
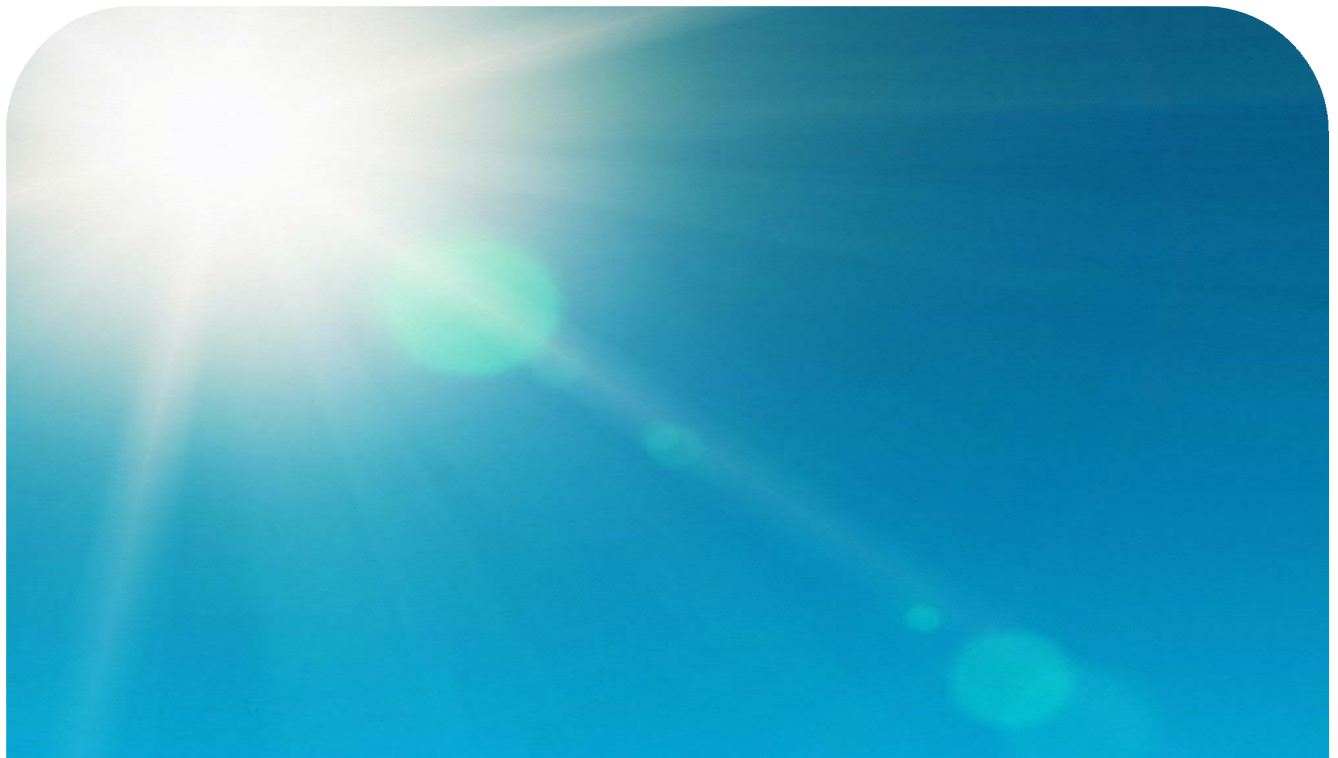


Chapter 14 – Human Health

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14 Human Health

14.1 Introduction

The NT EPA's objective for the Human health factor is to:

Protect the health of the NT population.

This chapter describes and assesses the significance of potential impacts to human health associated with the Project. Human health impacts identified during consultation for further consideration or potentially impacted by project refinements proposed in Chapter 2 including:

- Elevated NO₂ and PM₁₀ dust above assessment criteria levels outside the project footprint
- EMF impacting human health including to children, the elderly and other vulnerable groups
- Impacts on emergency services from EMI with UHF and other telecommunications infrastructure
- Impacts on emergency services from increased demand on services
- OHTL posing physical barriers to aircraft including emergency services aircraft and those responding to bushfire
- Increased risk of bushfires because of OHTL towers increasing lightning strike
- Cyclones damaging or knocking down OHTL towers and creating a public safety risk
- Low level humming or buzzing noise
- Electrical current from electrodes passing through the human body.

This chapter deals specifically with the impacts on human health resulting from project activities during construction and operation. Potential impacts to amenity from dust or noise are addressed in Chapter 10 Amenity. This chapter does not address WHS. General WHS matters are governed by the *Work Health and Safety (National Uniform Legislation) Act 2011 (NT)* and *Electricity Reform Act 2000 (NT)*. The Proponent will implement a WHS management system that complies with all legislative requirements, codes of practice and standards.

14.2 Information Sources

Since the Draft EIS was lodged, the following reports have been prepared which deal with standards to protect human health:

- Environmental Design Criteria and Standards (Appendix 2.1)
- Land Based Electrode Technical Report (Appendix 12.1).

14.3 Existing Environment and Values

The following AI is now sited outside of the Solar Precinct due to spacing concerns (Chapter 2 Project Refinement). AI is now located closer to the Aboriginal family outstation at Jangirurlu, see revised distances in Table 14-1. The distance from the solar precinct to Jangirurlu is approximately 18 km.

Table 14-1: Revised distances from infrastructure to Jangirulu

Infrastructure	Approximate distance to Jangirulu
Aerodrome	18 km
Batch Plant	18 km
Borrow Pit 1	13 km
Borrow Pit 2	9 km
Construction office & material laydown area (closest)	18 km (adjacent to airport)
Security / Site Access	20 km
Temporary Construction Accommodation	9 km
Vehicle Staging	14 km

The OHTL Corridor around Adelaide River township results in five homesteads being between 1 and 2 km from the OHTL and only one homestead less than 1 km (160 m). The original route along the railway easement had over 50 houses within 500 m of the OHTL with approximately 20 being within 100 m. Thus, the change of footprint will significantly reduce the number of receptors potentially impacted by dust and noise from the OHTL. The OHTL Corridor at Katherine and Pine Creek does not materially change from the Draft EIS.

14.4 Potential Impacts

The potential impacts to human health, have been assessed using the EIA methodology described in Chapter 3 of the Draft EIS and the Land Based Electrode Technical Report (Appendix 12.1). The following impacts were identified during consultation as requiring additional review, or may have potentially changed resulting from project refinements (see Chapter 2):

- Elevated NO₂ and PM₁₀ dust above assessment criteria levels outside the project footprint
- EMF impacting human health including to children, elderly, and vulnerable groups
- Impacts on emergency services from EMI with UHF and other telecommunications
- Impacts on emergency services from increased demand on services
- OHTL posing physical barriers to aircraft including emergency services aircraft and those responding to bushfire
- Increased risk of bushfires because of OHTL structures increasing lightning strike
- Cyclones damaging or knocking down OHTL structures and creating a public safety risk
- Low level humming or buzzing noise
- Electrical current from electrodes passing through body.

The impacts are summarised in Table 14-3 and Table 14-4 below, and are discussed in more detail within Sections 14.4.3 to **Error! Reference source not found..** Potential impacts to human health resulting from spreading of PFAS contamination have been addressed in Chapter 4 TEQ and Chapter 6 Hydrology.

14.4.1 Proposal Footprint

The direct footprint of the Project is described in Chapter 2 Project Refinement. Areas of additional footprint since the Draft EIS was prepared include the AI located outside the Solar Precinct and the delineation of the OHTL Corridor. The impacts of this footprint on proximity to sensitive receptors is detailed in Section 14.4.

14.4.2 Areas of Potential Impact

The zone of influence of the Project is different for each impact and is summarised in the each of the below sections.

14.4.3 PM₁₀ dust and NO₂ pollutants

As there have been no material changes in the construction methodology, the air quality model has not been updated for this SEIS and the screening distances of 1,079 m at the Solar Precinct, 468 m for the Southern OHTL, 327 m for the Northern OHTL, and 385 m for the DCS and Cable Transition Facilities are still applicable. As highlighted in Section □ the OHTL preferred route through Katherine, Pine Creek, and Adelaide River, while still being close to some receptors, has decreased the number of receptors within the screening distances. Figure 14-1 shows the screening distances for the selected route alteration at Adelaide River.

Figure 14-2 shows the screening distances for the pieces of AI at Powell Creek that are outside the Solar Precinct.

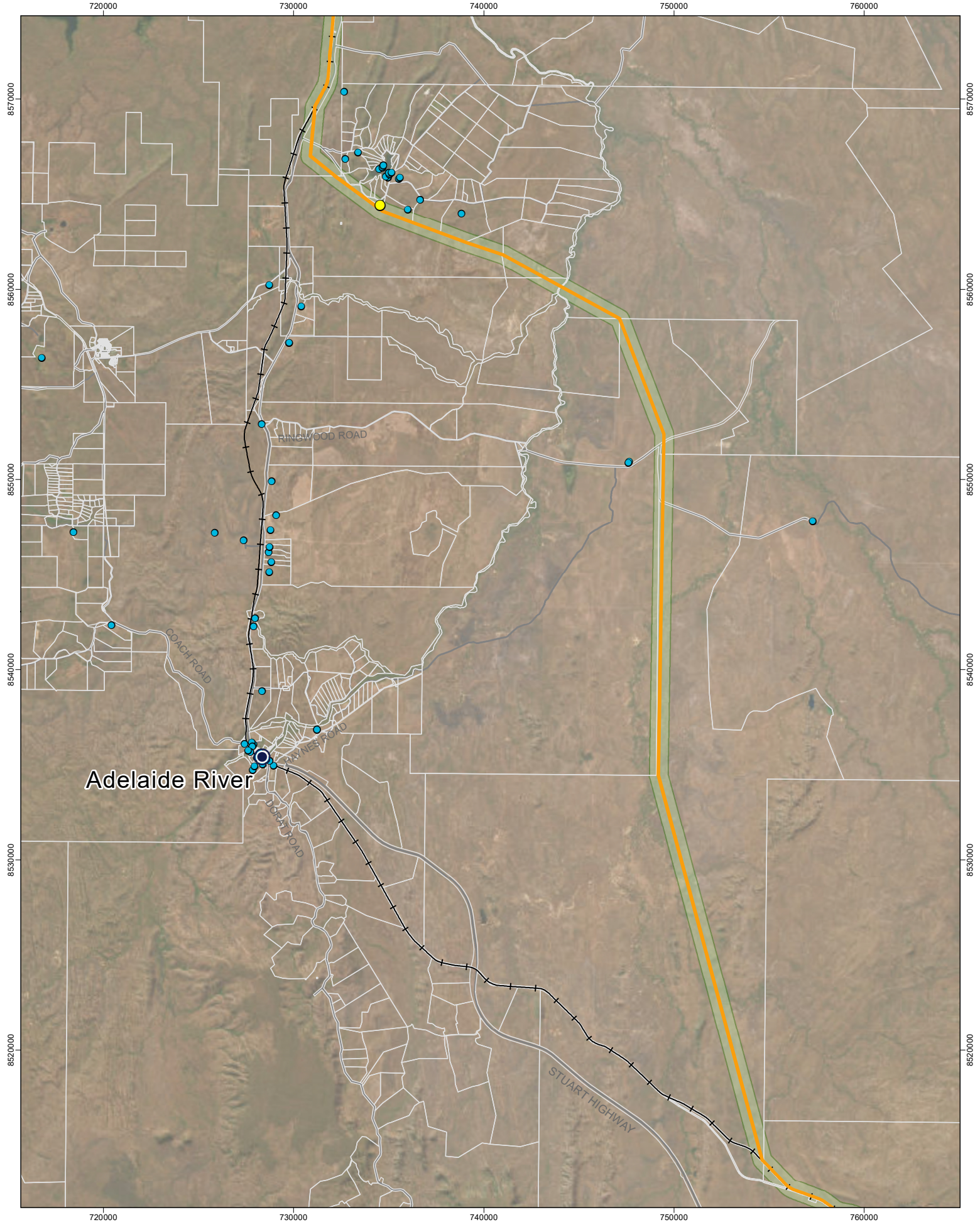
The Constraints Planning and Field Development Procedure (Appendix 4.1) identifies the scenario where construction activities are proposed to occur within a specified screening distance. Where this does occur, additional dust mitigation measures will be applied in the development of a TARP. This TARP will include monitoring and adaptive management techniques that can be applied should monitoring criteria be triggered. Examples of adaptive management techniques include:

- Dust suppression using water
- Vehicle speed restrictions
- All trucks containing road base or other high dust generating materials will be covered
- Stockpiles will be covered or wetted down where practical
- Dust screens (vegetation or cloth)
- Reducing or ceasing high risk dust generation work in hot, dry weather
- Progressively rehabilitating construction areas as soon as practicable after they are no longer required.

Monitoring will consist both of predictive monitoring (e.g., identifying wind direction, climatic conditions conducive to dust generation) and monitoring of impact (e.g., visible dust leaving site, complaint management and if required monitoring of TSP or PM₁₀ at sensitive receptors).

14.4.4 EMF

The area of influence related to EMF is 15 m either side of the OHTL (within the corridor). Design parameters for the OHTL are to meet the recommended exposure limit for the public (ICNIRP, 2010) at the edge of the easement (10 kV/m). Within the easement the occupational limit will be met and so there are no health impacts from passing through the easement. The Proponent will model the EMF associated with the final design to ensure these limits are met and once the OHTL has been constructed, monitoring will occur to demonstrate and validate the modelling results.



Legend

- Sensitive receptors within buffer zone
- Other sensitive receptors
- Existing railway line
- Cadastre
- OHTL Corridor
- Air emissions area of influence

Source: NTG data - Cadastre and conservation areas, Australian Government data - Railway and roads



Figure 14-1: Area of influence from construction air emissions Adelaide Creek OHTL

Project: **Australia-Asia PowerLink**

Kilometres

Reference # AAPL_GNR_CTA_GEN_MAP_0372

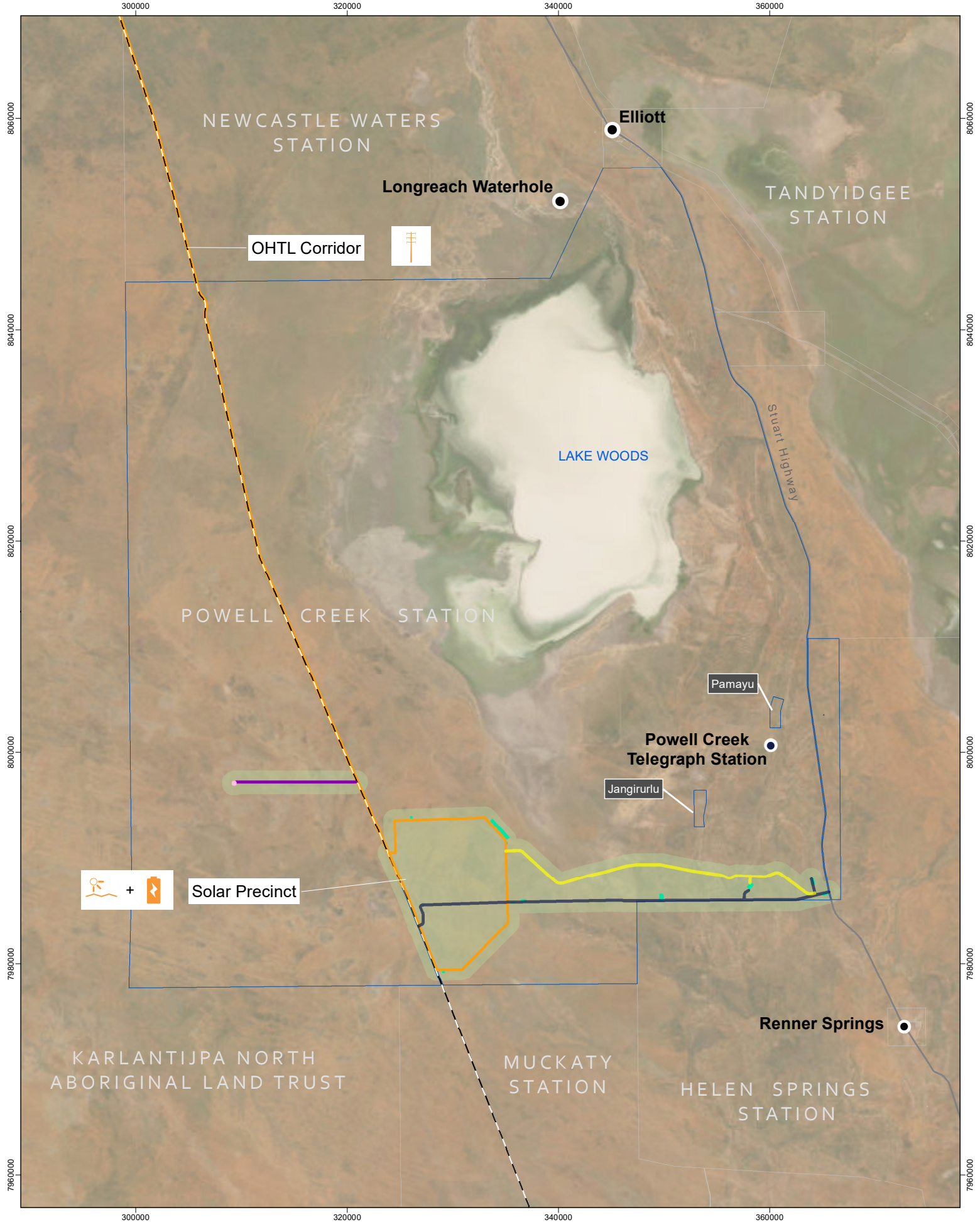
Date: 10/11/2022 | Figure: 1 of 1 | Revision: A

Scale: 1:250,000 Datum: GDA2020

Coordinate System: MGA 52 A4

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Legend

- Stuart Highway
- Existing railway line
- Main Access Road
- Gravel Access Road
- Cadastre
- Powell Creek Station
- AAPowerLink Infrastructure
- Air emissions area of influence
- HVDC Electrode Line corridor
- Electrode Area
- Ancillary Infrastructure



Figure 14-2: Area of influence from construction air emissions at the Solar Precinct

Project: **Australia-Asia PowerLink**

Reference #: AAPL_GNR_CTA_GEN_MAP_0347

Date: 04/11/2022 | Figure: 1 of 1 | Revision: A

Scale: 1:450,000 | Datum: GDA2020

Coordinate System: MGA 53 | A4

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14.4.5 EMI Impacting on Emergency Services

EMI has the same area of influence as EMF (within the OHTL Corridor). Design parameters to avoid EMI are set out in AS/NZS 2344:2016 and will be achieved at the edge of the OHTL Corridor. The Proponent will model the EMF associated with final design to ensure these limits are met. Once the OHTL has been constructed, monitoring will occur to demonstrate and validate the modelling results. Consultation with emergency services, including Bushfires NT, has been undertaken and no concerns were raised from emergency services regarding this issue.

14.4.6 Increased Demand on Emergency Services

The increased workers and activity in the area have the potential to increase the demand on emergency services. The Proponent has committed to providing a staffed medical centre within the Temporary Construction Accommodation and during operations in the Temporary Construction Accommodation in the Powell Creek Solar Precinct. In addition, the Proponent will develop Emergency Response and Disaster Management Plans, undertake engagement with local emergency services including entering into an MOU regarding medical evacuation (refer to Appendix 3.2 SIMP for further detail). NTP FES has advised the Proponent that Powell Creek sits outside its area of response. The Project has the potential to provide a benefit to the community by providing additional emergency services and skilled workers in the area that can respond in case of major incident which could otherwise strain local emergency services.

14.4.7 Physical Barriers to Aircraft

The OHTL will have a maximum height of 60 m and will therefore be below the 100 m height that triggers reporting of tall structures for aviation safety (CASA, 2021). Any towers that are near an aerodrome (in the approach surface) will be reported and design to comply with the relevant CASA standards. The Proponent will consult with CASA regarding requirements under the relevant regulations regarding aviation safety.

Along the OHTL Corridor there is potential for low flying aircraft that are involved with agricultural or bushfire safety works. The pilots that conduct these works have special training in low flying flight including how to avoid wire strikes, as the areas where these aircraft operate already contain several wire structures. As such, the Project will not introduce a new type of risk for the area. Bushfires NT informed the Proponent that the locations of towers will also be noted on a phone application which is available to all pilots in line with other tall structure requirements. Aircraft involved in agricultural activities will review the area and consult with landowners prior to take off to identify potential hazards, including power lines. Where possible the OHTL follows other major linear infrastructure such as the railway line and roads which will increase the visibility of the infrastructure at this location.

14.4.8 Increased Risk of Bushfire from Lightning Strike

Lightning is likely to strike the OHTL as the tallest structure in the vicinity (however, it will not 'attract' the lightning). Lightning strike of the OHTL will result in the line absorbing the energy from the lightning which is dissipated into the electrodes at Powell Creek and the DCS, and there may be flashover between the struck line and the grounding lines. The OHTL will be designed in accordance with relevant standards including AS7000:2016 Overhead Line Design which requires overhead earth wires to protect the system from lightning strike. All equipment will be designed and checked in accordance with AS/NZS requirements to reduce the risk of electrical faults creating an ignition source. Vegetation surrounding the OHTL will be managed to maintain an appropriate separation distance in accordance with the OHTL Vegetation Management Framework (Appendix 5.4).

Lightning strike of a tower or section of line would be automatically detected as a fault and the system would de-energise the line within 100 milliseconds and restart, to determine if the lightning strike has caused permanent damage. Where this does occur, the system will detect a fault and de-energise until fixed. This procedure for managing faults is common for both HVDC and HVAC as used all over Australia, including for the Basslink Interconnector (Victoria to Tasmania).

14.4.9 Potential for OHTL to Pose Public Safety Risk During Major Faults or Outages from Cyclone Damage

The OHTL will be designed in accordance with relevant standards including AS7000:2016 Overhead Line Design which includes design specifications to address concerns from cyclone winds near coastal regions. In the event of a cable break, tower collapse due to a natural disaster or other unforeseen event, the tower or section of line would automatically be detected as a fault and the system would de-energise the line within 100 milliseconds and restart once to check if the fault has been fixed before re-energising. This procedure for managing faults is common for both HVDC and HVAC used all over Australia, including the Basslink Interconnector (Victoria to Tasmania) of a similar voltage.

14.4.10 Low Level Humming Noise

A low-level humming or buzzing noise can be emitted from the OHTL due to the corona effect, which is a small discharge of electricity to the air surrounding the line. Modern OHTLs are designed to avoid the corona effect. HVDC lines are more prone to the corona effect in fair weather, although it can still occur during rain and storms (AS7000:2016). There have been multiple studies of the potential health impacts of low-level noise from high voltage lines, which have proven to be inconclusive (Alves *et al.*, 2015). A Noise Technical Report was submitted as Appendix L to the Draft EIS and represents the worst case scenario for noise impacts from the Project. The noise impacts are consistent with those presented in the Draft EIS, excepting the project refinements. An assessment of the changes to noise impacts have been addressed in Section 10.5.4 of Chapter 10 Amenity.

14.4.11 Electrical Current from Electrodes Passing Through Body

Electrodes will be designed to ensure appropriate current limits (IEC, 2018) are met including for vulnerable groups such as those wearing pacemakers in all publicly accessible areas. Current limits are prescribed for the following considerations: step voltage; touch voltage; metal-to-metal touch voltage; transferred voltage; and potential gradient in water. Only transferred voltage and potential gradient in water can extend for significant distances into publicly accessible areas (CIGRE, 2017). The design will then be modelled to ensure these limits have been met, including use of site-specific soil resistivity data to confirm extent of potential impacts.

14.5 Avoidance, Mitigation, and Monitoring

Impact mitigation was undertaken in accordance with the environmental decision-making hierarchy consistent with Section 26 of the *EP Act*. The decision-making hierarchy sets the following priorities when addressing impacts which have been considered in developing Table 14-2:

1. Avoid – ensure that actions are designed to avoid adverse impacts on the environment
2. Mitigate – identify management options to mitigate adverse impacts on the environment to the greatest extent practicable
3. Offset – if appropriate, provide for environmental offsets for residual adverse impacts on the environment that cannot be avoided or mitigated.

Table 14-2: Human Health - Commitments

Impact	Avoidance	Mitigation	Monitoring
<p>Elevated PM₁₀ dust and NO₂ pollutants above assessment criteria levels outside the project footprint.</p>	<p>Where possible maintain separation distances to sensitive receptors.</p>	<p>Develop a TARP prior to construction that demonstrates monitoring and adaptive management techniques that will be applied should monitoring criteria be triggered. Examples of adaptive management techniques include:</p> <ul style="list-style-type: none"> • Dust suppression using water • Vehicle speed restrictions • All trucks containing road base or other high dust generating materials will be covered • Stockpiles will be covered or wetted down where practical • Dust screens (vegetation or cloth) • Reducing or ceasing high risk dust generation work • Progressively rehabilitate construction areas as soon as practicable after they are no longer required. 	<p>Visible dust monitoring for adaptive management techniques.</p> <p>Climatic Conditions (hot, dry, and windy conditions leading to a higher risk)</p> <p>TSP or PM₁₀ monitoring for high-risk areas (adjacent to communities where separation distances to receptors may not be met).</p>
<p>EMF impacting human health including to children, elderly, and other vulnerable groups</p>	<p>Height of OHTL to provide separation distance to reduce EMF at ground level.</p> <p>Lead sheathing and armoured cores of subsea cables to minimize EMF.</p>	<p>Modelling to ensure design will achieve recommended limits.</p>	<p>Monitoring to demonstrate recommended limits have been achieved.</p>

Impact	Avoidance	Mitigation	Monitoring
Impacts on emergency services from EMI with UHF and other telecommunications.	Height of OHTL to provide separation distance to reduce EMI at ground level. Lead sheathing and armoured cores of subsea cables to minimize EMI.	Modelling to ensure design will achieve recommended limits.	Monitoring to demonstrate recommended limits have been achieved.
Impacts on emergency services from increased demand on services.	Fully staffed medical centre to be provided at the Solar Precinct to prevent reliance on local emergency services.	MOU to be developed with local emergency services regarding medical evacuation.	Nil
OHTL posing physical barriers to aircraft including emergency services aircraft and those responding to bushfire.	OHTL towers are below 100 m definition of a “tall structure”	Additional lighting and visibility requirements for towers within the approach landing surface for airports in accordance with CASA requirements. Consultation with CASA, airbases, emergency services and adjacent landowners (especially those engaged in agricultural pursuits) to highlight location of OHTL and discuss interface issues. Bushfires NT have informed the Proponent that locations of OHTL structures will also be noted on a phone application available to all pilots in line with other tall structure requirements.	Work Health and Safety Requirements CASA requirements for reporting of tall structures (within approach surface for airports).
Increased risk of bushfires because of OHTL towers increasing lightning strike.	Design to AS/NZS.	Vegetation management within OHTL Corridor in accordance with Appendix 5.4.	Nil
Cyclones damaging or knocking down OHTL towers and creating a public safety risk.	Design to AS/NZS.	Fault management procedures.	Nil

Impact	Avoidance	Mitigation	Monitoring
Low level humming or buzzing noise.	Design to AS/NZS. Constraints Planning and Field Development Procedure (Appendix 4.1) highlights approach of selecting site with lowest impacts.	Modelling of noise and vibration impacts to identify high risk areas where additional mitigation required. Additional control strategies that could be applied at high-risk sites are documented in the Constraints Planning and Field Development Procedure (Appendix 4.1) and include restricting high noise activities to day hours.	Nil
Electrical current from electrodes passing through body.	Design to IEC Standards and all applicable guidelines.	Modelling of voltages and surface potential to ensure the design complies with IEC standards.	Nil

14.6 Residual Impact

The residual impacts, after the adoption of the avoidance, mitigation and monitoring measures listed in Section 14.5 have been undertaken is listed in Table 14-3 and Table 14-4. Two residual risks have been rated as a moderate risk. In all cases, this is due to the consequence of these risks being a serious injury or fatality, despite being extremely unlikely to occur. The risk posed by the OHTL to aircraft and from towers being damaged or knocked over currently exists with these areas and all risks are well known. The OHTL and Electrodes will meet all applicable Australian and International Standards to manage these risks including automatic fault detection systems which are employed globally as a standard mitigation.

Table 14-3: Summary of EIA results – Human Health Factor - Construction

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Elevated NO₂ and PM₁₀ dust above assessment criteria levels outside the project footprint.	Solar Precinct	Likely Construction will involve movement of large amounts of soil and earthworks as well as destruction of vegetation and soil crusts which would otherwise stabilise soil and reduce dust.	Localised Distance at which dust will dissipate below regulated levels is consistent with Draft EIS.	Medium Term Construction for a period of approximately four years.	Minor Emissions are likely to exceed natural variability. However, mitigation is expected to reduce emissions below limits and due to the short period of time are unlikely to have significant impact.	Low No sensitive receptors present in areas where air quality criteria are predicted to be exceeded.	High Air quality modelling undertaken in Draft EIS. Risk is well understood as are control strategies.	Minor
	OHTL	Likely Construction will involve earthworks and movement of large amounts of soil as well as clearing of vegetation and soil crusts which would otherwise stabilise soil and reduce dust.	Localised Distance at which dust will dissipate below regulated levels is consistent with Draft EIS.	Short Term Construction for approximately four years), each construction site will only be under construction for a short period of time.	Minor Emissions are likely to exceed natural variability. However, mitigation is expected to reduce emissions below limits and due to the short period of time are unlikely to have	Medium There are residences and buildings present in the areas where air quality criteria are predicted to be exceeded.	High Air quality modelling undertaken in Draft EIS. Risk is well understood as are control strategies.	Minor

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
					significant impact.			
	DCS	Likely Construction will involve earthworks and movement of large amounts of soil as well as clearing of vegetation and soil crusts which would otherwise stabilise soil and reduce dust.	Localised Distance at which dust will dissipate below regulated levels is consistent with Draft EIS.	Medium Term Construction for approximately four years.	Minor Emissions are likely to exceed natural variability. However, mitigation is expected to reduce emissions below limits and due to the short period of time are unlikely to have significant impact.	Low No sensitive receptors present in areas where air quality criteria are predicted to be exceeded.	High Air quality modelling undertaken in Draft EIS. Risk is well understood as are control strategies.	Minor
EMF impacting human health including to children, elderly, and other vulnerable groups.	N/A – no source of potential impacts during construction.							
Impacts on emergency services from EMI with UHF and other telecommunications.	N/A – no source of potential impacts during construction.							

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Impacts on emergency services from increased demand on services.	All sites	Possible Without mitigation the additional workers and activity in the area could increase demand for emergency services.	Regional This is the potential to impact on the catchment area for each emergency service that the Project interacts with.	Short Term This would occur during construction only.	Negligible - Minor Mitigation measures proposed involve the Project supplying own emergency services and thus potentially providing a benefit by supplementing the local services during major incidents.	Low There are sensitive receptors present with resilience to change.	High The Proponent has undertaken consultation with emergency services and their capacity is understood.	Minor Note there is also potential for a moderate benefit from the control strategies (refer to Appendix 3.2 SIMP).

Table 14-4: Summary of EIA results – Human Health Factor - Operation

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Elevated PM₁₀ dust and NO₂ pollutants above assessment criteria levels outside the project footprint	Entire project length	Possible While there is no direct ground disturbance during this phase, areas that have not been revegetated (e.g., Access Tracks) have the potential to generate dust.	Localised Distance at which dust will dissipate below regulated levels is consistent with Draft EIS.	Long Term Continuous during operation.	Minor Emissions are likely to exceed natural variability, however mitigation is expected to reduce emissions to acceptable levels.	Medium There are residences and buildings present in the areas where air quality criteria are predicted to be exceeded.	High Air quality modelling undertaken in Draft EIS. Risk is well understood as are control strategies.	Minor
EMF impacting human health including to children, elderly, and other vulnerable groups	Reassessment of all sites	Unlikely Studies conducted have not shown a link between exposure to EMF above the standards Australian Radiation Protection and Nuclear Safety Agency (ARPANSA, 2021) and human health	Limited Within 15 m of emissions source.	Long Term Continuous during operation.	Negligible Negligible risk associated with low frequency fields below exposure standards (ARPANSA, 2021 and ICNIRP, 2010).	Low-Medium There are no sensitive receptors located in areas where EMF exposure could occur. No, impacts would occur from public access to project infrastructure.	High 20+ years of research into the impacts of EMF on human health including multiple reviews by reputable bodies including ARPANSA and ICNIRP.	Minor

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
		impacts (ARPANSA, 2014), noting standards have been updated to reflect the findings of this article.						
Impacts on emergency services from EMI with UHF and other telecommunications	OHTL	Unlikely Design of the OHTL will achieve guideline limits to prevent EMI (AS/NZS 2344:2016)	Limited Within 15 m of emissions source.	Long Term Continuous during operation.	Negligible Negligible risk associated with electromagnetic fields below exposure standards (AS/NZS 2344:2016).	Medium Receivers and transmitters likely to be present within, or in close proximity to, the area of influence, there is some resilience to change.	High Relationship between EMF and EMI well understood with guidance limits in AS/NZS.	Minor
Impacts on emergency services from increased demand on services	All sites	Possible Without mitigation the additional workers and activity in the area could increase demand for emergency services.	Regional This has the potential to impact on the catchment area for each emergency service that the Project interacts with.	Long Term Has potential to occur over life of Project.	Negligible - Minor Mitigation measures proposed involve the Project supplying own emergency services and thus could provide a benefit by supplementing the local	Low There are sensitive receptors present with resilience to change.	High The Proponent has undertaken consultation with emergency services and their capacity is understood.	Minor There is also potential for a moderate benefit from the control strategies (refer to Appendix 3.2 SIMP).

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
					services during major incidents.			
OHTL posing physical barriers to aircraft including emergency services aircraft and those responding to bushfire	OHTL	Possible The conductors are too low for most aircraft; those performing low flying tasks for agricultural, or bushfire safety reasons have the potential to interact with conductors.	Limited This is only an impact in immediate proximity to the conductors.	Short Term This impact could only occur during flight operations (i.e., short periods during agricultural seasons or bushfire seasons).	Major In the highly unlikely event that this results in a serious injury or even a fatality, the impact is permanent albeit the likelihood is extremely low due to visibility of towers and training of pilots to specifically address this risk.	Medium While there are likely to be sensitive receptors in the area, they are adapted to watching for addressing this specific risk.	High This is a known risk for pilots with several advisory bulletins and specific training for any pilot involved in low level flying to watch for and avoid wire collisions.	Moderate
Increased risk of bushfires because of OHTL towers increasing lightning strike	OHTL	Possible While not part of normal operations it is possible for lightning to strike the OHTL structures.	Limited Lightning striking the OHTL could cause a flashover arc that would be limited to the area of the transmission line.	Short Term This would be a potential impact only during storm events.	Minor Design of the OHTL in accordance with AS/NZS and vegetation maintenance will prevent vegetation from igniting should a flashover arc occur. In that case, the current from the lightning would	Medium While there are likely to be sensitive receptors in the area, they are resilient to change.	High Transmission lines occur throughout the NT and the risks associated with lightning strike and fires are well known.	Minor

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
					be transferred into the ground.			
Cyclones damaging or knocking down OHTL towers and creating a public safety risk	OHTL	Possible This would not occur as part of normal operations. However, it is possible during a cyclone. Noting that towers are designed to comply with AS/NZS AS7000 which has specific criteria for withstanding wind speeds.	Limited Limited to the area in which project infrastructure will be located within a cyclone zone (approximately 50km inland from coast) and to the immediate vicinity of the damaged cable or OHTL structure.	Short Term A fault from cyclone damage would be detected immediately (within 100 milliseconds) and the line would automatically switch off.	Major Should damage to a tower result in immediate contact with the public, the consequence could be serious injury or even a fatality. This is extremely unlikely to occur.	High Members of the public will be present along the OHTL Corridor.	High Transmission lines occur throughout the NT and Australia and the risks associated with faults and down wires are well known and understood.	Moderate
Low level humming or buzzing noise	OHTL	Possible The low-level humming/ buzzing sounds are caused by corona discharge.	Limited Noise modelling has identified impacts may occur up 101 m for operational noise.	Long Term There is potential for the impact to occur during operations.	Negligible – Minor Impact involves a low-level noise which is only audible at close range.	Medium There are receptors that may potentially be impacted.	High Noise levels have been modelled for the OHTL (Appendix L of Draft EIS) and mitigations well understood.	Minor

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual Impact
Electrical current from electrodes passing through body	Electrodes (Powell Creek and DCS)	Possible The electrodes are designed to discharge electricity into the ground in case of fault.	Limited Design will ensure areas with voltage above the recommended guidelines (IEC, 2018) are fully enclosed within the 2 ha electrode site.	Short Term The electrode only has the potential to generate current when operational (approximately 500 hours per year and up to 48 hours at a time)	Major Should voltages be above recommended guidelines the consequence could be injury or death. This is extremely unlikely to occur.	Medium Several potential sensitive receptors are located near the electrode sites (pastoral land for the Solar Precinct Electrode and land zoned for future horticulture/agriculture purposes proximate to the DCS Electrode)	High Ground based electrodes are common globally with defined guidelines and standards for managing the associated risks.	Moderate

14.7 Cumulative Impact Assessment

While two risks have residual impacts above ‘minor’ there are no known developments in the adjacent area with similar impacts which could create a cumulative impact.

14.8 Conclusion

The potential impacts on human health have been identified from the Draft EIS, stakeholder consultation and professional expertise of the EIS team. Impacts were either assessed as having a residual impact of minor or as low as reasonably practicable for those impacts with the potential for a fatality. The Project has identified and will manage all risks to achieve the NT EPA’s objective of “Protect the health of the NT population.”

14.9 Submission Response

During the Draft EIS Public Submissions period, Police, Fire and Emergency Services, CCGC, Brigid Robertson, Michelle Nicholson, and anonymous community submitters made comments with respect to human health. These comments relate to the key themes of EMI, EMF, safety, and noise.

The Proponent’s responses to the submissions received are provided in Section 14.9.1 to Section 14.9.6.

14.9.1 Police, Fire, and Emergency Services Submission

The remote location of the operation is outside Northern Territory Fire and Rescue Services’ (NTFRS) Emergency Response Area, which limits our ability to respond to an emergency in a timely manner.

With regards to road crash/response, the NTFRS crews will respond as required within existing capacity as with any other crash. If the timeliness of that response does not adequately mitigate the risk for AAPowerLink Australia Assets Pty Ltd – AAPowerLink Project, then self-funded measures should be implemented.

The NTFRS is happy to advise AAPowerLink Australia Assets Pty Ltd on current capabilities in the vicinity of their operations to inform their risk assessment.

14.9.1.1 Response

Agreements will be in place to provide services at site and to the workforce for emergency services, refer to SIMP (Appendix 3.2) and Stakeholder and Community Engagement Chapter 3 for further detail.

14.9.2 CCGC Submission

CCGC has listed the following human health concerns relating to the Project:

- *Physical barrier risks to aircraft, medical aircraft and plant*
- *Risk mitigation measures regarding system failure and damage on community health and environmental safety*
- *Concerns regarding EMF (electromagnetic fields).*

14.9.2.1 Response

The risks associated with the OHTL posing a physical barrier to aircraft is assessed in Section 14.4.7 and the risk posed by EMF from the Project is assessed in Section 14.4.4. Details about management of faults to prevent impacts from live down lines or fire due to flashback have been addressed in Sections 14.4.8 and 14.4.9.

14.9.3 Brigid Robertson Submission

I object to overhead powerlines going past my property. If you must use Alverly Rd, put them underground. It will devalue my property and be an eyesore as well as noisy and potential health problems.

14.9.3.1 Response

The health impacts associated with noise have been assessed in Section 14.4.10 and the amenity impacts associated with noise have been assessed in Chapter 10 Amenity.

14.9.4 Matthew James Farmer Submission

Increased potential for lightning strikes causing wild bushfires, every year we battle bush fires through the Noonamah area caused by lightning strikes, in previous years some of these fires have gone through the valley along the Elizabeth River causing huge damage to fauna and flora as well as causing property damage and endangering lives.

14.9.4.1 Response

This impact was assessed as a risk above (refer to Section 14.4.8 for further information). The towers, being taller than surrounding trees, will be more likely to receive the lightning strikes that do occur in the area and thus may provide a level of protection for the areas immediately surrounding the OHTL by receiving the strike and dissipating it through the earthing wire.

14.9.5 Michelle Nicholson Submission

I do however, object to the decision that the NTEPA has made regarding the diversion of the overhead transmission towers through the rural area utilities corridor. How wide is the utilities corridor on Alverly Road Noonamah?

We already have major cables and optical fibre in the area. Will the telecommunications be affected if towers are take down the utilities corridor for the rural area? The telco communications are very unreliable in this area now! How many additional rural residents will be disrupted if these towers are in the utilities corridor in the rural area rather than in its original rail corridor route?

The towers are from 35 to 45 meters high! How are the Air Tractors supposed to service the rural area when there is a bushfire? They fly over my property on Alverly Rd at very low altitude when there is a bush fire. When these Air Tractors are full, I believe that they would struggle to manoeuvre around these towers & lines. This decision to take the transmission towers down the rural utilities corridor would be putting many lives at risk.

Constant humming noise from the towers has potential to adversely affect wildlife let alone the humans living close by. The potential adverse effects on humans of high voltage EMFs also remain to be fully evaluated!

14.9.5.1 Response

The NTG utilities corridor is approximately 120 m wide at Alverly Road, Noonamah. The OHTL Corridor will be 60 m wide for most of the length with short sections 30 m wide where required. The potential impact of EMI and EMF has been assessed in Sections 14.4.4 and 14.4.5, above. Impacts to health resulting from the noise from the OHTL are assessed in Section 14.4.10, above and impacts to aircraft are assessed in Section 14.4.7. Potential impacts on wildlife are addressed in Chapters 5, 7 and 9 (Terrestrial Ecosystems, Aquatic Ecosystems and Marine Ecosystems).

14.9.6 Anonymous Submissions

14.9.6.1 EMF

Certain atmospheric conditions often cause high voltage cables to emit a buzzing/humming sound. There are also high levels of Electro-Magnetic Frequency (EMF) around these cables. What impact will noise/EMF emitted from the cables have on my family?

Above ground power lines create huge EMF when High voltage power is present, this has been proven to have health risks such as leukaemia to people that are exposed to it, the proposed route is along the bus route where many children wait and walk along when making their way to and from school, in addition to this many residents ride bikes, walk dogs, conduct fitness activities along this proposed route.

14.9.6.2 Response

The potential impact of EMF and EMI are assessed in Sections 14.4.4 and 14.4.5 above. Impacts to health resulting from the noise from OHTL are assessed in Section 14.4.10 above.

14.9.6.3 EMI

The following anonymous submission was also received regarding potential EMI impacts:

Power lines are known to affect communications signals. In the Lloyd Creek, Elizabeth Valley, Noonamah region, communications are already extremely poor. This is no exaggeration. Some properties have no mobile phone signal whatsoever, some residents have paid for additional personal infrastructure to be installed at their properties to have a 'reliable' phone or internet connection. Many, if not most, internet connections are achieved through Fixed Wireless, mobile, or Satellite connections, and there is little fixed line infrastructure. Residents are often isolated and there are already concerns regarding the ability to call for emergency assistance when required. I state this as a resident affected by all of the above points, and I am not alone. Have telecommunications experts been engaged for comment?

Additionally, UHF is also used for communication, especially by emergency services. Have Bushfires NT, Volunteer Fire Brigade Captains, or NT PFES been engaged for comment?

14.9.6.4 Response

The potential impacts of EMI have been assessed in Section 14.4.5, above. The Proponent has engaged with Bushfires NT and NT PFES, neither raised concerns regarding EMI impacts (Stakeholder Consultation Report, Appendix 3.1).

14.9.6.5 Bushfire

The following anonymous community submissions were received regarding potential bushfire risks:

- *To what extent could the OHTL infrastructure affect fires in the region of the Utilities corridor? This could be from introduced weed species such as gamba, which are known to increase intensity of fires. The land in the Lloyd Creek/Noonamah region has been burnt every single year, for the past 11 years on record according to documentation. Will project boundaries affect fire-fighting access during construction or thereafter? Have Bushfires NT been engaged for comment?*
- *Whilst the pylons themselves may have added grounding to protect from damage by lightning strikes, the area around my property has significant strikes each wet season, presumably due to the nature of the geology. Could these pylons increase the threat of lightning strikes nearby to my property or others, posing a safety risk and financial risk? Are there any risks for surrounding residents associated with cyclones?*
- *The proposed OHTL crosses the Stuart Highway, following the NTG Utilities corridor reserved in the LSLUP, which is just North of the Hughes airstrip, used during the dry season by crucial fire-fighting planes. Have Bushfires NT been consulted about the impact to their aviation operations?*

14.9.6.6 Response

Consultation has occurred with Bushfires NT (Appendix 3.1 Stakeholder Consultation Report), mitigation measures to prevent introduction and spread of weeds have been included in Chapter 5 Terrestrial Ecosystems, as well as Appendix 5.3 Weed Management Plan. Impacts to aircraft, including those used by Bushfires NT, have been assessed in Section 14.4.7. The OHTL will not restrict access to areas so the only fenced areas that could potentially pose an impact to firefighters being unable to gain access are those required for safety including the locations of Electrodes, the Solar Precinct, DCS and Cable Transition Facility. Areas with restricted access (for safety reasons) have facilities for firefighting and workers present in this area will allow access for emergency services.

All OHTL structures will be designed to AS/NZS to reflect the environmental conditions including AS1170.2:2021 Wind Actions which sets out the wind standards that the infrastructure will need to meet and AS7000.2016 Overhead Line Design which sets out recommended control strategies. Potential impacts of increased lightning strikes due to the placement of OHTL structures was assessed in Section 14.4.8 and determined not to pose an increased risk of bushfire. Potential impacts from cyclones interacting with the OHTL are assessed in Section 14.4.9.

14.9.6.7 Dust

The following anonymous community submission was also received regarding potential air quality / dust risks:

I already have an issue with dust from the mine access road that backs onto my property. This road is maintained by mining companies, and I have existing complaint records with NT EPA for the lack of dust management performed by mine operators using this road consistently and predominantly throughout the dry season. I am concerned that this road may be utilised for construction and maintenance traffic to access portions of the Utilities corridor, and dust will therefore become an increasing problem for my family, who have chronic lung conditions.

14.9.6.8 Response

Potential health impacts from dust resulting from construction and operation are assessed in Section 14.4.3. Impacts to amenity from dust emissions are assessed in Chapter 10 Amenity. Maintenance of the Access Track, to reduce dust emissions, is the responsibility of the road owner, however, the Proponent will take an adaptive management approach to dust emissions which will be documented in the TARP.

14.10 NT EPA Direction Responses

14.10.1 Dust Emissions – Comment 29

Dust will be generated during clearing, construction, and operation with the area of influence for each component of the proposal footprint modelled in the draft EIS as described in the Air Quality Impact Assessment (Appendix U).

The draft EIS indicates the locations likely to experience greatest impacts are the DCS during 30 month to 4 year construction phase and the Solar Precinct during construction and operation.

The draft EIS describes avoidance measures (locating site access roads, laydown areas and stationary equipment (e.g., generators) as far away as possible from sensitive receivers).

Mitigation measures to minimise and manage impacts to air quality are described in Chapter 17 Environmental Management, summarised in Section 11.5 and largely rely on water suppression and other suppressants if water is ineffective for all components and vegetation management at the Solar Precinct.

The draft EIS states that vegetation management will be used to control dust at the Solar Precinct as detailed in Chapter 2 Proposal Description. However, the vegetation management described in Chapter 2 relates only to vegetation management as an ongoing operations activity within the Solar Precinct to prevent shading of the panels and/or fire risk.

14.10.2 Information Required in the Supplement

Provide further information relating to dust management including, but not limited to detail about:

- 1. Dust management measures, including their expected efficiency and an assessment of the residual impact on air quality for the DCS and Solar Precinct during construction phase*
- 2. Land clearing program/staging at the solar precinct including maximum cleared area at any time*
- 3. Vegetation management as it relates to dust management at the solar precinct including timing, water requirements and success criteria*
- 4. Monitoring and management measures at sensitive receptors, particularly in the vicinity of the DCS.*

14.10.3 Response

Prior to construction, the Proponent will develop a TARP that demonstrates monitoring and adaptive management techniques that will be applied should monitoring criteria be met. Examples of adaptive management techniques include:

- Dust suppression using water
- Vehicle speed restrictions
- All trucks containing road base or other high dust generating materials will be covered
- Stockpiles will be covered or wetted down where practical
- Dust screens (vegetation or cloth)
- Reducing or ceasing high risk dust generation work in hot, dry weather
- Progressively rehabilitate construction areas as soon as practicable after they are no longer required.

Monitoring will consist both of predictive monitoring (e.g., identifying wind direction, climatic conditions conducive to dust generation) and monitoring of impact (e.g., visible dust leaving site, complaint management and if required monitoring of TSP or PM₁₀ at sensitive receptors).

Trials are underway to determine the most effective methodology for vegetation management at the Solar Precinct. The trials focus on plants with low water requirements that are adapted to the environment and success criteria will focus on percentage cover achieved by either plants or cryptogam crusts which stabilise the surface.

14.10.4 Dust Emissions along alternative routes – Comment 30

There is potential for dust emissions caused by wind erosion of exposed surfaces and traffic movements on unsealed roads/tracks during construction.

The draft EIS notes that some of the sensitive receptors presented in Chapter 11 will be avoided by the alternative routes near Katherine, Pine Creek and Adelaide River. However, any new sensitive receptors likely to be impacted and proposed avoidance and mitigation measures in the alternative routes are not presented in the proponent's draft EIS.

14.10.5 Information Required in the Supplement

Provide information and additional assessment of impacts from dust emissions, if necessary, about the proposed alternative location of the OHTL corridor, as required by the previous item above.

14.10.6 Response

Changes in the distance to sensitive receptors resulting from the OHTL Corridor is included in Section 14.3. Section 14.4.3 assesses the change to the dust risk resulting from the selected deviation. The Constraints Planning Framework and Field Development Procedure (Appendix 4.1) has been designed to highlight high risk areas for dust and implement additional controls as required under a TARP.

14.10.7 Combustion and dust emissions at the DCS, Cable Transition Facilities and Solar Precinct – Comment 31

Construction will occur over 30 months to four years. The draft EIS provides modelling results of emissions at the DCS showing that PM_{2.5} and NO₂ pollutants could be elevated above assessment criteria inside the construction site boundary but decrease rapidly and are unlikely to be at levels that cause health effects outside of the site. The assessment criterion for PM₁₀ is predicted to be exceeded up to 2 km (annual) and 3.5 km (daily) from the site boundary, with greater impacts during the dry season when background concentrations are elevated.

At the Cable transition facilities modelling shows that emissions could exceed air quality assessment criteria up to approximately 370 m from construction activities. The pollutant that is likely to affect the largest area is NO₂. PM_{2.5} and PM₁₀ are predicted to meet the assessment criteria within 48 m and 175 m from the construction activities.

During operation facilities at the Solar Precinct and DCS will be powered by the solar electricity that is generated, with no requirement for on-site diesel power generation.

The draft EIS states adverse impacts will be managed by engaging with people in specific project areas prior to construction, carrying out visual observations and adaptive management measures to mitigate fugitive dust events (as feasible), and providing a complaints process to track and respond to any stakeholder, Aboriginal and community concerns.

14.10.8 Information Required in the Supplement

Provide further detail about emissions at the DCS and Cable Transition Facilities in accordance with TOR requirements including, but not limited to:

- 5. Avoidance, mitigation, and management measures to not exceed criteria at the site boundary*
- 6. monitoring and reporting of emissions during construction and operation phases.*

14.10.9 Response

Prior to construction the Proponent will develop a TARP that demonstrates monitoring and adaptive management techniques that will be applied should monitoring criteria be met. Examples of adaptive management techniques include:

- Dust suppression using water
- Vehicle speed restrictions
- All trucks containing road base or other high dust generating materials will be covered
- Stockpiles will be covered or wetted down where practical
- Dust screens (vegetation or cloth)
- Reducing or ceasing high risk dust generation work in hot, dry weather
- Progressively rehabilitate construction areas as soon as practicable after they are no longer required.

Monitoring will consist both of predictive monitoring (e.g., identifying wind direction, climatic conditions conducive to dust generation) and monitoring of impact (e.g., visible dust leaving site, complaint management and if required monitoring of TSP or PM₁₀ at sensitive receptors).



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