage premium or discount in F1 Barley price to Adelaide from Kwinana

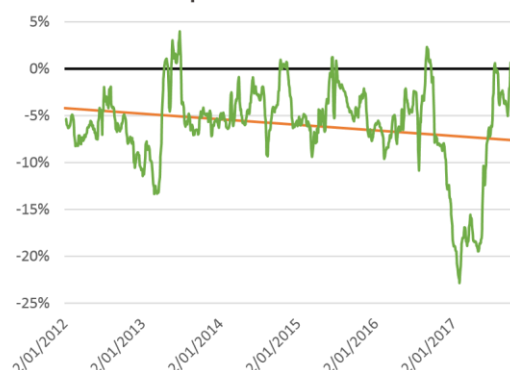


(c) Canola

Figure 21: Percentage premium or discount in Canola price to Adelaide from Geelong



Figure 22: Percentage premium or discount in Canola price to Adelaide from Kwinana



Source: Whitelaw, Dalgleish and Agar (2018).

3.2 Segregation, identity preservation and coexistence

The presence of both GM and non-GM crops in a region introduces the possibility that unwanted GM material could be found in non-GM produce, or vice versa. This could occur in the field, during transport, or when produce is being processed at receiving sites. The *Genetically Modified Crops Management Act 2004*, which gave effect to the South Australian Government's commitment to regulate the cultivation of genetically modified crops in South Australia to protect the State's markets, reflects a somewhat stricter recommendation of the South Australian House of Assembly Select Committee on Genetically Modified Organisms. The Committee recommended that the commercial release of GM crops into South Australian agriculture only be permitted when "coexistence to meet market demands for different classes of crops and products, e.g. GM free, non-GM and GM, can be guaranteed by industry through the establishment of rigorous and cost-effective segregation and identity preservation systems throughout the total production and supply chain." (SA Genetically Modified Crop Advisory Committee 2007).

Cross-contamination that results in an uncompensated loss of marketing advantages is sometimes referred to as a market failure. A key initial question is the extent to which such negative spillovers are effectively managed through market forces, and whether the costs of any residual uncompensated spillovers outweigh the net benefits of allowing the adoption of OGTR-approved GM crop varieties.

A 2007 report on potential impacts of GM canola production on organic farming in Australia concluded that, if GM canola was commercialised in Australia, the direct impacts on organic canola production in Australia most likely would be negligible, the introduction of GM canola would have minimal impact on the organic livestock industry, and the impact on organic honey production would be minimal (Apted and Mazur 2007).¹³

A survey of growers of both GM and non-GM canola even during 2008-10, in the earliest seasons involving GM adoption in New South Wales and Victoria, found that the worst fears relating to coexistence did not materialize: 88% of respondents said they had not received any complaints relating to their growing or transporting of GM canola, and nor had the issue affected their decision as to whether or not to grow GM canola (Hudson and Richards 2014b, p. 10).

That finding, foreshadowed by AOF (2007), is consistent with a series of annual reports on the status of the market for Australian canola, by AOF/GTA (2009, 2010, 2011), and with a report by Alcock (2015).

A subsequent independent impact assessment of GM canola production in New South Wales, Victoria and Western Australia during 2008-12 concluded that "After more than five years of extensive studies, Roundup Ready® (RR) genetically modified (GM) canola has been found to present no greater environmental or agronomic risks than conventional varieties. The movement of the GM trait via pollen declined rapidly with distance and was less than 0.03% at 100m from the source crop. GM canola is not responsible for significantly increased resistance in glyphosate in annual ryegrass or wild radish and does not have greater persistence or weediness in crops, roadsides and natural habitats than non-GM types." (GRDC 2015).

These findings vindicated the work done prior to the approval of GM crop production in those states to establish segregation and identity preservation protocols and codes of

¹³ Keep in mind that while the organics market has been growing rapidly (GFAR 2016), in 2017 it was no more than 0.7% of the value of Australia's conventional grains production and 0.3% of livestock fodder and feedstuffs (Lawson et al. 2018, p. 29). Globally, organics comprise just 1% of all agricultural land use (Meemken and Qaim 2018).

practice aimed at ensuring that GM and non-GM crops can coexist in a region.¹⁴ For example, Single Vision Grains Australia (2007a, 2007b) reports that the industry was ready from 2008 to manage GM and non-GM canola within the supply chain to deliver grain to meet customer specifications. It has set up a quality assurance process along the entire supply chain including verification (e.g. sampling and testing) when needed to verify that the integrity of the processes from planting seed through to grain presented for sale accords with customer specifications and government regulations at home and abroad (as outlined in, e.g., Mewett et al. 2008). In accordance with quality assurance requirements, compliance with the systems is capable of being verified by appropriate document reviews and references to standards held by relevant sectors of the industry. The principles and processes have been taken up and managed by the Australian Oilseeds Federation, which maintains and oversees the delivery of market requirements for domestic and export trade.

A submission from Western Australia reinforces the point that the supply chain manages the segregation of different crops efficiently and effectively (see also McCawley, Davies and Wyntje 2018). There the Co-operative Bulk Handling (CBH) Group is responsible for handling 90% of all grain along the state's supply chain, and has successfully segregated GM and non-GM canola to internationally acceptable levels such that there have been no contamination issues since the GM crop's introduction in 2010. Grains are segregated into groupings based on grain type, which include but are not limited to wheat, barley, oats, lupins, non-GM canola, chickpeas, and field peas. Beyond these grain type segregations, there are numerous quality segregations (15 wheat grades; 13 barley grades; four canola grades). The tolerance level, known as the Low Level Presence (LLP) value, has never been exceeded by the CBH Group.¹⁵ This capacity of the post-farmgate grain handling part of the value chain to effectively segregate GM and non-GM canola is not surprising, because varietal segregation has been a normal part of bulk grain transport and storage for decades in Australia (ESCOSA 2017; White, Carter and Kingwell 2018) and most grain-exporting, high-income countries (Kalaitzandonakes et al. 2016).

Finding 3.3: The experience of GM canola production and marketing in other mainland stages over the past decade reveals that segregation and identity preservation protocols and practice codes can and do ensure the successful coexistence of GM and non-GM crops in Australia.

¹⁴ This issue does not arise in Canada, where there is no segregation of GM and non-GM canola, because virtually all of the crop is GM (as is also the case for cotton in Australia).

¹⁵ The European Union, for example, has an LLP of 0.9% for canola. If an unintended LLP of GM canola is detected, each of the load samples that comprise the composite site sample are then tested individually in order to identify the source and location of the unintended LLP of GM canola in the non-GM stock. If testing confirms at any of those stages that a load of non-GM canola contains GM canola above the unintended LLP limit, CBH notifies the relevant grower to ensure they can investigate their relevant farm management practices. Loads that exceed the tolerance for GM canola are extremely rare (0.04% over the past five harvests). Further testing occurs when the grain is transported and received at the port. A sample is taken for every 500 tonnes received at the port and tested for the unintended presence of GM canola. If the test indicates the presence of GM canola, the grain is further tested to determine the quantitative levels of GM canola. If found to be above the tolerance for unintended low-level presence of GM canola, the grain is isolated and, if required, regraded (CBH Group 2018). There are several independent firms whose non-GM certification standard is recognised and accepted globally (see, e.g., <http://gmoid.com.au/> and <https://www.sgs.com.au/en-gb/agriculture-food/food/food-certification/non-gmo-certification>).

3.3 Extent of investment in agricultural R&D

The rates of return to agricultural R&D are very high in most countries, suggesting substantial under-investment in this source of economic growth (Hurley, Rao and Pardey 2014; Hurley et al. 2016; Fuglie 2018). A rise in the private sector's share of investment in global agricultural R&D has helped to reduce the degree of underinvestment (Pardey et al. 2016, 2018), thanks largely to the agricultural biotech revolution. This means that the incentives for attracting such private investment matter more now than in the past.

While ever there is a moratorium on GM food crop production, there is no local path to market for research aimed at developing new varieties suited to that jurisdiction. Without a path to market, even public research funders such as the Grains Research and Development Corporation are disinclined to invest in pre-commercial research. Thus an important consequence of South Australia's GM crop moratorium has been not only the withdrawal of private R&D investment by life science companies but also less public sector funding for the state's research institutions. Public funds for crop biotech research have instead been directed to those states without a GM moratorium.

A further disincentive to invest in biotech research in South Australia is the state-based regulatory process that approves GM field trials. This adds an additional cost and further delays to the development of new GM varieties over and above those required to get OGTR approval.

Yet another adverse impact of the moratorium on research is the signal it sends to young scientists: those interested in a career in frontier biotech research are more likely to move elsewhere or not come to South Australia when there are less-constrained research environments interstate and overseas.

With less dollars being spent on R&D and fewer scientists working at the technological frontier in South Australia, there is less "spill-in" to the state from the outcomes of R&D investments interstate and abroad that could be readily adapted for the local environment. This foregone benefit is difficult to measure, but the magnitude of "spill-ins" has been shown to be non-trivial in the past (Fuglie 2018).

Evidence of the growth in crop biotech research investments in the states that removed their GM moratorium a decade ago was provided in a number of submissions to this Review. For example, in 2014 Bayer CropScience opened a \$14 million state-of-the-art wheat and oilseeds breeding centre at Longerenong in the Wimmera region of Victoria; and Nuseed recently invested \$7 million expanding their research and development capabilities in Horsham. Such investments have been supplemented by the public sector too: the Victorian government has invested in glasshouse facilities and high-tech field-based plant assessment capabilities (phenomics) in Hamilton and Horsham, infrastructure that is supported by the \$288 million Centre for AgriBioscience at La Trobe University (a public-private partnership). Meanwhile, funding has shrunk at the University of Adelaide-hosted Australian Centre for Plant Functional Genomics.

Finding 3.4: The persistence of a GM crop moratorium in South Australia, especially in the face of the removal of moratoria a decade ago in neighbouring states, has discouraged both public and private agricultural R&D investments in this state.

3.4 Farm chemical use and herbicide resistance in weed populations

Many of the pro-moratorium submissions, including the duplicated campaign letter via <https://dogooder.co>, claim that there are fewer environmental costs, and in particular there is

less chemical use, on South Australian farms with the moratorium than would be the case without it. Those favouring its removal have a contrary view, even though they acknowledge the importance of ensuring weeds do not become resistant to particular herbicides used by GM and non-GM crop growers.

The reality is that growers of GM crops tend to use less farm chemicals overall than do producers of conventional crop varieties using no-till agriculture. A lower use of herbicide – especially glyphosate – is important following the widespread adoption of no-till cropping, because there is a risk of weeds becoming tolerant to such chemicals. To lower that risk of glyphosate resistance in key weeds, GM growers are advised to alternate Roundup Ready canola with other canola cultivars attuned to herbicide components other than glyphosate, as part of a comprehensive herbicide resistance management framework. That practice is well developed in Canada, where farmers rotate the use of two GM varieties so that only half as much of each herbicide is used on GM crops per two rotations (Kingwell 2011, p.5; Smyth et al. 2011a,b).

Finding 3.5: The adoption of GM crops typically leads to less, not more, use of farm chemicals, and the risk of herbicide resistance in key weeds can be reduced by rotating between different GM crop varieties.

3.5 Liabilities and dispute resolution

Some attention in the GM debate has focused on the issue of liability relating to the presence of GM content in non-GM crops, even though the use of legal remedies by grain farmers or the grains industry has been rare. Farmers and post-farm grain handlers in states without a GM moratorium have managed to avoid such spillovers by adopting the carefully planned protocols and codes of practice developed and fine-tuned over the past dozen years. In the few cases where spillovers have occurred, farmers have resolved issues typically by talking with their affected neighbours. Failing that, there is the ability of those damaged to seek redress through mediation and the courts if necessary, drawing on common law and existing statutes. The Australian Government has considered the matter, and has chosen not to implement a special liability regime for damage caused by GMOs. This approach is consistent with the approaches adopted in comparator countries, including the United Kingdom, Canada and the United States (Burrell 2006).¹⁶

¹⁶ Even so, an inquiry is currently under way into mechanisms for compensation for economic loss to farmers in Western Australia caused by contamination by GM material, by the Environment and Public Affairs Committee of the Legislative Council of Western Australia's Parliament. See [http://www.parliament.wa.gov.au/parliament/commit.nsf/\(\\$all\)/CA81A38C140AF895482581EE0081A3CC?op=endocument](http://www.parliament.wa.gov.au/parliament/commit.nsf/($all)/CA81A38C140AF895482581EE0081A3CC?op=endocument). One group, in their submission to this review and others (www.geneethids.org), proposes that non-GM farmer protection legislation be introduced to ensure non-GM farmers are fully compensated for any and all forms of contamination from GMOs. A classic key problem with such a proposal, as with a contrary one suggesting would-be GM farmers be compensated by society for being denied access to GM technology, is moral hazard.

4

Economic impacts of South Australia's GM moratorium and alternatives

There is a vast literature on the economics of GM adoption, including on measurement of its economic and environmental impacts. This section first provides a brief summary of recent empirical findings globally and for Australia. Standard methodology is then used to estimate key direct economic effects of South Australia's moratorium on the state's canola production historically to 2018, and of retaining the moratorium to 2025. The section concludes by pointing to additional benefits and costs not taken into account in those studies, which are more difficult or impossible to quantify but need to be kept in mind when evaluating the possible impacts of a change in GM policy.

4.1 Background: economic and environmental impacts of GM adoption globally

The adoption of GM crop varieties since the mid-1990s has had a significant impact on the world's agricultural and food production. To repeat this report's opening sentences, by 2017 (following two decades of gradual adoption) there were 190 million hectares of cropland (13% of the world's total) sown to GM varieties in 24 countries (Appendix 1), a little over half of it being in developing countries. A further 43 countries, including Australia, import GM products. In 2017 GM varieties accounted for 77% of the global area sown to soybean, 80% of maize, 32% of cotton and 30% of canola (ISAAA 2017, p. 3).

In those countries in which farmers have been permitted to grow GM crops, most growers embraced this biotechnology rapidly because it raises their net incomes, is having positive agronomic, environmental and health impacts (less tillage, less chemicals), and is providing more-effective weed control.

The most widely cited meta-analysis of 147 empirical studies around the world found that switching to GM varieties had reduced chemical pesticide use on average by 37%, raised crop yields by an average of 22%, and boosted farmers' net profits by 68% (Klümper and Qaim 2014).

In their latest annual global survey, Brookes and Barfoot (2018a) estimate that the net economic benefits at the farm level amounted to US\$186 billion in nominal terms during 1996-2016, with two-thirds of those gains coming from gains in yields and the remainder from cost savings. Through yield increases, those GM varieties have added the following to global production over that 21-year period: 405 million tonnes of maize, 213 million of soybeans, 27 million of cotton and 12 million of canola.

Moreover, the adoption of GM insect resistant and herbicide tolerant biotechnology has reduced pesticide spraying by 8% and, as a result, has decreased the adverse environmental impact associated with pesticide use on these crops by one-sixth. GM technology has also facilitated desirable tillage changes and cuts in fuel use. This has lowered the release of greenhouse gas emissions from the GM cropping area by the equivalent to removing 17 million cars from the world's roads (Brookes and Barfoot 2018b).

The case of GM canola in Canada is close to current South Australian interests. A survey of farmer views on its economics was undertaken a decade after its initial adoption. Among the results, compiled by Gusta et al. (2011), are that farmers found management of herbicide resistance in weeds, and efforts to control volunteer canola, if anything were easier with GM canola than with the conventional varieties they rapidly replaced. But more striking is the finding that there were multi-year spillover benefits from weed management in follow-on crops, which added to the direct benefits in the canola growing part of each farmer's multi-year crop rotation.

4.2 Economic and environmental impacts of GM adoption in Australia to date

Following the approval of GM cotton production in Australia in 1996, pesticide use in the cotton industry has fallen (by 90% in the case of insecticides), as have labour and fuel usage, so costs are lower and soils are less disrupted. Moreover, cotton output has more than doubled, with GM varieties accounting for virtually all of Australia's cotton area in the past few years (Cotton Australia 2018 and Figure 5(c) in Section 1 above). Now 95 per cent of the GM cotton varieties used in Australia are stacked traits for insect resistance and herbicide tolerance. The cumulative cash benefits of GM varieties to cotton farmers in Australia (net of the technology access fee) have amounted to an estimated US\$1.1 billion in nominal terms during 1996-2016 (Brookes and Barfoot 2018a). Since the nominal value of Australia's cotton production over those 21 years sums to US\$22.1 billion (based on data converted at average annual official exchange rates), that is equivalent to a 5% boost to growers' value of production, over and above the boost in their wealth (a rise in the value of cotton land) and in the quality of their environment and health due to the huge reduction in farm chemical use.

Canola is the only other GM crop so far permitted to be grown in Australia (apart from GM blue carnation and rose flowers and, since 27 June 2018, GM safflower). The canola permission was granted by OGTR during 2003, in time for planting from 2004. However, moratoria were introduced in all the states that could grow canola profitably such that adoption was delayed. Following demonstration trial plots a year earlier, the first unrestricted commercial plantings were in New South Wales and Victoria in 2009 and in Western Australia in 2010.

A review of the moratorium on GM canola in Victoria (Nossal, Forster and Curnow 2007) included an Appendix summarizing an ex ante cost-benefit analysis prepared for the Australian Government by ACIL Tasman (2007). That analysis suggested very large potential gains from removing the moratorium. However, some of its key assumptions turned out to be rather optimistic. Most notable were yield/ha increases of 20%, identical prices for GM and non-GM canola, no difference in the cost of getting the crop to a delivery point, and – most important of all – 80% adoption of GM varieties within eight years.

To date there has been a much slower uptake of GM canola varieties in Australia than was the case in Canada, following an initial interest in trying it out (see Figure 6 in Section 1). One reason is that Australia has had access to non-GM hybrid varieties (Clearview, and a Triazine-tolerant variety) that were developed partly because of the moratoria. Since they fit a no-till farming system too, they have reduced the current net economic and environmental benefits of switching to a GM canola variety, as compared with the net benefits that existed back in the mid-1990s in Canada. As well, prices have been slightly lower for GM than non-GM varieties, yields currently are not much above the best of non-GM varieties, the technology access fee for GM seed is considered high (even though the seeding rate and the cost of seed per hectare is lower for Roundup Ready canola), growers are wary of too much dependence on Roundup and so prefer not to plant Roundup Ready canola in every rotation,

and hence aggregate adoption rates have been much lower than anticipated by the benefit-cost analysis of ACIL Tasman (2007) that was drawn on by Nossal, Forster and Curnow (2007).

To gauge views of growers after three seasons of access to GM canola, the Grains Research and Development Corporation commissioned surveys in New South Wales and Victoria, covering 1,348 growers in those eastern states during 2008-10 (GRDC 2012). Both non-GM and GM growers were included in the surveys. The results have been comprehensively analysed by Hudson and Richards (2013, 2014a,b). Their findings cover agronomic and environmental impacts and coexistence issues in addition to economic impacts. Among their findings were the following:

- Fewer weed-control programs were adopted in GM canola than in non-GM canola;
- GM canola yields per hectare were not lower than those of non-GM canola;
- GM canola led to reduced use of ‘high-risk’ herbicides that develop herbicide resistance in weeds or leave residue in soils;
- GM canola growers were more likely to undertake conservation tillage practices;
- GM canola growers used less fuel due to fewer tractor passes over the paddock; and
- No coexistence concerns were evident for GM growers also growing non-GM canola or with their neighbours and the surrounding farming community.

However, GM canola involved higher average variable costs for weed control when the high technology access fee is included. That fee increased from 13% of variable weed-control costs in 2008 to 20% in 2010.

Those surveys also reveal other initial barriers to the uptake of GM canola varieties in New South Wales and Victoria. Hudson and Richards (2014b) list them as:

- A limited number of suitable GM cultivars with a range of maturity types being available in the first year (but concern fell from 36% to 18% by 2010 as the number of cultivars rose from 4 to 10);
- Wanting to see the experiences of other growers before adopting (decreased from 26% in 2008 to 5% in 2010);
- Concern that herbicide resistance in weeds would increase (it worried 15% of respondents);
- Lack of access to sellers of GM seed/technology (decreased from 25% in 2008 to 4% in 2010);
- The need for more and nearer sites to deliver the harvested product, to lower freight costs and raise competition among buyers of GM grain;
- A lower price for GM than non-GM canola; and
- High technology access fees that extracted much of the economic benefit of the technology.

In short, Hudson and Richards (2014b) conclude that the major barrier to early adoption of GM canola in New South Wales and Victoria was the perceived lack of economic value compared with available non-GM varieties. Looking forward, they believe that unless more-profitable GM varieties appear or the technology access fee is lowered, many growers will sow both GM and non-GM canola and reserve the Roundup Ready variety just for paddocks needing greater levels of weed control.

Western Australia has had a somewhat faster rate of adoption of GM canola. This is despite the Marsh vs Baxter court case that ran for five years before concluding in March 2015.¹⁷ The faster adoption speed in Western Australia may have been partly because GM canola provided better weed management outcomes in their settings than in the eastern states where weed problems are not as severe. It could also have been encouraged by the thorough

¹⁷ See, eg, Supreme Court of WA (2014, 2015) and http://www.appropedia.org/Marsh_v_Baxter

trials program of 2009, which demonstrated the agronomic viability of the Roundup Ready GM technology under Western Australian conditions. Overall, Western Australian GM canola growers reported that it was worth adopting the additional protocols and practices, not least to ensure effective segregation so that the technology was acceptable to non-GM growers (McCauley, Davies and Wytjje 2012).

4.3 Direct economic impacts on canola of relaxing South Australia's GM moratorium

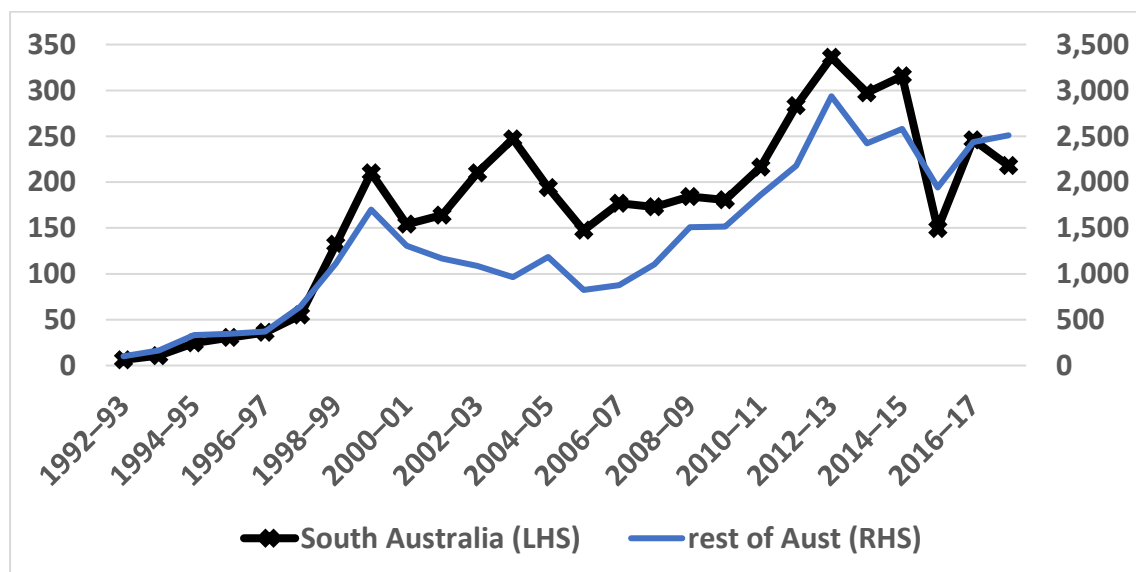
GM technology will have different impacts on farm businesses depending on their agronomic and climatic circumstances and their management expertise, as well as the traits of the GM varieties available each season. As with any new technology, farm managers may well use the technology in ways not currently anticipated, and modify farming systems to optimise the benefits of new traits as and when they become available and are judged to be worth trying.

Both the evolutionary nature of technologies, and the farming systems in which they are embedded, are complex. Estimating the likely economic impacts of a new technology therefore necessarily requires numerous assumptions about which there are varying degrees of uncertainty. However, the task of estimating just the main *direct economic effects* involves simply comparing costs and benefits of farming under the new technology with those associated with current practice in South Australia (the 'counterfactual' scenario). Hence attention can focus on just those costs and benefits that would differ by switching to growing a GM variety.

Since canola is the only food crop currently approved by the OGTR for growing in Australia (apart from safflower which so far is a very minor crop), this analysis considers just canola as it is the most-immediately relevant example. Discussion of the possibility that other GM crops may be approved in the future, as well as of (possibly even more important) *indirect economic effects* of removing the GM crop moratorium, is left to Section 4.4.

Canola is a relatively new crop in southern Australian farming systems, having emerged in the early 1990s. It expanded more rapidly in South Australia than in other states to the early 2000s, but the State's share of the national area has since fallen from one-quarter in 2003 to one-eleventh in 2017 (Figure 9).

Figure 9: Canola area, South Australian and rest of Australia, 1992-93 to 2017-18 ('000 ha)



Source: ABARES, *Australian Commodity Statistics*, various years.

The benefit-cost analysis to be undertaken here requires comparing gross margins of non-GM versus GM varieties. While this is a standard method, keep in mind that it underestimates the GM returns because it is not taking into account the impact of canola varietal choice on the profitability of other crops in the multi-year rotation and of other farming enterprises such as grazing (to be taken up qualitatively in the following Section 4.4).

The ‘counterfactual’ to be used as a comparator in this analysis is the gross margin for the variety that is currently most common in South Australia, namely triazine-tolerant (TT) canola, for which a gross margin spreadsheet for 2018 has been made publicly available by PIRSA (2018). TT canola typically has a slightly lower yield per hectare and lower oil content¹⁸ than Clearfield (the next-most popular non-GM variety) but also – like Roundup-Ready (RR) GM canola – it has slightly lower herbicide costs than Clearfield.

Studies of GM adoption elsewhere make clear that the variables likely to affect the comparison of gross margins most are the product price, crop yield per hectare, variable costs (most notably of chemicals and the technology access fee), and the speed and maximum rate of adoption of GM varieties. On the basis of numerous submissions to the Review, the analysis assumes that there would be no extra costs of segregation for either non-GM or GM growers if GM crops were allowed to be grown. The relative importance of it and various other assumptions are revealed below via sensitivity analysis.

Steps in the gross margin analysis

Capturing the direct economic effect of a new variety on the gross margin associated with canola production in South Australia requires the following several steps:

- Estimate the on-farm impacts on key variable costs and gross returns per hectare in 2018 of replacing the current TT canola variety with RR canola.
- Assume that the 2018 per-hectare gross margin difference prevails over both a retrospective period (2004-18) and a prospective period (2019-25), so as to estimate (a) the cost of having a moratorium in the state so far following OGTR approval in 2003, and (b) the cost of continuing the moratorium to its current end-year of 2025.
- Multiply the difference between the gross margins per hectare for GM and non-GM canola by the number of hectares that we assume would have gradually transferred to GM varieties each year over those two multi-year periods, to get an estimate of the total direct net benefit or cost to the state’s GM canola farmers of the moratorium. In this calculation, we assume conservatively that the state’s total area under canola in each period would not change if the moratorium was lifted.¹⁹ Since all values are in 2018 AUD, they are able to be added up to get a range of total estimates of the nominal dollar value of net farm income gain that adoption of the available biotechnology would have provided or could provide in the absence of South Australia’s GM crop moratorium.
- Calculate for each scenario the volume and value of South Australia’s GM and non-GM canola production in 2018 and 2025, and the revenue from the technology access fee (at least some of which might be re-invested in GM crop R&D in the state).
- Undertake some sensitivity analysis by looking at alternative yields per hectare, non-GM canola price premiums, GM adoption rates and plateaus, and additional segregation costs.

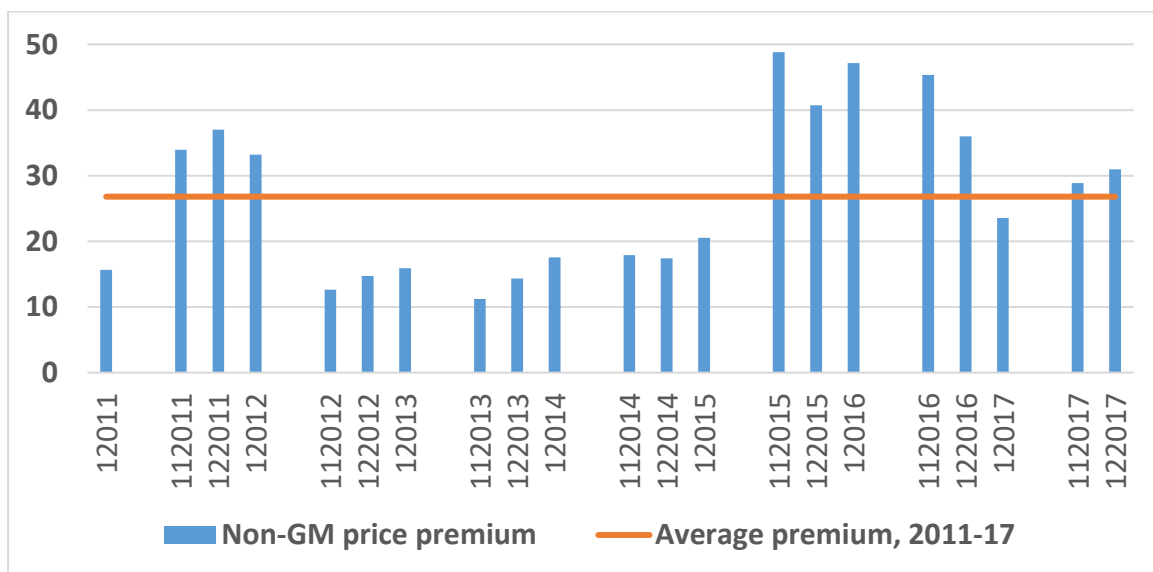
¹⁸ Oil content of seed matters because of bonification: there is a premium or discount of 0.15% of the price of canola for every 0.1% of oil above or below 42% (the oil content base rate).

¹⁹ Or equivalently, that any increase in the total area of canola is at the expense of other crops that would have generated (almost) as much net earnings.

Price of canola

The core scenarios assume the prices of GM and non-GM canola each year are unchanged over time, and that the price of (TT) non-GM canola, at \$526/tonne (the average price for non-GM canola in Australia over the seven seasons to 2017/18), is \$26 (5.2%) higher than the price of Roundup Ready (RR) GM canola each year. That \$26 premium is the simple average of two price spreads between non-GM and GM canola during that same 7-year period: the 5.4% one at Kwinana, Western Australia during the biggest selling months of November-January (Figure 10); and the 5.0% one between the prices of Australian (non-GM) and Canadian (GM) canola shipped to Japan.²⁰

Figure 10: Price spread between GM and non-GM canola, Kwinana, November-January, 2011 to 2017 (AUD/tonne)



Source: Whitelaw (2018), available also from www.profarmergrain.com.au

Yield per hectare

The yield per hectare of canola in Australia averaged almost 1.37 tonnes during 2011-17, when an average of 12% of the national area was under GM varieties. If the yield of non-GM canola was 10% lower than for RR canola, as it was for the five best RR and five best TT plots in Victoria's Wimmera region during 2013-17 (NVT 2018), then their respective yields would have averaged 1.35 and 1.50 tonnes, respectively.

For sensitivity analysis in the historical scenario, an alternative is to use South Australia's average yield of non-GM canola over the whole period from 2004, which is 1.20 tonnes, thereby doubling the gap between it and the current RR yield to 20%.

Variable costs

²⁰ Average of the spread in f.o.b. prices of exports from the two countries and the c.i.f. prices of Japan's imports from them, taken from the United Nations' COMTRADE database, accessed on 4 November 2018 at <https://comtrade.un.org/data/>.

RR seed costs about 16% more than TT seed, but only two-thirds as much RR seed is needed compared with TT seed (2kg/ha vs 3kg/ha). There is a technology access fee (TAF) that Monsanto has charged since 2012 on a per kg of RR seed basis. The TAF was \$6 in 2012 and it has risen gradually since then and was \$8/kg in 2018 (see <http://www.roundupreadycanola.com.au/where-to-buy-seed/technology-fee/>). Prior to 2012 the TAF had two components and was higher in aggregate and differed between states. Because it is unknown what the TAF would have been historically in South Australia without the moratorium, it is simply assumed the TAF is \$8/kg each year. All other costs per hectare are assumed to be the same (and taken from PIRSA 2018) except for weed control costs which, according to Biden, Smyth and Hudson (2018), averaged \$22.65/ha more for the non-GM than the GM crop.

GM adoption rate and ceiling

In New South Wales and Victoria, GM varieties currently account for about 10% of the total canola area, while in Western Australia their share had risen to 30% by 2015 (Figure 6 in Section 1). Industry participants expect that, with currently available varieties, South Australia would have a similar adoption rate to the eastern states, rather than to Western Australia where weed problems are more extreme. It is further assumed that the 10% adoption rate would be reached in five seasons, with each year adding the same one-fifth to the interim adoption rate (a linear progression). With a low adoption rate of 10%, it is likely that, as in Victoria, a smaller subset of delivery points in South Australia would accept GM than non-GM canola. Hence it is assumed freight to deliver the harvest to the receival point would be 50% greater per tonne for GM grain.

A new GM canola variety approved in 2018

For sensitivity analysis in the prospective scenario to 2025, a new GM canola variety, approved by the OGTR and FSANZ in February 2018 (and by USDA in August 2018), also is considered. This new canola variety is rich in long-chain omega-3 oil and so could be used as an ingredient in aquaculture feed and in human nutrition.²¹ A pair of alternative gross margins is therefore provided in which this GM variety (call it O3) is assumed to attract a higher price and thus a higher adoption rate and ceiling than RR canola (while having the same variable costs including the same technology access fee as for RR canola). With higher adoption, it is further assumed that more delivery points would accept GM canola, in which case the penalty freight cost would disappear. Two price scenarios are considered by way of example: one in which the price premium for non-GM canola disappears, and another in which a 5% price premium favours the omega-3 GM variety over the non-GM TT variety. It is further assumed that the GM adoption rate by year 5 reaches 20% in the first of those alternatives, and 30% in the second (higher-priced) O3 alternative.

Results

The results for the above GM adoption scenarios, should South Australia' GM crop moratorium be removed, are summarized in Tables 3 and 4. The differences between gross margins for the business-as-usual use of the TT variety and key alternative GM varieties are shown in the last two rows of Table 3.

²¹ <https://www.csiro.au/en/Research/AF/Areas/Plant-Science/Bio-based-oils/Omega-3-canola>.

Table 3: Differences in canola gross margins between non-GM and GM varieties, South Australia, 2018 (\$ per hectare)

	TT (non-GM)	RR (GM)	O3 (GM)	O3 (GM)
Assumed canola price (\$/t)	526.00	500.00	526.00	552.00
Assumed yield/hectare (tonnes)	1.35	1.50	1.50	1.50
GROSS INCOME/hectare	710.10	750.00	789.00	828.00
Assumed GM adoption rate max.		10%	20%	30%
VARIABLE COSTS THAT DIFFER:				
Seed	64.50	50.00	50.00	50.00
Technology access fee	0.00	16.00	16.00	16.00
Weed control	101.15	78.50	78.50	78.50
Freight to receival point	33.75	56.25	37.50	37.50
GRDC levy (1% of gross income)	<u>7.10</u>	<u>7.50</u>	<u>7.89</u>	<u>8.28</u>
TOTAL of variable costs that differ	206.50	208.25	189.91	190.28
Difference between GM and TT gross margins		38.15	95.51	134.12
or, if the yield gap is 20% instead of 10%:		112.51		

Source: Author's spreadsheet based on assumptions in text above.

Those estimates suggest there would be a small gain today of \$38/hectare by allowing the production of Roundup Ready canola, based on the current yield gap of 10% in favour of the GM crop and a price premium of 5.2% in favour of non-GM canola.

Were the omega-3 variety of GM canola to become available by the 2019 season (as the firm Nuseed suggests is possible, see <http://www.nuseed.com/au/innovation/omega-3>) and to attract a higher price, the estimated gross margin difference becomes considerably greater if the technology access is the same as for RR canola: it rises to about \$95/hectare if the O3 price were to match that for non-GM canola, and to \$134/hectare if O3 attracted a price premium of 5% (see penultimate row of Table 3). Even if the technology access fee for O3 was twice that for RR, that would lower those gross margin differences by just \$16/hectare. These comparisons illustrate the *sensitivity of the gross margin differences to price assumptions*.

Gross margin differences are also sensitive to assumptions about the gap in yields per hectare. The gap in yields between TT and RR canola in the Wimmera region of Victoria during 2013-17 was 10% (1.35 vs 1.50 tonnes). However, in South Australia the average yield for non-GM canola over the period since the moratorium was imposed in 2003 is just 1.20 tonnes/hectare, making the gap between it and RR 20%. When that is assumed (consider it an upper-bound estimate of the yield gap), the difference between the gross margins for TT and RR becomes \$113/hectare or three times the base case of \$38 shown at the bottom of column 2 in Table 3. These comparisons illustrate the *sensitivity of the gross margin differences to yield gap assumptions*.

What do these gross margin differences amount to in aggregate dollars for South Australia? The differences between GM and TT gross margins apply only to that fraction of the state's canola crop that would switch from a non-GM to a GM variety. With that fraction assumed to rise evenly over the first 5 years and then plateau, two sets of calculations are provided. The first is an historical one, involving estimates for the period 2004-18 of the cost of having a moratorium in the state so far following OGTR approval in 2003. The second set of calculations involves projections from 2019 to 2025, to estimate the canola farmers' net benefits foregone should the moratorium remain in place for that period, as currently legislated. In both cases it is assumed the per-hectare gross margin differences shown in

Table 3 prevail over both the retrospective period (2004-18, \$38/ha with a 10% yield gap or \$113/ha with a 20% yield gap) and the period ahead (2019-25, \$38/ha with a 10% yield gap). The average crop area of the state during 2004-16 is used in the historic case (225,000 ha/year), while the average for just 2011-16 is used in the prospective case (265,000 ha/year).

With these assumptions, and assuming conservatively that the GM technology does not add to the total area sown to canola in South Australia, the aggregate direct economic consequences of the moratorium for canola are summarized in Table 4, ignoring inflation and so expressed in 2018 AUD.²² The most-conservative analysis, assuming a lower price for GM canola, a lower yield gap (10%) and a low adoption rate (10% max.), suggests the state's farmers would have received \$11 million more revenue by 2018 from growing canola had the moratorium not been in place from 2004; and that they will forego another \$5 million during 2019-25 if the state's current moratorium is unchanged over that period. The historic estimate trebles to \$33 million when the more-realistic lower historical yield average is applied to non-GM canola to make a yield gap of 20%. This ***again shows the sensitivity of the estimated direct impact to the yield gap assumption.*** With just 10% of non-GM canola being displaced by GM canola, the total annual volume and value of South Australian production of canola in 2018 would each have been greater under this GM scenario, by 4-7 kt or \$1-3 million that year (see the first pair of rows of Table 4).

Table 4: Estimated direct economic consequences of the state GM crop moratorium on farm earnings from canola, 2004 to 2018 and 2019 to 2025 (\$m), and on the aggregate annual volume and value of GM and non-GM canola production in South Australia, 2018 or 2025 (kt and \$m)

	Extra farm receipts, full period (\$m)	Difference in volume of canola production, last year of period (2018 or 2025), kt/year			Difference in value of canola production, last year of period (2018 or 2025), \$million/year		
		GM	non-GM	Total	GM	non-GM	Total
<i>Historic (2004-18)</i>							
10% RR adoption, 10%yg ^a	11	34	-30	4	17	-16	1
10% RR adoption, 20%yg ^a	33	34	-27	7	17	-14	3
<i>Prospective (2019-25)</i>							
10% RR adoption, 10%yg ^a	5	40	-36	4	20	-19	1
20% O3 adoption	25	80	-72	8	42	-38	4
30% O3 adoption	53	119	-107	12	66	-56	10

^a yg refers to the yield gap between non-GM canola in South Australia historically since 2004 and the current RR yield.

Source: Author's spreadsheet, based on assumptions in text above.

That gain to farmers is net of the technology access fee paid to the producer of RR canola seed. Over the 2004-18 period the estimated TAF payment (at the assumed \$8/kg of GM seed and 2kg/ha) accumulates to (15 x 0.36 =) \$5.4 million, and during 2019-25 to (7 x 0.424 =) \$3 million plus \$424,000 per year thereafter.²³ In so far as a fraction of that \$8+

²² Discounting also is ignored. This is done because per tonne prices and costs vary though time and are unknown for future years, hence the use of representative numbers as of 2018. Were standard discounting to be applied, the negative net present value (NPV) of the moratorium's imposition to date would be greater; and so too would be the NVP of a continuation of the moratorium if its cost beyond 2025 indefinitely were to be included.

²³ Had the TAF been \$6 instead of \$8/kg of GM seed, the gross margin difference between GM and non-GM canola would have been \$4/hectare greater and the transfer from farmers to the life science corporation would

million TAF revenue is invested by the life science corporation into extra R&D in South Australia to provide even more suitable GM varieties in the future, it (plus any extra matching funding attracted from, e.g., GRDC) would be an additional gain to the state.

The prospective results depend heavily on not only the assumed price for GM canola and assumed yield gap but also on the associated speed and maximum extent of GM adoption. Now that a new more-profitable GM canola variety with Omega 3 is commercially available from 2019, the gains from removing the moratorium could be much larger by 2025 than if just the current RR variety of GM canola were to be available. For example, if the Omega 3 variety attracted the same price as non-GM canola, and if that led to 20% instead of just 10% GM adoption, the benefit to farmers over the next seven years would be \$25 million instead of \$5 million if they grew it rather than RR canola; and if the Omega 3 variety attracted a premium of 5% over non-GM canola and that led to a 30% GM adoption rate, farmers would be better off by \$53 million by 2025 (column 1 of Table 4). These increases are based on the higher gross margin differences associated with the O3 variety, shown in the final two columns of Table 3. These comparisons illustrate the *sensitivity of farm revenue to assumptions about new GM varieties' prices and production costs and the speed and extent of GM adoption*. That greater adoption also would lead to a larger volume (up from 4 kt to 8-12 kt) and value (up from \$1m to \$4-10m) of the state's annual canola production as of 2025 than if only 10% adoption of (RR) GM canola occurred (columns 4 and 7 of Table 4). Such high levels of oilseed production would increase the probability of a firm building an oil-crushing plant for the first time in South Australia, adding further to the economic gains to the state.

These and the earlier prospective estimates for the period from 2019 assume the technology access fee remains at the current \$8/kg of GM seed. If the fee were to be higher, the gain to GM-adopting farmers would be lower but the earnings of the producers of that new GM seed would be higher. For example, if the TAF doubled for Omega 3 canola seed and that constrained its maximum adoption rate to 20%, the cumulative gain to farmers during 2019-25 would drop from \$53m (with 30% adoption) or \$25m (with 20% adoption) to \$19m, while the life science firm's TAF revenue would rise from \$9m (with 30% adoption) to \$12m (despite an assumed drop in adoption to 20%).

These examples, showing the sensitivity of results to altered assumptions, provide a range of estimates of the past and prospective direct economic costs of the GM crop moratorium to South Australian canola farmers and revenue forgone for life science firms.

Finding 4.1: The cumulative cost to canola farmers of South Australia's GM crop moratorium is estimated to be up to \$33 million over 2004-18, and will be at least another \$5 million if the moratorium is kept until 2025 – and possibly much more if Omega 3 canola proves to be higher priced and more profitable than current Roundup Ready canola.

Finding 4.2: Gross revenue for the producers of GM canola seed would have been an estimated \$5.4m higher during 2004-18 without the SA crop moratorium, and \$3m higher during 2019-25 if the current technology access fee is unchanged – at least some of which would have been allocated to new crop R&D investments in South Australia.

Not captured in these calculations are the producer benefits in the crop rotation in the season following a GM canola crop, in the form of reduced weed control costs and increased

have been \$1.2 million less during 2004-18. The TAF would have to more than treble before the estimated gross margin for RR GM canola fell to that of non-GM canola.

cereal yields. Based on GRDC findings, PIRSA estimates they could amount to between \$12 and \$36 per hectare. Applied to an average of 265,000 hectares following each canola season, that adds an extra \$0.3-0.9 million to the annual benefits of withdrawing the moratorium even if the GM adoption rate is only 10%.

Offsetting this additional benefit might be higher segregation costs if it is more expensive to preserve the identity of GM versus non-GM crops than it is to do so between different non-GM crops. The above analysis assumes, on the basis of numerous submissions to the Review, that there would be no extra segregation costs for either non-GM or GM growers, but some earlier analysts have assumed they could amount to as much as \$11.50 per hectare of GM area (e.g., Biden 2016; Biden et al. 2018). With 10% adoption, such a cost would subtract \$0.3 million from the annual direct benefits of dropping the GM moratorium.

Finding 4.3: The above findings ignore farmers' reduced weed control costs and increased yields for the crop that follows GM canola the next season (worth up to \$0.9 million per year), but they also ignore possible additional segregation costs (up to \$0.3 million per year) if the GM moratorium is dropped.

Also not captured in these calculations is the benefit of having an enhanced number of crop varieties to choose from to best suit each season's weather anomalies and each region's local climatic, agronomic, etc. environment. Zhang et al. (2018a, 2018b) note that there is currently less of a yield gap in low-rainfall areas of South Australia than in higher-rainfall areas such as the Southeast, which suggests regional differences are large. Those benefits include reductions in the variability across seasons in yields and net farm incomes – something that farmers appreciate more and more as climate changes keep adding to the volatility of their earnings.

Nor do the above calculations show (as they are outside the Review's terms of reference) the environmental benefits of GM versus non-GM canola production from reduced farm chemical use, and any further reduction in tillage and thus in the greenhouse gas emissions associated with that activity. Those environmental benefits have been shown by others to be potentially very large (see, e.g., Biden et al. 2018).

In addition to potentially higher gross margins and hence annual farm revenues that would flow from being able to adopt GM varieties, their enhancement of farm productivity is likely to boost the value of farm land in the state. Any such wealth enhancement would be enjoyed by all farm landowners, including those who chose not to adopt GM varieties (assuming coexistence protocols and codes of practice work as well in South Australia as they have in the other mainland states).

Finding 4.4: Additional farmer benefits from being allowed to grow GM crops, not included in the above calculus, are (a) having more varieties to choose from to best suit specific environments and seasonal weather anomalies, (b) environmental and health benefits from reduced farm chemical applications, and (c) a likely boost to the value of farm land whose productivity and profitability is raised.

Yet another direct economic benefit to South Australia that would result from removing its GM moratorium that is not captured in the above calculations relates to the transporting of GM crop products. Such movements are banned under the current moratorium. If relaxed, there would be a stronger demand for South Australian transit services, should there be a wish to move grain or seed between the eastern states and Western Australia to smooth out seasonal anomalies. South Australian GM growers and GM seed suppliers would be in a stronger position than those in neighbouring states to supply such

demands, as they would have less intra-national distance to transport their product east or west than would their more-distant neighbours.

Finding 4.5: Removing the moratorium on the transport of GM crop products in South Australia would expand the demand for transport services and lead to more interstate shipments of canola.

Should it be decided to remove the GM crop moratorium in the mainland part of the state but not on Kangaroo Island, the above estimated benefits to farmers and GM seed producers would be reduced by less than 2%, which has been that island's maximum share of the state's canola production in recent years.

Finding 4.6: The benefits of allowing GM canola production in South Australia would be reduced by less than 2% if the GM moratorium were to be retained for Kangaroo Island.

4.4 Additional benefits and costs of retaining the GM moratorium in South Australia

One of the unquantifiable benefits of retaining the current moratorium is that it preserves the option of South Australia maintaining its GM-free status. Another is that it continues to benefit those who value that status for philosophical, ethical or spiritual reasons. Thirdly, it continues to benefit producers whose brand is enhanced by their buyers recognizing that South Australia is a GM-free zone. Against those unmeasured benefits are the regulatory costs of enforcing the moratorium (also unmeasured for South Australia, but found to be substantial in Tasmania, see TDPIPWE 2014), in addition to the benefits foregone by producers who would profit from the moratorium being dropped.

The illustration in Section 4.3 focuses on canola because that is considered by most commentators to be the only significant GM crop currently of relevance to South Australia should its GM crop moratorium be removed. Canola is a relatively minor crop in this state, however. More significant economically are wheat, barley, pulses and even hay, not to mention horticultural crops and winegrapes (Table 5). Hence if new GM varieties of any of those crops were to emerge, the economic benefit to the state of removing the GM moratorium would be potentially far greater than suggested in Section 4.3.

New GM varieties of a wide range of species are continually being developed around the world (Appendix 2), and permission for controlled-release field trials of new GM prospects in Australia are steadily being sought, and provided by, the OGTR (Appendix 3). The latter include nutritionally enhanced canola and Indian mustard, disease-resistant wheats and potatoes, more-nutritious perennial ryegrass and sorghum for animals, and abiotic stress-tolerant wheat and barley.²⁴ In addition, stacked traits are being developed to achieve more than one objective simultaneously (as with Australian GM cotton, which involves both insect resistance and herbicide tolerance).

While neither of the other OGTR-approved GM crops (cotton and safflower)²⁵ have been significant crops in South Australia in their non-GM forms, the removal of the state's

²⁴ A significant proportion of those Australian field trials of GM crops are being undertaken by public sector institutions. Of the 24 latest field trial licences issued, 18 (75%) are held by public sector agencies such as universities, Commonwealth research and development corporations and the CSIRO.

²⁵ This new GM sorghum, and Omega 3 canola, are the direct result of CSIRO and GRDC joining forces in 2004 to establish a Crop Biofactories Initiative. The \$15 million investment aims to develop a commercially viable plant-based industrial oils industry in Australia by 2020. Omega-3 oil and meal is for use in food production and as a feed for the seafood industry. The super-high oleic safflower produces an oil for use in the high-value oleo chemical industry, where it will replace current sources of oleic oil such as environmentally

GM moratorium would open up the possibility of them being experimented with for suitability in select locations within the state (see Eco Logical 2014).

Table 5: Shares of farm products in the quantity of grain, total value of agricultural and wine output, and value of all agricultural, food and wine exports, South Australia, 2016-17 (%)

	% of total tonnes of grain (10-year ave.)	% of total ag output value (at farm gate)	% of total ag, food & wine exports
Wheat	58.5	16.9	21.3
Barley	27.2	7.0	9.5
Pulses	4.0	6.8	9.1
Canola	4.2	2.9	3.6
Hay	na	4.5	2.1
Other grain or seed crops	6.1	0.9	0.9
Horticultural crops	na	13.8	4.5
Livestock, wool & dairy	na	38.2	24.3
Winegrapes & wine	na	9.0	24.7
TOTAL (%)	100.0	100.0	100.0
TOTAL (mmt & \$billion)	7.9mmt	\$5.3b	\$6.0b

Source: Compiled by PIRSA, based on value of agricultural commodities produced in South Australia (<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/7503.02016-17?OpenDocument>), PIRSA *Crop and Pasture Reports*, and South Australia Origin Exports from the Global Trade Atlas Database.

Some South Australia's lucerne seed producers and the hay industry also are hopeful that without the GM moratorium it would be possible to develop a new variety that emulates a GM lucerne grown in the United States that delivers up to 28% more digestibility through decreased lignin. That may enhance the export prospects not only for hay but also for high-valued lucerne/alfalfa seed.²⁶

Livestock and dairy producers have expressed a strong interest, from a grazing perspective, in the introduction of GM ryegrass. High Metabolisable Energy GM ryegrass has been shown in New Zealand's AgResearch's laboratories to grow up to 50% faster than conventional ryegrass.²⁷

To date the wine industry has been wary of adopting GM grape varieties for fear of an adverse consumer reaction. However, European countries are developing GM grape varieties that require less pesticide spraying, partly in response to some traditional sprays being (or soon to be) banned there. Easton (2018) reports that four GM grape varieties were released in France in 2018, with the expectation that more than 30 will be available by 2025. Should wine consumers' GM concerns ease over coming years – for example, because they perceive the heavy use of pesticides as a greater evil – South Australia's wine industry eventually could become a major beneficiary of the removal of the state's GM moratorium.

sensitive palm oil. The oil will be used for products such as lubricants (a substitute for petroleum products, so reducing carbon emissions), transformer oils, cosmetics and medical items.

²⁶ About one-fifth of the world's seeds now enter international trade (OECD 2018, p. 30). South Australia's participation in the GM part of that market, including for lucerne seed, would become a possibility if the GM moratorium were to be dropped.

²⁷ <https://www.agresearch.co.nz/news/key-step-forward-for-game-changing-grass/>

Finding 4.7: The benefits of removing the state’s GM moratorium may be far greater than just those from canola as new GM varieties of other crops (and pasture grasses) of relevance to South Australia are developed and approved by the OGTR.

Meanwhile, several exciting new plant breeding avenues are evolving (Appendix 4). Perhaps the most relevant to this Review involves gene editing.²⁸ Regulations relating to these new techniques are still evolving in Australia and elsewhere. The European Court of Justice ruled in July 2018 that gene editing is to be regulated in the same way as GMOs in the EU, even though gene editing, as explained by Pennisi (2016), is not transgenic.²⁹ The OGTR (2016) put out a discussion paper and a request for options as to how this and other new gene technologies should be regulated, and in October 2018 it released a guide that updates how they will be regulated in Australia (OGTR 2018). The guide suggests that, across the spectrum of gene editing interventions, the least invasive applications will be regulated like conventional breeding while the most invasive will be treated like GMOs. Thus South Australia would be able to take full advantage of these new technologies only if and when its GM crop moratorium is removed.

Finding 4.8: New crop breeding techniques such as gene editing offer further benefits to farmers, but some of the new varieties may be regulated as if they are GMOs and thus would be unavailable in South Australia while ever the state’s GM moratorium remains.

²⁸ The most ardent of those who criticise GMOs on ethical grounds may also oppose gene editing. Their view contrasts with that of the scientists developing these new techniques, who believe it is unethical NOT to use these new techniques to improve global food security, nutrition and health. See, e.g., <http://www.calyxt.com/>

²⁹ Gene editing technologies allow the high-precision addition, detection or replacement of gene segments or fragments, enabling the introduction of desired genetic variants or the suppression of undesirable ones, for example to improve drought and disease resistance, decrease the use of fertilisers, herbicides, insecticides and fungicides, and increase nutritional profiles. As noted in the Department of Health (2018, p. 24), these techniques produce changes that can be identical to those that are, or could be, produced in nature and are indistinguishable from conventional breeding. Some stakeholders are concerned about off-target effects of gene editing, but those can arise also during conventional breeding. During conventional plant breeding, large numbers of gene variants are introduced by outcrossing or mutagenesis, resulting in undesired traits being inherited together with the trait of interest. Plant breeders then undertake many generations of selective breeding to remove undesirable traits before they finally produce a new commercial variety of the crop with the desired trait. Gene editing can achieve the same result much quicker. For more details on new plant breeding techniques, see OECD (2018, Box 7.2). Some prospective agricultural gene technologies in play in Australia are listed in this Review’s Appendix 4.

5

Summary of findings and policy options

The three policy options this Review has been asked to consider are (a) maintaining, or (b) modifying, or (c) removing South Australia's moratorium on GM crop production and transport that is currently scheduled to remain in place until 2025.

Most of the submissions to the Review clearly favoured either the 'maintain' option or the 'remove' option. A small number favoured the 'modify' option, most with the specific proposal that the moratorium be maintained for Kangaroo Island even if the government chooses to remove it for the state's mainland regions. The illustration of canola, in Sub-section 4.3, found that the net economic benefits to the state's farmers and to providers of GM seed of adopting the 'remove' option would be at most only 2% lower if the GM crop moratorium were to be maintained for Kangaroo Island.

Those favouring the 'maintain' option include people who may have ethical, philosophical or spiritual objections to GM technology or, like those submitting the duplicated campaign letter from dogooder.co, they worry about as-yet-unknown risks that GM crops may bring in terms of food safety and farmer and environmental health. Those, however, are matters dealt with by Commonwealth agencies and therefore are outside the terms of reference of this Review. Most of the other pro-moratorium submissions suggest the GM moratorium provides greater access to domestic and foreign markets and/or a premium price for non-GM food produced in the state. Those favouring the 'remove' option, by contrast, argue the state would be a net beneficiary if the moratorium was dropped.

This divergence of views is to be expected, since almost every policy or regulatory change has potential losers as well as winners – as does the introduction of most new technologies. The terms of reference for this Review recognise that fact, and provide the logical headings, in what follows, for summarizing the findings of the Review.

5.1. Market benefits of South Australia's moratorium on cultivating GM crops

While some submissions claimed there are market benefits to being seen as a GM-free state, it was mentioned mainly as an additional attribute that could be included in marketing alongside such attributes as being clean and green. Supportive evidence was provided only by traders of Kangaroo Island grains.

Other hard evidence is not supportive, however. Specifically, data on canola exports from the key Australian states to the European Union do not support the view that South Australians enjoy better access in EU non-GM grain markets. Furthermore, data on prices of grain produced in South Australia versus grain produced in neighbouring states suggest there is no premium for grain from South Australia despite it being the only mainland state with a GM crop moratorium.

5.2. Awareness of the moratorium by key trading partners and food processors

There is awareness of South Australia's GM crop moratorium by at least one foreign firm (an importer of Kangaroo Island canola) and by several food processing businesses operating in South Australia. They believe it to be beneficial to be able to claim their product is GM-free. If the moratorium were to be dropped, they therefore would want segregation of GM and non-GM crop products to be robust enough to be able to claim their processed product does not contain GMOs.

5.3. Segregation to retain market benefits from the moratorium

The experiences of GM canola production and marketing in other mainland states over the past decade reveal that segregation and identity preservation protocols and codes of practice can and do ensure the successful coexistence of GM and non-GM crops in Australia. Traders of Kangaroo Island canola are confident they would be able to preserve their grain's unique identity even if GM crop production were allowed in mainland South Australia, provided the GM moratorium was maintained for Kangaroo Island. They and their buyers in Japan believe such an arrangement would be sufficient to retain access to Japan's high-priced market for GM-free grain.

5.4. Potential GM innovations likely to be available for commercial adoption by 2025

A new GM variety of canola that is rich in Omega 3 was approved by the OGTR in 2018 for commercial growing in Australia, as was a new GM variety of safflower that is rich in oleic oil. These are examples of success from a long-term program of research at CSIRO. Currently there are OGTR-approved GM crop field trials (75% by public sector institutions) exploring nutritionally enhanced canola and Indian mustard, disease-resistant wheats and potatoes, more-nutritious perennial ryegrass and sorghum for animals, and abiotic stress-tolerant wheat and barley.

Meanwhile, new crop breeding techniques such as gene editing offer further potential benefits to farmers, but some of them may be regulated as if they are GMOs and thus would be available to South Australia farmers only if and when the state's GM crop moratorium is dropped.

Several submissions stressed that, because of the GM crop moratorium, fewer research dollars, scientists and post-graduate students have been coming to (or remained in) South Australia – a trend that would reverse if the moratorium were to be dropped.

5.5 Economic costs and benefits of maintaining, modifying or removing the moratorium

The cumulative cost historically of the GM food crop moratorium to South Australia's farmers is estimated to be \$11-33 million over 2004-18. If the moratorium is kept until 2025, their foregone profits will be at least another \$5 million, and possibly much more if Omega 3 canola proves to be more profitable than current Roundup Ready canola. Farmers also would have reduced weed control costs and increased yields for the crop that follows GM canola the next season, which would add up to another \$0.9 million per year if the moratorium was dropped.

Other farmer benefits from being allowed to grow GM crops are difficult to value, but they include (a) having more varieties to choose from to best suit specific environments and seasonal weather anomalies, (b) environmental and health benefits from reduced farm chemical applications, and (c) a boost to the value of farm land whose productivity and profitability would be raised.

In addition, gross revenue for the producer of GM canola seed would have been an estimated \$5.4m higher during 2004-18 without the moratorium, and \$3m higher during 2019-25 if the current technology access fee is unchanged. At least some of that transfer from farmers to the GM seed producer would be allocated to new crop R&D investments in South Australia, which in turn would encourage more public (pre-commercial) agricultural R&D investments in the state.

These prospective benefits of allowing GM canola production in South Australia, and any additional ones from new GM crops that may become available and approved by the OGTR over coming years, would be reduced by less than 2% if the GM moratorium were to be retained for Kangaroo Island.

While difficult to quantify, removing the moratorium on the transport of GM crop products in South Australia would expand the demand for transport services and lead to more interstate shipments of canola.

Bringing South Australian GM legislation into line with other mainland states and the Commonwealth, including automatically adopting into South Australian law any future amendments to Commonwealth gene technology legislation, will be less costly to the state, including in terms of attracting/retaining research dollars, scientists and post-graduate students in South Australia.

Many of the submissions favouring the removal of the current moratorium on GM crop production and transport in the state – which include those from all the key farmer organizations – requested an immediate policy change. Given the positive experiences following reform in the other mainland states a decade ago, and the segregation protocols and codes of practices that have been established and proven over that period to ensure identity preservation for non-GM crop products at low cost, industry participants did not see a need for a one-year trial period as in Western Australia in 2009.

Appendix 1: Global area of GM crops by country in 2017

Rank	Country	Area (million hectares)	Biotech crops
1	USA	75.0	Maize, soybeans, cotton, canola, sugar beets, alfalfa, papaya, squash, potato, apples
2	Brazil	50.2	Soybeans, maize, cotton
3	Argentina	23.6	Soybeans, maize, cotton
4	Canada	13.1	Canola, maize, soybeans, sugar beets, alfalfa, potato
5	India	11.4	Cotton
6	Paraguay	3.0	Soybeans, maize, cotton
7	Pakistan	3.0	Cotton
8	China	2.8	Cotton, papaya
9	South Africa	2.7	Maize, soybeans, cotton
10	Bolivia	1.3	Soybeans
11	Uruguay	1.1	Soybeans, maize
12	Australia	0.9	Canola, cotton
13	Philippines	0.6	Maize
14	Myanmar	0.3	Cotton
15	Sudan	0.2	Cotton
16	Spain	0.1	Maize
17	Mexico	0.1	Cotton
18	Colombia	0.1	Maize, cotton
19	Vietnam	<0.1	Maize
20	Honduras	<0.1	Maize
21	Chile	<0.1	Maize, canola, soybeans
22	Portugal	<0.1	Maize
23	Bangladesh	<0.1	Brinjal/Eggplant
24	Costa Rica	<0.1	Cotton, pineapple
	total	189.8	

Source: (ISAAA 2017).

Appendix 2: Selected GM crop technologies at field-trial stage globally as of 2015

Crop	Trait	Type of research institution	Countries
Apple	Reduced bruising/browning	Private sector	Canada
Banana	Provitamin A content	Public sector	Uganda
	Bacterial resistance	Public sector	Uganda
	Insect/nematode resistance	Public sector	Uganda
Bean	Virus resistance	Public sector	Brazil
Cabbage	Insect resistance	Public sector	China, India
Canola	Herbicide tolerance with multiple modes of action	Private sector	Australia, USA, Canada
	Omega-3 content	Private sector	USA
	Nitrogen use efficiency	Private sector	USA
Cassava	Virus resistance	Public sector	Kenya, Indonesia, Uganda
	Provitamin A content	Public sector	Nigeria, Kenya, Uganda
Chickpea	Insect resistance	Public-private partnership	India
Cotton	Stacked insect resistance and herbicide tolerance	Private sector	Burkina Faso, Cameroon, Ghana, India, Kenya, Malawi, Pakistan, USA
Cowpea	Insect resistance	Public-private partnership	Burkina Faso, Ghana, Nigeria
Eggplant	Insect resistance	Public-private partnership	India, Philippines
Groundnut	Virus/fungal resistance	Public sector	India
Maize	High phytase (quality)	Public-private partnership	China
	Stacked drought tolerance and insect resistance	Public-private partnership	Kenya, South Africa, Uganda
	Stacked insect resistance and herbicide tolerance	Private sector	India, Indonesia, Pakistan, South Africa, USA, Vietnam
	Nitrogen use efficiency	Private sector	USA
	Abiotic stress and yield	Private sector	USA
Mustard	Male sterility	Private sector	India
Orange	Bacterial resistance	Private sector	USA
Pigeonpea	Insect resistance	Public sector	India

Potato	Fungal resistance	Public sector	Bangladesh, Indonesia, India
	Virus resistance	Public-private partnership	Argentina
Rice	Various quality traits	Private sector	USA
	Insect resistance	Public sector	China
	Insect resistance	Private sector	India
	Nitrogen use efficiency, water efficiency, salt tolerance	Public-private partnership	Colombia, Ghana, Nigeria, Uganda
	Nitrogen use efficiency	Private sector	USA
	Iron content	Public sector	India
	Provitamin A content	Public sector	Bangladesh, India, Indonesia, Philippines
Safflower	Stacked insect resistance and herbicide tolerance	Private sector	Argentina, USA
	High oleic acid	Public sector	Argentina, Australia
Sorghum	Stacked provitamin A, iron, zinc	Public-private partnership	Kenya, Nigeria
Soybean	Modified fatty acids	Private sector	USA
	Yield enhancement	Private sector	USA
Sugarcane	Multiple pest resistance	Private sector	USA
	Stacked insect resistance and herbicide tolerance	Private sector	Australia, USA
	Drought tolerance	Public-private partnership	Brazil, Indonesia
Tomato	Fungal resistance, insect resistance	Private sector	Argentina, Chile, Guatemala, India
	Fungal resistance, insect resistance	Public sector	China, Egypt
Wheat	Drought tolerance	Public sector	Australia, Egypt
	Insect resistance	Public sector	UK
	Fungal resistance	Public sector	China
	Virus resistance	Public sector	China
	Herbicide tolerance	Private sector	USA
	Improved grain quality	Public sector	Australia

Source: Qaim (2016).

Appendix 3: Recent GM crops licenced for limited and controlled release (field trials) in Australia

Organisation	Title of Project	Parent Organism	Modified Trait	Issue Date
Monsanto Australia Ltd	Limited and controlled release of canola genetically modified for herbicide tolerance	Canola	Herbicide tolerance	Under evaluation
Nuseed Pty Ltd	Limited and controlled release of canola genetically modified for altered oil content and herbicide tolerance	Canola	Composition - food (human nutrition), animal nutrition, herbicide tolerance	6-Sep-18
CSIRO	Limited and controlled release of bread wheat and durum wheat genetically modified for enhanced rust disease resistance	Bread wheat and durum wheat	Disease resistance	11-Jul-18
Department of Economic Development, Jobs, Transport & Resources	Limited and controlled release of perennial ryegrass genetically modified for fructan biosynthesis	Perennial ryegrass	Composition – animal nutrition, yield	6-Mar-18
Royal Melbourne Institute of Technology University	Limited and controlled release of buffalo grass genetically modified for herbicide	Buffalo grass	Herbicide tolerance, plant development-altered plant architecture	11-Apr-18

	tolerance and dwarf phenotype			
University of Queensland	Limited and controlled release of sorghum genetically modified for grain quality traits	Sorghum	Composition - animal nutrition, yield	25-Jul-17
University of Adelaide	Limited and controlled release of wheat and barley genetically modified for abiotic stress tolerance and yield improvement	Wheat and barley	Abiotic stress tolerance; enhanced yield	17-Jul-17
CSIRO	Limited and controlled release of wheat genetically modified for disease resistance, drought tolerance, altered oil content and altered grain composition	Wheat	Disease resistance, drought tolerance, Composition - food (processing), food (human nutrition)	1-May-17
Queensland University of Technology	Limited and controlled release of potato genetically modified for disease resistance	Potato	Disease resistance	20-Feb-17
Nuseed Pty Ltd	Limited and controlled release of Indian mustard (Juncea)	Indian mustard	Composition - food (human nutrition),	14-Feb-17

<http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/ir-1>

Appendix 4: Prospective agricultural gene technologies

The Australian Academy of Science, in its submission to the Independent Review, drew attention to a number of current and developing gene technologies likely to be of relevance to South Australian agriculture by 2025. They include:

- **Gene editing:** Gene editing is an umbrella term for techniques which make small, targeted changes to an organism's DNA, using precise genetic tools such as the CRISPR/Cas9 system or other site-directed nucleases. Gene editing is now in wide use in agricultural research and several examples are in the early stages of deployment by industry. This technique has high precision and the outcomes are often indistinguishable from traditional breeding methods. Because of these factors, the review of the *Gene Technology Act 2000* currently underway is considering whether gene editing techniques should be considered gene modification technologies.

- **Topical RNAi technology:** RNA interference, or RNAi, is a technique which uses RNA constructs to modulate the expression of genes. This allows control of aspects of the development of an organism which may or may not alter the organism's genome. Topical or exogenous RNAi does not involve altering the organism's genome and by most definitions would not be considered a gene modification technology.

- **Disabled Cas9 enzymes:** Disabled Cas9 enzymes make use of Cas9's highly specific DNA binding properties but do not cut the DNA. This allows other targeted modifications, such as using a methyltransferase enzyme to make epigenetic modifications, or deaminases to make point changes to DNA without cutting it. Under present definitions, it is not clear if such applications would be considered a gene modification technology.

- **Cas9 ribonucleases:** Higher specificity of Cas9 gene editing can be achieved using delivery systems to provide Cas9 ribonucleoproteins directly to the cell rather than using transgenic methods, because of the high turnover of the ribonucleoprotein.

Extensive testing of genetic modification technologies has not demonstrated that they pose any risk to agricultural products compared to conventionally produced products. For this reason, the Academy considers that restricting use of these technologies through mechanisms such as the South Australian moratorium ultimately disadvantages consumers and producers through loss of access to new products or traits.

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192	Leanne Wood	Not provided	Not provided	Organic beef farmer
193	David Baldwin	Torrensville	SA	Not provided
194	Gerhard Grasser	Longwarry Nth	Victoria	Pharmacist
195	Susanne Lee	Not provided	Not provided	Not provided

	<i>Name</i>	<i>Region (if Australia)</i>	<i>State (country if overseas)</i>	<i>Company/occupation</i>
196	David Abbott	Moonah	Tasmania	Not provided
197	Ian Onley	Not provided	Not provided	Not provided
198	Esther Willson	McGillivray	SA	Organic farmer
199	Franca Wild	Not provided	Not provided	Not provided
200	Pat Boag	Mount Martha	Victoria	Not provided
201	Fernando Longo	Greenvale	Victoria	Not provided
202	Rosemary Watson	Hawthorn East	Victoria	Not provided
203	Shaun Hinves	Hains	SA	Not provided
204	Robyn Cowdrey	Craigmore	SA	Not provided
205	Henry Koberle	Not provided	Not provided	Not provided
206	Phillipa Holden	Not provided	Not provided	Not provided
207	George Butcher	Not provided	Not provided	Not provided
208	Jenny Jackson	Anstead	Queensland	Not provided
209	Pam Jordan	Not provided	Not provided	Not provided
210	Martin Oliver	Not provided	Not provided	Not provided
211	Deanne Hammer	Cowwarr	Victoria	Not provided
212	Kym Evans	Not provided	Not provided	Not provided
213	Marion Cook	Not provided	Not provided	Not provided
214	Janet Grogan	Mt Hawthorn	WA	FOODwatch
215	Elizabeth Morgan	Taringa	Queensland	Not provided
216	Margaret Halliday	Not provided	Not provided	Not provided

The independent reviewer

Kym Anderson is an Emeritus Professor in the School of Economics at the University of Adelaide and an Honorary Professor at the Australian National University's Crawford School of Public Policy. He is also the founder and Executive Director of Adelaide's Wine Economics Research Centre and was founder and (during 1989-2004) Executive Director of Adelaide's Centre for International Economic Studies. After graduating from the University of New England he served as an Agricultural Economist for 3.5 years in the South Australian Department of Agriculture (now PIRSA) before undertaking doctoral studies at the University of Chicago and Stanford University and then 6 years as a Research Fellow at ANU. He was a Ford Foundation Visiting Fellow in Seoul, South Korea in 1980-81, and a Visiting Fellow at the University of Stockholm's Institute for International Economic Studies while on sabbatical in 1988. In two other periods of extended leave he served as deputy head of economic research and analysis at the GATT (now WTO) Secretariat in Geneva (1990-92) and as Lead Economist (Trade Policy) at the World Bank in Washington DC (2004-07). His publications (more than 400 articles and 40 books) concentrate on international trade and development and the economics of agriculture, food and wine. During 2010-17 he served on the Board of Trustees of the International Food Policy Research Institute (Washington DC), chairing it from 2015. He has also served the Australian Centre for International Agricultural Research as a Commissioner during 2011-14, and as President of its Policy Advisory Council since 2014. In 2009 he participated in a study week on Transgenic Plants for Food Security at the Pontifical Academy of Sciences in the Vatican, following a decade of independent research on national and global economic effects of GM technologies and associated policies. He is a recipient of an Honorary Doctor of Economics degree from the University of Adelaide and a Distinguished Alumni Award from the University of New England. In 2015 he became a Companion of the Order of Australia (AC).

Appendix 2

Genetically Modified Crops Management (Designation of Area) Variation Regulations 2019

South Australia

Genetically Modified Crops Management (Designation of Area) Variation Regulations 2019

under section 5 of the *Genetically Modified Crops Management Act 2004*

Contents

Part 1—Preliminary

- 1 Short title
- 2 Commencement
- 3 Variation provisions

Part 2—Variation of *Genetically Modified Crops Management Regulations 2008*

- 4 Variation of regulation 4—Designation of area in which cultivation of genetically modified food crops is prohibited
-

Part 1—Preliminary

1—Short title

These regulations may be cited as the *Genetically Modified Crops Management (Designation of Area) Variation Regulations 2019*.

2—Commencement

These regulations come into operation on 1 December 2019.

3—Variation provisions

In these regulations, a provision under a heading referring to the variation of specified regulations varies the regulations so specified.

Part 2—Variation of *Genetically Modified Crops Management Regulations 2008*

4—Variation of regulation 4—Designation of area in which cultivation of genetically modified food crops is prohibited

Regulation 4—delete "the whole of the State" and substitute:

Kangaroo Island

Note—

As required by section 10AA(2) of the *Subordinate Legislation Act 1978*, the Minister has certified that, in the Minister's opinion, it is necessary or appropriate that these regulations come into operation as set out in these regulations.

Made by the Governor

on the recommendation of the Minister, after consultation by the Minister in accordance with section 5(3)(a) and with the Advisory Committee, and the Minister being satisfied that regulation 4 should be made for marketing purposes, and with the advice and consent of the Executive Council

on

No of 2019

MPI19/0018CS

Appendix 3

*Draft AHC Submission on the State's proposed lifting of
the Moratorium on Genetically Modified Crops*



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File Ref: 05.20.9
OC19/

24 September 2019

GM Secretariat
Primary Industries and Regions SA
GPO Box 1671
Adelaide SA 5001

Email: pirsa.gmreview@sa.gov.au

Dear Sir/Madam

ADELAIDE HILLS COUNCIL STATUTORY CONSULTATION RESPONSE – PROPOSED LIFTING OF THE GENETICALLY MODIFIED FOOD CROPS MORATORIUM IN SOUTH AUSTRALIA

The Adelaide Hills Council notes that on the 19 August 2019 PIRSA announced the proposed recommendation to lift the moratorium on growing Genetically Modified (GM) Food Crops in all parts of the state, except Kangaroo Island. At all phases of the GM Food Crops Moratorium Review, Council has provided written feedback and appreciates the opportunity to provide additional comments at this late stage of the process.

As previously stated the Adelaide Hills has a rich and diverse agricultural history and continues to be a key producer for State, National and Global markets. Primary production is a major pillar of our Economic Development Strategy and in the Adelaide Hills consists of a mix of horticulture (82%), grazing (10%) and viticulture (8%) generating a combined farm gate value of approximately \$145 million annually.

Key economic development drivers and opportunities in the region are intrinsically linked to the primary production and tourism sectors, both of which are underpinned by the Adelaide Hills having a reputation as a premium food and beverage producer.

With the significance of the primary production sector to our region in mind, Council adopted a GM Food Crop Policy in September 2012 (reviewed in December 2018) which applies across the Council area. We understand that this is the first of its kind for a local council in the state, a copy of which is attached for your reference as **Enclosure A**. Adopting the precautionary principle, the Policy considers that genetically modified crops have the potential (until proven otherwise) for irreversible and unforeseen environmental and human health impacts.

However, it is noted that lifting the ban would provide farmers with flexibility to choose whether or not to grow GM crops (such as drought or pest resistant varieties), but that mechanisms such as buffers should be put in place to protect farmers who choose to either grow organic or non-GM crops. On this

basis, and dependent on whether or not the State Government decides to lift the GM Food Crop Moratorium, Council has flagged the need to review its previously mentioned Policy.

Regional Approach

The decision to grant Kangaroo Island GM Crop Free status clearly highlights the economic advantage for some areas and regions to remaining GM Free. This has been further strengthened by the Tasmanian Liberal Government's recent decision to further extend the state wide ban on GM crop cultivation until 2029, citing that GM Free status provides strong branding opportunities in an increasing competitive export market. This regional approach is supported and it is considered that the legislative framework in South Australia supporting any lifting of the GM Food Crop Moratorium should allow for whole regions within South Australia to remain GM free should an economic rationale be justified e.g. access to emerging markets etc. This approach favours the Adelaide Hills which already has a strong brand and export potential and allows the region's farmers to determine whether or not to remain GM free.

Human Health, Safety & Environmental Considerations

As emphasised in earlier correspondence with your Department dated 26 October 2018, it is considered that the grounds for lifting the GM crops should consider the potential human health, safety and environmental impacts of GM crop use in South Australia. Simply ignoring the growing national and international resistance to GM food crops largely based a lack of scientific consensus points to rash policy development. It is noted that this specific but critical issue was not within the scope of the recent reviews commissioned by the State Government.

Protection and Protocol for Non-GM and GM Farmers

As previously expressed in our correspondence dated 26 October 2018, it is considered that the legislative framework should be developed to protect agricultural activities and enterprises from the potential negative impacts and lost opportunities as a result of the introduction of GM agriculture within the State. Leaving it to common law in isolation creates ambiguity and uncertainty for growers, as evidenced by the recent Western Australian (WA) Court Case¹. The State Government is therefore strongly urged to ensure this matter is addressed in any forthcoming GM legislation in order to protect both GM and non-GM farmers.

Supporting Growers

In supporting local producers, Council is aware of the need for agricultural industry to remain competitive and adaptive in a changing climate and understands that a flexible policy position may need to be considered in order for the industry to react to specific market forces or events. It is noted that some farmers recognize that there are benefits of having drought or pest resistant crops which will deliver higher yields.

Given the approved GM crop licenses currently available in Australia largely involve crops suited to broad hectare applications, there would be limited impact on the choice for farmers in the Adelaide Hills region immediately, further strengthening the case for a regional approach to provide flexibility for regions to remain GM free should they choose to do so.

¹ <http://www.abc.net.au/news/rural/2014-05-28/gm-court-case-debate/5349598>

Farmer Autonomy

Council consulted with its Rural Land Management Advisory Group (RLMAG) in preparing this submission. A concern raised by the RLMAG was that farmers who grow GM crops may lose their autonomy as they would essentially be under the control of Corporate Organisations who own the patents for the GM crop they are growing and who may wish to control the volume of produce that goes to market, as well as the price achieved in this instance. It is considered that the State Government should investigate this claim, and if it is an issue, then provide the relevant legislative framework to address this matter and to protect farmers where possible in this instance.

Summary

As highlighted above, the scope of the review used to justify the lifting of the ban has not addressed general public concern regarding the possible human health, environmental and social impacts of the GM food crop industry. It is noted that this was deliberately excluded from the scope of the Review but note that there still is significant public concern in this regard.

Council supports the flexibility offered to farmers within the district to be able to adapt to changing conditions and to the possible use GM Crops which are drought or pest resistant. With this in mind it is noted that there are only a limited number of GM Crops approved for cultivation in Australia (i.e. primarily canola and cotton). Therefore the lifting of the ban in the Adelaide Hills is unlikely to offer any real advantage for growers at a regional level immediately, and therefore the rationale for the wholesale lifting of the ban across the whole of the state (excluding Kangaroo Island) is questioned.

As previously stated, it is considered imperative that the Adelaide Hills remains renowned for its clean, sustainable and premium food and beverage production and that this be protected should primary producers, tourism operators and others consider this essential to protecting the region's brand. It is considered that neighboring regions may share similar sentiments. Council therefore urges the State Government to ensure that the legislative framework supports a regional approach to the lifting of the GM Crop Moratorium by allowing those who wish to remain GM free the opportunity to do so.

Should you have any further queries in this regard please do not hesitate to contact Marc Salver, Director Development & Regulatory Services on 8408 0522.

Yours sincerely

Andrew Aitken
Chief Executive Officer

Appendix 4

*AHC's Submission on the PIRSA Independent Review
Moratorium GM Crops - Terms of Reference*



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26 October 2018

GM Review
Primary Industries and Regions SA
GPO Box 1671
ADELAIDE SA 5001

Email: pirsa.gmreview@sa.gov.au

Dear Sir/Madam

Submission on PIRSA's Independent Review of South Australia's Moratorium on the Commercial Cultivation of Genetically Modified Food Crops

The Adelaide Hills Council understands that on the 14 September 2018 PIRSA announced its intention to commission a high-level independent review of South Australia's Moratorium (the Moratorium) on the commercial cultivation of Genetically Modified (GM) food crops.

In commencing this process, it is understood that the independent review will provide an opportunity for stakeholders and Government to build a relevant evidence base pertaining to the benefits and costs of the Moratorium, to ultimately inform future policy directions. Council appreciates the opportunity to provide comments in this regard.

Adelaide Hills Council Agricultural Profile

The Adelaide Hills has a rich and diverse agricultural history and continues to be a key producer for State, National and Global markets. Primary production in the Adelaide Hills consists of a mix of horticulture (82%), grazing (10%) and viticulture (8%) generating a combined farm gate value of approximately \$145 million annually.

Approximately 60% of South Australian horticulture is undertaken in the Adelaide Hills, supplying 83% of the States apple and pear crops annually. The Adelaide Hills also has a reputation for cooler climate wines, with 21 wineries, 90 wine labels and 48 cellar doors producing wine for local and overseas markets, with 7.9 million litres of wine exported annually. There is also a burgeoning distillery and cidery scene.

Key economic development drivers and opportunities in the region are intrinsically linked to the primary production and tourism sectors, both of which are underpinned by the Adelaide Hills having a reputation as a premium food and beverage producer.

Council's Position on GM Food Crops

With the significance of the primary production sector to our region in mind, Council adopted a GM Food Crop Policy in September 2012 (reviewed in December 2014) which applies across the Council area. We understand that this is the first of its kind for a local council in the state, a copy of which is attached for your reference as **Enclosure A**.

The objectives of the Policy primarily seek:

- To increase the level of sustainable agriculture within the Adelaide Hills Council area for current and future generations
- To state Council's position with regard to the growing of genetically modified crops within the Adelaide Hills Council area
- To protect existing agricultural activities and enterprises from potential negative impacts and lost opportunities as a result of GM agriculture, and
- To link agricultural activity more closely with the protection of biological diversity and the maintenance of essential ecological processes and life-support systems upon which agriculture and all other activities depend

In summary, the policy considers that genetically modified crops have the potential (until proven otherwise) for irreversible and unforeseen serious environmental and economic impacts and does not consider that the agricultural industry would be adversely affected by any continued restrictions on the cultivation of GM crops within the Adelaide Hills Region.

As such Council has adopted a position that **does not** support the growing of genetically modified crops.

Notwithstanding, Council respects the need for evidence based policy making and it understands that the area of genetically modified crops is very 'fluid' and changes rapidly.

In particular in supporting local producers, Council is aware of the need for agricultural industry to remain internationally competitive and understands that a flexible policy position may need to be considered in order for the industry to react to specific market forces and requirements.

For example, if the South Australian Apple and Pear industry were to suffer the effects of the Fire Blight disease, the industry would be seeking immediate access to any products including rootstocks and varieties that were resistant to the disease and that would assist the industry in returning to a viable situation in the shortest possible time. It is noted that the industry wishes to ensure a flexible approach to deal with this type of scenario.

Notwithstanding unforeseen circumstances, Council holds a precautionary position to the broad introduction of any genetically modified crops to the Adelaide Hills and South Australia.

Council's Strategic Direction

Council is working on a number of strategic projects that aim to solidify the Adelaide Hills as a leader and innovator in sustainable agriculture.

Council aims to achieve this by seeking planning policy changes to make farming easier and providing expanded value adding opportunities for farmers. Further, Council will assist the horticultural industry where possible to attain Pest Free Area status across the district.

In addition, the Mount Lofty Ranges UNESCO World Heritage Listing Bid seeks to value add to these initiatives by putting the region on the world stage so to speak by recognising the significant historical and working agrarian landscape aspects of the region.

These projects aim to spur on innovation and secure the Adelaide Hills' reputation and image as a high quality primary production and tourism region.

Terms of Reference

With respect to the points raised in the PIRSA Terms of Reference, Council advises that it generally supports all six of the review topics. However, it is considered that there is a need to expand the scope of the Terms of Reference to include human health, safety and environmental impacts of genetically modified crop use, the reasoning for which is expanded below.

The following provides additional commentary to each point in the Terms of Reference and the recommended inclusions for any subsequent review:

Review Topic 1: Assess available evidence on the market benefits of South Australia's moratorium on the commercial cultivation of GM crops

Most GM crops have been aimed at providing agronomic benefits such as drought and pest resistance. It would also be useful for the review to consider the market costs associated with the moratorium and whether South Australia's agricultural productivity and profitability has been negatively impacted by not having access to GM crops. Further, the potential impacts on the organic sector should also be considered in this context. In effect, a retrospective look at and review of topic 6 is considered appropriate.

Review Topic 2: Assess the degree of awareness of South Australia's moratorium by key trading partners and food production businesses operating in South Australia and other Australian states

With regard to market access, it is considered that this review would benefit from analysing examples where South Australia has gained or may gain market access over other trading partners as a result of the moratorium i.e. markets where GM crops act as a barrier to trade and where non-GM or organically grown crops are considered to have a higher value in the food supply chain. Such investigation would be assisted by determining the long term value of continuing the moratorium over long term forecasts.

Review Topic 3: Where there is evidence of market benefits resulting from the moratorium, examine whether it is possible to retain such benefits for industry through the use of systems of segregation in the supply chain, having regard to segregation protocols adopted in other jurisdictions

It is considered that segregation in the supply chain should be considered at the regional scale as well as the individual producer. For instance, retaining market benefits where an entire region declares that it is GM free, particularly where economics of scale in the supply chain could be more efficiently unlocked should be considered.

The findings of such analysis would present the basis for GM crop legislation to allow for GM crop cultivation zoning regions thereby reducing the potential conflicts and negative impacts on non-GM producers. This would allow for a flexible framework that could respond to regional preferences i.e. a region and its producers that elect to identify as non-GM versus those that wish to utilize GM crops.

Review Topic 4: Consider evidence from South Australian businesses and industry, market and trade data, the experience in other Australian and international jurisdictions and other relevant evidence to inform the analysis

It is noted that the European Union Member States have the right to prohibit or restrict the cultivation of approved GM crops based on adverse effects on health and the environment. Notably both France and Germany are two such Member States that have similar restrictions to South Australia's current Moratorium. By comparison the United States imposes no such restrictions on the cultivation of GM crops.

For the purposes of this high level review, a detailed comparative analysis of the EU and US markets using the Terms of Reference lens (the 6 review points and the additional points suggested below) would be beneficial to identify long term trends within these legislative settings, and hopefully conclude which is the best option for South Australia.

Review Topic 5: Explore whether there are potential innovations likely to be available for commercial adoption by South Australia's agricultural industries prior to 2025 that would justify a reconsideration of the moratorium on grounds of economic benefit to the state

It is considered that the exclusion of human health, safety and environmental considerations from providing the 'grounds' to justify lifting the moratorium, implies that the review does not intend to undertake a comprehensive economic assessment.

This is considered unacceptable particularly when in other jurisdictions it is for the abovementioned reasons, citing the EU example, that the use of GM crops can be and is restricted. Therefore it is considered that the review should be expanded to include human health, safety and environmental impacts of GM crop use.

Notwithstanding the aforementioned aspects, it is considered that there is sufficient local and international research out there from which to draw on, both for and against GM food production, in order to come to an appropriate conclusion regarding whether or not to lift the moratorium.

Review Topic 6: Quantify where possible the economic costs and benefits of maintaining, modifying or removing the moratorium, not limited to but including on-farm impacts, food manufacturing, supply chain costs and impacts on research and development investment in South Australia

It is considered imperative that any on farm cost and benefit analysis should consider the influence of GM crops on the use of synthetic agricultural inputs, including but not limited to fertilizers, herbicides and pesticides, and any subsequent impacts on the long term health of soils, regional biodiversity and the environment more generally.

In addition, it is considered that the protection of existing agricultural activities and enterprises from the potential negative impacts and lost opportunities as a result of the introduction of GM agriculture should also be considered. A recent Western Australian Court Case¹ highlights the importance of such a consideration, whereby in this instance an organic farmer attempted to sue his neighbour over GM crop contamination. The case highlighted how grossly inadequate the legislative framework was to appropriately protect the livelihoods of both the GM farmer and their non-GM neighbours.

It is considered that the legislative framework in South Australia relating to this matter should also be reviewed to ensure such gaps are addressed should the moratorium be lifted.

Additional Comments

Community concern for human health and environmental impacts of GM crop usage is influenced by inadequate scientific understanding of the likely long-term physiological and health impacts on humans, and on surrounding crops, ecologies and other food chains as a result of the use of GM crops/foods. Therefore the review should consider the best available science on this issue to better inform policy makers, the industry and the community more broadly. If the science is inconclusive on the long term impacts of GM crops, then it is considered that the Moratorium should not be lifted.

There are also concerns regarding the economic and social impacts of GM products being subject to strict intellectual property law. These legal parameters quite often require farmers to sign licence agreements with seed companies that give over many of their rights, just to be able to grow a GM crop. This type of agreement – already exploited in developing countries – is considered an onerous level of control, and policy makers ought to consider the extent to which intellectual property rights should be able to control farmers and their ability to grow and sell their crops. The economic and social implications of these arrangements should also be assessed over the long term as part of the review.

Finally, Council considers that the widest possible public consultation should be undertaken prior to any legislative change resulting from the high-level review. This should include all tiers of Government, industry, producers, NGO's and the community more broadly.

¹ <http://www.abc.net.au/news/rural/2014-05-28/gm-court-case-debate/5349598>

Summary

In general, the Adelaide Hills Council supports a high-level review of GM crop cultivation on the basis that this is a highly dynamic and rapidly changing area of agricultural research and development.

However, as highlighted above, the scope of the review needs to be expanded to encompass human health, environmental and social considerations before any recommendations can be fully supported.

It is imperative that the Adelaide Hills remains renowned for its clean, sustainable and premium food and beverage production and that this is protected. Council is therefore opposed to any legislative changes that would threaten this image and the economic base of the region moving forward.

For these reasons and in line with Council's current Policy in this regard, we would implore the State to take a cautious approach to any consideration of lifting the Moratorium.

Adelaide Hills Council appreciates the opportunity to support the high-level review and welcomes any further involvement in the establishment of a successful GM framework for South Australia.

Should you have any further queries in this regard please contact Marc Salver, Director Development & Regulatory Services, on 8408 0522.

Yours sincerely



Andrew Aitken
Chief Executive Officer

enc: A – Council Policy: Genetically Modified Crops