



Minutes of the Council Meeting

Alexandrina Council Ordinary Meeting

19 October 2026

9. Administration Reports

9.1. Management of Little Corellas

Moved Cr Milli Livingston

That Council:

1. Receive and note the report titled *Management of Little Corellas*.
2. Investigate and present options of increasing current activities and/or exploring other non-lethal measures to a Council information session before the end of 2026.
3. Write to the Member for Finniss, Lou Nicholson MP and the Minister for Environment and Water, the Hon Murray Watt advising of the situation and calling on urgent action for a region wide long term approach.
4. Support the continuation of Council's current Little Corellas deterrence activities within existing operational resources.
5. Approve the development of an Integrated Little Corella Management Plan in collaboration with Landscape SA – Hills & Fleurieu, Primary Industries and Regions SA (PIRSA), Department for Environment and Water (DEW) and the Southern & Hills Local Government Association.
6. Receive a progress report by March 2027 on the outcomes of the Little Corella Population Control Program, including the progress on the development of the Integrated Little Corella Management Plan.
7. Require Administration to present the proposed Integrated Management Plan to Council for consideration following consultation and development with the relevant partners.

8. Consider funding for the second year of the program as part of the 2027/28 Annual Business Plan and Budget process

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C350/10/26

Moved Cr Peter Oliver seconded Cr Sue Miller

That Council:

1. Receive and note the report titled *Management of Little Corellas*.
2. Approve the immediate implementation of a humane Little Corella Population Control Program using suitably qualified and professional contractors to use targeted night time roost shooting and other appropriate methods, subject to required approvals, animal welfare requirements, public safety controls and operational arrangements.
3. Approve a budget variation of \$100,000 (includes contingency) to fund the 2026/27 Little Corella Population Control Program, with the budget variation to be reflected in the First Quarter Budget Review.
4. Supports the continuation of Council's current Little Corellas deterrence activities within existing operational resources.
5. Approve the development of an Integrated Little Corella Management Plan in collaboration with Landscape SA – Hills & Fleurieu, Primary Industries and Regions SA (PIRSA), Department for Environment and Water (DEW) and the Southern & Hills Local Government Association.
6. Receive a progress report by March 2027 on the outcomes of the Little Corella Population Control Program, including the progress on the development of the Integrated Little Corella Management Plan.
7. Require Administration to present the proposed Integrated Management Plan to Council for consideration following consultation and development with the relevant partners.
8. Consider future funding for the program as part of the 2027/28 Annual Business Plan and Budget process.
9. The program is to be undertaken between November 2026 and February 2027 with a targeted reduction in bird numbers of 30% of the super flocks.
10. The questions submitted by Cr Peter Oliver to the Chief Executive Officer, and the responses provided, are recorded in the Council Meeting Minutes as follows:

Question 1: Why has trapping been selected as the sole method, rather than night-time roost shooting or a combination of both methods?

Answer 1: Trapping has been recommended because it has the potential to remove a greater number of birds than shooting. Based on current estimates, six traps could capture approximately 100 birds per trap per week.

Trapping also provides greater control over the location of bird removal activities, as traps can be strategically placed on Council-controlled land in areas where Little Corellas typically congregate. Compared with shooting, trapping is considered a lower-risk activity and can be undertaken more discreetly.

Question 2: Does trapping involve the subsequent use of gassing as the culling method?

Answer 2: The method used will depend on the number of birds captured. Smaller numbers will be euthanised by shooting, while larger numbers will be euthanised by gassing.

Question 3: What is the cost difference between the two methods? Is shooting less expensive?

Answer 3: Night-time shooting has been quoted at \$2,520 (ex GST) per week over 16 weeks (November to the end of February), totalling \$40,320 (ex GST).

Trapping has been quoted at \$5,300 (ex GST) per week over the same 16-week period, totalling \$84,800 (ex GST).

As noted above, trapping is the recommended approach, as it has the potential to remove significantly more birds than shooting, is considered a lower-risk activity and can be undertaken more discreetly.

Question 4: Can other organisations contribute funding towards the bird removal program?

Answer 4: Opportunities for shared funding are expected to be explored as part of the Integrated Management Plan.

Question 5: What baseline flock number is Administration using?

Answer 5: Accurately estimating the size of the Little Corella population is extremely difficult. An alternative approach is to monitor the number of birds removed through the program. The contractor can provide weekly figures on the number of birds removed.

Question 6: How many birds, and what percentage of the total population, are expected to be removed during Phase 1, between November and February?

Answer 6: It is estimated that approximately 8,000 to 10,000 birds could be removed between November and February. Based on the current estimate of six traps, each capturing approximately 100 birds per week over a 16-week period, the potential total would be 9,600 birds.

The contractor is seeking to increase the number of traps available. However, additional traps will need to be manufactured, which may take approximately six weeks. If additional traps become available during the season, the number of birds removed could well exceed 10,000.

While the total population is difficult to establish, this would represent a substantial number of birds removed. As a result, a reliable estimate of the percentage of the total population cannot currently be provided.

Question 7: What is the annual cost of deterrent activities, and could these resources be redirected to the bird removal program?

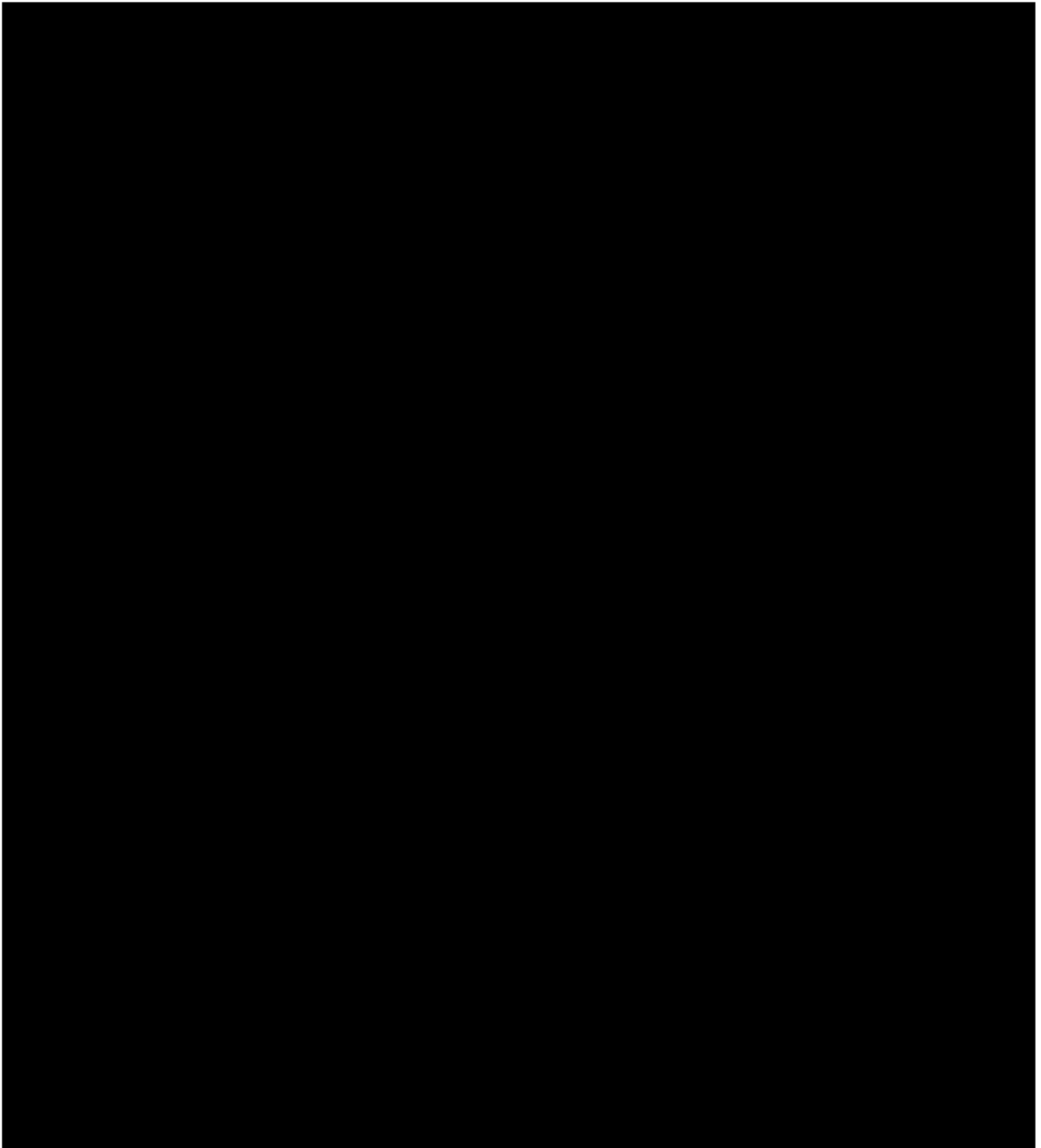
Answer 7: Deterrent activities are currently undertaken within existing Council staffing resources. Accordingly, there is no separately identified annual program expenditure that could readily be reallocated to the bird removal program.

Conclusion

Ultimately, the scale of the outcomes achieved will depend on the resources allocated to the management program. Controlled trapping is recommended due to its potential to remove a substantial number of birds, the ability to strategically locate traps on Council-controlled land within known Little Corella resting areas, its lower level of risk compared with shooting, and the capacity to undertake bird removal activities discreetly.

The development of an ongoing, Integrated Little Corella Management Plan, in collaboration with the Hills and Fleurieu Landscape Board, PIRSA, DEW and the Southern & Hills Local Government Association, is arguably the most important recommendation. A coordinated, regionwide approach will be critical to achieving the sustained and effective management of Little Corella populations long-term.

CARRIED



9. Administration Reports

9.1. Management of Little Corellas

Decision Report

Responsible Officer: Alan Harvey (General Manager Infrastructure)

Report Author: Andrew MacDonald (Chief Executive Officer)

Previous Decisions: C321/09/26, C265/08/26, C080/03/25

Report Purpose

For Council to consider the immediate implementation of a two-year humane Little Corella Population Control Program using qualified and professional contractors, and to consider the development of a longer-term Integrated Little Corella Management Plan, in collaboration with the Landscape SA – Hills & Fleurieu, Primary Industries and Regions SA (PIRSA), the Department for Environment and Water (DEW), and the Southern & Hills Local Government Association.

Recommendation

That Council:

1. Receive and note the report titled *Management of Little Corellas*.
2. Approve the immediate implementation of a two-year humane Little Corella Population Control Program using suitably qualified and professional contractors to trap and remove birds, subject to required approvals, animal welfare requirements, public safety controls and operational arrangements.
3. Approve a budget variation of \$100,000 (includes contingency) to fund the 2026/27 Little Corella Population Control Program, with the budget variation to be reflected in the First Quarter Budget Review.
4. Supports the continuation of Council's current Little Corellas deterrence activities within existing operational resources.
5. Approve the development of an Integrated Little Corella Management Plan in collaboration with Landscape SA – Hills & Fleurieu, PIRSA, DEW and the Southern & Hills Local Government Association.
6. Receive a progress report by March 2027 on the outcomes of the Little Corella Population Control Program, including the progress on the development of the Integrated Little Corella Management Plan.
7. Require Administration to present the proposed Integrated Management Plan to Council for consideration following consultation and development with the relevant partners.
8. Consider funding for the second year of the program as part of the 2027/28 Annual Business Plan and Budget process.

Background

Statewide and Alexandrina Context

The management of abundant bird species is a statewide issue affecting primary producers, conservation and land management organisations, local government, communities and State Government agencies. Impacts include crop losses, infrastructure damage, noise, fouling of public spaces and risks to workplace health and safety.

Within Alexandrina, Little Corellas and feral pigeons are the primary abundant bird species of concern. Council currently undertakes targeted control programs to manage feral pigeon populations, primarily within Strathalbyn. This report focuses on Little Corellas due to their widespread impacts and the ongoing community concern regarding their numbers and behaviour.

Little Corellas are highly mobile and adaptable native birds that occupy both natural and urban environments. Their movements across public and private land, as well as local government boundaries, limit the effectiveness of isolated, localised control measures. While targeted management can reduce impacts at specific locations, sustained regional population reduction is unlikely to be achieved through a single approach. A combination of removal methods is likely to be more effective and should be considered as part of an integrated management program.

Council has a role in managing impacts on its assets and infrastructure, supporting affected communities and advocating for a coordinated response. However, successful long-term management requires collaboration with State Government agencies, landscape boards and neighbouring councils.

Community Impacts

Little Corellas have affected communities across the Alexandrina district for more than 20 years and have been the subject of Council reports, petitions, deputations and ongoing complaints.

Large flocks regularly occupy townships between October and May. Flocks can number up to approximately 15,000 birds when smaller groups congregate. Known problem locations include Strathalbyn, Goolwa, Milang, Port Elliot, Hindmarsh Island and Mount Compass.

Reported impacts include:

- Excessive noise from screeching vocalisations.
- Damage to trees, vegetation and crops.
- Fouling of public spaces, schools and private properties.
- Damage to buildings, lighting, playgrounds, sporting facilities and other infrastructure.
- Reduced amenity for residents, schools and businesses.

Community views vary, with some residents valuing the birds as part of the natural environment and others experiencing significant impacts. These differing perspectives need to be considered when determining future management approaches.

Previous Management Activities

Over the past 20 years, Council has trialled a range of management measures, including sound and light deterrents, pyrotechnics, clap boards, starter pistols, gas guns, birds of prey, stock whips, shoot-to-scare techniques, trapping, gassing, shooting and visual deterrents.

Although some measures have achieved short-term results, their effectiveness has often declined as birds adapt to them. Other methods have been constrained by regulatory requirements, community concerns, labour demands or cost.

Previous control programs have also faced limitations, as some control methods were labour-intensive and costly, while removal efforts were often constrained by the presence of birds on private land where Council could not undertake control activities.

Council currently undertakes deterrence activities in accordance with Resolution C080/03/25 of 17 March 2025, including drone operations, flashing lights and clap boards. Council also provides advice to residents and businesses on managing impacts on private property.

These activities are currently delivered within existing operational resources, without a dedicated abundant bird management budget or a dedicated management position.

Research and Regional Initiatives

Between 2015 and 2017, Council participated in a statewide Little Corella research project involving universities, government agencies, the Local Government Association of South Australia (LGASA) and several South Australian councils. The project examined the social, environmental and regulatory aspects of Little Corella management.

The resulting report was presented to Council in June 2017. Council resolved (ACM17200) to continue deterrence and removal activities at specific problem sites and to advocate for stronger State Government leadership.

Council has continued to engage with PIRSA and DEW, including following Resolution C080/03/25.

PIRSA and LGASA have also investigated the development of a pest bird baiting program. Further research may establish whether baiting can provide an additional long-term management option. The report *A New Bait for Pest Birds of the Grains Industry* is provided as Attachment 1.

The Kangaroo Island Landscape Board undertook a two-season night-time roost control trial between 2024 and 2026. The trial demonstrated that night-time contractor control activities can remove significant numbers of Little Corellas and may reduce local impacts. However, effectiveness was lower within townships, reinforcing the importance of sustained, multi-year programs to achieve meaningful outcomes.

The Limestone Coast Local Government Association is also considering regional and potentially statewide flock monitoring to improve understanding of Little Corella movements. Participation by Alexandrina and the broader Southern & Hills region may support future planning.

These initiatives highlight the need for sustained, coordinated management using a combination of approaches.

Council Resolutions

At its meeting on 17 August 2026, Council received deputations regarding Little Corella management in Goolwa and Strathalbyn, together with petitions seeking the reinstatement of lethal culling. Council subsequently resolved (C265/08/26):

C265/08/26

That Council receive the petition requesting Council to reinstate lethal culling of Little Corellas as part of a Corella Action Plan by October 2026 and that it be forwarded to the Infrastructure division for assessment and response to Head Petitioner and further:

1. Note the deputation by Ms L Bradey regarding 'the management of the impact of the large flocks of Little Corella in the Goolwa Township'
2. Note the deputation by Mr M Ferry of Strathalbyn on behalf of the Strathalbyn Eastern Fleurieu School and Community regarding 'Strathalbyn-Corella Action Plan – October 2026'
3. Note item 9.1 to be considered later in this agenda 'Community Engagement Outcomes - Future planning for Goolwa Main Street Trees' references corella management;
4. Note on page 186 of this agenda that Environment, Rural Land and Natural Assets key messages arising from the Strathalbyn and Surrounds Town Plan engagement included calls for culling of Little Corellas expressing concerns about environmental balance; and
5. Request administration as an interim short-term solution prepare a report including costings and budget impact for the 19 October 2026 council meeting for the purpose of commencing lethal culling of Little Corellas in Strathalbyn and Goolwa and other townships as required, as soon as possible.
6. Write to the State Members for Hammond, Heysen and Mawson in addition to writing to the State Member for Finniss to seek advice and support for the management of Little Corellas from a regional and local perspective.

CARRIED UNANIMOUSLY

At the same meeting, Council considered the *Future Planning for Goolwa Main Street Trees* report and resolved (C267/08/26, Item d):

C267/08/26

That Council approve the development of Option 2, with further reporting being provided on:

- a. Increasing the streetscape level of service in Cadell Street (from Gardiner Street to Goolwa Terrace).
- b. Development and implementation of a specific tree management plan for the existing Cadell Street trees.
- c. Scoping and execution of specific plans to manage the interaction of trees within the state heritage area and heritage listed buildings.
- d. Investigation and development of corella management strategies from a regional and local perspective for the 19 October 2026 Council meeting.
- e. Investigation of better engagement with businesses within Cadell Street to support the ongoing management of the street and the trees.
- f. Note that as a matter of priority elements a, b and d are proposed to be reported first over the coming few months followed by elements c and then e.

CARRIED UNANIMOUSLY

At its meeting on 21 September 2026, Council considered a Notice of Motion regarding Little Corella management and resolved (C321/09/26):

C321/09/26

Moved Cr Peter Oliver seconded Cr Margaret Gardner

That Corella Management Plans be escalated with the objective of reduction in super flock numbers by 30% by 31/12/2026.

CARRIED

This report responds to these resolutions by outlining some management options, their limitations, the proposed immediate response, longer-term management opportunities and associated financial implications.

Discussion

The proposed approach is to reduce the local impacts of Little Corellas at priority locations across Alexandrina, as soon as possible, while developing a coordinated, evidence-based approach to longer-term management.

It is broadly recognised that Little Corellas move between townships, rural areas and neighbouring council districts. The number of birds present at any particular location can change significantly over short periods. Accordingly, reductions in local flock numbers do not necessarily equate to a sustained reduction in the overall regional population.

Many known roosting and problem locations are on private land, limiting Council's ability to undertake direct management activities. Any proposed control program must therefore consider land access, site suitability, operational costs, animal welfare, public safety and the roles of other agencies.

Option 1 — Continue Existing Service Levels

Council could continue its current deterrence and community support activities within existing operational resources.

This option would maintain:

- Drone operations and other deterrents.
- Resident education and advice.
- Management of impacts on Council assets where practicable.
- Advocacy for a coordinated State Government response.

This option would not require additional program funding or staffing. However, it would not expand Council's management capacity and is unlikely to deliver materially different outcomes from those currently being achieved.

Option 2 — Implement a Two-Year Trapping and Removal Program

Council could engage suitably qualified professional contractors to undertake targeted trapping and bird removal at selected locations over two years, subject to confirmation of the applicable approvals, legal requirements, animal welfare safeguards and operational arrangements.

This approach would involve:

- establishing feeding stations and attracting birds to suitable locations;
- deploying modular capture traps capable of capturing approximately 200-300 birds per day;
- releasing any non-target bird species;
- humane removal of captured Little Corellas; and
- ongoing monitoring and adjustment of trapping locations.

The program would occur from November to February, for 4 days per week with 6-hour contractor shifts, and consider known problem locations including Strathalbyn, Goolwa, Milang, Port Elliot, Hindmarsh Island and Mount Compass. The program and associated operating cost will be closely monitored by Administration and reported to Council as appropriate. The cost of the program has been estimated at \$88,000.

Before implementation, the operational arrangements would need to confirm:

- How priority sites are selected and assessed.
- The land access, authorisations and safety requirements for each operation.
- The contractor's qualifications, insurance and reporting obligations.
- Animal welfare procedures, including the management of injured birds.
- Responsibility for community notification and complaints.
- Records of operations, birds removed, incidents and expenditure.
- The measures used to assess effectiveness and determine whether further operations are warranted.

Further considerations include:

- Trapping and removal can only be undertaken on Council land or land under Council's care and control;
- trapping and removal are generally more effective in rural and fringe township locations than within urban areas; and
- effectiveness may be limited where birds are roosting on private land.

Formal approval with DEW would be required to ensure regulatory requirements and operational arrangements are met.

The proposed program should be subject to regular monitoring and review. Its intended outcome is to reduce local impacts at selected locations; it should not be presented as a guarantee of a sustained reduction in the overall Little Corella population.

A two-year program would allow Council to assess results across successive seasons and inform decisions regarding future management.

Longer-Term Option — Integrated Little Corella Management Plan

A longer-term Integrated Little Corella Management Plan would provide a coordinated framework for managing impacts across the district and working with State Government agencies and neighbouring councils.

The plan could include:

- Continued bird deterrence activities and community education across the region.
- Assessment of trapping and other control methods, subject to relevant approvals.
- Identification of preferred targeted trapping and removal methods, informed by program results.
- Identification of suitable locations across the region and development of a regional trapping program.
- Participation in PIRSA and DEW research initiatives, including future baiting trials where appropriate.
- Participation in regional or statewide flock monitoring initiatives.
- Continued advocacy for coordinated State Government leadership.
- Annual reporting to councils on activities, costs, outcomes and effectiveness.

The plan should identify priority locations, management objectives, responsibilities, resource requirements, performance measures and review arrangements. It should also consider the practical and regulatory limitations of individual methods and determine how the approaches can be integrated over time.

A dedicated Corella Management Officer position may be required longer-term and has been estimated at \$100,000 per annum. The position would support ongoing program coordination and could potentially be shared with other regional partners.

Recommended Approach

Administration recommends that Council consider a staged approach comprising:

1. **Immediate action:** Implement a two-year targeted trapping and removal program at suitable priority locations, subject to confirmation of operational requirements and safeguards.
2. **Longer-term planning:** Develop and implement an Integrated Little Corella Management Plan in partnership with the Landscape SA – Hills & Fleurieu, PIRSA, DEW and the Southern & Hills Local Government Association.
3. **Evidence and collaboration:** Participate in relevant research, baiting trials and regional flock-monitoring initiatives as opportunities arise.
4. **Monitoring and review:** Report on expenditure, activities, outcomes, incidents and effectiveness, using the findings to inform future decisions about management methods and resource allocation.

This approach provides an immediate response to community concerns while recognising the limitations of localised control and the need for coordinated adaptive management.

Council Resolution C321/09/26 refers to a 30% reduction in superflock numbers by 31 December 2026. Administration cannot guarantee that outcome through a local control program. Little Corellas are highly mobile, and the number of birds present within Alexandrina varies over time. Any assessment against this target would need to establish a reliable baseline, define the geographic area and measurement method, and distinguish changes in local flock numbers from changes in the broader population.

Financial Implications

The proposed change in service levels has significant financial implications and will require additional operational funding and further consideration by Council.

There is currently no dedicated operational budget for Little Corella management. Administration has identified a proposed operational budget requirement of \$88,000 for 2026/27, which would require a budget adjustment to be considered by Council.

Funding for the second year of the proposed two-year targeted trapping and shooting program will need to be considered as part of the 2027/28 Annual Business Plan and Budget process.

Longer-term funding requirements will need to be considered by Council, taking into account the effectiveness and actual costs of the proposed two-year targeted trapping and removal program, as well as the requirements of the Integrated Little Corella Management Plan. The Plan is expected to provide cost estimates and identify how implementation costs and resources will be shared among the various program partners.

Furthermore, Council may need to consider establishing a dedicated Corella Management Officer position. The need for this position will be informed by the outcomes of the two-year targeted trapping and shooting program and the level of resourcing required to implement the Integrated Little Corella Management Plan. As previously stated, the cost of a dedicated Corella Management Officer could possibly be shared with other regional partners.

Risk Implications

In accordance with Alexandrina Council's Risk Assessment Matrix, the risk associated with adopting the recommendations is assessed as **Medium**. The principal risks relate to animal welfare, public safety, regulatory compliance, financial management, operational effectiveness and community response.

These risks would be managed through appropriate site assessments, contractor requirements, operational controls, incident reporting and ongoing monitoring and review.

Community views regarding Little Corella management vary, particularly in relation to lethal control. Clear and timely communication will be important to explain the purpose, scope and limitations of the proposed program, while acknowledging differing community perspectives.

Subject to Council's consideration of this report, the Alexandrina Council website will be updated to reflect Council's approach to Little Corella management and its associated management actions.

Attachments

Attachment 1 — *A New Bait for Pest Birds of the Grains Industry*.

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A new bait for pest birds of the grains industry

Funded by the Local Government Research and Development Scheme

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A new bait for pest birds of the grains industry

Information current as of April 2026

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Contents

Background.....	4
Stakeholder engagement.....	4
Surveys	5
Workshops	5
Technical assessment of candidate toxins	6
Economic analysis	6
Cost for stakeholders.....	6
Cost of control measures.....	6
Benefits	7
Draft project plan to progress work to develop a bait for pest birds	8
Overview	8
Scope.....	8
Budget and funding applications.....	9
Strategic Plan for Pest Birds.....	9
Conclusions	10
Appendix.....	10
Appendix 1. Pest bird impacts in South Australia - Stakeholder workshop summary	10
Appendix 2. Literature review of candidate toxins for baiting pest birds in Australia.....	10
Appendix 3. Pest bird control tool - Economic analysis. A report by BDO Services Pty Ltd.	10

Background

Pest birds include introduced species like feral pigeons and starlings as well as native species that are over-abundant and problematic like little corellas and silver gulls. When populations of pest birds are in high numbers, they impact primary industries, including grains, fruit, nuts, and fisheries, as well as infrastructure and residential properties in regional communities.

PIRSA partnered with Local Government Association (LGA) to analyse the costs and benefits of developing and registering a new bait for use on pest birds, which are impacting primary industries and communities.

To quantify impacts of pest birds, stakeholders were engaged through surveys and workshops. Information acquired through surveys and the workshop was modelled by independent economists to analyse the costs and benefits of developing and registering a new bait.

Impacts from pest birds have been increasing over the last decade. The surveys indicated that the most affected primary industries were the fruit, nut and tuna industries.

These findings strengthened the understanding of the need for, and the development and application of, a bait for pest birds. The cost versus benefit analyses highlighted the large benefits and relatively low costs of the new bait. This information will inform project plans and funding proposals to undertake the required research and development for the new bait.

This report summarises the findings of the project and provides a project plan for future actions.

Stakeholder engagement

To understand impacts and identify priorities, stakeholders were engaged from fruits, nuts, grains, and tuna industries, as well as local councils, landscape boards, and the Department for Environment and Water (DEW).

At a stakeholder workshop, PIRSA outlined findings of population modelling, which indicated exponential population growth of pest birds. The population models are reproduced in the report on the economic analyses of the proposed bait. Stakeholders also shared information on the relevant legislation and impacts of pest birds.

Short-, medium- and long-term actions were identified based on feedback from stakeholders. Full details are provided in Appendix 1. Pest bird impacts in South Australia - Stakeholder workshop summary.

Surveys

PIRSA surveyed over 65 stakeholders to understand and quantify the impacts of pest birds on primary industries and local communities. Findings from the surveys are summarised in Table 1.

Table 1. Production loss and control cost of pest birds on different industries and local governments.

Group	Production loss	Control cost
Grain growers (n = 4)	~9% crop loss	~\$3/ha or ~11 days/year
Grain storage (n = 4)	~\$1/t	~300 days per year
Fruit producers (n = 11)	100% of unnetted crops	~\$4,500/ha
Nut producers (n = 7)	100% without control	~\$500/ha
Tuna producers (n = 1)	~4% of stock feed (~\$2 m)	\$250,000/year
Kingfish producers (n = 1)	~\$1.4 m/harvest	
Council – non-native birds (n = 26)	NA	~\$10,000/year ~6 days/year
Council – native birds (n = 26)	NA	~\$22,500/year ~18 days/year

Some costs (e.g., mental health, poor working conditions, and health risks) were harder to quantify but were noted in the economic analysis (see below).

Workshops

PIRSA facilitated a stakeholder workshop in February 2025, bringing together 32 representatives from local and state governments and primary industries to discuss pest bird impacts. Details of the workshop are included in Appendix 1.

Birds such as pigeons, sulphur-crested cockatoos, little corellas, cormorants, swallows and starlings were highlighted as causing increasing losses across the grain industry during seeding, harvest and storage. Impacts include crop consumption, infrastructure damage and fouling of stored grain, with concerns that impacts increase during droughts. Growers and handlers have trialed a range of controls including trapping, gassing, shooting and emerging technologies such as AI-assisted deterrents and a bait called *Ovo-control*.

Fruit and nut growers report that bird damage has become more severe over the past 10–15 years, with species such as rosellas, lorikeets and little corellas destroying buds and crops and damaging farm infrastructure. Some farms reported production losses of up to 80%, requiring substantial labour and resources for bird management. Exclusion netting remains the most reliable control method, but high costs and logistical constraints limit its widespread use. Uncoordinated management between neighbouring properties was highlighted as reducing the effectiveness of control measures.

In the tuna industry, silver gull numbers have increased over the past decade, with flocks around cages growing from small numbers to thousands. This has led to significant feed losses—estimated at an average of \$1.76 million annually—and increased biosecurity and worker health risks. Current controls, such as egg oiling are costly and ineffective. Local councils are also receiving more public complaints

about pest birds, but Councils were uncertain about their role in management, with limited coordination and with some community opposition to lethal control.

At the workshop, PIRSA outlined the research and development work required to register a new bait for pest birds, including non-native species and abundant native species.

Technical assessment of candidate toxins

Toxins used to control pest birds have been used internationally, but few examples exist in Australia. PIRSA reviewed information to identify a candidate toxin, which could be used humanely while also minimising risks to non-target animals and the environment. The three candidate toxins that were assessed are outlined in Appendix 2. PIRSA, 2026.

The most suitable candidates were identified based on their species specificity, low risk of secondary poisoning and humaneness. Lack of trials in the field and in captivity were identified as gaps that were required to be addressed through future research.

Economic analysis

PIRSA engaged BDO Pty. Ltd. to conduct an economic analysis using the information gathered from stakeholder surveys and workshop discussions. The full economic analyses are included in Appendix 3. BDO Services Pty. Ltd.

Cost for stakeholders

Economic impacts identified by the analysis are listed in Table 2. The fruit industry was the most impacted followed by the nut industry and aquaculture industry.

Table 2. Impact of pest birds on industries. Abbreviations – GSP = gross state product; FTE = full time equivalent

Sector	Total GSP (20 yrs)	Direct GSP	Flow-on Effects	Avg Annual GSP	Employment Impact (Avg FTE)	Direct FTE	Flow-on FTE
Fruit growing	\$503 M	\$403 M	\$100 M	\$25 M	+32	+17	+15
Nut growing	\$138 M	\$268 M	-\$129 M	\$7 M	-145	-116	-29
Aquaculture	\$15 M	\$6 M	\$9 M	\$1 M	+5	+2	+3
Other sectors	\$6 M	\$16 M	-\$10 M	\$0.3M	-3	<-1	-2

Cost of control measures

The economic analyses modelled the projected costs of pest bird control measures using stakeholder inputs and population modelling undertaken by PIRSA.

In 2030–31, ten bait stations are proposed to be constructed across South Australia at a cost of \$10,000 each to support coordinated pest bird control. From 2031–32 onwards, coordination costs are estimated at \$250,000 per year and baiting at \$500,000 per year, with ongoing bait station repairs estimated at \$20,000 annually from 2032–33 (Table 3). The research and development for a bait will cost \$5,040,000 to test three candidate toxins, analyse data and report findings (Table 4).

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Table 3. Estimated cost of coordinated area-wide pest bird control deployment costs (Appendix 3. BDO Services Pty. Ltd., 2025).

Control measures	Timeline	Cost
Research and development of bait (Table 4)	3 years commencing 2027	1,260,000 X 4 phases
Deployment of ten bait stations	1 year commencing 2030-31	\$10,000 per station x 10
Delivery and coordination of a control program	2 years commencing 2031-32	\$250,000 per year x 2
Baiting operations	2 years commencing 2031-32	\$500,000 per year x 2
Repair and maintenance	2 years commencing 2031-32	\$20,000 per year x 2
	Total	\$6,680,000

Benefits

The economic analysis indicates that the proposed pest bird control tool is a worthwhile investment.

In South Australia, the program is projected to generate a net present value (NPV) of \$604 million and a benefit–cost ratio (BCR) of 5.3, contributing \$1.3 billion to Gross State Product over 20 years, or an average of \$63 million annually.

The initiative is estimated to deliver an annual NPV of \$5 billion and a BCR of 3.3, contributing \$14 billion to GDP over 20 years. The largest annual sectoral benefits are expected in fruit (\$542 million), grains (\$62 million) and nuts (\$52 million).

Draft project plan to progress work to develop a bait for pest birds

Overview

Industries and stakeholders most impacted by pest birds have been identified and consulted.

The development and registration of a new bait has been proposed to mitigate the impacts.

The next phase of the project will focus on continuing stakeholder engagement, seeking funding to progress work to research, development and registration of a bait.

The findings and processes of the project will be used to develop a Strategic Plan for Pest Birds, linking the impacts of pest birds, the proposed strategic actions, and the economic benefits to South Australia and nationally.

Scope

Continuing stakeholder engagement

The project involves stakeholders from the fruit, nut, grain and tuna industries, as well as local councils, landscape boards and the Department for Environment and Water (DEW). Future workshops will build on this existing stakeholder base to strengthen collaboration with, and co-funding from, national peak industry groups. Inputs from these stakeholders will achieve outcomes at state- and national- levels.

Bait research and registration

PIRSA will develop and submit proposals to research and register a new bait for pest birds, including both non-native species and abundant native species. PIRSA has experience in working to register a new bait for feral cats and PIRSA is in the process of registering a bait for feral deer.

There are limited toxins that could be used for pest bird control. PIRSA conducted a literature review to identify candidate toxins for pest birds. The review identified candidate toxins that have potential be delivered using bird-specific feeders with future incorporation of artificial intelligence (AI) recognition models to increase specificity of targets. To ensure that the bait is humane and does not impact non-target species, trials are proposed to be conducted in the following phases until a suitable bait is identified:

Phase 1 – Conduct aviary trials of DRC-1339

Phase 1A – Analysis and reporting

Phase 1B – If aviary trials are successful, the project would progress to the preparation of APVMA registration package for a bait based on DRC-1339.

Phase 2 – If Phase 1A is not successful, conduct aviary trials of sodium fluoroacetate (1080)

Phase 2A – Analysis and reporting

Phase 2B – If aviary trials are successful, the project would progress to the preparation of APVMA registration package for a bait based on sodium fluoroacetate.

Phase 3 – If Phase 2A is not successful, conduct aviary trials of cyanide

Phase 3A – Analysis and reporting

Phase 3B – If aviary trials are successful, the project would progress to the preparation of APVMA registration package for a bait based on cyanide.

Phase 4 – Analysis, reporting and liaison with APVMA through the registration process.

Trials would be undertaken in a controlled environment followed by analysis of the findings to inform whether the candidate toxins may be suitable for a new bait.

Baits are regulated by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and must be target-specific, humane, and have minimal impacts on non-target species. This process requires expertise to develop and synthesise an application package that will be provided to the APVMA based on the literature reviews and aviary trials.

Budget and funding applications

Funding is required to progress the research and development of a bait for pest birds and to draft the application to the APVMA, and to engage with them during the 3-year registration process.

The project identified several primary industries that are impacted by pest birds. PIRSA would seek to discuss potential funding opportunities with representatives from the peak bodies of these industries, and with other state governments and the Commonwealth Government.

Economic analyses (Appendix 3. BDO Services Pty. Ltd., 2025) indicate that an investment of \$5 million will be required to develop an effective and humane bait and secure national registration, with funding over four years from 2027–28. Literature review of bird toxins (Appendix 2. PIRSA, 2026) identified DRC – 1339, sodium fluoroacetate (1080) and cyanide as candidate toxins. Funding will enable completion of the phased research and development, which includes stop-go points, outlined below (Table 4).

If Phase 1 is successful then the project can move directly to Phase 4 resulting in the development of a bait for a minimum of \$2,52,0000.

Table 4. Estimated cost of research and development of a bait.

Research and development phases	Cost	Timeline
Phase 1 – Aviary trials of DRC -1339	\$1,26,0000	2027 - 2028
Phase 2 – Aviary trials of 1080	\$1,26,0000	2028 - 2029
Phase 3 – Aviary trials of cyanide	\$1,26,0000	2029 - 2030
Phase 4 – Analysis and reporting	\$1,26,0000	2027 - 2030
Total	\$5,040,000	

Strategic Plan for Pest Birds

A strategic plan for the management of pest birds in South Australia is essential to ensure a coordinated, evidence-based approach across government, industry and community stakeholders.

A clear framework would enable prioritisation of resources, alignment of short and long-term actions, and integration of emerging tools and technologies to improve effectiveness.

It would also provide defined objectives and measurable outcomes, supporting accountability and sustained reduction in economic, environmental and social impacts.

Conclusions

Population modeling indicated that several species of pest birds are increasing exponentially, and the independent economic analyses indicated that pest birds are already having significant economic impacts on several primary industries. Impacts are likely to worsen as populations of pest birds continue to increase, especially since no effective method of control exists.

A systematic approach to the research, development and registration of a bait has been outlined, which would result in the availability and deployment of a bait that will benefit impacted sectors.

Appendix

Appendix 1. Pest bird impacts in South Australia - Stakeholder workshop summary

Appendix 2. Literature review of candidate toxins for baiting pest birds in Australia

Appendix 3. Pest bird control tool - Economic analysis. A report by BDO Services Pty Ltd.

Pest bird impacts in South Australia

Stakeholder workshop: Monday 3 February 2025, Adelaide

PIRSA facilitated a collaborative stakeholder workshop on 3 February 2025, bringing together over 30 representatives from government and primary industries to discuss pest bird impacts. The purpose was to:

1. **Understand** and **quantify** the impacts of pest birds in South Australia
2. **Plan** for the development of a new bait for pest bird management

Participants included representatives from fruits, nuts, grains, and tuna industries, as well as local councils, landscape boards, and the Department for Environment and Water (DEW). Everyone shared their experiences with pest birds; we heard about crop losses, infrastructure damage, huge control costs, stress, and human safety issues. We also heard about population trends, legislation, and the Biodiversity Bill. PIRSA summarised results from over 60 surveys across primary industries and councils, and participants contributed to further quantifying the impacts and costs of pest birds.

The PIRSA proposal to develop a new bait was presented and a discussion was held on roles of different stakeholders, funding avenues, and other challenges. The workshop highlighted a common need to foster social license for a toxin to manage pest birds at a population level. Strong support existed for cross-agency, council, and industry collaboration on pest bird management



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Workshop outcomes and actions

Short term

- PIRSA to follow-up with all groups, capture more data on impacts for cost-benefit analyses
- Modelling work continues, including for silver gulls, cormorants, and starlings
- New stakeholders identified and engaged
- Form a Pest Bird Advisory Group for planning, messaging, and advice

Medium term

- Release cost-benefit analyses
- Pest Bird Advisory Group to provide input on draft regulations for pest birds
- Apply for funding for bait work, including from research and development funds
- Start work on technical and field trials
- Facilitate other works, such as flock monitoring programs for developing social licence

Long term

- Registration package for new bird bait submitted to the APVMA
- Scientific applications to use bait adopted and baits laid
- Capture benefits of reduced pest bird impacts from the bait



Summary of workshop content

Understanding stakeholder impacts

Stakeholders from the grain, fruit, nut, and tuna industries and local councils shared the impacts they experience from pest birds. They included:

Grains

- Pest birds are a significant problem during seeding, at harvest, and during storage
- Impacts include crop losses, damage to infrastructure, and fouling of stored grain
- Pest species include pigeons, sulphur-crested cockatoos, little corellas, cormorants, swallows, and starlings
- Growers are fearful that when the drought breaks birds will come back in high numbers; with no effective control tools, populations will be difficult to manage
- Birds are a major problem for grain handlers and storage sites. Viterra has tried many control tools including trapping, gassing, and shooting; they are currently trialling non-lethal tools, including the AI-assisted [CHIRRP](#) system at Tailem Bend and Ovo-control

Fruits

- Twenty years ago, birds were not a significant problem; first started experiencing damage 10-15 years ago
- Impacts include eating and stripping fruit buds in winter, and destroying fruit crops
- Rosellas and lorikeets cause the most damage
- This season was exceptionally bad because of drought conditions; the birds are starving and arrived earlier than in previous years
- Control tools include shooting; However, permits do not allow enough numbers to be shot, and a permit holder can shoot through a permit within weeks, with little effect on impacts
- Only current effective tool is exclusion netting, which is not always feasible for large properties because it can be expensive and difficult to finance
- One farm spent 60 days a year on average managing birds, where they lose anywhere between 0-80% of production
- Management costs may exceed \$100,000 per hectare; more data needed to understand costs for industry

Nuts

- Little corellas cause major damage to almond farms; they chew buds, consume nuts, and damage infrastructure (tear holes in tarps and drip lines)
- Without control tools, little corellas will destroy almost 100% of crops
- Control tools include gas guns and scare planes; one farm is trialling AI-assisted [CHIRRP](#) system. Another farm has staff on quad bikes with guns, scaring birds for up to four hours per day during specific seasons. In severe circumstances, up to seven people are deployed to shoot birds for 4-6 weeks (or more than 1,300 hrs)
- Growers are managing impacts independently, so birds just move among properties
- Best approach is coordinated use of multiple control tools together (lethal and non-lethal)

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Tuna

- Significant issue with silver gulls eating tuna feed; problem has been growing considerably over last 10 years
- Over 20 years ago only 5 birds per cage, now over 5,000 birds per cage
- Sardines are fed to tuna for 6 months of the year; the silver gulls find alternative food outside of this time, moving into townships, kingfish farms, and landfill sites
- Huge costs incurred, including average loss of \$1.76 million in feed that needs to be replaced (net cost of \$3.52 million); biosecurity and work health and safety risks are severe, with workers at the cage being covered in faeces, cuts become infected
- Controls include large egg oiling program; it is an expensive program spraying 27,500 eggs per year, barely scratches the surface of the problem

Local Councils

- Administrative perspective, managing environments for people is important
- Complaints regarding pest birds are increasing; councils are not a pest management agency; is there a role for councils to be involved in pest management?
- Councils not coordinating bird management; some scare birds into neighbouring councils
- Contractors engaged to regularly shoot pigeons; one council tried to shoot little corellas and within 24 hours community members were demonstrating against killing them
- Pressure from the community to reduce little corella impacts, but currently have no answers
- Lots of costs associated with pest birds, but difficult to quantify in monetary terms (e.g., tree damage, loss of tourism, social licence)

Other costs	
Grain	maintenance staff - high risk health impacts 4, people / 5 days to shovel + hose guano
Fruit	morale of workers, stress in cost of living crisis
Nuts	morale, financial stress
Aquaculture	health/infections - time of work work conditions that involve guano
Councils	Public abuse staff for bird impacts Public + staff health Public amenity
All	social licence + reputation for business + indiv's - range of perspectives in public on culling birds - activists ~ businesses need plan for this

Population trends by Seamus Doherty – PIRSA

- Maps of occurrence records for pest bird species over time and modelling of the expected future distributions of feral pigeons and little corellas showed exponential growth in numbers
- Models aligned with observations from the group, i.e. dramatic increase in last 10-15 years
- Discussions occurred around bird survey data and accounting for increase efforts to robustly infer past and future population trends for different species (e.g., manually collected from councils and BirdLife Australia)
- Similar analysis completed so far for little corellas and feral pigeons will be conducted for little pied cormorants, silver gulls, and starlings



Summary of survey results by Annette Scanlon – PIRSA

- Over 65 surveys were completed to understand and quantify the impacts of pest birds on primary industries and local communities
- Noting that the sample sizes were small, it is a start to articulate the quantity of costs
- The group discussed other costs that are difficult to quantify, but will be noted in the economic analysis (e.g., mental health, poor working conditions, and health risks)

Group	Production loss	Control cost
Grain growers (n = 4)	~9% crop loss	~\$3/ha or ~11 days/year
Grain storage (n = 4)	~\$1/t	~300 days per year
Fruits (n = 11)	100% of unnetted crops	~\$4,500/ha
Nuts (n = 7)	100% without control	~\$500/ha
Tuna (n = 1)	~4% of stock feed (~\$2 m)	\$250,000/year
Kingfish (n = 1)	~\$1.4 m/harvest	
Council – non-native birds (n = 26)	NA	~\$10,000/year ~6 days/year
Council – native birds (n = 26)	NA	~\$22,500/year ~18 days/year

Legislation by Karl Hillyard and Tony Halls – DEW

- Three pieces of legislations in South Australia relate to the protection of wildlife and the welfare of animals
 - *National Parks and Wildlife (NPW) Act 1972* provides for the conservation of wildlife in a natural environment and for other purposes
 - The *Landscape South Australia Act 2019* gives powers to landscape boards to coordinate the destruction of animals
 - The *Animal Welfare (AW) Act 1985* prohibits cruelty to animals (protected and unprotected species)
- A new Biodiversity Bill is currently under review; it will replace the NPW Act. Under the new bill, **all native species are protected**
- It will include a range of mechanisms to enable the management of 'impact causing' birds
- Have your say on the [Biodiversity Bill](#) – the current round of consultation closes 18 February 2025

Method	Protected species (NPW Act)	Unprotected species (NPW Act)	Code of Practice
Shooting	Permit required	No permit required	Yes
Trap and gas	Not generally permitted	Permit required for little corellas and galahs	Yes
Eggs – oiling, pricking, destruction	Permit required	Permit required for little corellas and galahs	No

Working toward a new bait by Annette Scanlon – PIRSA

- PIRSA has a proposal to develop and register a new bait for pest birds, including non-native species and abundant native species
- Almost no toxins exist for pest birds. A painless narcotic called alphachloralose can be used by licenced pest controllers to stupefy specific introduced bird species, with individual sleeping birds being collected and euthanised
- Existing, common control methods include deterrents, exclusion, trapping, and shooting
- No bait is available for population-level control of pest birds
- Baits are a cost-effective, landscape-scale control tool used on many invasive species
- Poisons are highly regulated by the [APVMA](#)
- All registered poisons must be 1) highly specific to the target species; 2) humane; 3) carry minimal residual or secondary affects
- PIRSA is partnering with the Local Government Association (LGA) to deliver the first phase of the proposal, due March 2026
- Outputs from that work include:
 - Literature review
 - Stakeholder workshop
 - Cost-benefit analysis of pest birds in South Australia
 - Project plan

Pathway – Developing a bait for pest birds



1. Technical assessment – [underway](#)
 - [literature review](#), [workshop](#), [C-B analysis](#), and [project plan](#)
2. Technical trials
 - Trials of candidate toxins on target species
 - Efficacy and humaneness
3. Field trials, demonstrating:
 - Environmental appraisals
 - Bait delivery pathways (species-specific feeders)
 - Restrictions for use, e.g., townships
4. Registration package:
 - Valid scientific arguments (safety, efficacy, trade, labelling)
 - Application to APVMA



Quantifying impacts from pest birds – Everyone

- All representatives participated in a systematic discussion to quantify the impacts from pest birds for each sector and group
- Participants started identifying new types of costs to incorporate into the discussion
- Groups agreed that data collected so far was good, but that PIRSA staff would follow-up with all groups to capture more information
- All information will feed into a cost-benefit analysis to calculate state-wide impacts from pest birds

Group Discussion (90 min)

Grain growers

Production loss ~9% crop losses
Control cost ~\$3/ha + ~11 days per year

Fruits

Production loss 100% unnetted crops
Control cost ~\$4,500/ha

Tuna

Production loss ~4% of feed (~\$2 m)
Control cost ~\$250,000

Local councils - introduced

Production loss ??
Control cost ~\$10,000 ~6 days

Grain storage

Production loss ~\$1/t stored
Control cost ~300 days per year

Nuts

Production loss 100% without controls
Control cost ~\$500/ha

kingfish

Production loss 15,000 fish killed (~\$1.4 m)
Control costs: ??

Local councils - native

Production loss ??
Control cost ~\$22,500; ~18 days

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	Survey	lost production	man. costs	infrastructure
Grassiers	9/1 \$3/ha	competition for pasture for follow up on survey	livestock	fencing impacted by emus
Grain growers	\$1/t	follow up		Cormorants big impact
Storage			\$250k/site/yr = \$1/t - \$0.30/t tailor made	Big site smaller site
Fruit	100% unnetted \$4500/ha control	0 - 80% loss/farm	\$40k-\$100k/ha = cost of net nets last 10 years 60 days staff costs for 1 farm plus capital costs	
Nuts	\$100% without control \$500/ha	100% without control \$500/ha		
Tuna	4/1 feed \$250,000 - \$2 million cost of feed	land based abalone loses feed	\$250k capped but want lot more	
Kingfish	15000 fish	\$2 million lost production \$2 million to buy more feed		
Residential				
Councils			15 years - annual + quarter meetings + briefings + TIME	replace infrastructure (built + natural) more frequently like planting trees
Natural assets	fewer small birds, weed dispersal	lost repeat business due to disturbance + reviews	Marketing cost	water + waste infra.
Tourism				
Transport				

Discussion about a bait

What do you expect from a bait?

- Highly regulated (like 1080)
- Not too restricted that landholders would struggle to get permits
- Technology needs to be accessible, not too expensive
- Need sufficient evidence that the bait is safe, minimal risk to threatened or off-target species

If there could be a bait registered, what would success look like to you?

- Manageable population levels (not extinction)
- Impacts were manageable 15+ years ago, aim for that level again
- Improved diversity of native birds, and reduced impact on native vegetation
- Need a baseline to be able to pick a size that can be culled
- Silver gulls will need a greater reduction than most species to get back to natural levels

Social license

- A common challenge acknowledged by the group surrounded the social license
- Identified need for all stakeholders to co-develop and agree on shared messages
- Need clear environmental message, not too much focus on industry, highlight the welfare and public health issues
- Is it better to start advertising now, or wait until a clear plan, with timelines and costs has been developed? Need a strategy for communication
- Lessons can be learnt from other examples, what has and has not worked for other over abundant species (e.g., kangaroos)

Where to next?

Next 12 months...

- PIRSA to work with stakeholders to gather more detailed information on pest bird costs
- New stakeholders will also be engaged, including:
 - More processors, packing houses (flow-on affects from lower yields)
 - Meat and Livestock Australia (MLA), livestock producers on the west coast have reported needing to clean troughs twice a day because of bird impacts
 - Table grape and wine industry – impacts of birds on grape growers
 - Land-based aquaculture – abalone industry (silver gulls)
 - The Department for Education – impacted assets (ovals, buildings, schools)
 - SA Water – impacts of birds on water quality/nutrient levels
 - SA Power Networks – infrastructure costs (bats and birds?)
- Other risks from pest birds to be explored, including:
 - Business, industry, reputation, market access risks from pest birds
 - Diseases such as bird flu, psittacosis
- Roles and responsibilities to be clearly defined; for example, councils can support stakeholders through community education; industry groups can facilitate access to growers and trial sites; landscape boards will help drive the project forward

Pest Bird Advisory Group

- PIRSA will coordinate formation of an advisory group to continue collaboration and coordination of the bait project and pest bird management more broadly
- The group will act as a unified voice, engage networks and sectors, and distribute information to their wider networks
- The group will help identify funding opportunities and support proposals as well as provide coordinated submission on regulations for managing pest birds

The workshop was supported by PIRSA and LGA SA.

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Candidate toxins for baiting pest birds in Australia

Literature review



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Candidate toxins for baiting pest birds in Australia – Literature review

Information current as of April 2026

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Contents

1	Introduction.....	5
1.1	Purpose	5
1.2	Pest bird impacts	5
1.3	Managing pest birds.....	5
1.4	Developing a bait for pest birds.....	6
2	Candidate toxins.....	6
2.1	Sodium fluoroacetate (1080)	6
2.1.1	General information and history of use	6
2.1.2	Toxicity to birds	6
2.1.3	Delivery methods	7
2.1.4	Humaneness.....	7
2.1.5	Environmental and human health impacts.....	8
2.1.6	Practical considerations	8
3.3	Cyanide.....	8
3.3.1	General information and history of use	8
3.3.3	Toxicity to birds	9
3.3.4	Delivery methods	9
3.3.5	Humaneness.....	9
3.3.6	Environmental and human health impacts.....	10
3.3.7	Practical considerations	10
4.4	DRC-1339.....	10
4.4.1	General information and history of use	10
4.4.2	Toxicity to birds.....	10
4.4.3	Delivery methods.....	11
4.4.4	Humaneness	11
4.4.5	Environmental and human health impacts.....	11
4.4.6	Practical considerations	12

5. Recommendations 13

5.1 Sodium fluoroacetate (1080)..... 13

5.2 DRC-1339 13

5.3 Bait research and registration pathway..... 13

6. References..... 14

1 Introduction

1.1 Purpose

This document provides a literature review of candidate toxins to assess their suitability and potential, for the lethal baiting of pest birds in Australia. In this context, 'pest birds' includes introduced species and impact-causing abundant native species.

1.2 Pest bird impacts

Over 60 native and introduced bird species impact Australia's primary industries by consuming and contaminating produce and feed, damaging infrastructure, and posing health and biosecurity risks. Pest birds also impact amenity and outcompete other birds for limited resources, such as tree hollows.

Twenty years ago, the annual cost of pest birds to horticultural industries, including cereal crops, was estimated to be \$310 million (Tracey *et al.*, 2007); the management costs of controlling established pest animals, including feral birds, was estimated to be a further \$75 million annually (Gong *et al.*, 2009).

Following anecdotal reports of increasing impacts, the Department of Primary Industries and Regions in South Australia (PIRSA), with the Local Government Association (LGA), launched a new initiative to quantify current costs of pest birds to primary industries and communities. As part of that work, independent economists showed most affected sectors include fruit (\$542 million annually), grains (\$62 million annually) and nuts (\$52 million annually) (BDO Services Pty Ltd, 2025).

New insights into the severity and magnitude of the impacts of pest birds provides an impetus to consider new ways to manage them, including population level control tools, such as baits.

1.3 Managing pest birds

Non-lethal tools

Many stakeholders conduct pest bird deterrent activities, deploying exclusion nets, gas guns, and planes to frighten bird flocks away from crops or towns. Studies assessing the efficacy of these tools (Bomford and Sinclair, 2002; Tracey *et al.*, 2007; Scanlon *et al.*, 2017; Rivadeneira *et al.*, 2018) indicate that non-lethal deterrents are ineffective because birds, especially smart birds like corellas, quickly become habituated to the measures, or move to the next property where they continue to cause damage. Fertility control with OvoControl® is available for use on some bird species. It requires repeated consumption during the breeding season, which can last year-round.

Lethal tools

Shooting is commonly used to manage pest birds. Land managers are restricted by the number they can kill, time, and money, meaning that shooting can be an effective deterrent, but is not a population control tool.

Two toxins (alpha-chloralose and 4-aminopyridine) are registered in Australia for the lethal control of pigeons (*Columba livia*), sparrows (*Passer domesticus*, *P. montanus*, hereafter *Passer* spp.), starlings (*Sturnus vulgaris*) and Indian mynas (*Acridotheres tristis*), but these compounds typically act like chemical repellents and do not reduce population numbers. Strychnine can be used to control emus in Western Australia and Victoria. No toxin is registered for use on other abundant native birds in Australia.

1.4 Developing a bait for pest birds

Baiting is the most efficient and widely used method for controlling most vertebrate pests in Australia. Baits can be effective for large-scale population reductions, and for maintaining low numbers.

One review highlighted that a population reductions were achieved by farmers illegally poisoning birds, including little corellas (*Cacatua sanguinea*) (Bomford, 1992). Illegal poisoning of pest birds is unacceptable; that it occurs even occasionally demonstrates the desperation of some landholders. Access to a safe, effective, and humane bait to reduce impacts from pest birds is apparently needed for primary industries and other land managers who are struggling with the impacts of pest birds.

While species specificity and non-target impacts are important and relevant for registration, an assumption of this work is that the bait would be dispensed in a species-specific feeder. As such, many off-target impacts would be mitigated, and the assessment of humaneness in this review is focussed on pest birds and secondary impacts, rather than direct impacts on non-target species. Species-specific feeders have been demonstrated for lethal baiting of feral deer and goats, with 100% of non-target species, including macropods, rodents and birds, being excluded (NSW National Parks and Wildlife Service Invasive Projects and Research Unit (IPRU), 2024).

Three toxins are assessed in this review, they are [sodium fluoroacetate](#), [cyanide](#), and [DRC-1339](#), (in no particular order). Toxins used for pest bird control in Australia and excluded from this review include anti-coagulants (e.g., pindone, warfarin, brodifacoum), cholecalciferol, and strychnine.

2 Candidate toxins

2.1 Sodium fluoroacetate (1080)

2.1.1 General information and history of use

Sodium fluoroacetate, commonly known as 1080, is both a naturally occurring and synthetic chemical, which has been used as a toxin to control vertebrate pests in Australia since the 1950s (Calver and King, 1986). It is biosynthesised by plants, with the toxin being recorded in over 40 species of native Australian plants (Claridge *et al.*, 2006). 1080 is used to control pest animals in Australia and New Zealand.

1080 is toxic to many vertebrate species, particularly mammals, and was introduced in Australia in the 1950s for rabbit control. It is now used to control wild dogs, foxes, feral cats, and pigs (McLeod and Saunders, 2013); over 100,000 1080 fox baits are deployed annually across South Australia, for example. New trials have also demonstrated it to be an effective and humane toxin for the lethal control of feral deer (PIRSA, 2025). Outside of Australia, 1080 has been used to control rats, possums, stoats, and rabbits in New Zealand. Livestock protection collars containing 1080 are approved to control coyotes in USA (APVMA, 2008), and 1080 is approved as a rodenticide in Israel, Japan, Korea, and Mexico (McCranor *et al.*, 2019).

1080 has not been used to control birds; many bird species are reportedly moderately sensitive to the toxin (McIlroy, 1984). However, reports exist of deaths from 1080 poisoning in scavenging birds such as magpies, crows, and pest species such as sparrows, starlings, doves, and pigeons (APVMA, 2008).

2.1.2 Toxicity to birds

1080 is absorbed through inhalation or ingestion, and may also be absorbed through cuts, but not through intact skin (McLeod and Saunders, 2013). Once absorbed, toxicity arises through inhibition of tricarboxylic acid cycle (McLeod and Saunders, 2013), resulting in energy deprivation. The decline in

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energy production can affect any organ with high metabolic rates (McIlroy, 1984), making this a potentially good candidate for birds due to their higher metabolic rate compared to similar-sized mammals (Holmes and Austad, 1995).

There is a lag between bait consumption and first sign of symptoms (McLeod and Saunders, 2013). For birds, McIlroy (1984) showed that signs of poisoning post 1080 bait consumption occurred within 1-60 hours, and birds that received a lethal dose died within 1-262 hours, with the large variation in times being linked to metabolic differences among species.

Parrots (Psittaciformes) are particularly sensitive to 1080, with LD50 values indicating it is highly toxic to species such as the crimson rosella (*Platycerus elegans*) and Australian ringneck (*Barnardius zonarius*), and similarly high sensitivity has been observed in little corellas (*Cacatua sanguinea*). Introduced pest birds like starlings, house sparrows, and feral pigeons also show high susceptibility, with LD50 values making 1080 highly toxic for these groups. In contrast, the emu is far less sensitive, with a much higher LD50, meaning 1080 is moderately toxic to this species.

Use of 1080 has typically not targeted birds, with most research focusing instead on reducing unintended impacts during baiting for other species such as the brushtail possum. A review of aerial baiting in New Zealand found that 6.5% of tagged native birds died in treated areas compared to 2.1% in non-baited controls. Earlier studies also showed that certain bait types, such as raspberry-lured carrot and apple baits, were attractive to birds and led to increased unintended mortality.

No comparable studies are available from Australia; birds are known consumers of surface-laid grain and meat baits (McIlroy, Gifford and Forrester, 1993), with emus and corvids observed taking wild dog baits (H. Miller pers. obs., Kreplins and Algar, 2025). Trials of 1080 baiting of feral pigs showed around 19% of baits were moved by birds (Australian magpies, raptors) and lizards (varanids), but less than 2% of baits were consumed (Gentle, Speed and Pople, 2014); studies have demonstrated that birds of prey (raptors) from north-western Australia have a high tolerance to 1080 (Martin and Twigg, 2002). (Fleming et al. (2000) reported that 58% of meat baits were consumed by birds. These studies show that birds will consume 1080 baits in Australia.

2.1.3 Delivery methods

1080 has been delivered to pigs using grain, and to deer using oats and other grains. A food bait would be an effective means for delivering 1080 to pest birds, with substrate type being determined by dietary preferences. Grain, fruit and other crops targeted by pest birds have been identified by PIRSA (2026) that could be used for delivery.

2.1.4 Humaneness

The cause of death varies among individuals and species, but is typically from organ failure, because of a decline in energy reserves and disruption of the central nervous system. Observations indicate that when the animal shows signs of central nervous system dysfunction in the latter stages of absorption, they are less likely to experience pain or distress during this time (Gregory, 1996).

In herbivorous mammals symptoms of distress are minimal compared to carnivores mammals (PIRSA, 2026). In birds, early signs of poisoning may include vomiting, or attempts to vomit, and hypersensitivity. Most birds fluff their feathers out and occasionally shiver, are reluctant to walk or fly, and become uncoordinated. Rapid panting, vocalisations, and violent flapping can occur, prior to convulsions, slow breathing, paralysis, and death (McIlroy, 1984).

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2.1.5 Environmental and human health impacts

The environmental and human health impacts of 1080 have been thoroughly studied because it is widely used in Australia on a range of pest species. 1080 biodegrades in water, soil, and animal carcasses (King, 1990). Many Australian mammalian species have demonstrated tolerance to 1080. In South Australia reintroduced threatened quolls and possums are thriving in regions where fox and wild dog baiting is common (e.g. Ikara-Flinders Ranges National Park)

Pest birds can move away from the baiting site and experience symptoms and die; adverse outcomes from that scenario include dead or dying birds being eaten by scavenging animals, leading to secondary poisoning. This risk is mitigated by bait label conditions, which would require notification of neighbours and signage, as well as by the reduced mobility of birds following consumption of bait.

2.1.6 Practical considerations

- Training and authorisation: Handlers must hold appropriate authorisation, such as an Agricultural Chemical Users Permit with a 1080 endorsement, before working with 1080 products.
- Notification of use: Neighbours within 1 km of the baiting location must receive notification at least 72 hours (and sometimes up to 4 days) before baits are laid.
- Signage: Warning signs are required at all property entrances, baiting area entry points, and along with any bordering public thoroughfares, and must remain in place for a minimum of four weeks after the program ends.
- Minimum distance requirements: baits must be laid at least 150m from any dwelling, 20m from permanent water sources, and 5m from boundary fences, though these distances vary between states.
- Disposal of unused bait: Any unused or uneaten bait must be collected and disposed of by deep burial (at least 500mm) or incineration.

3.3 Cyanide

3.3.1 General information and history of use

Cyanides are compounds that occur naturally in plants. Globally, cyanogenic glycosides (compounds that release cyanide) are found in thousands of plant species, where they act as a defence mechanism against herbivores and other plant pests. In Australia, these compounds are found in over 130 plant species, but unlike for 1080 (see [1080 Environmental and human health impacts](#)), no indication of cyanide tolerance is known in native animals.

First synthesised in 1782, cyanide was registered as a pesticide in 1947 to control ants in the United States (USDA-APHIS-Wildlife Services, 2019). Cyanide was first approved for use on pest mammals in New Zealand in the 1960s to control possums, and has since been used to control tamar and Bennett's wallabies (Ross *et al.*, 2011; Shapiro *et al.*, 2011) and coyotes, wild dogs and foxes (USDA, 2019). It is registered as a pest control tool in the United States and New Zealand. In Australia cyanide was approved under special permit to control brushtail possums on Keppel Island in Queensland. Cyanides have been trialled as a poison for pigs (Gentle *et al.*, 2011), foxes (Marks and Gigliotti, 1996), wild dogs, Bennett's wallabies, brushtail possums, and goats (McLeod and Saunders, 2013) and was assessed for the control of deer (Davis *et al.*, 2016).

Cyanide is considered humane because of rapid onset of symptoms and time to death, low risk of secondary poisoning, and little persistence in the environment (Statham *et al.*, 2010). Cyanide is highly toxic to all vertebrates, including humans, and has low palatability.

3.3.3 Toxicity to birds

Cyanides have high toxicity, with levels being dependent on the exposure dose, type, and length (USDA, 2019). The toxin is readily absorbed through inhalation, ingestion, or skin contact (McLeod and Saunders, 2010, USDA, 2019). Cyanide disrupts energy metabolism by preventing the transfer of oxygen, depressing the central nervous system, resulting in rapid suffocation and death (Wiemeyer *et al.*, 1986; John Hopkins University, 2022).

The onset of symptoms is usually within 15 seconds and can be up to 10 minutes (Cope, 2021). Symptoms include vomiting, breathing difficulties, weakness and lethargy, loss of coordination, and irritation of the eyes, nose, and throat (Cope, 2021). Severe poisoning can result in convulsions, paralysis, loss of consciousness, cessation of respiration, and cardiac arrest (McLeod and Saunders, 2013). In birds, large doses will generally result in death within 1-41 minutes but can take up to 3 hours in birds that receive small doses (Dumonceaux and Harrison, 1994).

Toxicity data in birds are limited, but evidence indicates that raptors and scavengers are more susceptible to cyanide poisoning than non-predatory species. Hawk-like birds such as the American kestrel and scavengers like the black vulture have very high toxicity levels (LD50 ~4.0–4.8 mg/kg), compared with higher LD50 values (>17 mg/kg) in species like the European starling and domestic chicken. This increased sensitivity is attributed to the lower digestive pH in predatory birds, which accelerates cyanide breakdown and leads to more rapid release of the toxin (Wiemeyer *et al.*, 1986; Donato *et al.*, 2007).

3.3.4 Delivery methods

Cyanide has been delivered on pastes, pellets, and in ejector devices. Cyanide pastes have been used to control possum populations in New Zealand, where there have also been reports of bait shyness (Morgan *et al.*, 2001). Pastes were trialed to control pigs and foxes, but concerns around effective formulations, environmental stability, and palatability halted further exploration (Gentle *et al.*, 2011).

In New Zealand, cyanide is also delivered to possums and wallabies through encapsulated pellets (Feratox®). The pellets were developed to overcome bait shyness and improve the stability of cyanide in the environment. The pellets comprise 120 (possum) or 200 (wallaby) mg per kg of cyanide powder, coated in a capsule; it requires jaw compression to crack open, and has a coating of sugar and flour as an attractant. The capsule protects the cyanide from air and moisture, allowing it to remain stable in the environment (Statham *et al.*, 2010; Connovation, no date).

A single pellet contains enough cyanide to kill birds, but no evidence exists that small birds have the strength to break the hard outer shell (Connovation, no date). Larger birds, including weka (*Gallirallus australis*) have been killed by Feratox®, because they are large enough to swallow the pellets (Thomas and Ross, 2007).

In the US, cyanide is delivered to target livestock predators, including coyotes, wild dogs, and foxes, using 'canid pest ejector' (CPE) devices. These devices are baited, and spring loaded; they release a single dose of cyanide into the mouth of an animal that pulls on the baited capsule. One capsule contains enough cyanide to be lethal to canids through oral, inhalation, and skin contact (USDA, 2019, Marks and Gigliotti, 1996).

3.3.5 Humaneness

Salivation, excess generation of tears and irritation of the eyes, uncontrolled urination and faeces and discolouration of mucous membranes may occur. Muscle twitching is involuntary and progresses to generalised spasms and coma before death. Animals may stagger and struggle before collapse. Sudden death may also occur with few symptoms.

Time to death ranges from 3-12 minutes in rabbits (USDA-APHIS-Wildlife Services, 2019), 29 minutes in mice (USDA-APHIS-Wildlife Services, 2019), 19-70 mins in pigs (Gentle et al., 2011) and 22 minutes in Bennett's wallabies (Ross et al., 2011).

3.3.6 Environmental and human health impacts

Degradation behaviour of cyanides varies in different environments. Cyanide is soluble in water, posing a high risk of contaminating ground water (Ya et al., 2022). They persist in the environment for several days (Department of Climate Change, Energy, the Environment and Water, 2022).

3.3.7 Practical considerations

Risks to non-target species would be mitigated by bait label conditions, which would require notification of neighbours and signage, as well as by the reduced mobility of birds following consumption of bait.

4.4 DRC-1339

DRC-1339 (3-Chloro-p-toluidine hydrochloride), also known as Starlicide®, is a slow acting avicide that is toxic to some pest bird species and some mammals. It is considered humane, with high selective toxicity, delayed on-set of toxicity, and a low risk of secondary poisoning (Decino, Cunningham and Schafer, 1966). DRC-1339 is registered for use in the USA and New Zealand for use on pest birds.

4.4.1 General information and history of use

DRC-1339 was first registered as a toxin for pest birds in the USA in 1967 (USDA-APHIS-Wildlife Services, 2019). DRC-1339 is a water soluble organochlorine that was identified as a potential toxin by the Denver Research Centre after evaluating over 2000 chemicals for pest starling control (Eisemann, Pipas and Cummings, 2003). DRC-1339 has been tested on a wide range of avian species, as well as mammals (Dawes, 2006). It was highly toxic to starlings, had low toxicity to mammals, produced a slow, non-violent death that reduced bait aversion, and had minimal secondary poisoning risks (Decino, Cunningham and Schafer, 1966).

DRC-1339 is an effective tool for the control of starlings, pigeons, blackbirds, corvids, and gulls (Klug et al., 2023). The chemical was registered for use on starlings and rooks (New Zealand), mynas (Cook Islands and Seychelles) and Indian house crows (Kenya) (Klug et al., 2023; BBC News, 2024). An application to import DRC-1339 into Australia has previously been approved, with the compound trialled as a toxin for the control of starlings in the early 2000s (Invasive Animals CRC, 2012).

The use of this toxin provides potential for development of effective feed strategies using trials to refine its use on pest birds in Australia.

4.4.2 Toxicity to birds

Studies assessing DRC-1339 toxicity to starlings, which were dosed via three pathways (oral, bait consumption, and intravenously) showed similar LD₅₀ of 'very highly toxic' (3.8 mg/kg, 4.2 mg/kg and 3.5 mg/kg respectively) (DeCino et al., 1966). Absorption of DRC-1339 results in the impaired function of the kidney and liver, with death resulting from nephrotoxicity, uremic poisoning, and congestion of major organs (Nelson, 1994; Dawes, 2006). Birds that receive a lethal dose will generally die within 3-50 hours after death, but up to 80 hours to death has been recorded (Nikodémusz and Imre, 1982; Dawes, 2006).

Toxicity data for over 55 bird species were summarised by Eisemann et al. (2003). In Australia, corvids, pigeons and doves, quail, gulls, ducks and swans, and species of the Icteridae family (starlings,

blackbirds, and common mynas) are the most sensitive to DRC-1339. Multiple pest bird species in Australia are from the Psittacidae family (e.g., little corellas, long-billed corellas), of which information on the toxicity is limited, except for the budgerigar to which DRC-1339 is 'moderately toxic' (LD₅₀ 242 mg/kg).

In the United States, early trials of DRC-1339-treated poultry pellets destroyed 75% of starlings (from an initial population of 2,280) in seven days (Besser, Royall and Degrazio, 1967) and 93% of starlings (from an initial population of 1,800) in 4 days (Royall, DeCino and Besser, 1967). Another study showed a starling population reduction of 80% over four months (West, 1968) and a 90% reduction over 36 days (Stickley Jr, 1979). West (1968) reported 94% of birds were destroyed within the first seven weeks of the baiting program. These studies noted that other bird species fed from baited feedlots or were observed nearby; however, blackbirds were the only reported non-target species that was killed.

DRC-1339 has also been used in attempts to eradicate pest birds from the Cook Islands. The initial aim of the program was to control Common Myna numbers using DRC-1339 and trapping. As the benefits of reduced populations became apparent, the program changed to an eradication. After 3.5 years, 11,500 birds were killed using DRC-1339 baits (Avery and Feare, 2020).

4.4.3 Delivery methods

A wide variety of DRC-1339 bait substrates have been deployed, with different foods mobilised for targeting of different species. A study of DRC-1339 bait preferences for starlings demonstrated a preference for poultry pellets over other substrates, including cracked corn mixed with lard, distiller's grain (wet powder and pellets), and livestock feed (calf-started pellet and sweet-feed mix) (Homan et al., 2010). Baiting programs in New Zealand and USA applied DRC-1339 to cereals, cereal pellets, bread and drippings, sultanas, and potato chips during ground baiting operations. Maize, shelled walnuts, grub grass beetles and cooked macaroni were less preferred bait substrates (Nelson, 1994). In New Zealand, bread was successfully substituted for maize and shelled walnuts after bread attracted off-target species (magpies and black-backed gulls) or was not being consumed by rooks (Porter, Clapperton and Coleman, 2008). Rooks were baited during seasons when their preferred foods were scarce. DRC-1339 has also been injected into hard-boiled chicken eggs, which are then consumed by particular target bird species such as ravens (Spencer, 2002).

In USA, a large and baiting program targeting blackbirds was conducted on harvested rice fields during late winter and early spring, when alternative foods were limited (Glahn and Wilson, 1991). Bait uptake was negatively related to the amount of alternative food sources. Linz and Bergman (1996) reported no change in the number of blackbirds around sunflower fields after baiting; the baiting began when sunflowers were ripening, and blackbirds showed a strong preference for the ripening crops.

4.4.4 Humaneness

DRC-1339 is considered humane, with susceptible species displaying minimal outward clinical signs of toxicity (Timm, 1983; Dawes, 2006). The central nervous system becomes depressed, resulting in cardiac or respiratory arrest. Death can occur within one to three days of symptoms emerging. Birds that ingested a lethal dose of the compound died a quiet death; there was no flapping, convulsing, vocalisation or any other indication of pain or distress (Williams and Corrigan, 1994; Dawes, 2006). In non-targets, symptoms can also be successfully treated (USDA-APHIS-Wildlife Services, 2001). No evidence of lethal position of non-target species exists in field conditions; however, during toxicity trials, death from DRC-1339 was reported to be quiet and painless (Schafer Jr, 1984).

4.4.5 Environmental and human health impacts

DRC-1339 poses low risk of primary or secondary poisoning to non-target species (Bentz et al., 2007). The risk of primary poisoning of non-target species is minimised because of high selective toxicity to target pest bird species. The slow action of DRC-1339 allows the chemical to be mostly metabolised into

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a non-toxic substance and excreted prior to death, minimising secondary poisoning to non-target species (Spencer, 2002; USDA-APHIS-Wildlife Services, 2022). Approximately 90% of the toxin is metabolised and excreted within 2 hours of ingestion, with residues highest in the kidneys (Cunningham, Schafer Jr and McConnell, 1979; Goldade, Tessari and Johnston, 2004).

DRC-1339 has a low risk of secondary poisoning. Scavengers and predators would need to consume two to three times their body mass to receive a lethal dose due to low levels of residue (Cunningham, Schafer Jr and McConnell, 1979). Dogs, cats, pigs, owls, foxes, and hawks have been observed scavenging on birds killed with DRC-1339, yet no animals were observed to suffer from secondary poisoning (Besser, Royall and Degrazio, 1967; Ford, 1967; Royall, DeCino and Besser, 1967; Lefebvre *et al.*, 1979).

Crows are highly sensitive to DRC-1339, indicating a risk of secondary poisoning in susceptible species. (Cunningham, Schafer Jr and McConnell, 1979) suggested that for such species, the risk of secondary poisoning exists if animals feed solely on poisoned birds for an extended period (i.e., > 30 d). Off-target risk can be mitigated by identifying bird species and determining their sensitivity to DRC-1339 at baiting sites (Kostecke, Linz and Bleier, 2001).

DRC-1339 does not remain active for extended periods. It does not bioaccumulate like other organochlorines (e.g., dichlorodiphenyltrichloroethane (DDT)), and will degrade rapidly in soil when exposed to sunlight, heat, or ultraviolet radiation (Cowan *et al.*, no date). Baits exposed to these treatments lost their efficiency after three days, or after one year in storage with no treatment (NPCA, 2018). DRC-1339 strongly binds to organic matter and has an average half-life of 0.17 days in soil (reviewed in USDA, 2022). If DRC-1339 leaches from a bird feeder into the environment, it will degrade quickly, or bind to soil organic material, reducing risk of uptake by plants. The rapid and irreversible binding to organic matter also means that there is no risk of exposure because of vaporisation back into the atmosphere, nor through groundwater and surface water.

Despite its resistance to hydrolysis, DRC-1339 is unlikely to bioaccumulate in water, because light will degrade the toxin (Cowan *et al.*, 2010, USDA, 2001). The half-life in water is estimated to range from 6.5 to 41 hours, with degradation occurring faster in summer (USDA, 2001). Some aquatic invertebrates may be sensitive to DRC-1339, but marine species may be more tolerant (96-hour LC₅₀ in water fleas = 0.079 mg/L, white river crayfish = 15 mg/L, blue crab = 16.0 mg/L) (Walker *et al.*, 1979, Marking and Chandler Jr, 1981). It is thought to be moderately toxic to fish (bluegill sunfish = 11 mg/L, rainbow trout = 9.7 mg/L southern leopard frog tadpoles = 44 mg/L) (USDA, 2001).

DRC-1339 is hazardous to humans if swallowed, inhaled, or absorbed through the skin (Sterner, Elias and Cerven, 1992), however, no human exposure cases have been documented (USDA, 2022). In the USA and New Zealand, only trained and licensed operators can apply and place the baits.

4.4.6 Practical considerations

Optimal baiting periods need to be identified to ensure uptake by pest-birds and effective control. The availability of alternative food influences the uptake of pest-birds, with greater uptake achieved during snow-cover months in USA.

DRC-1339 is the best studied and most used avicide for the control of pest birds and has been used for the control of rooks throughout New Zealand. The species selectivity, low risk of secondary poisoning, and humaneness of DRC-1339 make this toxin a promising control tool for pest birds throughout Australia. Investment in developing baiting strategies would improve the success of previous field trials (Bentz *et al.*, 2007).

Reduced impacts have been reported with control activities targeting pest birds. A two year DRC-1339 baiting program targeting blackbirds was estimated to remove between 1.3 and 2.7 million birds annually (Glahn and Wilson (1991). The blackbirds were damaging sprouting rice, during the program, growers reported a reduction in impacts exceeding 80% (Glahn and Wilson, 1991). In New Zealand, DRC-1339

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has been used to reduce numbers of rooks, and more recently starlings. A large baiting program delivered between 1971 and 1985 was estimated to have removed 86,000 rooks and reduced costs associated with their damage from \$154,000 in 1970 to almost no cost in 1980s (Porter, Clapperton and Coleman, 2008).

5. Recommendations

Based on history of use, humaneness and minimal poisoning of non-targets, DRC-1339 and 1080 (in order) are potential candidate toxins for overabundant pest birds in Australia.

5.1 Sodium fluoroacetate (1080)

Australian land managers are experienced in using 1080 since the 1950s providing an established regulatory and operational framework that could be adapted for pest bird control.

Proven efficacy: 1080 has reduced abundances of ship rats (*Rattus rattus*), brushtail possums (*Trichosurus vulpecula*) and stoats (*Mustela erminea*) in New Zealand (Kemp, Elliott and Hunter, 2018).

Favourable toxicological profile: The toxin's natural occurrence in many native Australian plants reduces the risk to non-target species, while its biodegradable and non-residual properties minimise environmental persistence (Gooch, Fleming and Meek, 2025).

Industry acceptance: 1080 is accepted one of the key methods for invasive species control in agricultural, pastoral and conservation sectors in Australia. Authorised training and regulations are in place to handle and deliver 1080 products.

Proven Australian potential: 1080 is being used across Australia.

5.2 DRC-1339

DRC-1339 is recommended based on its international track record and favourable characteristics:

Proven efficacy: DRC-1339 has demonstrated effectiveness in reducing livestock feed losses caused by starlings in United States feeding operations (Besser et al. 1967)

Favourable toxicological profile: The compound is considered humane and presents low risk of secondary poisoning to non-target species

Industry acceptance: Research indicates willingness among Australian feedlot and piggery operators to adopt poison baits that are cost-effective, target-specific, and humane (Bentz et al., 2007)

Proven Australian potential: Preliminary feasibility analyses with starlings in Australia have yielded promising results (Bentz et al., 2007)

Economic efficiency: Control programs could use existing affected grain crops as bait, eliminating the need for specialised bait formulations

5.3 Bait research and registration pathway

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The next steps to advance regulatory approval and optimise deployment of both toxins for pest bird control include:

Pen trials to:

- Generate empirical evidence for species-specific efficacy
- Refine application protocols and dosing regimes
- Assess humaneness
- Develop comprehensive data packages to support APVMA registration

Field trials:

- Grain production facilities experiencing significant impacts from pest birds
- Grain-handling facilities with documented economic losses
- Diverse agricultural sites across varying climatic conditions and production systems
- Sites with different non-target bird assemblages to assess selectivity

This multi-site approach would be effective to assess efficacy across the range of Australian agricultural conditions required for product registration with the APVMA.

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Pest Bird Control Tool Economic Analysis

A report for the Department of Primary
Industries and Regions

1 September 2025

Table of contents

Table of contents	ii
Tables	iv
Figures	v
Abbreviations	vi
Document history and status	vi
Executive summary	vii
1. Introduction	1
1.1. Background	1
1.2. Purpose and scope of the economic analysis	2
1.3. Document structure	2
2. Methods of analysis and data	3
2.1. Cost benefit analysis	3
2.1.1. Purpose and scope of the cost benefit analysis	3
2.1.2. Method of analysis	3
2.1.3. Costs and benefits	4
2.1.4. Pest bird population modelling	4
2.1.5. Trends in functional feeding groups	7
2.1.6. Stakeholder engagement	9
2.1.7. Quantified costs and benefits	9
2.1.8. Unquantified costs	14
2.2. Economic impact - method and data	15
2.2.1. Economic impact models	15
2.2.2. Economic activity	16
2.2.3. Indicators of economic activity	16
2.2.4. Categories of economic activity	16
2.2.5. Data and assumptions	17



3.	Cost benefit analysis results	18
3.1.	South Australia	18
3.2.	Sensitivity analysis - South Australia	19
3.3.	Australia	20
4.	Economic impact analysis results	22
4.1.	South Australia	22
4.1.1.	Pest bird control development, registration and deployment	22
4.1.2.	Primary industry	23
4.1.3.	Local government	26
4.1.4.	Aggregate results	27
4.2.	Australia	28
	References	30
Appendix 1	Detailed CBA results	32
Appendix 2	Detailed economic impact results, Australia	39

Tables

Table 2-1	CBA options	3
Table 2-2	In-scope costs and benefits	4
Table 2-3	Change in the mean predicted probability of detecting a species between 2000 and 2045	6
Table 2-4	Mean predicted probability of detecting a functional group between 2000 and 2045	8
Table 2-5	SA aquaculture sector parameters used to estimate cost ^a	10
Table 2-6	SA fruit sector parameters used to estimate cost ^a	11
Table 2-7	SA nuts sector parameters used to estimate cost ^a	11
Table 2-8	SA winegrapes sector parameters used to estimate cost ^a	12
Table 2-9	SA grains sector parameters used to estimate cost ^a	12
Table 2-10	SA local government parameters used to estimate cost ^a	13
Table 2-11	Avoided operating costs, SA primary industry	13
Table 2-12	Australia-wide cost assumptions	14
Table 2-13	Percentage agreement with statements about pest birds	15
Table 3-1	CBA results, South Australia	19
Table 3-2	Sensitivity analysis, discount rates	20
Table 3-3	Sensitivity analysis, pest bird control tool costs	20
Table 3-4	Indicative CBA results, Australia	21
Table 4-1	Economic impacts of pest bird control development, registration and deployment, South Australia	22
Table 4-2	Economic impacts of pest bird control, aquaculture, South Australia	23
Table 4-3	Economic impacts of pest bird control, fruit, South Australia	24
Table 4-4	Economic impacts of pest bird control, nuts, South Australia	25
Table 4-5	Economic impacts of pest bird control, winegrapes, South Australia	25
Table 4-6	Economic impacts of pest bird control, grains, South Australia	26
Table 4-7	Economic impacts of pest bird control, local government, South Australia	27
Table 4-8	Summary of economic impacts of pest bird control, South Australia	28

Table 4-9	Summary of economic impacts of pest bird control, Australia	29
Appendix Table 1-1	Detailed CBA, South Australia	33
Appendix Table 1-2	Detailed CBA, Australia	36
Appendix Table 2-1	Economic impacts of pest bird control development, registration and deployment, Australia	39
Appendix Table 2-2	Economic impacts of pest bird control, aquaculture, Australia	39
Appendix Table 2-3	Economic impacts of pest bird control, fruit, Australia	40
Appendix Table 2-4	Economic impacts of pest bird control, nuts, Australia	40
Appendix Table 2-5	Economic impacts of pest bird control, winegrapes, Australia	41
Appendix Table 2-6	Economic impacts of pest bird control, grains, Australia	41
Appendix Table 2-7	Economic impacts of pest bird control, local government, Australia	42

Figures

Figure 2-1	Primary production and local government regions involved in the assessment of pest bird impacts	5
Figure 2-2	Predicted probability of presence (as a proxy for abundance) between 2000 and 2045 for six impact causing bird species ^a	7
Figure 2-3	Predicted probability of presence (as a proxy for abundance) between 2000 and 2045 for five functional feeding groups ^a	8

Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
BCR	benefit cost ratio
CBA	cost benefit analysis
DFA	Department of Finance and Administration
DTF	Department of Treasury and Finance
fte	full-time equivalent
GDP	gross domestic product
GSP	gross state product
IO	input-output
NPV	net present value
PIRSA	Department of Primary Industries and Regions
RISE	Regional Industry Structure and Employment
SA	South Australia

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vi

Executive summary

Introduction and scope

In South Australia, invasive pest birds and overabundant native bird species are causing serious damage to agriculture, ecosystems and communities. Bird control is increasingly urgent due to rising populations and ineffective, costly management tools. Scalable solutions like targeted baiting are needed but currently unavailable.

The proposed coordinated pest bird control case was compared to a base scenario with no such tool developed or implemented. The analysis spanned 2025-26 to 2044-45, including five years for bait development and registration, followed by 15 years of implementation. In the base case, bird populations continue rising; under coordinated control (program case), they return to 2005 levels. PIRSA's pest bird modelling informed the assessment of impacts on South Australia's primary industries and local governments. These findings were scaled nationally using proportional industry impacts.

Cost benefit analysis results

The cost-benefit analysis (CBA) for South Australia of the program case yielded a net present value (NPV) of \$604.3 million and a benefit-cost ratio (BCR) of 5.3. The BCR is higher than economic analyses of other recent area-wide pest control initiatives due to lower implementation costs—mainly affordable technology rather than labour-intensive or expensive methods. It also underscores the value of coordinated, effective control compared to the current fragmented and ineffective efforts.

At the national level, including South Australia, the high-level CBA produced a net present value of \$5.2 billion and a benefit-cost ratio of 3.3.

The estimated benefits are likely conservative, as they do not account for all affected industries or the full range of social impacts—such as emotional stress—experienced by stakeholders dealing with pest bird issues. The majority of surveyed industry groups and local councils acknowledged that pest birds negatively impact staff wellbeing and pose risks to trade, safety, and biosecurity.

Economic impact analysis results

Over a 20-year period, the development, registration, and implementation of a strategic pest bird control tool is projected to contribute a total of \$1.3 billion to South Australia's GSP, with an average annual contribution of \$62.7 million. The initiative is expected to result in a net reduction of an average of 172 full-time equivalent (fte) jobs. While employment effects are expected to be initially positive between 2026-27 and 2029-30—driven by activities related to the tool's development and registration—long-term impacts are negative. This is due to reduced time and financial investment by primary industries and local governments in ineffective pest bird control measures.

Nationally, the strategic pest bird control tool is estimated to contribute \$13.7 billion to GDP over 20 years, with an average annual contribution of \$683.7 million. The most affected sectors include fruit (\$542.4 million annually), grains (\$62.0 million annually) and nuts (\$52.2 million annually). A total average reduction of 660 fte jobs is anticipated. Like South Australia, employment impacts are initially positive from 2026-27 to 2029-30 due to development and registration efforts. However, long-term employment declines as primary industries and local governments allocate fewer resources to ineffective pest bird control practices.

1. Introduction

1.1. Background

Many pest birds in South Australia (SA), including non-native and overabundant native species, have detrimental impacts on economic, social, and environmental resources (Bomford and Sinclair, 2002). For example, information collected 20 years ago, in 2005-2007, indicated that pest birds were costing the grains and horticulture industries across Australia over \$300 million annually (Tracey et al., 2007). The social and environmental effects of pest birds can be hard to measure, yet they can be quite significant. In May 2025, one producer who had grown almonds for 40 years said he was leaving the industry in 2025 because of birds and was “devastated” by their impacts (PIRSA pers. comm.).

Increasing reports of pest bird impacts in recent years, including huge flocks of little corellas around Taillem Bend, led the Department of Primary Industries and Regions (PIRSA) to investigate how the impacts from pest birds have changed in the last 25 years, and what new tools could be developed to manage their impacts. This report was co-funded by PIRSA and the Local Government Association of South Australia's Research and Development Scheme¹. The method of analysis involved workshops, site visits, meetings, phone calls, and online surveys with affected producers and communities. The overarching theme that emerged from stakeholder consultation was that pest bird impacts (and management costs) have increased dramatically over the last 15 years for the primary industries and communities in SA.

While the impacts were not assessed for other jurisdictions, likely, similar types and levels of impacts occur elsewhere. PIRSA staff have received anecdotal evidence of these impacts from counterparts in Western Australia and Victoria, as well as from industry groups. The impact-causing bird species identified in this study are also ubiquitous and abundant across target primary industry areas interstate. Work is needed to quantify the pest bird impacts on primary industries nationally, noting the relatively recent dramatic changes being experienced in SA.

Producers and councils have limited control tools available to address pest bird issues. These stakeholders invest heavily in bird management, deploying exclusion nets, gas guns, planes, falconry, drones and lasers to deter pest birds. Unfortunately, studies assessing the efficacy of these tools (Bomford and Sinclair 2002, Tracey et al., 2007 and Rivadeneira et al., 2018) find non-lethal deterrents to be ineffective because birds, especially smart birds like parrots, quickly become habituated to the measures, or will move to the next property where they will continue to cause damage. Lethal tools include egg-oiling (silver gulls) and shooting, but land managers are restricted by the need to apply for a permit (native species), the number they can kill, time, and money, as well as other constraints, such as social licence.

Baiting is the most cost-effective, efficient, and widely used method for controlling most vertebrate pests in Australia (reference). Two toxins (alphachloralose and 4-aminopyridine) are registered in Australia for the lethal control of non-native bird species (such as sparrows, starlings, and Indian mynas), but these toxins do not typically reduce population numbers (PIRSA, pers. comm.). Strychnine can be used to control emus in Western Australia and Victoria, but it is highly toxic to mammals, so it is rarely deployed. Baits can be an effective tool for large-scale population reductions for vertebrate pests, but there is no current effective bait available for use on pest birds (PIRSA, pers. comm.).

¹ <https://www.lga.sa.gov.au/members/services/research-and-publications/library/2024/developing-a-new-bait-for-pest-birds-of-the-grains-industry>

1.2. Purpose and scope of the economic analysis

The Government of South Australia anticipates the need to develop a business case for developing an effective area-wide control tool (as a bait) for controlling pest and over-abundant native bird species. The intention is to develop the tool and register it nationally. PIRSA engaged BDO to undertake an economic analysis to support the business case for investment.

The economic analysis includes:

- Cost-benefit analysis (CBA) to assess whether investing in an area wide control tool and strategy is an efficient and appropriate use of government resources (i.e., whether the project provides a positive return to the community). The analysis is completed at two geographic scales: South Australia and Australia.
- Economic impact analysis to assess the economic impact of investing an area wide control tool and strategy on the South Australian and Australian economies, using the extended input-output (IO) RISE model.

The analysis focussed on the impacts on the agriculture industry and local government and their flow-on effects. Analysis of the effects on the natural environment were out of scope.

1.3. Document structure

The rest of the report is structured as follows. An outline of the key characteristics of the CBA and IO methods employed in this study, the scope of costs and benefits and data sources/assumptions are provided in Section 2 of the report. Results of the CBA, including key indicators and sensitivity analysis, are detailed in Section 3. The results of the economic impact analysis are provided in Section 4.

2. Methods of analysis and data

2.1. Cost benefit analysis

2.1.1. Purpose and scope of the cost benefit analysis

The cost-benefit analysis (CBA) was aimed at evaluating the net benefits of a strategic pest bird control tool being developed and implemented in South Australia. Additionally, it provided a scaled estimate of the potential net benefits if the control tool is adopted across Australia over the same timeframe. The results of the CBA present the net benefit (or cost) to the community by appropriately categorising the monetary costs and benefits to all relevant impacted parties. No non-market costs or benefits have been included directly in the CBA but are discussed qualitatively.

The proposed coordinated pest bird control tool development and implementation case (program case) was compared against a base case scenario, in which no coordinated pest bird control tool is developed or implemented, as described in Table 2-1.

Table 2-1 CBA options

Option	Description
Base case	No new coordinated pest bird control tool is developed or implemented. Pest bird populations continue to grow, and agricultural and council losses increase over time. Primary industries and local communities continue to invest in the management of pest birds at a site-by-site level (i.e., no state-wide coordination).
Program case: Pest bird control tool case	A new funding commitment of \$5 million is allocated from 1 July 2026 for 4 years to develop and register a new bait for pest birds. By 2030-31, the bait is deployed at scale, and populations of target pest bird species return to 2005-06 levels within 15-20 years (i.e., by 2045-2050). Crop and stock losses return to 2005-06 levels within 15 years. Control costs for primary industries and local government return to 2005-06 levels within 15 years. Social impacts caused by pest bird impacts decrease to 2005-06 levels.

2.1.2. Method of analysis

The CBA followed the South Australian and Commonwealth Government guidelines for conducting evaluations of public sector projects (DFA 2006, DTF 2008). Given that the costs and benefits were specified in real terms (i.e. 2025 dollars), future values were converted to present values by applying a discount rate of 7 per cent, with discount rates of 4 and 10 per cent included in the sensitivity analysis. The analysis was conducted over a 20-year period, which is a reasonable period for the life of the project.

Results were expressed in terms of net benefits, that is, the incremental benefits and costs of the program relative to those generated by the base case scenario. The evaluation criteria employed for this analysis are described below.

- NPV - discounted project benefits less discounted project costs. Under this decision rule, the program case is considered to be potentially viable if the NPV is greater than zero. The NPV for the program case was calculated as an incremental NPV, using the standard formulation:

$$NPV_{Program\ case} = PV(B_{Program\ case} - B_{Base\ case}) - PV(C_{Program\ case} - C_{Base\ case})$$

- BCR - the ratio of the present value of benefits to the present value of costs. Under this decision rule, the program case was considered to be potentially viable if the BCR was greater than one. The ratio was expressed as:

$$BCR_{Program\ case} = \frac{PV(B_{Program\ case} - B_{Base\ case})}{PV(C_{Program\ case} - C_{Base\ case})}$$

2.1.3. Costs and benefits

As described in Section 2.1.1, the proposed coordinated pest bird control tool development and implementation case was compared against a base case scenario, in which no coordinated pest bird control tool is developed or implemented (as described in Table 2-1). The major economic costs and benefits of the program are listed in Table 2-2.

Table 2-2 In-scope costs and benefits

Item	Cost or Benefit	Agent	Description	Expected change between base case and program case
Produce loss	Avoided cost	Primary producers, packers and handlers	Harvest ready and harvested produce loss (grains, fruit, nuts and winegrapes). Fingerlings and fish food loss (aquaculture)	Costs decrease through reduced produce or input losses
Staff cost	Avoided cost	Primary producers, packers, handlers, local government	Time spent by land managers to control bird numbers	Cost decreases through reduced effort in managing bird numbers
Management cost	Avoided cost	Primary producers, packers, handlers, local government	Cash spent by land managers to control bird numbers and repair damage to infrastructure	Cost decreases through reduced effort in managing bird numbers
Business operating costs	Cost	Primary producers, packers and handlers	Operating costs associated with harvesting and storage (grains, fruit, nuts and winegrapes) and feed (aquaculture)	Increase as more produce is saved to be harvested, packed, stored
Pest bird control tool development and registration	Cost	State Government	Development and national registration of the bait tool for pest bird control	Increase (nil in the base case)
Pest bird control tool implementation	Cost	State and local government	Costs of implementing area wide pest bird control tool program	Increase (nil in the base case)

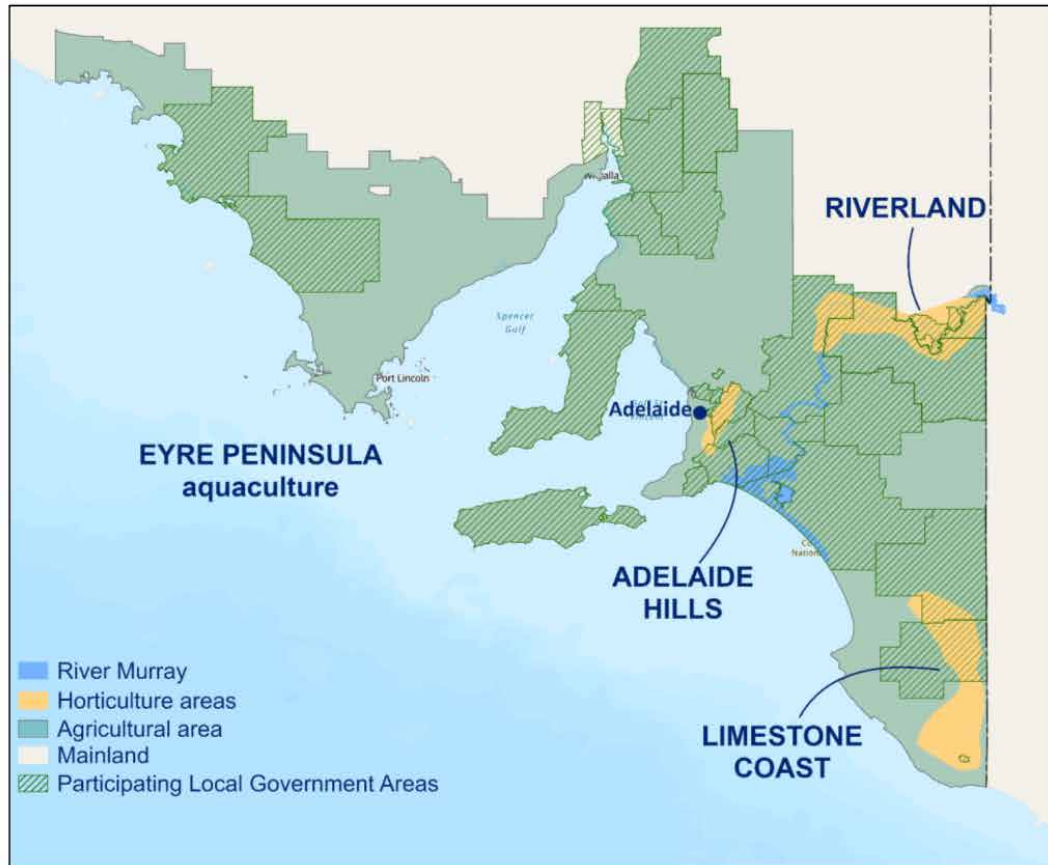
2.1.4. Pest bird population modelling

Pest bird population modelling for the base case and program case was provided by PIRSA. The bird survey data (collected between 1 January 2000 and 12 May 2025) from the Atlas of Living Australia and eBird (Sullivan et. al. 2009) were modelled to identify relative changes in the probability of observing a species during a survey, as a proxy for abundance, as per Campbell et al. (2022).

The datasets were purposefully restricted to two target regions (see Figure 2-1):

1. Agricultural regions of SA, where 5 of the 6 study species are commonly reported to cause damage
2. 30-kilometre buffer (15 kilometres inland and 15 kilometres over water) along the coastline for silver gulls.

Figure 2-1 Primary production and local government regions involved in the assessment of pest bird impacts



Source: PIRSA

Logistic regression models to predict the probability of observing a given species, on a survey list of a given length and year, were fitted for each species independently in R using the *MCMCpack* package. List length was incorporated to account for effort, where surveys with a longer list of species were assumed to equate to greater survey effort.

To predict future trends, detection probabilities were projected for each year from 2000 to 2045, assuming a consistent level of observer effort (based on the median survey length). The model was run many times using random sampling (*MCMCpack*) to capture uncertainty in the predictions. The robustness of the models was confirmed by comparing trends to those published for other Australian major cities (Sydney, Melbourne, Brisbane and Perth) (Campbell et. al. 2022).

The population modelling (see Table 2-3) provides a mean probability of detection on a scale from 0 to 1. For example, a probability of 0.072 equates to 7.2 per cent likelihood of recording that species during a survey. The models showed that two native species, little corella and rainbow lorikeet, are becoming far more abundant across the agricultural landscape in the last 25 years (Figure 2-2). The probability of observing a little corella in the year 2000 was 0.032, which increased by 125 per cent to 0.072 in 2025, and by another 88 per cent to 0.135 in 2045 (overall increase of 322 per cent in 45 years; Table 2-3). The rainbow lorikeet showed the greatest increase of all species between 2000 and 2045 (345 per cent) and were the most abundant species modelled here. The modelling suggests, that by 2045, the likelihood of observing a rainbow lorikeet during a survey is 56 per cent. For the coastal buffer regions, silver gulls had also become more abundant since 2000 (Figure 2-2). The likelihood of observing a silver gull during a survey in 2000 was 10.5 per cent, compared to 13.6 per cent in 2025, and is projected to increase to 16.6 per cent by 2045 (Table 2-3).

Of the non-native species in agricultural areas, the rock dove was increasing in abundance (Figure 2-2), with the probability increasing from 0.053 in 2000 to 0.069 in 2025, and 0.084 by 2045 (a 56 per cent increase; Table 2-3). Both the common starling and house sparrow declined in abundance over time, despite producers often reporting severe impacts from these species (Figure 2-2). It is not known why these populations are declining, but it could be a consequence of growing competition with other species, including native birds occupying the same habitat, or changing urban environments (Campbell et. al. 2022). Note that these trends do not imply that starlings and sparrows are now uncommon (they are very common), rather they are becoming less common than they were, relative to other species.

The trends in SA are very similar to those observed in other major cities of Australia. The rainbow lorikeet and little corella were among the top species with the largest increase in prevalence across all major cities. Silver gulls increased in Sydney and Perth, declined in Brisbane, and were not reported for Melbourne. Similarly for the introduced species, the rock dove increased in three of four major cities, whereas the house sparrow and common starling declined in the same three cities.

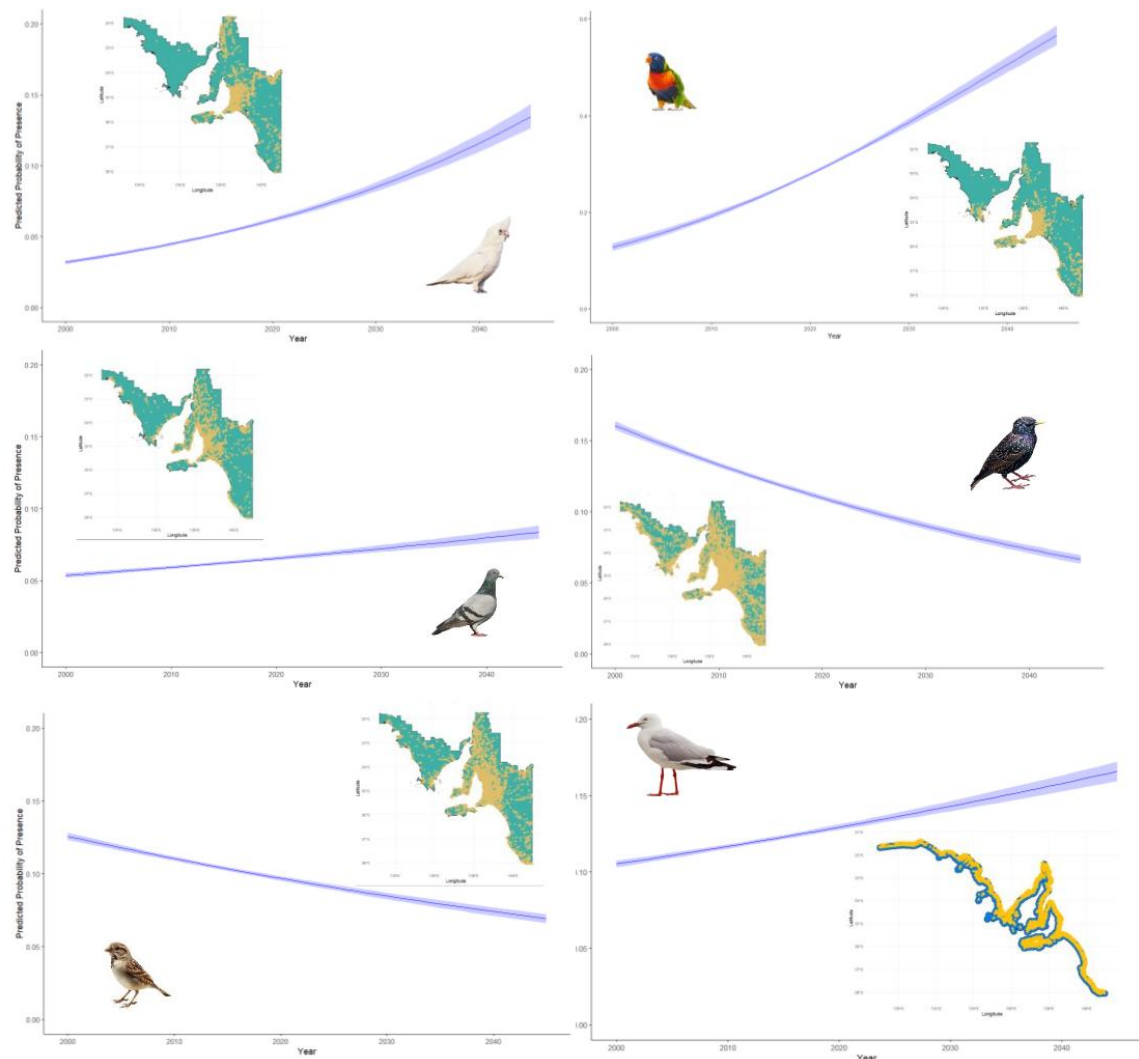
Table 2-3 Change in the mean predicted probability of detecting a species between 2000 and 2045

Species	Mean probability of detection [95% confidence intervals]			% change
	2000	2025	2045	
Little corella	0.032 [0.031, 0.033]	0.072 [0.070, 0.075]	0.135 [0.126, 0.143]	322.46%
Rainbow lorikeet	0.127 [0.120, 0.135]	0.33 [0.326, 0.335]	0.566 [0.546, 0.587]	344.6%
Silver gull	0.105 [0.103, 0.107]	0.136 [0.134, 0.138]	0.166 [0.159, 0.172]	57.65%
*Rock dove	0.053 [0.052, 0.055]	0.069 [0.067, 0.071]	0.084 [0.079, 0.088]	56.36%
*Common starling	0.160 [0.157, 0.164]	0.099 [0.097, 0.101]	0.066 [0.063, 0.069]	-58.69%
*House sparrow	0.126 [0.123, 0.128]	0.090 [0.89, 0.092]	0.069 [0.066, 0.072]	-44.94%

* Non-native species.

Source: PIRSA

Figure 2-2 Predicted probability of presence (as a proxy for abundance) between 2000 and 2045 for six impact causing bird species^a



^a The light blue ribbon either side of the trend line indicates the 95 per cent confidence intervals. Note the change in scale on the y-axis for the rainbow lorikeet.

Source: PIRSA

2.1.5. Trends in functional feeding groups

To determine impacts on different industries inflicted by multiple bird species, population trends were assessed for different functional feeding groups², including those with predominately fish, fruit, grain, and nut diets. These results (see Table 2-4 and Figure 2-3) indicate an increase in all groups. Fruit-eating birds continue to increase from an already high base; fish-eating birds increase steadily; grain-eating birds

² Species included in functional groups include fish - silver gull; fruits - rainbow lorikeet, *European starling; nuts - little corella; grains - little corella, *rock dove, *house sparrow; general (local government) - little corella, *rock dove.

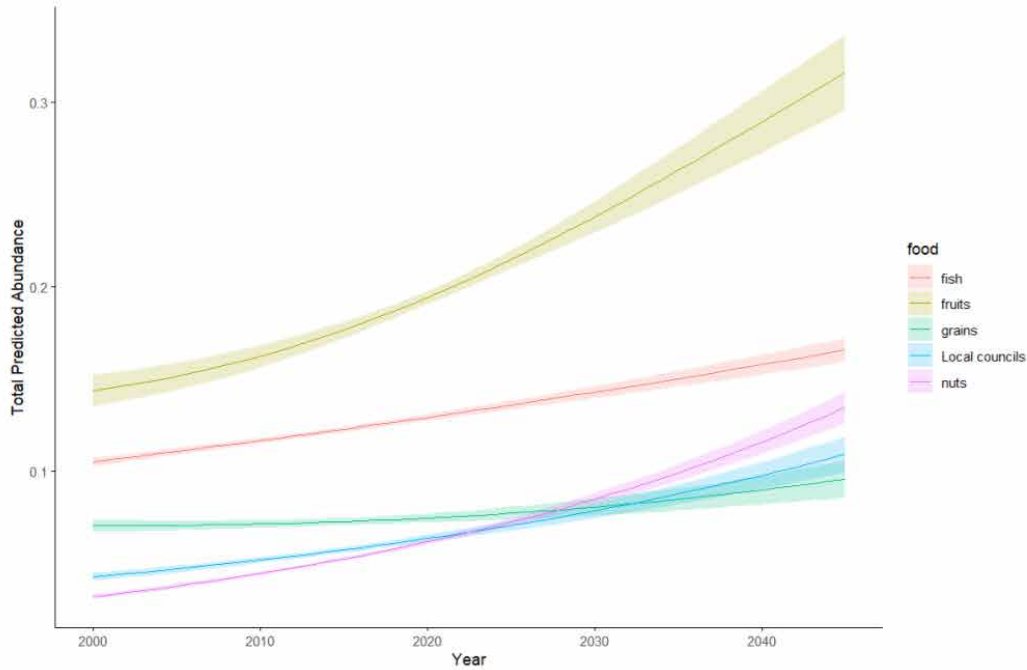
continue to increase dramatically, and nut-eating birds showed the greatest relative increase, of over 320 per cent since 2000 and a predicted 87.5 per cent increase on current levels to 2045 (Table 2-4). The predicted increase in functional groups of pest birds is used to extrapolate expected associated increases in impacts from current to 2045 levels, in subsequent economic projections in this report.

Table 2-4 Mean predicted probability of detecting a functional group between 2000 and 2045

Commodity/group	Mean probability of detection [95% confidence intervals]			% change
	2000	2025	2045	
Fish	0.105 [0.103, 0.107]	0.136 [0.134, 0.138]	0.166 [0.159, 0.172]	57.65%
Fruits	0.144 [0.135, 0.152]	0.215 [0.209, 0.219]	0.316 [0.296, 0.337]	120.00%
Nuts	0.032 [0.031, 0.033]	0.072 [0.070, 0.075]	0.135 [0.126, 0.143]	322.46%
Grains	0.070 [0.067, 0.074]	0.077 [0.074, 0.081]	0.096 [0.096, 0.106]	36.00%
General (local government)	0.043 [0.041, 0.045]	0.070 [0.068, 0.073]	0.109 [0.099, 0.119]	156.00%

Source: PIRSA

Figure 2-3 Predicted probability of presence (as a proxy for abundance) between 2000 and 2045 for five functional feeding groups^a



^a The shaded ribbon either side of the trend line indicates the 95 per cent confidence intervals.

Source: PIRSA

2.1.6. Stakeholder engagement

Stakeholder engagement activities to collect impact data were conducted over eight months, from November 2024 to June 2025; they included:

- Phone surveys - 48 completed
- On-line surveys - 66 completed
- Workshops - two completed with over 40 attendees
- Site visits and inspections - six completed.

From over 160 stakeholders, PIRSA collected detailed data on the annual costs of pest birds (e.g., loss of stock or stock feed) and the costs of controlling pest birds (e.g., investment in deterrence tools, staff costs) from 20 to 25 plus years ago, trends in last five to 15 years, and current impacts, as an average in last five years.

Costs were analysed in current (2025) dollars, and the value of production losses were estimated at current farmgate prices. The following bird species were used to model impacts as they were identified as the key impact causing species and representative of the nature and scale of impact:

- Native pest bird species:
 - Little corella (*Cacatua sanguinea*) - large cockatoo that impacts nut and grain industries and local councils
 - Rainbow lorikeet (*Trichoglossus moluccanus*) - medium-sized parrot that impacts the fruit industry
 - Silver gull (*Chroicocephalus novaehollandiae*) - medium-sized coastal gull that impacts the aquaculture industry
- Introduced pest bird species:
 - Rock dove or feral pigeon (*Columba livia*) - medium-sized dove that impacts the grain industry and local councils
 - Common or European starling (*Sturnus vulgaris*) - small-to-medium sized bird that impacts grain and fruit industries and local councils
 - House sparrow (*Passer domesticus*) - small sparrow that impacts the grain industry and local councils.

Costs (value of farmgate losses, management costs and infrastructure costs) were assumed to change in direct proportion to bird population changes.

2.1.7. Quantified costs and benefits

The following costs and benefits were estimated:

Bait development and registration costs

The following data and assumptions were provided by PIRSA:

- \$5.0 million investment in developing an effective, humane bait and registering it for use nationally
- Investment spread evenly over 4 years, commencing 2026-27.

Coordinated, area-wide pest bird control deployment costs

The following data and assumptions were provided by PIRSA:

- Ten bait stations, at a cost of \$10,000 each are constructed around SA in 2030-31
- Coordination commences in 2031-32 at a cost of \$250,000 per year
- Baiting commences in 2031-32 at a cost of \$500,000 per year
- Bait stations are repaired or replaced from 2032-33 onwards, at an annual cost of \$20,000.

Costs to industry

Costs to industry include direct costs (loss of produce and loss of feed) and pest bird management costs (both cash and in staff time). Costs were assumed to change in direct proportion to bird population changes; and were estimated for the South Australian aquaculture sector (tuna, kingfish and abalone), fruit growing (apples, pears and cherries), nut growing (almonds and pistachio), winegrapes and grains sectors. Table 2-5 to Table 2-9 summarise the estimated rate of population change, costs and staff hours data used to model costs for each of these industries.

Table 2-5 SA aquaculture sector parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.01015	0.01008	0.01000	0.00991	0.00982
Direct - lost feed (\$m)	2.91	3.03	3.19	3.35	3.52
Direct - lost produce (\$m)	1.56	1.63	1.71	1.80	1.89
Management (\$m)	0.63	0.65	0.69	0.72	0.76
Staff hours	1,437	1,496	1,573	1,652	1,735
Staff wages (\$m)	0.04	0.04	0.05	0.05	0.05
Program case					
Rate of population change (factor)	0.01015	0.01008	-0.01977	-0.02193	-0.02463
Direct - lost feed (\$m)	2.91	3.03	2.75	2.48	2.20
Direct - lost produce (\$m)	1.56	1.63	1.48	1.33	1.18
Management (\$m)	0.63	0.65	0.60	0.54	0.48
Staff hours	1,437	1,496	1,363	1,231	1,098
Staff wages (\$m)	0.04	0.04	0.04	0.04	0.03

^a Parameters were estimated for each year of the analysis. Years 1, 5, 10, 15 and 20 are shown here.

Source: PIRSA

Table 2-6 SA fruit sector parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.02067	0.02078	0.02022	0.01905	0.01743
Direct - lost produce (\$m)	45.44	49.33	54.56	60.03	65.56
Management (\$m)	19.77	21.46	23.74	26.12	28.53
Staff hours ^b	-86,355	-93,757	-103,698	-114,101	-124,606
Staff wages (\$m)	-2.55	-2.77	-3.06	-3.37	-3.68
Program case					
Rate of population change (factor)	0.02067	0.02078	-0.07143	-0.11112	-0.25005
Direct - lost produce (\$m)	45.44	49.33	35.63	21.92	8.22
Management (\$m)	19.77	21.46	16.16	10.87	5.57
Staff hours ^b	-86,355	-93,757	-81,273	-68,790	-56,306
Staff wages (\$m)	-2.55	-2.77	-2.40	-2.03	-1.66

^a Parameters were estimated for each year of the analysis. Years 1, 5, 10, 15 and 20 are shown here.

^b Reduced hours in the packing sheds from reduced volumes of fruit.

Source: PIRSA

Table 2-7 SA nuts sector parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.03258	0.03224	0.03175	0.03119	0.03055
Direct - lost produce (\$m)	19.31	21.92	25.65	29.92	34.80
Management (\$m)	8.32	9.45	11.05	12.90	15.00
Staff hours	338,040	383,850	449,003	523,824	609,257
Staff wages (\$m)	9.99	11.34	13.27	15.48	18.00
Program case					
Rate of population change (factor)	0.03258	0.03224	-0.05130	-0.06900	-0.10535
Direct - lost produce (\$m)	19.31	21.92	17.26	12.59	7.93
Management (\$m)	8.32	9.45	7.44	5.43	3.42
Staff hours	338,040	383,850	302,654	221,457	140,261
Staff wages (\$m)	9.99	11.34	8.94	6.54	4.14

^a Parameters were estimated for each year of the analysis. Years 1, 5, 10, 15 and 20 are shown here.

Source: PIRSA

Table 2-8 SA winegrapes sector parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.02067	0.02078	0.02022	0.01905	0.01743
Direct - lost produce (\$m)	32.83	35.64	39.42	43.38	47.37
Management (\$m)	46.04	49.99	55.29	60.83	66.43
Program case					
Rate of population change (factor)	0.02067	0.02078	-0.02980	-0.03502	-0.04246
Direct - lost produce (\$m)	32.83	35.64	30.90	26.15	21.41
Management (\$m)	46.04	49.99	43.83	37.68	31.52

^a Parameters were estimated for each year of the analysis. Years 1, 5, 10, 15 and 20 are shown here.

Source: PIRSA

Table 2-9 SA grains sector parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.00760	0.00891	0.01048	0.01196	0.01329
Direct - lost produce (\$m)	134.86	139.64	146.89	155.66	166.07
Management (\$m)	18.34	18.99	19.98	21.17	22.59
Staff hours	90,714	93,929	98,804	104,703	111,704
Staff wages (\$m)	2.56	2.66	2.79	2.96	3.16
Program case					
Rate of population change (factor)	0.00760	0.00891	-0.00881	-0.00922	-0.00966
Direct - lost produce (\$m)	134.86	139.64	133.70	127.76	121.82
Management (\$m)	18.34	18.99	18.19	17.38	16.57
Staff hours	90,714	93,929	89,933	85,936	81,940
Staff wages (\$m)	2.56	2.66	2.54	2.43	2.32

^a Parameters were estimated for each year of the analysis. Years 1, 5, 10, 15 and 20 are shown here.

Source: PIRSA

The current estimate of production losses for grains (\$134.9 million) is approximately 3.7 per cent of the farmgate value (\$3.7 billion) and 3.0 per cent of the export value (\$4.5 billion) of grain production in SA in 2023/24 (PIRSA 2025)³.

³ To put these losses into context, Murray and Brennan (2010) estimated losses from three major wheat pathogens to the national wheat crop of \$447 million (with control) and \$994 million (without control) in 2008 dollars.

Costs to local government

Costs to local government included pest bird management costs (both cash and in staff time). As per the primary industries, costs were assumed to change in direct proportion to bird population changes. Table 2-10 summarises the estimated costs modelled for local government.

Table 2-10 SA local government parameters used to estimate cost^a

Parameter	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Rate of population change (factor)	0.02145	0.02175	0.02206	0.02229	0.02241
Management (\$m)	1.41	1.54	1.71	1.91	2.14
Staff hours	7,735	8,429	9,398	10,491	11,719
Staff wages (\$m)	0.42	0.46	0.51	0.57	0.64
Program case					
Rate of population change (factor)	0.02145	0.02175	-0.03511	-0.04259	-0.05412
Management (\$m)	1.41	1.54	1.30	1.06	0.83
Staff hours	7,735	8,429	7,131	5,834	4,536
Staff wages (\$m)	0.42	0.46	0.39	0.32	0.25

Source: PIRSA

Avoided operating costs

With produce loss, operating costs associated with harvesting and storage were assumed to be reduced proportionately. Table 2-11 summarises the estimated reduced costs modelled for the primary industries.

Table 2-11 Avoided operating costs, SA primary industry

Primary industry	2025-26	2029-30	2034-35	2039-40	2044-45
Base case					
Aquaculture (\$m)	0.41	0.43	0.45	0.48	0.50
Fruit (\$m)	23.56	25.58	28.30	31.13	34.00
Nuts (\$m)	2.80	3.18	3.72	4.34	5.05
Winegrapes (\$m)	5.53	6.00	6.64	7.31	7.98
Grains (\$m)	13.77	14.26	15.00	15.90	16.96
Program case					
Aquaculture (\$m)	0.41	0.43	0.39	0.35	0.31
Fruit (\$m)	23.56	25.58	18.48	11.37	4.26
Nuts (\$m)	2.80	3.18	2.50	1.83	1.15
Winegrapes (\$m)	5.53	6.00	5.21	4.41	3.61
Grains (\$m)	13.77	14.26	13.65	13.05	12.44

Source: BDO analysis

The following gross margin data were used to estimate the reduced operating costs per million dollars of farmgate production (output):

- Aquaculture: \$270,000/\$m output, based on BDO (2025)
- Fruit: \$520,000/\$m output, based on Naturallogic and EconSearch (2015)
- Nuts: \$150,000/\$m output, based on Pocock (2007)
- Winegrapes: \$170,000/\$m output, based on Wheeler et al. (2022)
- Grains: \$100,000/\$m output, based on ABARES (2025).

Australia-wide cost assumptions

PIRSA did not complete a detailed assessment of pest bird populations and impact on primary industries and communities in other jurisdictions. However, based on anecdotal evidence received from counterparts in Western Australia and Victoria, and from industry groups, it is likely that similar types and levels of impacts occur in other Australian jurisdictions. To assess national production losses, local impacts from SA, including crop losses and management costs, were extrapolated to a national context. This analysis assumes uniform effects across targeted crops and aquaculture sectors. The resulting estimates of potential production losses are indicative and serve to illustrate the possible broader impacts (Table 2-12). These costs include SA impacts.

Table 2-12 Australia-wide cost assumptions

Industry	Industry GVP (\$m)	Current production losses (\$m)	Management costs	
			Cash (\$m)	Staff Hours ('000 hours)
Aquaculture	2,136.0	21.4	1.3 ^a	3.2 ^a
Cherries	215.7	64.7	364.4 ^a	-1,639.6 ^a
Apples	989.9	178.2	Included in above ^a	Included in above ^a
Pears	129.4	19.4	Included in above ^a	Included in above ^a
Winegrapes	1,005.0	76.4	94.9 ^a	Nil ^a
Almonds	1,690.1	166.9	65.7	2,628.0
Grains	12,250.0	500.0	47.0	470.0

^a Estimated by BDO based on SA data

Source: PIRSA

Production losses, management cash costs and staff time were scaled up over the 20-year analytical period based on the relative magnitude of production losses. Where national management costs (cash and time) were provided, these were used to scale up their respective SA values over the analytical period.

Bait development and registration costs were included in the national analysis as per the SA analysis (i.e. without scaling). Coordinated, area-wide pest bird control costs were included in the national analysis and were scaled up based on the aggregate production losses.

Due to a lack of suitable information, local government costs were included without scaling up.

2.1.8. Unquantified costs

While difficult to quantify in dollar terms, it is important to note the social risks associated with pest birds. Table 2-13 shows that most industry groups and local councils agreed that pest birds affected staff wellbeing

and created trade, safety and biosecurity risks. Relevant related comments are provided below Table 2-13 in verbatim.

Table 2-13 Percentage agreement with statements about pest birds

Pest birds....	Aquaculture	Fruit	Nuts	Grapes	Fruit storage	Grain storage
affect staff wellbeing	100%	80%	93%	50%	Agree	Agree
create market and trade risks	100%	83%	92%	83%	Disagree	Agree
create serious health and safety concerns	100%	83%	100%	25%	-	Agree
are a biosecurity risk and biohazard	100%	83%	93%	50%	-	Agree

PIRSA, pers. comm.

".. the last 10 years it's been getting worse, now it's unbearable, made growing a misery"

"... we got out of the [horticulture] industry because of the birds"

"...I spent \$0.5 million on staff wages for thinning out the apples, the next week the birds decimated the remaining fruit, we won't harvest that block this year"

"The impacts of little corellas on people are equal to mice and rabbits when they are in plague proportions, e.g. damaging trees and infrastructure and, for some people, allowing no sleep for months on end, and turning ordinary people suicidal, angry and stressed"

"There needs to be an overall state effort to reduce and control little corellas as they seem to go from one council to the next as each does its own control action"

"Council has been advocating to local Landscapes SA Boards and the State Government to implement better control methods"

"As there is no help from State or Commonwealth Governments, the weight of management falls on underfunded, small, rural, and regional Councils with few resources, large areas, and no method of controlling the problem"

2.2. Economic impact - method and data

2.2.1. Economic impact models

Economic impacts of the pest bird control tool's development and implementation were analysed using SA and Australian RISE (regional industry structure and employment) models based on 2022/23 data. RISE models are extended input-output (IO) models developed by BDO over a decade and updated occasionally for use by the Department of the Premier and Cabinet, Government of SA.

IO models are widely used to assess the economic contribution of existing levels of economic activity and the economic impact of shocks. The models are based on IO tables that describe the interdependencies between industries within the regional economy and with the economy outside of the region. This makes the comprehensive economic framework provided by the RISE models useful for disentangling the direct and flow-on effects of activity in an economy.

The IO method used in the RISE model has been extended to incorporate population and unemployment changes. Modelling population allows for the impacts on population driven sectors, such as government administration, health, defence and education. Modelling unemployment change allows estimation of an offsetting effect on consumption-induced flow-on impacts as some new employees may have previously claimed unemployment benefits in the region and some may be new to the region. These extensions improve the reliability of the RISE model compared to conventional IO models.

2.2.2. Economic activity

Economic activity indicators: the focus of this aspect of analysis is the generation of economic activity resulting from development and implementation of a coordinated pest bird management program. The key economic activity indicators considered in the analysis are gross state/domestic product (GSP/GDP) and employment.

Economic impact: changes in economic activity are referred to as economic impacts. Generally, changes in economic activity indicators result from some stimulus or external shock imposed on the economy. In this analysis, the economic impact includes the increases in contributions to the economy stimulated by the pest bird control activities and increased production, as well as decreases in contributions from reduced bird management costs by industry and local government as pest bird populations are brought under control.

2.2.3. Indicators of economic activity

Gross state/domestic product (GSP/GDP): is a measure of the contribution of an activity to the economy. GSP is measured as value of gross output (business revenue) less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as the sum of household income, gross operating surplus and gross mixed income net of payments to owner managers and taxes less subsidies on products and production. It represents payments to the primary inputs of production (labour, capital and land). Using GSP as a measure of economic impact avoids the problem of double counting that may arise from using the value of output. GDP is the Australian equivalent of GSP.

fte employment: is a measure of the number of working proprietors, managers, directors and other employees in terms of the number of full-time equivalent (fte) jobs. Fte is a way to measure a worker's involvement in a project. An fte of 1.0 means that the person is equivalent to a full-time worker, while an fte of 0.5 signals that the worker is half-time. In this report, employment has been reported in terms of fte units on a per annum basis.

2.2.4. Categories of economic activity

This section describes the components (direct, flow-on, and total contributions) of the economic indicators described in Section 2.2.3. Estimates of economic contribution are presented in this study in terms of:

- direct contribution
- flow-on (or indirect) contribution
- total contribution.

Direct contributions are the initial round of effects (i.e. employment and GSP) generated by an economic activity (i.e. government investment, landholder investment, and livestock enterprises).

Flow-on (or indirect) contributions are the sum of production-induced effects and consumption-induced effects. Production-induced effects are additional employment and GSP resulting from re-spending by firms (e.g. contractors) that receive payments from the sale of goods and services to the activities mentioned above. Consumption-induced effects are additional employment, household income and GSP resulting from re-spending by households that receive income from employment in direct and indirect activities.

Total contributions are the sum of direct and flow-on (indirect) contributions.

2.2.5. Data and assumptions

The data and assumptions used to calculate the economic impacts are the same as those used for the CBA (Section 2.1.7).

In addition to the assumptions embodied in the IO model itself, it was necessary to make several other general assumptions in estimating the economic impacts:

- The impacts were measured using models that represent the structure of the economy for the year in which the most recent data are available (2022/23). However, over time there are likely to be improvements in primary factor productivity in these economies. To allow for these improvements, an across-the-board (all sectors) labour productivity improvement rate of 0.5 per cent per annum has been incorporated into the modelling.
- When new jobs are created, it should be determined where the people come from to fill those jobs. In some cases, the jobs will be taken by previously unemployed locals or by someone who is currently employed locally but whose own job is taken by a previously unemployed local. In both cases the impact of the newly created job and associated income is particularly offset by the fact that someone who was previously receiving unemployment benefits, for example, is no longer doing so. To calculate this effect requires estimates of the parameter ρ , the proportion of new jobs that are likely to be filled by previously unemployed locals. The values for ρ of 0.8 for SA and 0.99 for Australia were used.

3. Cost benefit analysis results

This section describes the results from the CBA of the SA pest bird control tool development, registration and deployment (Section 3.1) and associated sensitivity analysis (Section 3.2). It also presents the CBA results for the high-level, national analysis (Section 3.3).

3.1. South Australia

The primary focus of the CBA in this study was the tangible costs and benefits to primary industries and local government from a strategic pest bird control tool being developed and implemented in SA (this section), and a simple scaled version of the net benefits if the control tool is extended across Australia over the same period (Section 3.3). The CBA is used to assist in the identification of the option that maximises the net social benefits. The two scenarios were:

- Base case: no coordinated pest bird control tool is developed, registered or implemented.
- Program case: Proposed coordinated pest bird control development, registration (\$5.0 million investment) and implementation (over 20 years).

The program case was compared against the base case.

Summary results of the CBA for South Australia are presented in Table 3-1 and detailed CBA results are presented in Appendix 1. The results of the economic analysis have been presented in terms of two evaluation criteria: net present value (NPV) and benefit cost ratio (BCR). NPV is a measure of the aggregate, annual net benefits (i.e. benefits - costs) of an option over a 20-year period, discounted (i.e. expressed as a present value) using a discount rate of 7 per cent. BCR is the ratio of the present value of benefits to the present value of costs.

The CBA shows whether the proposed investment represents an efficient use of public money. The results of the CBA for the program are described in Table 3-1. These results are based on expected values for key variables, as outlined in Section 2.1.7.

The results indicate that according to the two evaluation criteria used, investing in the development, registration and implementation of a coordinated pest bird control tool is a worthwhile investment. The NPV of \$604.3 million indicates that, relative to the base case, the program will generate a net benefit to the community of \$604.3 million over a 20-year period. The decision rule is that the investment will be worthwhile if the NPV is greater than zero.

The BCR provides a measure of the return on investment. Under this decision rule, the investment is considered to be potentially viable if the BCR is greater than one. The BCR of 5.3 indicates that investing in developing, registering and deploying a coordinated area-wide pest bird control tool provides excellent returns to the South Australian community. The BCR result is higher than other, recent coordinated, area-wide pest animal control initiative CBAs (see, for example BDO EconSearch 2022, BDO EconSearch 2021), primarily because the implementation costs are relatively low (i.e. relatively low-cost technology, rather than labour and high-cost technology of other initiatives). The high BCR also reflects the value of investing in coordinated control using effective tools, especially when compared to the current fragmented approach, where land managers across various industries rely on limited and ineffective control methods.

Accordingly, the net benefits of investing in the coordinated pest bird control tool outweigh the net benefits of the base case in which primary industries and local government continue to control pest birds in an uncoordinated manner and with ineffective tools.

Benefits are likely to be underestimated because not all industries or all social impacts, such as emotional stress, were included for stakeholders experiencing pest bird impacts. Most industry groups and local councils surveyed, agreed that pest birds affected staff wellbeing and created trade, safety and biosecurity risks (Table 2-13).

Table 3-1 CBA results, South Australia

Item	Present value (\$m)
Net benefits (\$m)	
Avoided loss of produce & feed and avoided pest management costs (cash and time)	
Aquaculture	7.2
Fruit	243.9
Nuts	157.8
Winegrapes	180.8
Grains	150.4
Avoided pest management costs (cash and time)	
Local government	5.2
Total net benefits (\$m)	745.3
Net costs (\$m)	
Pest bird control tool	
Bait development & registration	4.2
Capital cost	0.1
Capital replacement	0.1
Bait	3.1
Coordination	1.6
Additional operating costs (due to lower loss of produce)	
Aquaculture	0.6
Fruit	92.7
Nuts	11.8
Wine grapes	13.6
Grains	13.3
Total net costs (\$m)	141.0
Net present value (\$m)	604.3
Benefit cost ratio	5.3

BDO analysis

3.2. Sensitivity analysis - South Australia

The results of the CBA were re-estimated using values for key variables that reflect the uncertainty of those variables. The sensitivity analysis included the following:

- Discount rates
- Pest bird control tool costs

The range of values used for each uncertain variable and detailed results of the sensitivity analysis are set out below with some interpretation of the results. Note that each sensitivity analysis for each variable was undertaken by holding all other variables constant at their 'assumed' values. The assumptions and results of the sensitivity analysis are summarised and described in the following sections.

Discount rates

Costs and benefits are specified in real terms (i.e. in current dollars) and future values are converted to present values by applying a discount rate of 7 per cent. A sensitivity analysis was conducted using discount rates of 4 and 10 per cent (Table 3-2).

Table 3-2 Sensitivity analysis, discount rates

Discount rate	Value	NPV (\$m ^a)	BCR
Low	4%	892.4	5.3
Assumed	7%	604.3	5.3
High	10%	418.4	5.2

^a In current dollars

Source: BDO analysis

As expected, the NPV improves with the lower (4 per cent) discount rate. This occurs because, although the bulk of the program costs are 'up front' and are not significantly affected by the discount rate, the benefits accrue over many years and are greater, in present value terms, when the discount rate is lower. However, although the results are sensitive to the discount rate applied, the positive NPVs across the range of discount rates tested indicate that the program case is still preferable to the base case.

Pest bird control tool costs

The development, registration and deployment of the pest bird control tool is based on estimated costs. These costs have potential to vary, and a sensitivity analysis was conducted using cost estimates that were 25 per cent lower and higher (Table 3-3).

Table 3-3 Sensitivity analysis, pest bird control tool costs

Pest bird control tool costs	Value	NPV (\$m ^a)	BCR
Low	25 per cent lower	606.6	5.4
Expected	Expected	604.3	5.3
High	25 per cent higher	602.0	5.2

^a In current dollars

Source: BDO analysis

The indicators (NPV and BCR) vary marginally with the range of values tested (with higher costs reducing the NPV and BCR indicators slightly) and the positive NPVs across the range of discount rates tested indicate that the program case is still preferable to the base case.

3.3. Australia

The CBA was completed, at a high level, for the whole of Australia (including SA). As described earlier (Section 2.1.7), a detailed assessment of pest bird populations and impact on primary industries and communities in other jurisdictions was not completed. However, assuming the same relative proportion of production losses for the same primary industries, an indicative CBA was completed for Australia as a whole using scaled-up estimates based on SA data. The results of this analysis are summarised in Table 3-4 and detailed results are presented in Appendix 1.

Table 3-4 Indicative CBA results, Australia

Item	Present value (\$m)
Net benefits (\$m)	
Avoided loss of produce & feed and avoided pest management costs (cash and time)	
Aquaculture	17.8
Fruit	5,076.9
Nuts	1,392.7
Winegrapes	419.2
Grains	544.6
Avoided pest management costs (cash and time)	
Local government	5.2
Total net benefits (\$m)	7,456.4
Net costs (\$m)	
Pest bird control tool	
Bait development & registration	4.2
Capital cost	0.4
Capital replacement	0.6
Bait	15.7
Coordination	7.9
Additional operating costs (due to lower loss of produce)	
Aquaculture	1.5
Fruit	2,009.6
Nuts	109.7
Wine grapes	33.0
Grains	49.7
Total net costs (\$m)	2,232.2
Net present value (\$m)	5,224.2
Benefit cost ratio	3.3

BDO analysis

4. Economic impact analysis results

This section describes the results from the economic impact analysis of the SA pest bird impact assessment (Section 4.1) and the high-level, national analysis (Section 4.2).

4.1. South Australia

This section presents the economic impacts that a strategic pest bird control tool being developed and implemented is expected to make to the SA economy in terms of GSP and employment. Note that the impact measured here is the difference between the income, expenditures and staff resulting from the program case and base case scenarios. Results are presented for the pest bird control tool program (Section 4.1.1), primary industries (Section 4.1.2), local government (Section 4.1.3) and concluding with a summary of the aggregate impacts (Section 4.1.4).

4.1.1. Pest bird control development, registration and deployment

Pest bird control tool development, registration and deployment included the following activities (i.e. expenditures):

- Bait development and national registration, from 2026-27 to 2029-30
- Bait station construction, 2030-31
- Area-wide pest control program coordination, 2031-32 to 2044-45
- Bait deployment, 2031-32 to 2044-45
- Bait station repair and replacement, 2032-33 to 2044-45.

The results of the impact analysis are summarised in Table 4-1.

Table 4-1 Economic impacts of pest bird control development, registration and deployment, South Australia

	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY35	FY40	FY45	Av. annual	Total
GSP (\$m^a)												
Direct	0.0	0.6	0.6	0.6	0.6	0.0	0.3	0.3	0.3	0.3	0.3	6.7
Prod'n induced flow-ons	0.0	0.3	0.3	0.3	0.3	0.0	0.2	0.2	0.2	0.2	0.2	4.4
Cons'n induced flow-ons	0.0	0.4	0.4	0.4	0.4	0.0	0.2	0.2	0.2	0.2	0.2	4.6
Total^b	0.0	1.3	1.3	1.3	1.3	0.1	0.7	0.7	0.7	0.7	0.8	15.7
Employment (fte jobs)												
Direct	0	5	5	5	5	0	2	2	2	2	2	N/A
Prod'n induced flow-ons	0	2	2	2	2	0	1	1	1	1	1	N/A
Cons'n induced flow-ons	0	2	2	2	2	0	1	1	1	1	1	N/A
Total^b	0	9	9	9	9	0	4	4	4	4	5	N/A

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

The estimated impact of these activities on the South Australian economy were:

- GSP: \$15.7 million in GSP in total over 20 years, \$6.7 million from direct effects and \$9.0 million from flow-on effects. The average annual contribution was \$0.8 million (total GSP)
- Employment: an average of five fte jobs in total, two fte jobs directly and three fte jobs through flow-on effects. The peak contribution to employment occurred in 2026-27, comprising 9 fte jobs in total.

4.1.2. Primary industry

Aquaculture

Coordinated area-wide pest bird control from 2031-32 to 2044-45 is expected to have the following effects:

- Increased aquaculture output (from reduced losses from pest birds) in the kingfish and abalone sectors
- Consequently, increased feed costs in the kingfish and abalone sectors
- Decreased feed costs in the tuna industry
- Decreased management effort on controlling pest birds (cash and staff time).

The results of the impact analysis are summarised in Table 4-2.

Table 4-2 Economic impacts of pest bird control, aquaculture, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	0.7	1.4	2.1	0.8	16.8
Prod'n induced flow-ons	0.0	0.0	-0.4	-0.7	-1.1	-0.4	-8.7
Cons'n induced flow-ons	0.0	0.0	-0.1	-0.2	-0.3	-0.1	-2.0
Total^b	0.0	0.0	0.3	0.5	0.8	0.3	6.1
Employment (fte jobs)							
Direct	0	0	0	0	0	0	N/A
Prod'n induced flow-ons	0	0	-2	-4	-6	-2	N/A
Cons'n induced flow-ons	0	0	0	-1	-1	0	N/A
Total^b	0	0	-2	-5	-7	-3	N/A

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

The estimated impact of these changes in activities by the aquaculture sector on the South Australian economy were:

- GSP: \$6.1 million in GSP in total over 20 years, \$16.8 million from direct effects and a reduction of \$10.7 million from flow-on effects. The average annual contribution was \$0.3 million (total GSP)
- Employment: an average reduction of three fte jobs in total, less than one fte jobs directly and two fte jobs through flow-on effects.

Fruit

Coordinated area-wide pest bird control from 2031-32 to 2044-45 had the following effects:

- Increased produce output (from reduced losses from pest birds)

- And consequently, increased harvest and packing costs
- Decreased management effort on controlling pest birds (cash and staff time).

The results of the impact analysis are summarised in Table 4-3.

Table 4-3 Economic impacts of pest bird control, fruit, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	16.7	33.6	50.6	20.2	403.0
Prod'n induced flow-ons	0.0	0.0	3.1	6.2	9.3	3.7	74.5
Cons'n induced flow-ons	0.0	0.0	1.1	2.1	3.2	1.3	25.6
Total^b	0.0	0.0	20.8	42.0	63.1	25.2	503.1
Employment (fte jobs)							
Direct	0	0	14	29	43	17	N/A
Prod'n induced flow-ons	0	0	7	15	22	9	N/A
Cons'n induced flow-ons	0	0	5	10	15	6	N/A
Total^b	0	0	27	54	81	32	N/A

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

The estimated impact of these changes in activities by the fruit growing sector on the South Australian economy were:

- GSP: \$503.1 million in GSP in total over 20 years, \$403.0 million from direct effects and \$100.1 million from flow-on effects. The average annual contribution was \$25.2 million (total GSP)
- Employment: an average of 32 fte jobs in total, 17 fte jobs directly and 15 fte jobs through flow-on effects.

Nuts

Coordinated area-wide pest bird control from 2031-32 to 2044-45 would have similar effects as per the fruit industry. The results of the impact analysis are summarised in Table 4-4.

The estimated impact of these changes in activities by the nut growing sector on the South Australian economy were:

- GSP: \$138.2 million in GSP in total over 20 years, \$268.1 million from direct effects and a reduction of \$129.4 million from flow-on effects. The average annual contribution was \$6.9 million (total GSP)
- Employment: an average reduction of 145 fte jobs in total, 116 fte jobs directly and 29 fte jobs through flow-on effects.

Table 4-4 Economic impacts of pest bird control, nuts, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	10.8	22.3	34.6	13.4	268.1
Prod'n induced flow-ons	0.0	0.0	-1.4	-2.9	-4.4	-1.7	-34.5
Cons'n induced flow-ons	0.0	0.0	-3.8	-7.9	-12.3	-4.8	-95.4
Total^b	0.0	0.0	5.6	11.5	17.8	6.9	138.2
Employment (fte jobs)							
Direct	0	0	-93	-192	-298	-116	N/A
Prod'n induced flow-ons	0	0	-6	-11	-18	-7	N/A
Cons'n induced flow-ons	0	0	-18	-37	-58	-22	N/A
Total^b	0	0	-116	-241	-373	-145	N/A

^a In current dollars^b Sums may not add to totals due to rounding

BDO analysis

Winegrapes

Coordinated area-wide pest bird control from 2031-32 to 2044-45 would have similar effects as per the fruit industry. The results of the impact analysis are summarised in Table 4-5.

The estimated impact of these changes in activities by the winegrape growing sector on the South Australian economy were:

- GSP: \$266.8 million in GSP in total over 20 years, \$456.4 million from direct effects and a reduction of \$189.6 million from flow-on effects. The average annual contribution was \$13.3 million (total GSP)
- Employment: an average reduction of 48 fte jobs in total, less than one fte jobs directly and 48 fte jobs through flow-on effects.

Table 4-5 Economic impacts of pest bird control, winegrapes, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	18.8	38.1	57.4	22.8	456.4
Prod'n induced flow-ons	0.0	0.0	-6.2	-12.5	-18.9	-7.5	-150.3
Cons'n induced flow-ons	0.0	0.0	-1.6	-3.3	-4.9	-2.0	-39.3
Total^b	0.0	0.0	11.0	22.3	33.5	13.3	266.8
Employment (fte jobs)							
Direct	0	0	0	0	0	0	N/A
Prod'n induced flow-ons	0	0	-32	-64	-97	-38	N/A
Cons'n induced flow-ons	0	0	-8	-16	-24	-9	N/A
Total^b	0	0	-40	-80	-120	-48	N/A

^a In current dollars^b Sums may not add to totals due to rounding

BDO analysis

Grains

Coordinated area-wide pest bird control from 2031-32 to 2044-45 would have similar effects as per the fruit industry. The results of the impact analysis are summarised in Table 4-6.

Table 4-6 Economic impacts of pest bird control, grains, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	13.6	28.8	45.7	17.4	347.7
Prod'n induced flow-ons	0.0	0.0	-0.2	-0.5	-0.7	-0.3	-5.6
Cons'n induced flow-ons	0.0	0.0	-0.2	-0.4	-0.6	-0.2	-4.9
Total^b	0.0	0.0	13.2	28.0	44.4	16.9	337.3
Employment (fte jobs)							
Direct	0	0	-6	-12	-19	-7	N/A
Prod'n induced flow-ons	0	0	0	0	0	0	N/A
Cons'n induced flow-ons	0	0	-1	-2	-3	-1	N/A
Total^b	0	0	-7	-14	-22	-8	N/A

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

The estimated impact of these changes in activities by the grain growing sector on the South Australian economy were:

- GSP: \$337.3 million in GSP in total over 20 years, \$347.7 million from direct effects and a reduction of \$10.4 million from flow-on effects. The average annual contribution was \$16.9 million (total GSP)
- Employment: an average reduction of 8 fte jobs in total, seven fte jobs directly and one fte job through flow-on effects.

4.1.3. Local government

Coordinated area-wide pest bird control from 2031-32 to 2044-45 is expected to decrease management effort on controlling pest birds (cash and staff time). The results of the impact analysis are summarised in Table 4-7.

The estimated impact of these changes in activities by local government on the South Australian economy were:

- GSP: a reduction of \$13.6 million in GSP in total over 20 years, \$3.0 million from direct effects and \$10.6 million from flow-on effects. The average annual contribution was reduction of \$0.7 million (total GSP)
- Employment: an average reduction of 4 fte jobs in total, 2 fte jobs directly and 2 fte jobs through flow-on effects.

It is worth noting that these impacts can be viewed as a release of funds and staff time for other, more productive uses of council resources.

Table 4-7 Economic impacts of pest bird control, local government, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
GSP (\$m ^a)							
Direct	0.0	0.0	-0.1	-0.3	-0.4	-0.2	-3.0
Prod'n induced flow-ons	0.0	0.0	-0.3	-0.5	-0.8	-0.3	-6.2
Cons'n induced flow-ons	0.0	0.0	-0.2	-0.4	-0.6	-0.2	-4.3
Total^b	0.0	0.0	-0.5	-1.1	-1.7	-0.7	-13.6
Employment (fte jobs)							
Direct	0	0	-1	-3	-5	-2	N/A
Prod'n induced flow-ons	0	0	-1	-3	-4	-2	N/A
Cons'n induced flow-ons	0	0	-1	-2	-3	-1	N/A
Total^b	0	0	-4	-7	-11	-4	N/A

^a In current dollars^b Sums may not add to totals due to rounding

BDO analysis

4.1.4. Aggregate results

The aggregate economic impact of developing and implementing a strategic pest bird control tool and its effects on primary industry and local government in South Australia is summarised in Table 4-8.

The estimated aggregate impact of developing registering and implementing a strategic pest bird control tool and the effects on primary industries and local government in South Australia were:

- GSP: \$1.3 billion in GSP in total over 20 years and an average annual contribution of \$62.7 million (total GSP)
- Employment: an average reduction of 172 fte jobs in total. Employment impacts are expected to be initially positive (2026-27 to 2029-30), with the development and registration of the pest bird control tool, and thereafter employment impacts are negative overall, as primary industry businesses and local government spend less time and financial resources on ineffective pest bird control activities.

Table 4-8 Summary of economic impacts of pest bird control, South Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
<i>Total GSP (\$m^a)</i>							
Pest bird control tool	0.0	1.3	0.7	0.7	0.7	0.8	15.7
Aquaculture	0.0	0.0	0.3	0.5	0.8	0.3	6.1
Fruit	0.0	0.0	20.8	42.0	63.1	25.2	503.1
Nuts	0.0	0.0	5.6	11.5	17.8	6.9	138.2
Winegrapes	0.0	0.0	11.0	22.3	33.5	13.3	266.8
Grains	0.0	0.0	13.2	28.0	44.4	16.9	337.2
Local government	0.0	0.0	-0.5	-1.1	-1.7	-0.7	-13.6
Grand total^b	0.0	1.3	51.1	103.8	158.6	62.7	1,253.6
<i>Total employment (fte jobs)</i>							
Pest bird control tool	0	9	4	4	4	5	N/A
Aquaculture	0	0	-2	-5	-7	-3	N/A
Fruit	0	0	27	54	81	32	N/A
Nuts	0	0	-116	-241	-373	-145	N/A
Winegrapes	0	0	-40	-80	-120	-48	N/A
Grains	0	0	-7	-14	-22	-8	N/A
Local government	0	0	-4	-7	-11	-4	N/A
Grand total^b	0	9	-138	-289	-449	-172	N/A

^a In current dollars^b Sums may not add to totals due to rounding

BDO analysis

4.2. Australia

Aggregate, high-level results for Australia are presented in this section and detailed results for pest bird control tool investment and by sector are presented in Appendix 2.

The aggregate economic impact of developing and implementing a strategic pest bird control tool and its effects on primary industry and local government in South Australia is summarised in Table 4-9.

The estimated aggregate impact of developing registering and implementing a strategic pest bird control tool and the effects on primary industries and local government in Australia were:

- GDP: \$13.7 billion in GDP in total over 20 years and an average annual contribution of \$683.7 million (total GDP). Fruit, grains and nuts are the most significantly impacted sectors (\$542.4 million, \$62.0 million and \$52.2 million annually, respectively).
- Employment: an average reduction of 660 fte jobs in total. Employment impacts are initially positive (2026-27 to 2029-30), with the development and registration of the pest bird control tool, and thereafter employment impacts are negative overall, as primary industry businesses and local government spend less time and financial resources on ineffective pest bird control activities.

Sensitivity analyses on the Australia CBA were not undertaken as the CBA is an extrapolation of the SA analysis, and sensitivity analysis results would form similar conclusions.

Table 4-9 Summary of economic impacts of pest bird control, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45	Av. annual	Total
<i>Total GDP (\$m^a)</i>							
Pest bird control tool	0.0	1.7	4.1	4.1	4.1	3.2	64.4
Aquaculture	0.0	0.0	0.5	1.1	1.6	0.6	12.9
Fruit	0.0	0.0	449.4	904.5	1,361.0	542.4	10,848.4
Nuts	0.0	0.0	42.0	86.8	134.6	52.2	1,044.5
Winegrapes	0.0	0.0	19.8	40.0	60.3	24.0	479.8
Grains	0.0	0.0	48.7	103.0	163.3	62.0	1,241.0
Local government	0.0	0.0	-0.7	-1.4	-2.2	-0.9	-17.0
Grand total^b	0.0	1.7	563.8	1,138.1	1,722.7	683.7	13,673.9
<i>Total employment (fte jobs)</i>							
Pest bird control tool	0	9	20	19	19	16	N/A
Aquaculture	0	0	-4	-8	-12	-5	N/A
Fruit	0	0	617	1,247	1,880	747	N/A
Nuts	0	0	-1,013	-2,094	-3,248	-1,260	N/A
Winegrapes	0	0	-99	-200	-302	-120	N/A
Grains	0	0	-26	-55	-88	-33	N/A
Local government	0	0	-4	-8	-13	-5	N/A
Grand total^b	0	9	-510	-1,100	-1,764	-660	N/A

^a In current dollars^b Sums may not add to totals due to rounding

BDO analysis

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Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.

Appendix 1 Detailed CBA results

Appendix Table 1-1 Detailed CBA, South Australia

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Base case - no new pest bird control tool											
Benefits (\$m)											
Avoided operating costs (due to lost produce)											
Aquaculture	5.1	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
Fruit	311.2	23.6	24.1	24.6	25.1	25.6	26.1	26.6	28.3	31.1	34.0
Nuts	40.6	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.7	4.3	5.0
Wine grapes	73.0	5.5	5.6	5.8	5.9	6.0	6.1	6.3	6.6	7.3	8.0
Grains	168.1	13.8	13.9	14.0	14.1	14.3	14.4	14.5	15.0	15.9	17.0
Total benefits	597.9	46.1	46.9	47.7	48.6	49.5	50.4	51.3	54.1	59.2	64.5
Costs (\$m)											
Aquaculture											
Direct (loss of produce & feed)	54.7	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.9	5.1	5.4
Management	7.7	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8
Management (staff cost)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Fruit											
Direct (loss of produce)	600.0	45.4	46.4	47.3	48.3	49.3	50.3	51.4	54.6	60.0	65.6
Management	261.0	19.8	20.2	20.6	21.0	21.5	21.9	22.4	23.7	26.1	28.5
Management (staff cost)	-33.7	-2.6	-2.6	-2.7	-2.7	-2.8	-2.8	-2.9	-3.1	-3.4	-3.7
Nuts											
Direct (loss of produce)	279.6	19.3	19.9	20.6	21.2	21.9	22.6	23.4	25.6	29.9	34.8
Management	120.5	8.3	8.6	8.9	9.2	9.4	9.8	10.1	11.1	12.9	15.0
Management (staff cost)	144.6	10.0	10.3	10.6	11.0	11.3	11.7	12.1	13.3	15.5	18.0
Wine grapes											
Direct (loss of produce)	433.5	32.8	33.5	34.2	34.9	35.6	36.4	37.1	39.4	43.4	47.4
Management	608.0	46.0	47.0	48.0	49.0	50.0	51.0	52.1	55.3	60.8	66.4
Management (staff cost)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grains											

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Direct (loss of produce)	1,645.9	134.9	136.0	137.1	138.4	139.6	141.0	142.4	146.9	155.7	166.1
Management	223.9	18.3	18.5	18.7	18.8	19.0	19.2	19.4	20.0	21.2	22.6
Management (staff cost)	31.3	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.8	3.0	3.2
Local councils											
Management	18.9	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.9	2.1
Management (staff cost)	5.6	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6
Total costs	4,401.9	341.9	347.4	353.1	359.0	365.0	371.2	377.5	397.4	433.5	472.8
Scenario 1 - new pest bird control tool developed and implemented											
Benefits											
Avoided operating costs (due to lost produce)											
Aquaculture	4.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Fruit	218.5	23.6	24.1	24.6	25.1	25.6	24.2	22.7	18.5	11.4	4.3
Nuts	28.8	2.8	2.9	3.0	3.1	3.2	3.0	2.9	2.5	1.8	1.1
Wine grapes	59.4	5.5	5.6	5.8	5.9	6.0	5.8	5.7	5.2	4.4	3.6
Grains	154.8	13.8	13.9	14.0	14.1	14.3	14.1	14.0	13.7	13.0	12.4
Total benefits	466.0	46.1	46.9	47.7	48.6	49.5	47.6	45.8	40.2	31.0	21.8
Costs											
Pest bird control tool											
Bait development & registration	4.2	0.0	1.3	1.3	1.3	1.3	0.0	0.0	0.0	0.0	0.0
Capital cost (bait stations)	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Capital replacement (bait stations)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bait	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5
Coordination	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3
Aquaculture											
Direct (loss of produce)	48.4	4.5	4.5	4.6	4.6	4.7	4.6	4.5	4.2	3.8	3.4
Management	6.8	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.5	0.5
Management (staff cost)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fruit											
Direct (loss of produce)	421.3	45.4	46.4	47.3	48.3	49.3	46.6	43.8	35.6	21.9	8.2
Management	189.5	19.8	20.2	20.6	21.0	21.5	20.4	19.3	16.2	10.9	5.6

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Management (staff cost)	-27.4	-2.6	-2.6	-2.7	-2.7	-2.8	-2.7	-2.6	-2.4	-2.0	-1.7
Nuts											
Direct (loss of produce)	198.5	19.3	19.9	20.6	21.2	21.9	21.0	20.1	17.3	12.6	7.9
Management	85.6	8.3	8.6	8.9	9.2	9.4	9.0	8.6	7.4	5.4	3.4
Management (staff cost)	102.8	10.0	10.3	10.6	11.0	11.3	10.9	10.4	8.9	6.5	4.1
Wine grapes											
Direct (loss of produce)	357.0	32.8	32.8	33.5	34.2	34.9	35.6	34.7	31.8	27.1	22.4
Management	503.6	46.0	45.9	46.9	47.9	48.9	49.9	48.6	45.0	38.8	32.7
Management (staff cost)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grains											
Direct (loss of produce)	1,515.7	134.9	136.0	137.1	138.4	139.6	138.5	137.3	133.7	127.8	121.8
Management	206.2	18.3	18.5	18.7	18.8	19.0	18.8	18.7	18.2	17.4	16.6
Management (staff cost)	28.8	2.6	2.6	2.6	2.6	2.7	2.6	2.6	2.5	2.4	2.3
Local councils											
Management	14.9	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.3	1.1	0.8
Management (staff cost)	4.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.2
Total costs	3,665.7	341.9	346.9	352.6	358.4	364.4	357.9	349.3	321.6	275.3	229.1
Incremental benefits	-131.9	0.0	0.0	0.0	0.0	0.0	-2.7	-5.5	-13.9	-28.2	-42.7
Incremental costs	-736.2	0.0	-0.5	-0.5	-0.6	-0.6	-13.3	-28.2	-75.8	-158.1	-243.7
Net present value	604.3	0.0	0.5	0.5	0.6	0.6	10.5	22.7	62.0	130.0	201.0
Benefit cost ratio	0.2										
Alternative BCR	5.3										

BDO analysis

Appendix Table 1-2 Detailed CBA, Australia

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Base case - no new pest bird control tool											
Benefits (\$m)											
Avoided operating costs	(due to lost produce)										
Aquaculture	12.7	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.3
Fruit	6,747.7	511.0	521.6	532.5	543.5	554.8	566.3	577.9	613.6	675.2	737.4
Nuts	378.2	26.1	27.0	27.8	28.7	29.7	30.6	31.6	34.7	40.5	47.1
Wine grapes	177.1	13.4	13.7	14.0	14.3	14.6	14.9	15.2	16.1	17.7	19.4
Grains	628.1	51.5	51.9	52.3	52.8	53.3	53.8	54.3	56.1	59.4	63.4
Total benefits	7,943.9	603.0	615.2	627.7	640.4	653.4	666.6	680.1	721.6	794.0	868.4
Costs (\$m)											
Aquaculture - direct (loss of produce & feed)	137.6	11.3	11.4	11.5	11.6	11.7	11.8	12.0	12.3	12.9	13.6
Aquaculture - Management	16.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.6
Aquaculture - Management (staff cost)	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fruit - direct (loss of produce)	13,010.9	985.3	1,005.8	1,026.7	1,048.1	1,069.8	1,091.9	1,114.3	1,183.2	1,301.9	1,421.8
Fruit - Management	4,812.0	364.4	372.0	379.7	387.6	395.6	403.8	412.1	437.6	481.5	525.8
Fruit - Management (staff cost)	-625.2	-47.3	-48.3	-49.3	-50.4	-51.4	-52.5	-53.5	-56.9	-62.6	-68.3
Nuts - Direct (loss of produce)	2,607.5	180.1	185.9	191.9	198.1	204.5	211.0	217.8	239.2	279.0	324.6
Nuts - Management	1,025.5	70.8	73.1	75.5	77.9	80.4	83.0	85.7	94.1	109.7	127.6
Nuts - Management (staff cost)	1,172.9	81.0	83.6	86.3	89.1	92.0	94.9	98.0	107.6	125.5	146.0
Winegrapes - Direct (loss of produce)	1,051.2	79.6	81.3	83.0	84.7	86.4	88.2	90.0	95.6	105.2	114.9
Winegrapes - Management	1,253.1	94.9	96.9	98.9	100.9	103.0	105.2	107.3	114.0	125.4	136.9
Grains - Direct (loss of produce)	6,150.6	504.0	508.1	512.5	517.1	521.8	526.8	532.0	548.9	581.7	620.6
Grains - Management	578.2	47.4	47.8	48.2	48.6	49.1	49.5	50.0	51.6	54.7	58.3
Grains - Management (staff cost)	155.1	12.7	12.8	12.9	13.0	13.2	13.3	13.4	13.8	14.7	15.6
Local government - Management	18.9	1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.9	2.1
Local government - Management (staff cost)	5.6	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6
Total costs	31,371.5	2,387.4	2,433.7	2,481.1	2,529.8	2,579.6	2,630.5	2,682.6	2,844.8	3,133.8	3,441.9

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Scenario 1 - new pest bird control tool developed and implemented											
Benefits											
Avoided operating costs (due to lost produce)											
Aquaculture	11.3	1.0	1.1	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.8
Fruit	4,738.1	511.0	521.6	532.5	543.5	554.8	524.0	493.2	400.7	246.6	92.4
Nuts	268.5	26.1	27.0	27.8	28.7	29.7	28.4	27.1	23.3	17.0	10.7
Wine grapes	144.1	13.4	13.7	14.0	14.3	14.6	14.2	13.8	12.6	10.7	8.7
Grains	578.4	51.5	51.9	52.3	52.8	53.3	52.8	52.4	51.0	48.8	46.5
Total benefits	5,740.4	603.0	615.2	627.7	640.4	653.4	620.5	587.5	488.7	323.9	159.2
Costs											
Pest bird control tool											
Bait development & registration	4.2	0.0	1.3	1.3	1.3	1.3	0.0	0.0	0.0	0.0	0.0
Capital cost (bait stations)	0.4	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Capital replacement (bait stations)	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Bait	15.7	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	2.5	2.5
Coordination	7.9	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3
Aquaculture											
Direct (loss of produce)	121.8	11.3	11.4	11.5	11.6	11.7	11.5	11.3	10.7	9.6	8.5
Management	14.5	1.3	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.1	1.0
Management (staff cost)	1.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fruit											
Direct (loss of produce)	9,135.9	985.3	1,005.8	1,026.7	1,048.1	1,069.8	1,010.3	950.9	772.6	475.4	178.3
Management	3,493.7	364.4	372.0	379.7	387.6	395.6	376.1	356.6	298.0	200.3	102.6
Management (staff cost)	-508.8	-47.3	-48.3	-49.3	-50.4	-51.4	-50.0	-48.7	-44.6	-37.7	-30.9
Nuts											
Direct (loss of produce)	1,851.2	180.1	185.9	191.9	198.1	204.5	195.8	187.1	161.0	117.4	73.9
Management	728.2	70.8	73.1	75.5	77.9	80.4	77.0	73.6	63.3	46.2	29.1
Management (staff cost)	833.8	81.0	83.6	86.3	89.1	92.0	88.1	84.2	72.5	53.1	33.6
Wine grapes											

	Present value (\$m)	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2034-35	2039-40	2044-45
Direct (loss of produce)	855.6	79.6	81.3	83.0	84.7	86.4	84.1	81.8	74.9	63.4	51.9
Management	1,029.6	94.9	96.9	98.9	100.9	103.0	100.5	98.0	90.3	77.7	65.0
Management (staff cost)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grains											
Direct (loss of produce)	5,664.0	504.0	508.1	512.5	517.1	521.8	517.4	512.9	499.6	477.4	455.2
Management	532.4	47.4	47.8	48.2	48.6	49.1	48.6	48.2	47.0	44.9	42.8
Management (staff cost)	142.8	12.7	12.8	12.9	13.0	13.2	13.0	12.9	12.6	12.0	11.5
Local councils											
Management	14.9	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.3	13.2	10.3
Management (staff cost)	4.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.2
Total costs	23,943.8	2,387.4	2,434.9	2,482.4	2,531.1	2,580.9	2,476.4	2,375.9	2,064.8	1,546.2	1,027.5
Incremental benefits	-2,203.4	0.0	0.0	0.0	0.0	0.0	-46.2	-92.6	-233.0	-470.1	-709.2
Incremental costs	-7,427.7	0.0	1.3	1.3	1.3	1.3	-154.2	-306.6	-780.0	-1,587.7	-2,414.4
Net present value	5,224.2	0.0	-1.3	-1.3	-1.3	-1.3	108.0	214.1	547.0	1,117.6	1,705.2
Benefit cost ratio	0.3										
Alternative BCR	3.3										

BDO analysis

Appendix 2 Detailed economic impact results, Australia

Appendix Table 2-1 Economic impacts of pest bird control development, registration and deployment, Australia

	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY35	FY40	FY45
GDP (\$m ^a)										
Direct	0.0	0.6	0.6	0.6	0.6	0.2	1.5	1.5	1.5	1.5
Prod'n induced flow-ons	0.0	0.4	0.4	0.4	0.4	0.2	1.3	1.4	1.4	1.4
Cons'n induced flow-ons	0.0	0.6	0.6	0.6	0.6	0.2	1.2	1.2	1.2	1.2
Total^b	0.0	1.7	1.7	1.7	1.7	0.6	4.0	4.1	4.1	4.1
Employment (fte jobs)										
Direct	0	4	4	4	4	1	8	8	8	8
Prod'n induced flow-ons	0	2	2	2	2	1	6	6	6	6
Cons'n induced flow-ons	0	3	3	3	3	1	6	6	6	6
Total^b	0	9	9	9	9	3	20	20	19	19

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-2 Economic impacts of pest bird control, aquaculture, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	1.7	3.5	5.2
Prod'n induced flow-ons	0.0	0.0	-1.0	-2.0	-3.0
Cons'n induced flow-ons	0.0	0.0	-0.2	-0.4	-0.6
Total^b	0.0	0.0	0.5	1.1	1.6
Employment (fte jobs)					
Direct	0	0	0	-1	-1
Prod'n induced flow-ons	0	0	-3	-6	-9
Cons'n induced flow-ons	0	0	-1	-2	-3
Total^b	0	0	-4	-8	-12

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-3 Economic impacts of pest bird control, fruit, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	337.4	679.1	1,021.8
Prod'n induced flow-ons	0.0	0.0	82.2	165.4	248.8
Cons'n induced flow-ons	0.0	0.0	29.8	60.0	90.3
Total^b	0.0	0.0	449.4	904.5	1,361.0
Employment (fte jobs)					
Direct	0	0	270	546	823
Prod'n induced flow-ons	0	0	212	428	646
Cons'n induced flow-ons	0	0	135	272	410
Total^b	0	0	617	1,247	1,880

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-4 Economic impacts of pest bird control, nuts, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	97.6	201.7	312.8
Prod'n induced flow-ons	0.0	0.0	-16.7	-34.4	-53.4
Cons'n induced flow-ons	0.0	0.0	-39.0	-80.5	-124.8
Total^b	0.0	0.0	42.0	86.8	134.6
Employment (fte jobs)					
Direct	0	0	-771	-1,593	-2,471
Prod'n induced flow-ons	0	0	-67	-138	-214
Cons'n induced flow-ons	0	0	-176	-363	-563
Total^b	0	0	-1,013	-2,094	-3,248

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-5 Economic impacts of pest bird control, winegrapes, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	41.6	84.0	126.7
Prod'n induced flow-ons	0.0	0.0	-16.9	-34.1	-51.4
Cons'n induced flow-ons	0.0	0.0	-4.9	-9.9	-14.9
Total^b	0.0	0.0	19.8	40.0	60.3
Employment (fte jobs)					
Direct	0	0	0	0	0
Prod'n induced flow-ons	0	0	-77	-155	-233
Cons'n induced flow-ons	0	0	-23	-45	-69
Total^b	0	0	-99	-200	-302

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-6 Economic impacts of pest bird control, grains, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	48.9	103.4	164.0
Prod'n induced flow-ons	0.0	0.0	0.4	0.9	1.4
Cons'n induced flow-ons	0.0	0.0	-0.6	-1.4	-2.2
Total^b	0.0	0.0	48.7	103.0	163.3
Employment (fte jobs)					
Direct	0	0	-29	-62	-99
Prod'n induced flow-ons	0	0	6	13	20
Cons'n induced flow-ons	0	0	-3	-6	-10
Total^b	0	0	-26	-55	-88

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

Appendix Table 2-7 Economic impacts of pest bird control, local government, Australia

	2025-26	2029-30	2034-35	2039-40	2044-45
GDP (\$m ^a)					
Direct	0.0	0.0	-0.1	-0.3	-0.4
Prod'n induced flow-ons	0.0	0.0	-0.3	-0.7	-1.1
Cons'n induced flow-ons	0.0	0.0	-0.2	-0.5	-0.7
Total^b	0.0	0.0	-0.7	-1.4	-2.2
Employment (fte jobs)					
Direct	0	0	-1	-3	-5
Prod'n induced flow-ons	0	0	-2	-3	-5
Cons'n induced flow-ons	0	0	-1	-2	-3
Total^b	0	0	-4	-8	-13

^a In current dollars

^b Sums may not add to totals due to rounding

BDO analysis

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