*APR.Intern Final Report Template*

*To be completed by the Intern, submitted to APR.Intern, and Reviewed by the Industry Partner*

This template is intended as a guide for the Final Report required by APR.Intern at the end of the internship project. It is not mandatory to use this format. The minimum standard for the Final Report is a generic overview of the research purpose, objectives, methodology and outcomes. The report may require disclosure of any IP developed from the research.

The purpose of the Final Report is to assess whether the objectives were met, outline the impact of the work for the Industry Partner and ensure sufficient recording of the research project is made available to the Industry Partner. The Final Report required for APR.Intern is 5-10 pages long. The Industry Partner may require additional documentation separate to this to finalise the internship.

**Please note:** The Final Report is protected under the Confidential Information Clause of the agreement. APR.Intern will request a copy for reporting purposes. The Industry Partner may request the removal of any IP or confidential information prior to submission to the APR.Intern Business Development contact and [contact@aprintern.org.au](mailto:contact@aprintern.org.au)

1. **Summary of Project**

In about 200-300 words, please provide a description of the purpose, objectives and expected outcome of the research project.

Energy released by fires can drastically change the nearby atmosphere and lead to unexpected fire spread hazardous spotting, understanding of which requires both atmospheric and fire spread modelling. The project aims to determine whether the operational numerical weather prediction model ACCESS, coupled to an empirical fire model can aid in the diagnosis and prediction of fires in a-typical topological or meteorological scenarios.

By examining two case studies through simulation and analysis, the project will determine if the ACCESS-Fire model can be used to reasonably simulate complex fire scenarios, and further to help explain the underlying causes of unexpectedly bad fires. These case studies will be used in both conference presentations and eventually a publication. There is potential for the modelling work to help inform the fire danger index, as it may help diagnose dangerous conditions not currently understood.

*The project uses Australia’s premier research and operational numerical weather prediction model ACCESS, coupled to an empirical fire model to run case studies of extreme fire events and examine the interactions between the fire and surrounding atmosphere. The energy released by the simulated fire into the surrounding atmosphere, changes the surrounding wind fields and influences how the fire behaves. The project is supported by the Bushfire and Natural Hazards CRC and the project team is a small group of three in the Bureau of Meteorology’s Science to Services section. The project works closely with external stakeholders in fire and land management agencies. The work is of international interest due to climate change and increasing populations on the urban-rural fringe driving increased frequency and impacts of large bushfires, as well as a requirement for enhanced risk management during prescribed burns. The coupled-fire atmosphere model captures feedbacks between the fire and atmosphere, and examining the output enhances scientific understanding of the dynamical interactions and assists in development of tools and methods to predict fire behaviour and impacts.*

1. **Summary of Research**

In 3-4 pages, describe the project, methodology and results using the headings below as a guide.

* 1. ***Project Background***

\* Is there a good blurb you guys have already written for the CRC research grant stuff? I feel like that would be better than me trying to explain the overarching project.

* 1. ***Research Method***

\* if you want me to fill this bit in I probably can, but it will be vague and short like fog after the sunrise. Alternatively I feel like this item could be deleted

*The intern will develop familiarity with the output of the ACCESS NWP system and run and modify available conversion scripts to reformat ACCESS output files (to .nc or equivalent). Output will be visualised with Python and Matplotlib using various methods, including time series, multiple parameters, temporal and spatial scales, vertical levels (pressure, height, sigma) and cross sections. If time permits, it is desired to develop three-dimensional trajectory animations of model output using appropriate visualisation tools.*

*The intern will work closely with the other members of the project team to decide on optimal approaches to data analyses and must be flexible with exploring different display approaches and testing and refining analysis tools.*

*Manipulation and display of observational data may also be required, including displaying combinations of spatial datasets from different platforms.*

*The key deliverables on the project are case studies of two significant bushfires using the coupled fire-atmosphere model. These have been delayed due to required model development, particularly configuration of boundary layer settings, therefore assistance is required to accelerate the analysis stage of the project. ACCESS-Fire will be run on two case studies; the Waroona and Sir Ivan fires. It is expected that the model runs and write-up will mostly be performed by other team members (however the intern may be involved). The intern will assist with managing the large datasets (on NCI) and plotting and analysing the output, including multiple fields, derived parameters, spatial and temporal plots, cross sections and animations. Plots will be required in a format suitable for journal publication*

* 1. ***Intern’s Contribution***

My job has been to manage output, storage, visualisation, and preliminary analysis of ACCESS-Fire model ouptut along with some measurement data. This required advanced understanding of the national computational infrastructure provided by ANU, along with large scale data processing and visualisation techniques. Further learning of fire spread and meteorological parameters has been necessary along with advanced mapping procedures to enable detailed visualisations of 3D+time model output.

A suite of python scripts has been created to help analyse model output from the broad to the fine scale. These scripts show topographical overlays and interpolated transects of various meteorological metrics allowing an understanding of the simulated system. This includes collaborative work with Dr. Kevin Tory, on pyrocumulonimbus fire power threshold calculation.

A framework of python scripts, with documentation including examples has also been created. The programs have all been streamlined to work with minimal friction on the NCI infrastructure – to allow easy analysis of future model output and provide an intuitive code base for future enhancements.

\* Presentations: I will discuss collaborative presentations for the client summary, ACCOMC, and the meeting with James hilton

\* NAME model preliminary work on installation and whatever else I manage to get done will go into a paragraph here

\* If I think of any other stuff that can be summarised into a paragraph that will go here.

* 1. ***Research Results and Outcomes***

Model visualisations have successfully been used to find and help explain simulated pyrocumulonimbus (PCB) formation. Model visualisation has also contributed to model design, as large sets of gridded output require exploration and analysis in order to determine how reasonably the model behaves. Newly developed model iterations have been validated and preliminarily analysed along with the production and causes of PCB.

\* Escarpment anomalous fire spread appears to be captured and model output may help explain the driving meteorological causes and eventually be used to enhance the fire danger index

\* I feel like this section is again better left to you guys, I’ve been mostly analysing model output.

*The intern will contribute to the delivery of case studies for the 'Coupled fire-atmosphere modelling' project. Interest in the project is very high in land management and fire agencies and our external partners are very keen for us to share the simulation results. Therefore, it is expected that the graphics produced by the intern will be shared broadly across a range of forums in Australian fire and emergency management, including conference presentations, online webinars and training material as well as being a key component of the required publications. The findings from the project will inform decisions pertinent to safety of life and property during bushfires.*

*The intern will learn elements of the fundamental sciences of meteorology and fire behaviour, with a focus on boundary layer and mesoscale meteorology, fire prediction systems and extreme fire behaviour. The intern will be expected to contribute to regular team meetings, and there is the opportunity to attend seminars at the Bureau of Meteorology. The intern will also be exposed to Australia's leading numerical weather prediction system and may have the opportunity to learn how to run simulations.*

*Through the project team the intern will be able to draw on the experience of two leaders with extensive people and project management skills and be supported in developing capabilities in soft skills required in contemporary workplaces. The intern will have the opportunity to benefit from valuable mentoring during the project.*

*The internship will be provided training and supervision by the Intern supervisor and other members of the team. They will also receive training in developing their soft-skills such as team working, presentation and communication skills. As a result of this placement, the intern will be industry ready.*

*The intern will also have opportunity to attend regular internal science seminars on a range of meteorological, climate and modelling topics as well as attend the week-long annual research seminar series, usually held in October/November*

* 1. ***Future Research***

\* this template is generic, I think we can combine this and the business recommendations into one item: Future plans?

\* I’m not sure what stuff you guys want to put in here, or if there’s anything for me to add?

\* I could add a paragraph about the ember storm analysis using NAME

* 1. ***Business Recommendations***

Insert text here

1. **Final Comments**

Insert any additional comments if applicable.

\* “Tell my wifi lover her” is the best name for a home network

*APR.Intern Executive Summary Template*

*To be completed by the Intern, submitted to APR.Intern, and Reviewed by the Industry Partner*

The Executive Summary is a mandatory component of the APR.Intern program and is to illustrate the educational outcomes of the internship for the Intern. The Intern Executive Summary is to be completed in a manner that is suitable for publication and as such does not require the disclosure of any IP developed from the research.

The Intern Executive Summary may be disclosed to the student’s institution upon request.

The Executive Summary will require review and approval by the Industry Partner to ensure no confidential information is disclosed.

Please note: The report requires review by the Academic Mentor and approval by the Industry Partner prior to submission to ensure no confidential information is disclosed. Please submit in PDF format to your APR.Intern Business Development contact and [contact@aprintern.org.au](mailto:contact@aprintern.org.au)

1. **Summary of Research Project Background & Objectives**

In about 100 words, please provide a description of the purpose and expected outcome of the project that is suitable for media or other publicity material.

\* I will basically shorten the ‘summary of project’ paragraphs into here

1. **Summary of Research Undertaken**

In about 300 words, please provide a description of the research undertaken, in terms of methodology and your contribution to the research as an intern.

\* Paragraph about using available literature and you guys’ help to drive model visualisations and meteorological analyses, providing model feedback to Harvey for further model iterations, and model analysis for the group as a whole

\* paragraph about learning more about python and NCI in order to provide a useful project framework for ongoing work within the group

1. **Summary of the Educational Outcomes**

In about 100 words, in plain language, summarise how the internship contributed to your professional development as a researcher. Discuss any challenges translation of research, research environment etc. that occurred during the internship?

\* 100 words mentioning meteorological literature, programming and met based seminars/coursework, peer based programming help that would not have been available elsewhere

1. **Intern Impact Statement**

In about 75 words, please outline the impact that the internship has had on you in terms of work-readiness and competitiveness for future employment.

\* I’ve learned a great deal about fire and met modelling, python, GIS, NCI, and the work environment outside of university, etc.

1. **Final Comments**

Insert any additional comments if applicable

It has been a real pleasure to work with the exceptional Harvey, Jeff, and Mika, who have all shown real passion and verve.

*APR.Intern Industry Impact Statement Template*

*To be completed by the Industry Partner*

This template is intended as a guide for the Industry Impact Statement required by APR.Intern at the end of the internship project. The Industry Impact Statement is in to be completed by all Industry Partners as agreed to in Clause 4.1 of the APR.Intern Agreement and may be used for publicity and marketing purposes. The impact statement does not require disclosure of any IP developed from the research.

1. **Impact Statement for the Industry Partner**

In 250-300 words, please outline the research project outcomes and relevance/impact that the research will have on the organisation.

\* Paragraph about how the work I’ve done will enable quick and useful analysis of model output, and help with publication.

\* Paragraph assuming that my code will be a good basis for further visualisation of the model output and allow speedy future analysis.

\* Maybe I’m not meant to have input into this section, I’m not sure – if that’s the case let me know and I’ll