



**Australian Government**

**Department of Defence**

# Engine Test Cell 1 Upgrade

RAAF Base Amberley, Queensland

Statement of Evidence

to the

Parliamentary Standing Committee

on Public Works

Canberra, ACT

December, 2017

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# Engine Test Cell 1 Upgrade

## Identification of the need

1. Defence's Capability Acquisition and Sustainment Group (CASG) contracts with industry for the delivery of engine maintenance and testing for the RAAF's fleet of Classic Hornet, Super Hornet and Growler aircraft. These functions are primarily performed at RAAF Base Amberley, Queensland. Following maintenance, engines for these aircraft are tested in a specialist facility (Engine Test Cell No 1 or ETC1) that allows an uninstalled engine to be tested through its full operating range. TAE Aerospace (TAE), as a sub-contractor to the engine Original Equipment Manufacturer (OEM) and Prime Contractor, General Electric International Incorporated (GEII), performs these maintenance and testing services. ETC1 at RAAF Base Amberley is provided to TAE as a Government Furnished Facility (GFF).
2. In December 2014, the US F-35 Joint Project Office (JPO)<sup>1</sup> announced that Australia had been successful in securing the opportunity to host an Asia-Pacific regional F-35 Engine Maintenance, Repair, Overhaul and Upgrade (MRO&U) Depot<sup>2</sup>; this assignment was made on the strength of the performance of TAE in the engine maintenance and testing domain. TAE will partner with the F-35 engine OEM, Pratt & Whitney (P&W) to maintain engines for the Global Support Solution (GSS). The GSS applies to all F-35 user nations, and is managed centrally by the JPO; the success of the GSS therefore has a direct impact on the Australian F-35 capability. TAE will be the sole regional F-35 engine MRO&U service provider in the Asia-Pacific until 2023 when Japan is expected to activate its depot.
3. At the time Australia was announced as the regional F-35 engine MRO&U depot, Defence and TAE expected to utilise the existing test cell and workshops at RAAF Amberley for all engine MRO&U activity. As further information was made available by the engine manufacturer P&W and the JPO, it became clear that existing facilities would not be adequate. TAE is concurrently working towards the construction of a new

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<sup>1</sup> The F-35 Joint Program Office referred to as JPO is responsible for the management of the global F-35 program.

<sup>2</sup> The term 'depot' is the compilation of appropriate facilities, specialist equipment, general support equipment, workforce and other relevant infrastructure.

Commercially Owned Commercially Operated facility in the vicinity of RAAF Base Amberley in which they will conduct F-35 engine MRO&U work, and relocate their existing scope of work. Post-maintenance engine testing will be conducted in a modified ETC1 at RAAF Amberley.

4. Without modification, ETC1 will not be able to support F-35 engine work due to its larger size, weight and significant increase in power. The increased throughput required to support current and new product lines necessitates a restructure of product flow through the facility. Furthermore, as the products from two competing OEMs are to be tested in the one facility, equipment and information categorised as Intellectual Property needs to be segregated whilst not hindering efficiency.

## **Project Location**

### **Background**

5. RAAF Base Amberley has been used for military operations since 1938, and is one of the largest Defence Force bases in Australia. It occupies in excess of 350 hectares of land. Since the early 1970s through to today the base is home to many Air Force flying squadrons, training and support units, as well as Defence industry partners. The base is also home to a large contingent of Army personnel and is undergoing significant redevelopment to improve living and working accommodation.
6. The engine test facility at RAAF Base Amberley is Australia's largest fast jet engine test facility. The engines currently tested in this facility are serviced or repaired by TAE in the Turbine Engine Maintenance Facilities located in Buildings 71 and 76 within RAAF Base Amberley. ETC1 is the primary engine test cell used in support of the Super Hornet and Growler based at RAAF Base Amberley and is the back-up test facility for the Classic Hornet aircraft based at RAAF Bases Williamtown and Tindal. Classic Hornet engines will continue to be tested at RAAF Base Williamtown upon completion of this Project. The Classic Hornet fleet is approaching the end of their service life will be withdrawn from service as F-35 aircraft are introduced.
7. ETC1 was built in the 1960s to enable testing of the Pratt and Whitney TF30 engine for the F-111. The building is a steel reinforced concrete structure. It was upgraded in 1997 to convert it from a water-cooled test facility to an air-cooled test facility. The upgrade aimed to improve test chamber airflow, heat load capacity and extend its useful life. This was achieved by replacing the concrete in the exhaust chamber, making

modifications to improve operability when tailwinds were present and improve the data acquisition system capability. In 2009/10 a further upgrade was undertaken to facilitate Super Hornet and Classic Hornet engine testing coinciding with the F-111 aircraft's withdrawal from service.

### **Description of the proposal**

8. The ETC1 proposed upgrade works will provide Defence additional capability to that provided under the 2009/2010 upgrade. The ETC1 upgrade will enable efficient kitting and testing of the Super Hornet, Growler and F-35 engines at RAAF Base Amberley, (Attachment 1) located 50 kilometres southwest of Brisbane and 8 kilometres from Ipswich. ETC1 is located along the southern perimeter road near the southern end of the main North-South runway.
9. The ETC1 facility will enhance engine testing capability through process efficiencies, new F-35 engine testing support and new transport and control systems. The proposed upgrade ensures that the ETC1 can support the higher loadings and airflows created by the F-35 engine and also provides isolation between the two OEM suppliers GEII and P&W. Construction of an additional trailer storage area will allow engine transport trailers to be stored whilst the engines are being kitted or under test.
10. The facility work includes:
  - a. an additional control room, engine preparation and equipment storage areas, strengthening of the test chamber roof to support blade loss related loads, and surface treatment of the existing concrete structures;
  - b. internal fitout of the existing test cell structure to increase airflow through the facility; and
  - c. upgrades to existing infrastructure.
11. The facility will be certified for a maximum occupancy of 10 people. The number of personnel expected to operate from this facility during normal operation is 6 personnel.

### **Options considered to fulfil the identified need**

12. In 2016, Defence commissioned a feasibility study that examined a range of options to satisfy the new engine testing requirement including:
  - a. **Option 1.** Upgrade of ETC1 to meet ongoing testing requirements and the addition of F-35 engines.

- b. **Option 2.** New standalone engine test facility on a green-field site elsewhere within RAAF Base Amberley.
  - c. **Option 3.** New engine test facility co-located with ETC1 in order to leverage efficiencies from common services (eg. fuel supply).
  - d. **Option 4.** Do Nothing.
13. During the feasibility study, careful consideration was given to facility re-use/refurbishment; minimising the need for new infrastructure where possible to maximise and sustain assets.
14. After analysis of the feasibility study, Option 1, an upgrade to the Engine Test Cell, was the preferred course of action. An upgrade makes use of an existing purpose-built facility, and is most favorable in terms of achieving schedule to support the US F-35 JPO and the GSS, and minimises the need for additional infrastructure work required to achieve the capability need, and presents the best value for money proposition.

#### **Environment Impact Assessment and Heritage Considerations**

15. Defence commissioned an environmental consultant to prepare an Environment Report that assesses the environment and heritage considerations specific to the scope of the ETC1 upgrade. To prepare this report, the consultant completed a desktop assessment of available reports; a review of databases and official records for documented site conditions; and performed a site inspection which included an ecologist, bushfire consultant and heritage consultant. During the period of review and investigation, consultation occurred with the Base Regional Environmental and Sustainability Officer to identify key concerns and site specific requirements. The report concluded that there are no matters of environment or heritage significance that would trigger referral of this project in accordance with the Environment Protection and Biodiversity Conservation (EPBC) Act.
16. The Environment Report does however identify a presence of contaminants at this site including Per- and Polyfluoroalkyl substances (PFAS) including perfluorooctane sulphonates (PFOS) and perfluorooctanoic acid (PFOA). The concentrations of contaminants in the soil have been measured against ecological screening levels. Contaminants have been identified in shallow soil, which means run off from the site will need to be managed during construction to prevent soil migrating to nearby Warrill Creek. Warrill Creek is approximately 100 metres from ETC1, outside the base



boundary fence. Defence will require the construction contractor develop a soil and sediment management strategy, and incorporate this into their Construction Environment Management Plan (CEMP).

17. The construction contractor will be required to prepare and submit an Environment Clearance Certificate (ECC) for review and approval by the Regional Environment Officer at RAAF Base Amberley prior to commencing any work on site. This process affords Defence subject matter experts an opportunity to provide input on site specific considerations and oversight as to the Contractors method of governance. The CEMP is appended to the ECC for reference and completeness.
18. Acoustic design criteria issued for the ETC1 upgrade are that the external noise levels shall not exceed legislative limits for standard day exposure (average 85 dB(A) over an 8hr day, with 140 dB(C) peak permitted) and should be maintained at or below current levels experienced during Hornet and Growler engine testing. Within the ETC1 facility, Control Rooms are to be designed to limit engine noise to 75 dB(A) and the Kitting Facility to be designed to limit engine noise to standard day exposure levels.
19. F-35 engines will be transported to TAE for maintenance and subsequent testing at RAAF Base Amberley via truck.

### **Key Legislation**

20. The following key legislation is relevant to this Project:
  - a. Environment Protection Biodiversity and Conservation (EPBC) Act 1999;
  - b. Work Health and Safety Act 2011;
  - c. Disability Discrimination Act 1992;
  - d. National Construction Code (BCA and PCA), 2016
  - e. Fair Work Act 2009.

### **Applicable Codes and Standards**

21. The design of the proposed facility will comply with all relevant Australian Standards, Codes and Guidelines including the National Construction Code and the Building Code of Australia. The design will be compliant with the revision of the Building Code of Australia / National Construction Code which is most current at the time of the Building Certifiers approval of the design.

## **Consultation with Key Stakeholders**

22. The following stakeholders have been consulted in preparing the Statement of Evidence
- a. Capability Acquisition and Sustainment Group, Joint Strike Fighter Division – Advice on project scope and operational requirements.
  - b. Estate and Infrastructure Group, Infrastructure Division – Advice on Zone and precinct planning, site selection, environment planning, heritage, related projects, engineering policy and compliance, facilitation of and advice on the Parliamentary Standing Committee on Public Works.
  - c. Estate and Infrastructure Group, Defence Support Queensland – Consideration of regional issues and concerns.
  - d. Estate and Infrastructure Group, Service Delivery Division – Review and assessment of the Net Personnel and Operating Cost Estimate.
  - e. Defence Security and Vetting Services – Advice on Physical Security policy.
  - f. Chief Information Officer Group – Advice on Information Communication Technology policy and costing.
  - g. Estate Maintenance and Operating Services Contractor, Spotless – Consideration of design from a base services, through life support and maintenance perspective.
  - h. Pratt and Whitney – Advice on the propulsion system and testing requirements of the F-35 engine.
  - i. TAE – Advice on depot level maintenance and testing of afterburning turbo-fan engine types.
  - j. US F-35 Joint Program Office – Planning for and activating initial depot capabilities.
  - k. General Electric (GE) International Incorporated – Advice on Control Room and other relevant GE related design inputs.
23. Defence has developed a community consultation plan and communication strategy that recognises the importance of providing local residents, statutory authorities and other interested stakeholders an opportunity to provide input to or raise concerns relating to the proposal. Community consultation is planned to commence in November 2017

which will allow sufficient time for the collation of community concerns and issues for Defence to review and provide a considered response to, and to form part of the Community Consultation Report.

24. The individuals and groups currently identified for consultation are listed below:

- a. Federal Member for Blair;
- b. State Member for Ipswich;
- c. State Member for Ipswich West;
- d. State Member for Lockyer;
- e. Deputy Premier, Minister for Infrastructure and Planning & Minister for Transport;
- f. Assistant Minister for Transport and Infrastructure;
- g. Minister for State Development and Minister for Natural Resources and Mines;
- h. Ipswich City Council;
- i. Ipswich Chamber of Commerce and Industry;
- j. Local Property Owners, Land holders, Land Managers, Land Trust, Traditional Owners;
- k. RAAF Amberley Community Consultation Group;
- l. Queensland Department of Transport and Main Roads;
- m. Ipswich Residents Against Toxic Environment;
- n. Willowbank Area Residents Group; and
- o. Ipswich Ratepayers and Residents Association.

## Purpose of the Works

### Project objectives

25. The purpose of this project is to establish a fit-for-purpose engine test facility that satisfies both the ongoing (Super Hornet and Growler) and new (F-35) engine testing needs.

### Site Selection

26. The scope of this project is an extension of the existing Engine Test Cell 1 functionality at RAAF Base Amberley. The test cell is located at the southern end of the main North-South runway (adjacent taxiway Alpha) and bordered by the southern perimeter road.
27. The site selection has been undertaken in accordance with the Defence Estate Quality Management System (DEQMS) inclusive of all Defence policy, environment, and heritage, operational and existing planning guidance under the relevant Base Development Plan.
28. The scope of work is contained entirely within Commonwealth owned land. This project does not involve the acquisition or disposal of any land or property by Defence

### Detailed Description of the Proposed Works

29. The upgrade is concentrated on key functional areas of the engine test cell. A summary of works proposed for each functional area are described below:
  - a. **Control room 1 (to be used by General Electric).** Will be refitted to remediate age-based defects inclusive of the slope that has developed to the floor and to remove the current window panel between the control room and the test cell. The room will be fitted with new services and furniture and lined with acoustic panelling appropriate to its location.
  - b. **Control room 2 (to be used by Pratt & Whitney).** Will be established in place of the current kitting space incorporating the same provisions as Control Room 1 and a separate communications room for company proprietary server equipment. The room will be fitted with new services and furniture and lined with acoustic panelling appropriate for its location.
  - c. **Segregation between OEM spaces.** The space between the two control rooms will become a common access lobby. For the purpose of protection of Intellectual Property of both GEII and P&W, the remainder of the facility will

be designed to limit access by one OEM to the other's space. This segregation will extend to each OEM's access to the common test cell when occupied by the other, including the ability to access the cameras mounted in the test chamber. Note TAE personnel will be able to access both OEM areas.

- d. **Kitting Facility.** The kitting facility is used for receiving engines by truck and mounting them to support frames that hold them in place for testing. Once fitted to the support frames, engines are moved from the kitting facility into the test chamber. The kitting facility is an extension of the existing building. It will be fire-isolated from the test cell building. It will have two direct vehicle access points for engine delivery and a rail-based connection to the test cell to allow for engine movement within the facility.
- e. **Test Cell.** Modifications will be made to the test cell to achieve noise attenuation and compliance with fire safety regulations. Access to the test cell chamber will be via new doors at the end of the test cell. The height and width of the existing doorway will be increased to enable movement of the F-35 engine into the test cell. Airflow turning vanes will be installed to satisfy the increased inlet airflow requirements of the F-35 engine. The floor will be upgraded to accommodate the new rail-based engine movement system. New emergency egress points will be added to the test cell building and the exhaust building.
- f. **Trailer Store.** The trailer store will be an enclosed garage structure for four trailers used to support engine movement. The building will be metal clad and be lined with bird mesh.
- g. **Amenities / Lunch Room.** The amenities / lunch room will be modified to achieve compliance with the Disability Discrimination Act (DDA). This includes increased doorway widths. Minor repairs and grading will be undertaken on existing paths external to the lunchroom building.

### **Zoning and Local Approvals**

- 30. The RAAF Base Amberley Master Plan states the Engine Test Cell is located within an operational zone precinct. The scope of this project is consistent with the zone classification and continues the intended use of this facility. The scope of works and identified future use are compliant with the Master Plan.

31. There are no changes proposed to the zone classification of this site as a result of this project. There are no Local or State Government project approvals required.

#### **Childcare provisions**

32. There is no requirement for additional childcare facilities at RAAF Base Amberley as a result of this project.

#### **Impact on Local Community**

33. It is anticipated that the project will generate employment opportunities, predominantly in the building construction, labour and supply markets from within the areas in close proximity to the Ipswich region.
34. Construction vehicle traffic will be continuously managed and monitored; and the Contractor(s) will prepare Traffic Management Plans under their contract conditions; which is incorporative and considerate of Community Impacts. As part of all Community Consultation there will be an on-going requirement to keep community informed of any changes, and the project will be pro-active to engage with Community relating to changes to Traffic Conditions.

#### **Planning and Design Concepts**

The design has been incorporative of the following considerations:

- a. Where possible existing services and infrastructure services have been reused or retained;
- b. Recognition of site constraints, security requirements and the existing facility functionalities that exist;
- c. Maximising existing and current infrastructure where feasible to minimise capital cost;
- d. Design is in accordance with current Australian and Defence regulatory requirements; inclusive of National Construction Code-BCA 2016 and MFPE 2011; and
- e. Design adopts energy efficient solutions, and minimises excessive maintenance regimes.

### **Structural Design**

35. The structural design philosophy is based on providing an efficient and cost effective structural system for the ETC1.
36. The key considerations taken into account in the structural design were:
- a. maintaining and enhancing the operational effectiveness of the facility;
  - b. ensuring the design is fit for purpose;
  - c. cost-effectiveness over the whole of life of the building;
  - d. minimisation of in-service maintenance requirements;
  - e. minimisation of risks inherent in the design (both safety, technical and economic risks); and
  - f. maintaining flexibility of the use of internal spaces where appropriate.
37. The design of the proposed kitting area, hardstands, access roads and the building structures has also taken into account local geotechnical conditions and will meet all relevant Australian Standards and Codes. Appropriately qualified and experienced geotechnical and structural engineers have been engaged in the design of the proposed facility.

### **Materials**

38. Australian and locally sourced materials will be used for this project, and will comply with the National Construction Code (NCC) (BCA and PCA), 2016, the relevant Australian standards and requirements of the relevant local authorities.

### **Hydraulic**

39. The new works have been designed in accordance with the relevant Australian Standards, Local, Queensland State and Commonwealth legislation, NCC Volume 3 – Plumbing Code of Australia; AS3500 Parts 0, 1, 2, 3 and 4.
40. Hydraulic services will be provided for the provision of sanitary drainage and plumbing; trade waste drainage; domestic cold and hot water supplies; roof drainage and hot water units.

### **Electrical**

41. The existing circuit breakers and cabling from Substation 37 to Buildings 611 and 624 will be retained with power distribution modified from/within the respective buildings.
42. Electrical services installations shall comply with BCA, AS/NZS 3000 and other applicable and relevant Australian standards for the type of the installation to be used, irrespective of their status.
43. The new Low Voltage Switchgear and New Cabling have been designed to a 30 year life; Luminaires, 20 years.

### **Fire Protection**

44. The fire protection services shall be designed to adhere, as a minimum, to the NCC; AS2419; AS2441; AS2118 Part 1; AS1670 Part 4; Department of Defence BEPM; MFPE; Defence Safety Manuals (SAFETYMAN)
45. Fire Protection new services to be provided for are Fire hydrant; Fire hose reel; Fire sprinkler protection and Fire extinguishers.

### **Acoustics**

46. The external noise shall NOT exceed legislative limits for standard day exposure and noise levels will be maintained at, or below current levels.
47. Legislative limits will be applied – LAeq8h SPL of 85 decibels (A); LC, Peak SPL of 140 decibels (c).
48. The Control Rooms have specific design criteria and shall be lined with acoustics treatment to enable personnel working within its confines not to be exposed to hazardous noise. This treatment shall include treatment to doors, walls and ceiling.

### **Security**

49. The security of the Test Cell will be improved to benefit and maintain best practice in facility access. The Test Cell will incorporate provisions, as a minimum for – Electronic Access Control System; Type 1 Alarm and CCTV Coverage.
50. All Electronic and physical security for the works will comply, as a minimum, with all relevant Australian Legislative Standards, including NCC, ISO 9001 and ISO 9003 Quality Management Systems.



51. The Test Cell will be surrounded by Class 2 security fence. The gates within the fence will be provided with an appropriate chain, and a SCEC endorsed padlock to secure the gates at night. Security lighting will also be provided.

### **Ecologically Sustainable Development (ESD)**

52. The following ESD<sup>3</sup> measures have been considered as part of Defence Smart Infrastructure manual and checklist to enable infrastructure delivery to be linked to operational performance and Whole of Life (WOL) costs.
  - a. Mechanical - The mechanical services will be designed to comply with the requirements of the Defence Estate Quality Management System (DEQMS) and Building Energy Performance Manual (BEPM) to reduce energy consumption of its facilities and meet specific energy performance targets.
  - b. Electrical - the design shall aim to provide the required indoor illumination within the Defence energy efficiency target of 10W/m<sup>2</sup>. Care shall be taken to avoid over-lighting of spaces, such as ensuring maintained illuminance levels for office installations are below 400lux for 95% of the net floor area.

### **Landscaping**

53. Landscaping for this project will be limited to remediation of disturbed ground to match the adjacent areas. The proposed remediation is to replace disturbed grass areas with turf of the same species.

### **Work Health and Safety measures**

54. The proposed facility upgrade will comply with the Department of Defence Work Health and Safety policy, the Work Healthy and Safety Act, Work Health & Safety Regulations and the Defence Work Health and Safety Manual.
55. Building Contractors will be required to hold full work health and safety accreditation from the Office of the Federal Safety Commissioner under the Australian Government Building and Construction Work Health and Safety Accreditation Scheme.

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<sup>3</sup> Ecologically Sustainable Development (ESD) is an important concept in environmental law and is a long standing and internationally recognised concept; also is defined in the EPBC Act as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

56. The design of the works has been developed in accordance with the safety-in-design provisions of the Work Health & Safety Act 2011, and the construction of the works will be managed in accordance with the Work Health and Safety Act 2011. All construction sites will be appropriately secured to prevent unauthorised access during the construction period. Site safety will be continually monitored; and thus during construction the Contractor site safety management plans will be updated to reflect mitigation measure of identified risks.

#### **Provisions for people with disabilities**

57. The project will comply with the provisions of the National Construction Code (BCA and PCA) 2016, and the DDA. In the event of a departure, a dispensation will be sought from the relevant approval authority.

### **Cost Effectiveness and Public Value**

#### **Outline of project costs**

58. The total estimated out-turned cost of this project is \$23.7 million excluding GST. This cost estimate includes construction, design, ICT, preliminaries, contingencies, escalation and management costs.

#### **Details of project delivery system**

59. Defence has engaged TAE to assist with the Engine Test Cell 1 Upgrade works. TAE will conduct a competitive tender process for construction services, using the Defence suite of facilities contracts. The terms of the current GFF licence issued for TAE's use of ETC1 will be modified to permit conduct of approved upgrade works.

#### **Construction program**

60. Subject to Parliamentary approval of this project, construction is planned to commence in second-quarter of 2018 and construction completion is anticipated for fourth quarter-of 2019. Fitout and user acceptance testing is estimated for completion by end of 2019.

#### **Public Value**

61. It is anticipated that throughout project delivery up to 120 personnel will be employed onsite at various stages, and that a significant percentage of the tendered work packages will provide opportunities for local small to medium sized enterprises.

## **Revenue**

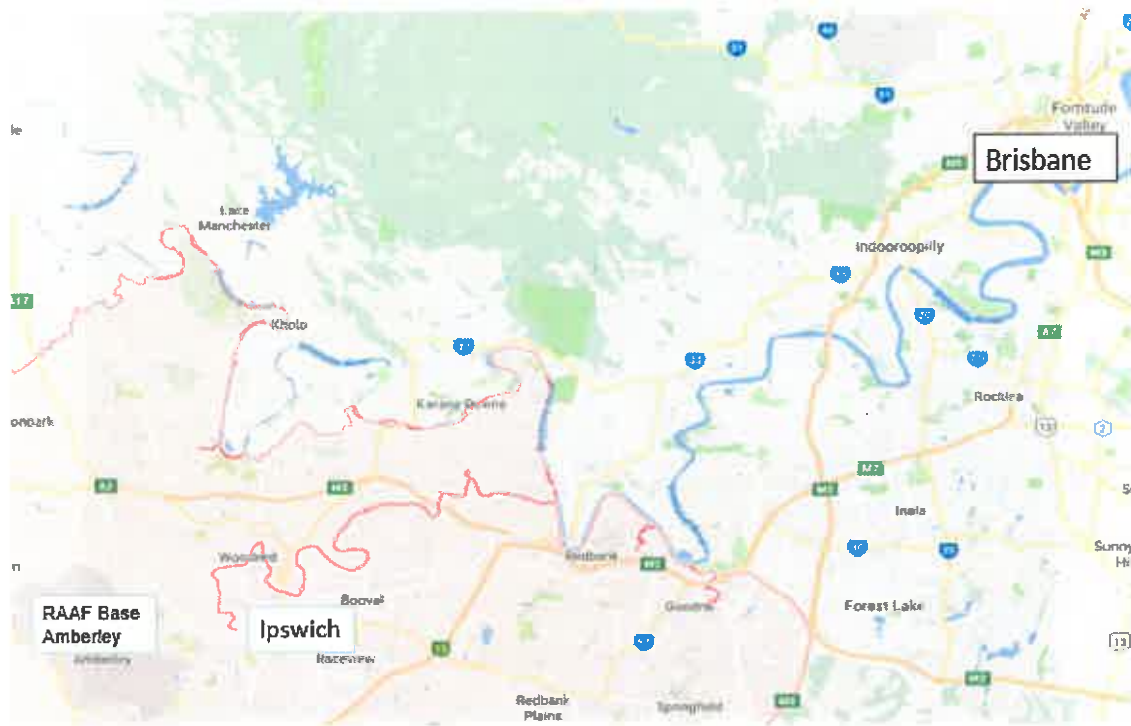
62. No revenue is expected to be delivered from this project.

## **Attachments**

- 1) Locality Plan
- 2) Engine Test Cell 1 Location in Context of RAAF Base Amberley
- 3) Aerial Photograph of Engine Test Cell 1
- 4) Existing Floorplan of Engine Test Cell 1
- 5) Proposed Floorplan of Engine Test Cell 1
- 6) 3D View Proposed Engine Test Cell 1

## ATTACHMENT 1

**Figure 1 – RAAF Base Amberley Location**



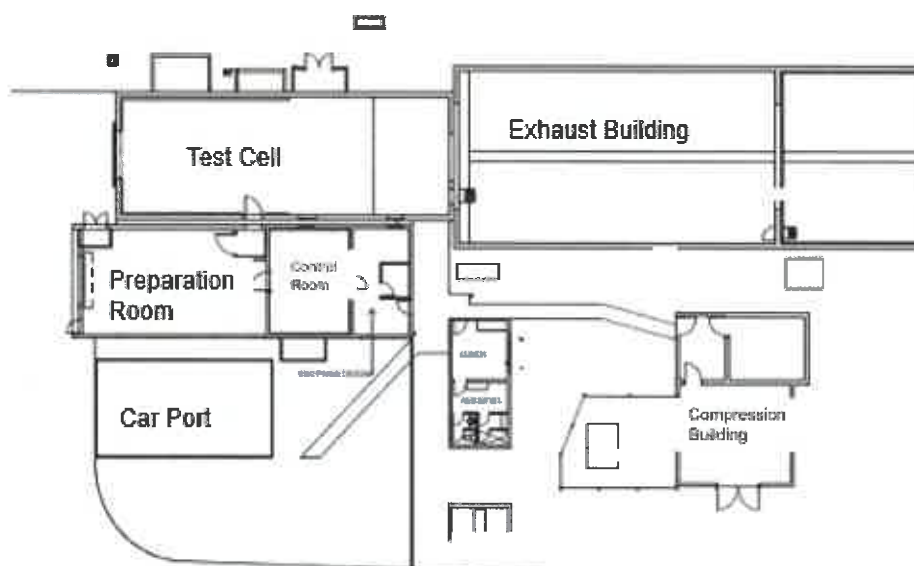
**Figure 2 – Engine Test Cell 1 Location in the context of RAAF Base Amberley**



**Figure 3 – Aerial Photograph RAAF Base Amberley and Engine Test Cell 1**

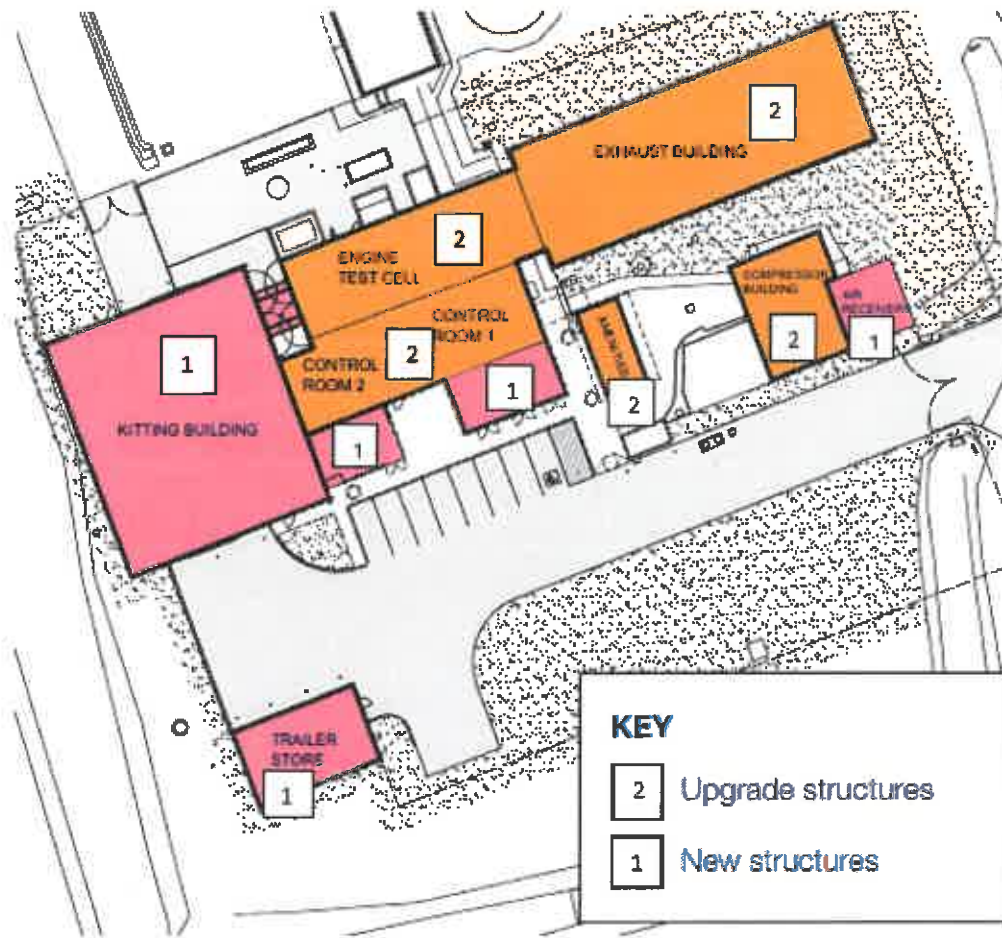


**Figure 4 – Existing Floor Plan of Engine Test Cell 1**





**Figure 5 – Proposed Floor Plan of Engine Test Cell 1**



**Figure 6 – 3D View Proposed Engine Test Cell 1**



