EQUATORIAL LAUNCH AUSTRALIA

Supplementary Environmental Report - Executive Summary

ELA-000177

EXECUTIVE SUMMARY

Equatorial Launch Australia (ELA) proposes to increase the capacity of the Arnhem Space Centre (ASC) to launch commercial and research rockets into sub orbital and orbital trajectories. Expansion of the ASC will involve the clearance of ~ 91 ha of vegetation, primarily from within an existing mined area, the construction of up to fourteen (14) launch pads and supporting infrastructure, the increase in launching of multi-stage rockets each year, and the retrieval of some first stage launch vehicles (LV) from land in the Northern Territory (as well as Queensland and Commonwealth waters).

ELA made a referral to the Northern Territory Environmental Protection Agency (NT EPA) under section 48 of the *Environment Protection Act 2019* (EP Act) and the Environment Protection Regulations 2020 (EP Regulations) for the expansion of the ASC and its activities. The responding Determination made by the NT EPA was that the method of environmental impact assessment would be by Supplementary Environmental Report (SER). The matters for consideration in the SER are:

- The potential impacts of vegetation clearing within the ASC
- The potential impact of rocket launches on air quality
- Mitigation of risks and impacts of falling debris in the expanded recovery zone
- Mitigation of risks and impacts to Aboriginal sacred sites in the expanded recovery zone
- Community (Aboriginal) engagement within the vicinity of the project area and expanded recovery zone
- Community (Aboriginal) access to knowledge and information about the project and possible impacts on their values and interests

These matters for consideration are summarised in the following sections.

Potential impact of vegetation clearing

The vegetation in the project area is primarily *Eucalyptus tetrodonta* open woodland, which is typical of the region. Small pockets of monsoon vine forest occur on the southern plateau side slopes. Frequent fires and windstorms have led to large areas of early succession and sparse vegetation within the project area. Twenty-seven trees with a diameter at breast height (dbh) >40 cm (with 9 >50 cm dbh) occur within the ~91 ha to be cleared. This is significantly less than the threshold of 30 stems per ha with a dbh >40 cm or 5 stems per ha >50 cm dbh to be considered significant for biodiversity in the NT land clearing guidelines.

Assessment of sixty-five (65) listed threatened species that may occur in the wider region determined that only five (5) species had a medium likelihood of occurrence in the project area and the majority had a very low or non-likelihood of occurrence. Habitat assessment for seven (7) species, including the species identified as having medium likelihood of occurrence and those identified as being of concern in the NT EPA Direction (Ref EP2023/031), determined that the vegetation condition and lack of permanent water provided low quality to non-existent habitat for these species. Further, there are no recent regional or local records of occurrence of Black-footed tree-rat (*Mesembriomys gouldii gouldii*), Partridge pigeon (*Geophaps smithii smithii*), Northern brushtail possum (*Trichosurus vulpecula arnhemensis*), Northern brush-tailed Phascogale (*Phascogale pirata*), and Fawn antechinus (*Antechinus bellus*), with the three of these likely to be locally extinct in east Arnhem Land.

The monsoon vine forest patches may provide habitat for the Black-footed tree-rat, Northern brushtail possum, and Northern blue-tongued skink (*Tiliqua scinoides intermedia*) if they occur locally. This vegetation community will not be affected by vegetation clearance.

The vegetation of the project site does not contain significant, important, or quality habitat for any listed migratory species, the majority of which are coastal species.

Clearance of ~91 ha of Eucalyptus tetrodonta open woodland at the project site will not have an adverse effect on listed threatened fauna or flora as this does not provide quality, important or significant habitat. Consequently, monitoring, inspection, or reporting of impacts on threatened species will not be required.

ELA proposes the following control measures to protect ecological values while allowing for vegetation clearance:

- Laying of large diameter trees that have been felled within uncleared vegetation or rehabilitated vegetation to provide habitat for ground nesting species
- Applying a non-clearing buffer of at least 50 m to the majority of the outer edge of the monsoon vine forest community, however there may be a small area which goes no closer than 20m
- Applying a 20 m non-clearing buffer around the plateau edge to minimise erosion risk, except in specific instances where hard engineering will also achieve the same function
- Undertake vegetation clearance and site stabilisation during the dry season
- Revegetate exposed soils with appropriate native grass and/or shrub species where possible
- Develop an erosion and sediment control plan for the life of the project

Other environmental management controls are:

- Launch planning and trajectory control to avoid known areas of significant environmental value, including Matters of Territory and National Environmental Significance
- Weed management and control practices include pressure washing of non-local construction vehicles before entry to site, use of local fill only, and application of weed surveillance and control measures
- Water extraction licence obtained if groundwater is required to supplement surface water collection for launch deluge system
- Spill containment infrastructure and systems implemented at fuelling and storage sites

Potential impact on air quality

Rocket launches can cause short-term elevated levels of exhaust emissions. The primary polluting emissions from liquid and gas fuelled LV are carbon monoxide (CO) and nitrogen dioxide (NOx) and the primary polluting emissions from solid fuelled LV are hydrochloric acid (HCl) and aluminium oxide (Al_2O_3).

Dispersion modelling of the exhaust from the largest possible liquid fuelled LV that could be launched from the ASC and of the exhaust of a typical solid fuelled sounding rocket was conducted with AERMOD. The models assumed that one of each LV would be launched every hour over a period of one year (i.e., 8,760 launches per year) and that meteorological conditions, e.g. wind strength and direction, were typical for each hour of the day or year. The mass of these pollutants per launch modelled is provided in the table below.

LV type	Average fuel burn rate (kg/s)	Mass of emissions per launch (kg)			
		CO	HCl	NO_x	Al_2O_3
Liquid fuelled	403.5	44,726.7	nil	1,129.8	nil
Solid fuelled	61.0	50.8	166.7	2.4	301.7

The modelling process significantly overestimates the possible ground level concentrations of pollutants relative to regulatory or published air quality standards given what the spaceport could achieve at full capacity and the LV will be of varying sizes.

The 1-hour and 8-hour average ground-level concentrations of CO per launch are predicted to comply with the respective air quality standard at the nearest sensitive receptor, the Garma Cultural Knowledge Centre. The 15-minute, 1-hour, and 24-hour average ground-level concentration of HCl are predicted to comply with the respective air quality standards at the Garma Cultural Knowledge Centre. The 1-hour average ground level concentration of NO_2 is predicted to comply with the air quality standard. The average ground-level concentration of Al_2O_3 as PM_{10} is predicted to comply with the air quality standard.

Consequently, there is unlikely to be a significant impact on air quality at sensitive receptors adjacent to the ASC, on environmental or heritage values adjacent to the ASC, or at locally or regionally important sites.

Small amounts of the greenhouse gas nitrous oxide (N2O) are produced in the combustion of fuel. This gas is not regarded as a pollutant under Australian standards; however, ELA will be required to report the production of this gas if the facility exceeds the 25,000 tonnes of carbon dioxide equivalent in a year (t CO2-e/y) from fuel combustion. This threshold is unlikely to be exceeded.

Mitigation of environmental risks and impacts of falling debris

Each launch will have a defined trajectory and known area where a LV or associated debris will land. While the original Referral provided a mapping that showed objects could descend anywhere in the NT, this is incorrect and has been re clarified on Figure 2.

ELA collaborated with 5 Traditional Owner groups to develop an agreed protocol for land and water down range access and retrieval. This was used successfully for NASA with the Northern Land Council, Aboriginal Areas Protection Agency and impacted local Traditional Owner groups. This protocol is additional and complimentary to completing the required application for an AAPA Certificate for Sacred Site investigation of the down range recovery area. ELA is seeking to extend this protocol with the Central Land Council and other relevant stakeholders in this area of the Northern Territory (as well as be used in other States). The protocol includes requirements for consultation, information sharing, launch planning, and communication (including in language) prior to and during a launch and retrieval, and remediation of any site damage.

ELA will assess the potential for significant impact on environmental values during launch planning and will refer these to the Northern Territory and/or Australian Government, if necessary, for regulatory and conditional approval.

It is anticipated that LV dropped in the Northern Territory will be smaller than the largest LV first stage booster motor (i.e., 10 m x 2 m) and consequently the total area of physical impact to land will be relatively small and easily remediated.

Mitigation of risks to Aboriginal sacred sites

ELA has conducted a Heritage Register check for the proposed ASC expansion area and applied for an Authority Certificate from the AAPA covering the site and activities.

Inspections undertaken for the original mine development in the ASC area with senior Traditional Owners and elders determined that there were no sacred sites, objects, or other areas of heritage significance within the ASC area. ELA maintains a close relationship with the Gumatj Traditional Owners as well as the Northern Land Council regarding the ASC and proposed activities.

As part of ELA's down range recovery planning and access protocol, ELA will assess the potential for significant impact on cultural or heritage values in consultation with AAPA and the relevant Land Council during launch planning and will refer these to the Northern Territory Government if necessary for regulatory and conditional approval.

Community (Aboriginal) engagement within the vicinity of the project area and expanded recovery zone

ELA has adopted the International Association for Public Participation framework for community engagement (IAP2) recognising the need for a process that incorporates the interests and concerns of all affected stakeholders and meets ELAs commercial and operational needs. ELAs Stakeholder Engagement Plan defines the approach undertaken to identify, consult, and engage with stakeholders including Traditional Owners and their representative bodies during the expansion and future launch operations.

The plan's objectives are:

1. To determine the specific communication needs of impacted and potentially affected communities, and identifying culturally appropriate methods of communication

2. To provide direction on approach for community awareness and potential involvement during site expansion activities and launch operations activities as appropriate for the stakeholders impacts
3. To recognise the role that Aboriginal people have as stewards of their country and the importance of participation of Aboriginal people and communities in environmental and recovery decision making processes
4. To enable building relationships with key stakeholders, gaining local support and maximising positive benefits
5. To meet legislative requirements to engage with stakeholders for land access, agreements, and approvals

ELA has an established Safety and Retrieval Committee (SRC) forum that includes a core set of local Traditional Owner Groups and the Northern Land Council and as each launch is planned, expanded to incorporate impacted down range Traditional Owner Groups and Land Councils. These groups are engaged and invited >9months out from each launch.

Community (Aboriginal) access to knowledge and information about the project and possible impacts on their values and interests

ELA is committed to ensuring that the Aboriginal community who own the ASC site or are Traditional Owners and custodians of Country where LV may land and be recovered from are communicated to, engaged and consulted, both in the establishment of protocols for consultation and actual consultation during launch planning where the trajectory will land LV on Country.

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ELA recognises the role that the ASC and its operations will have in providing social and economic opportunities in the region, particularly as bauxite mining reduces in scale by the end of the decade. ELA has agreed to pay the Yolngu people royalties associated with each launch and will also provide:

- Jobs and commercial contracts in the local community
- Jobs and commercial contracts to support site operations support and launch recover
- Engagement with local educational institutions to promote STEM/STEAM1 and space as career options, including trainee and apprenticeship opportunities
- Permanent paid staff residing in Nhulunbuy
- Tourism and cultural opportunities through visiting professionals and space companies

The following table shows the projected staff and contractor roles required for the ASC over the next five (5) years. This includes dedicated Yolngu and indigenous positions, recognising the role for upskilling where possible and sourcing necessary skills outside of the region if needed.

Direct Jobs to NT over 5 years					
	2023/2024	**2024/2025**	**2025/2026**	**2026/2027**	**2027/2028**
Contractors					
Earthmoving in Nhulunbuy	1	2	1	1	1
Construction Services in NT	10	12	12	8	8
Construction in Nhulunbuy	5	10	10	5	5
ASC Support services	1	5	7	10	10

Direct Jobs to NT over 5 years					
Permanent Local ASC Staff					
Nhulunbuy	2*	5*	15	25	30
Yolngu positions (10%)	10%*	10%*	2	3	3
Indigenous positions (10%)	10%*	10%*	2	3	3

**Crucially dependent on talent required for key roles to scale ELA quickly to profitability and regular operational launch cadence*

Summary

The clearance of *Eucalyptus tetrodonta* open woodland for the proposed expansion of the Arnhem Space Centre will not have an adverse environmental impact on threatened species and communities, due to its low habitat quality and the low likelihood of occurrence of these species in the project area. Management controls are proposed to protect remaining ecological values inside and outside of the project area.

The emissions to air from rockets launched from the site will not adversely affect human or environmental health or features of indigenous or heritage significance. The predominant fuel used is likely to be RP-1, a more refined version of the Jet A-1 or Jet B combusted by aeroplanes at the nearby Gove airport. Any individual launch is unlikely to trigger air quality standards and the emissions of carbon monoxide (CO), nitrogen dioxide (NO_2), hydrochloric acid (HCl), or aluminium oxide (Al_2O_3) will not accumulate in the environment regardless of fuel type.

The trajectory for each launch will be determined by commercial requirements and the area where the first stage launch vehicle (LV) will be recovered (land or water) will be known during launch planning. Assessment of potential impact on environmental values will be undertaken during planning and pre-existing protocols for LV retrieval and site rehabilitation will be implemented. The point of impact will be relatively small, with the largest possible LV being 10 m x 2 m in size.

Protocols for LV that are launched from the ASC and that land on land and are recovered from Arnhem Land have been agreed with the Traditional Owners through the ELA SRC forum. This includes obtaining required AAPA Certificates for the recovery area for protection of cultural, heritage, and environmental values. ELA is seeking to extend this protocol with the Central Land Council and other relevant stakeholders in this area of the Northern Territory (as well as be used in other States). ELA is committed to ensuring that relevant Aboriginal communities and stakeholders have access to knowledge and information about the project and possible impacts on their values and interests.

ELA is committed to ensuring that the Traditional Owners of the ASC site and east Arnhem Land community can benefit from the economic and educational opportunities that an expanded and operating space port will bring to the region.