

ESG considerations for major substations

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Contact Information

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<https://www.endeavourenergy.com.au/Working-with-us/Standards-forms-and-guides/Standards>

For any enquiries relating to the content of this document please contact the Standards Coordinator.

Document Control

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1 Purpose

To minimise the environmental impact from transmission substations, zone substations and switching stations (hereafter known as major substations), that are constructed, operated and maintained within Endeavour Energy's network.

2 Scope

This instruction shall be read in conjunction with Substation Design Instruction SDI 505 Minimum design and construction requirements for transmission and zone substations and switching stations.

This instruction defines the minimum requirements to mitigate the impact of Endeavour Energy's major substations on the environment.

3 References

Legislative Requirements
Contaminated Land Management Act 1997 (NSW)
Environment Planning and Assessment Act 1979 (NSW)
State Environmental Planning Policy (Transport and Infrastructure) 2021
Protection of the Environment Operations Act 1997
Work Health and Safety Act 2011 (NSW) and Work Health and Safety Regulation 2025 (NSW)
EPA Policies and Guidelines, Noise Policy for Industry (2017), Interim Construction Noise Guideline (2009)
National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)
NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Guidelines for Consultants Reporting on Contaminated Sites
ANZECC Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018
Australian Radiation and Nuclear Protection Agency, (ARPANSA) Standard for Limiting Exposure to Radiofrequency Fields- 100 kHz to 300 GHz, Rev 1, 2021
International Commission on Non-ionizing Radiation Protection (ICNIRP) Guidelines for Limiting Exposure to Time-varying electric and magnetic fields (1 Hz- 100 kHz)

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External Standards		
Standard No.	Year	Title
AS 62271.1	2012	High-voltage switchgear and control gear – Part 1 - Common specifications for alternating current switchgear and control gear
AS IEC 62271.4	2015	High voltage switchgear and control gear – Part 4 – Handling procedures for Sulphur Hexafluoride (SF6) and its mixtures
ENA Doc 001	2019	National Electricity Network Safety Code

Company Policies and Procedures	
Board Policy (Environment) 4.0	Sustainability
Company Policy (Network) 9.2.2	Network Protection
Company Policy (Network) 9.2.5	Network Asset Design
Company Policy (Network) 9.9.1	Network Asset Maintenance
Company Policy (Network) 9.2.14	Network Property Acquisition
Company Procedure (Environment) GPE 0009	Contaminated land management
Company Procedure (Health & Safety) GSY 1066	Worksite Hazard and Risk Assessment
Company Procedure (Health & Safety) GSY 0050	Hazardous Chemical Management
Company Procedure (Health & Safety) GSY 1065	Asbestos Management
Company Procedure (Network) ENG 0002	Network Standards Framework Preparation and Amendment of Network Standards (includes Environmental Management Standards)
Electrical Safety Management System requirements	Endeavour Energy Electrical Safety Rules

Company Standards	
Environmental Management Standard EMS 0001	Environmental impact assessment and environmental management plans
Environmental Management Standard EMS 0005	Substation landscaping
Environmental Management Standard EMS 0007	Waste management
Environmental Management Standard EMS 0008	Environmental incident response and management

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Company Standards	
Environmental Management Standard EMS 0013	Spoil and imported material management
Environmental Management Standard EMS 0016	Industrial and Construction Noise
Environmental Management Standard EMS 0017	Oil management
Substation Design Instruction SDI 502	Hydraulics for transmission & zone substations & switching stations
Substation Design Instruction SDI 503	Transmission and zone substation fire detection, control and suppression
Substation Design Instruction SDI 505	Minimum design and construction requirements for transmission and zone substations and switching stations
Substation Design Instruction SDI 510	Major Substation Building Design
Substation Design Instruction SDI 524	Fencing and perimeter security at zone and transmission substations and switching stations.
Substation Design Instruction SDI 528	Substation signs and equipment labels
Substation Design Instruction SDI 529	Light and power
Substation Design Instruction SDI 540	Transformer oil containment
Substation Maintenance Instruction SMI 119	Transmission and zone substation data asset structure and nameplate details
Substation Maintenance Instruction SMI 121	Storage and handling of insulating oil
Substation Maintenance Instruction SMI 122	Use and handling of sulphur hexafluoride (SF ₆)

4 Definitions and Abbreviations

Term	Definition
Bund	An impervious embankment of concrete or other suitable material that may form a part or the entire perimeter of a compound and which provides a barrier to retain liquid.
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environment Protection Authority of New South Wales - incorporated into the Office of Environment and Heritage.
Major Substation	Major substation includes, Zone, Transmission and Switching Stations, excluding distribution network assets (pole/pad subs and 11/22kV Switching Stations)
OEH	Office of Environment and Heritage
PCB	Polychlorinated biphenyl
SF6	Sulphur hexafluoride
Sustainability By Design	Sustainability by Design is an approach where environmental, social, and governance (ESG) considerations are intentionally embedded from the very beginning of planning, strategy, and decision-making, rather than being added later as mitigation or compliance measures.

5 Actions

5.1 General ESG Considerations

Endeavour Energy is committed to constructing, operating and maintaining installations in a manner that manages actual or potential environmental impacts. In addition, where feasible the Infrastructure Sustainability Council, 'Sustainability by Design' principles should be included when designing, constructing or upgrading substations and their associated Engineering Standards.

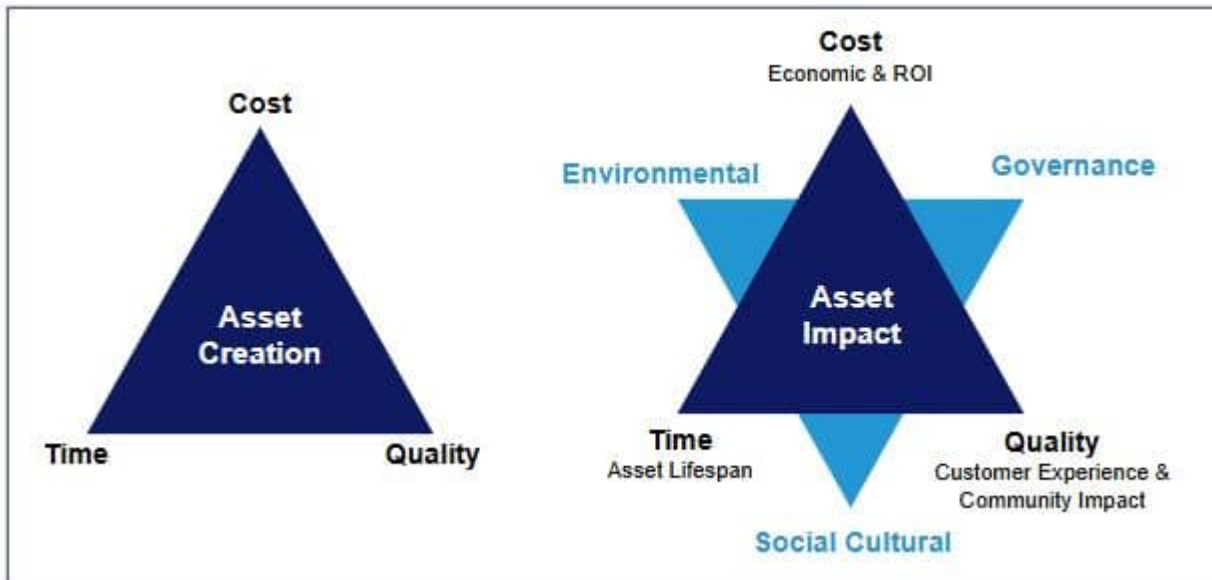
Sustainability by Design

Sustainability by Design aims to embed practical, business-beneficial sustainability measures into everyday decision-making and delivery, rather than treating sustainability as a retrospective compliance exercise. Its scope is to optimise specific process elements and design choices across the asset lifecycle, not to require full process redesign.

Sustainability by Design is an approach where environmental, social, and governance (ESG) considerations are intentionally incorporated from the very beginning of planning, strategy, and decision-making, and then systematically carried forward through delivery, operation, and end-of-life. By integrating sustainability at each stage, major substations can achieve improved whole-of-life outcomes while balancing cost, time, quality, and risk.

When applied consistently, this approach shifts the focus from short-term asset creation to long-term asset impact—maximising economic value and resilience while minimising environmental footprint and adverse social impacts over the full asset lifespan.

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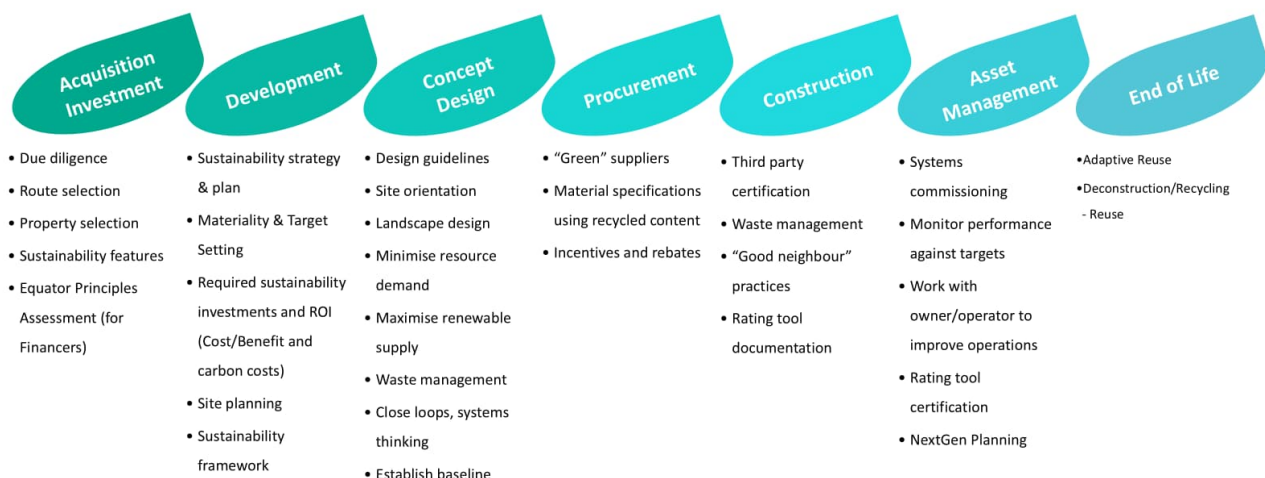
Decisions made early in the lifecycle—particularly during investment, development, and concept design—have a disproportionate influence on long-term environmental performance, community outcomes, operational efficiency, and total cost of ownership. Embedding Sustainability by Design ensures that:

- ESG risks and opportunities are identified proactively rather than managed reactively
- Trade-offs between cost, time, quality, and sustainability outcomes are transparent and deliberate
- Sustainability objectives align with business priorities such as asset reliability, safety, regulatory compliance, and community trust
- Performance against sustainability targets can be monitored, refined, and improved over time

This approach supports a transition from a traditional “project delivery” mindset to a whole-of-life asset stewardship model.

Social impacts should also be considered, where feasible community benefits should be considered such as stakeholder/community engagement and indigenous engagement. In addition to this modern slavery risks should be reviewed during the approach to market and procurement processes.

The Sustainability by Design process chart below illustrates how sustainability considerations are integrated at each stage of the asset lifecycle—from initial investment decisions through to end-of-life. The chart demonstrates how asset creation decisions (time, cost, and quality) directly influence broader asset impacts, including economic return, environmental outcomes, social and community impacts, governance, and asset lifespan.



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The Sustainability by Design framework and process chart (above) should be used as a practical decision-support tool, guiding project teams to ask the right ESG questions at each stage and to understand how individual decisions contribute to overall asset impact.

By embedding sustainability deliberately and consistently across acquisition, design, delivery, operation, and end-of-life, major substations can deliver assets that are resilient, efficient, trusted by communities, and aligned with long-term business and ESG objectives.

5.2 Location selection and site procurement

Electrical substation locations shall be selected, where possible, to meet the needs of the network demand but also where feasible minimise their impact on the surrounding environment and the community. Where feasible site selection and asset designs should consider a nature positive approach, minimising removal of native vegetation and enhancing nearby habitats where possible through effective landscaping or additional habitat creation on nearby facilities.

Selection shall be based upon a due diligence methodology whereby a preliminary environmental impact assessment of the proposed substation location should be completed and consider the following and meet the requirements of Company Policy (Network) 9.2.14 Network Property Acquisition:

- The substation site should not be contaminated. At a minimum, a Preliminary Site Investigation into potential contamination risks at the site should be undertaken in accordance with NSW EPA guidelines, prior to the purchase of a property. Where contamination is suspected at the site following the Preliminary Site Investigation, a Detailed Site Investigation in accordance with NSW EPA guidelines may be required to determine the extent and severity of the potential contamination before a decision on whether to purchase the property can be made.
- The substation site shall be free from flooding by remaining above the 1:100 flood levels.
- The land titles of proposed sites shall indicate that the site is free from encumbrances that may hinder the development of that site as an electrical substation.
- Sites shall be free of Endangered Ecological Communities.
- New substation sites wherever possible shall not be located next door to schools or childcare centres or current/former service station sites.
- Site frontages shall be of sufficient size to allow the ultimate intended capacity to be delivered.

5.3 Development approval

Substation development may be permitted without consent under Division 5 Subdivision 1 of the State Environmental Planning Policy (Transport and Infrastructure) 2021

The impacts to the environment of the substation construction works shall be assessed to determine if it is suitable to proceed under Section 5.5 Part 5 of the *Environmental Planning and Assessment Act 1979*.

5.4 Waste management

All waste generated as part of the substation construction works shall be managed in accordance with Environmental Management Standard EMS 0007 Waste Management.

Endeavour Energy encourages a circular economy approach to waste management to maintain sustainable practices including resource efficiency, prevention of environmental harm, and waste minimisation. In summary, circular economy principles include:

- avoidance of unnecessary resource consumption/ waste, this includes avoiding single use products where possible and avoiding ordering surplus of products

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- consideration of designing for low carbon infrastructure/assets, material selection, whole of life carbon and lifecycle considerations of assets and products during design, optioning and procurement
- re-use of products and surplus materials where possible
- recovery and recycling of materials including appropriate sorting of materials and
- disposal as a last option.

A sustainable materials management plan shall be developed as required in accordance with the Notice of Determination. The plan shall consider the avoidance, minimisation and management of waste generated through the construction and operational and demolition phases of the substation.

The Project Manager shall obtain waste disposal dockets/waste data on a regular basis for all waste disposed of during the substation construction. This information shall be retained and made available for audit purposes.

5.5 Excavated and imported material

Excavated material can be re-used on site if it meets the requirements of Environmental Management Standard EMS 0013 Spoil and imported material management and Substation Design Instruction SDI 523 Switchyard surfaces. Imported material for use as fill on site shall be certified as virgin excavated natural material or excavated natural material, and it shall be free of any signs of contamination. If recovered aggregates and/or mulch are used, these shall be free of any contaminants, certified and be sourced from a suitably licensed supplier. Refer to Environmental Management Standard EMS 0013 Spoil and imported material management for further guidance is planning to import fill, recovered aggregate, recovered mulched and/or other recovered products at the site.

5.6 Environmental Impact Assessment

An Environmental Impact Assessment (EIA) shall be prepared for the construction of new major substations and for the refurbishment of existing facilities.

The EIA shall be carried out in accordance with all relevant legislation and in accordance with Environmental Management Standard EMS 0001 Environmental Impact Assessment and Environmental Management Plans.

The EIA shall set out in detail the environmental requirements to be followed during the design, construction and operation of the substation. The report shall also include the approved mitigation measures to be undertaken during these phases to minimise any impact that the development may have on the environment.

Construction impacts shall be identified and where possible, mitigated in accordance with Environmental Management Standard EMS 0001 Environmental impact assessment and environmental management plans and the specific conditions imposed as part of each Determination.

5.6.1 Noise emissions

Noise emissions emanating from Endeavour Energy substations shall be managed in accordance with company standard EMS 0016 Industrial and Construction Noise and the NSW EPA Noise Policy for Industry 2017. The policy is specifically aimed at assessing noise from industrial sources scheduled under the *Protection of the Environment Operations Act 1997*. Endeavour Energy substations are not classified as scheduled premises under this Act, because Endeavour Energy is not required to hold a licence under the Act to operate its substation premises. However, in the absence of other relevant standards, the limits set out in this policy shall be used to determine whether the level of noise emanating from a substation premises is considered to be a nuisance or annoying to neighbouring properties.

Where a noise source, such as the transformers, Battery Energy Storage Systems (BESS) and capacitor banks in a substation contains certain noise characteristics, such as tonality, impulsiveness, intermittency,

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irregularity or dominant low frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Acceptable noise levels will vary depending upon the location of the substation site (for example, rural, residential, or industrial).

Accordingly, an environmental noise impact report, prepared by a reputable acoustic consultant, shall be obtained when relevant works might impact the community during operation or construction, such as when:

- planning to construct a new substation
- upgrading substation facilities, for example, constructing/extending control buildings or constructing additional buildings on the site
- replacing transformers
- installing additional transformers
- installing capacitor banks
- installing any other equipment or doing any other type of work that can interfere with or permanently change the existing noise environment at the site and
- receiving complaints regarding the noise emanating from an existing substation site.

Where the noise impact report indicates that the site contravenes the recommendations outlined in the policy, all reasonable measures shall be adopted to incorporate proposals for noise mitigation, as outlined in the noise impact report. Where a non-compliance is identified with existing infrastructure any proposed remediation shall be approved by the General Manager Future Grid and Asset Management.

The results and recommendations of the environmental noise impact report shall be included in any EIA carried out for any proposed substation/switching station development.

5.6.2 Construction noise

Reasonable and feasible measures shall be undertaken to reduce the noise levels during construction and/or maintenance. Where this requirement is unavoidable, due to the nature of the work to be performed, Endeavour Energy will take reasonable measures to notify those likely to be affected by the noise of the expected duration of the activities and the reasons for undertaking the work.

All construction works on site, including out of hours works shall be undertaken in accordance with the NSW EPA Interim Construction Noise Guideline 2009 and company standard EMS 0016 Industrial and Construction Noise. In emergency situations, the provision of notifications may not be possible. In these cases, every effort shall be made to limit noise disturbance from ensuing operations.

5.7 Oil containment

Oil containment and any legacy Polychlorinated biphenyl (PCB) materials, including oil with PCB shall be in accordance with:

- Substation Design Instruction SDI 540 Transformer oil containment and
- Environmental Management Standard EMS 0017 Oil management

Oil spills or leaks are to be managed in according with company standard EMS 0008 Environmental Incident Response and Management.

Further guidance can also be found in company standard SMI 121 Storage and handling of insulating oil.

5.8 Contaminated land

Contaminated land within substations shall be treated in accordance with the *Contaminated Land Management Act 1997* and Company Procedure (Environment) GPE 0009 Contaminated land management.

5.9 Hazardous chemicals, dangerous goods and hazardous materials

The use of hazardous chemicals at substations shall be minimised. Known carcinogens shall not be used in new substations. Equipment containing known carcinogens, in existing substations, shall be managed in accordance with current legislation and Endeavour Energy guidelines.

A manifest of chemicals, asbestos and other hazardous materials is required for each site in accordance with Substation Design Instruction SDI 528 – Substation signs and equipment labelling and should be included on the company's hazardous materials register and chemicals register. Please refer to company procedures GSY0050 - Hazardous Chemical Management and GSY 1065 - Asbestos Management for further information.

(PCB) materials, including oil with PCB, shall be managed in accordance with Company Standard EMS 0017 - Oil Management and the *Protection of the Environment Operations Act 1997*.

5.10 Drainage

Measures shall be taken so that water leaving any of Endeavour Energy's substations does not contain more than 10ppm of oil or grease, and not more than 30 milligrams of suspended solids in each litre of discharge water¹.

Equipment used to separate oil, grease or other contaminants from water shall be designed for a 24-hour, one in 20-year storm.

Works shall be undertaken to avoid pollution of surrounding water bodies from the work site. Pollution refers to anything other than clean water entering the stormwater system including water that is pumped out of open trenches.

Discharging soil, cement or other building materials to stormwater is illegal. Stormwater drainage for new sites shall be designed by a qualified hydraulic engineer. Stormwater drainage on all sites shall be in accordance with local council requirements. Drainage design shall be conducted in accordance with Environmental Management Standard EMS 0001 Environmental impact assessment and environmental management plans, and the *Protection of the Environment Operations Act 1997*.

Any site-specific issues shall be addressed in the EIA, the Notice of Determination and the EMP prepared for the project. Refer also to Substation Design Instruction SDI 502 Hydraulics for transmission and zone substation and switching stations for further plumbing and drainage details.

5.11 Fire

The NSW fire authorities shall be consulted to determine the fire risk (including bushfire risk) and the mitigation measures to be undertaken at the substation due to its location.

Endeavour Energy shall commission its own bushfire hazard assessment for any proposed substation development in any bushfire prone area. The recommendations contained in this report shall be included in the EIA and the Notice of Determination prepared for the project and incorporated into the substation design as required.

Refer also to Substation Design Instruction SDI 503 Transmission and zone substation fire detection, control and suppression for fire suppression and segregation details.

¹ ANZECC Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018.

5.12 Electric and magnetic fields

The National Health and Medical Research Council's Guidelines¹ suggest a magnetic field exposure limit for members of the public (24-hour exposure) is 0.1 milli Tesla (1,000 milligauss), and for occupational exposure (whole working day) is 0.5 milli Tesla (5,000 milligauss).

The substation design shall not compromise these magnetic field levels. Magnetic field levels at the substation boundary fence shall be verified after commissioning.

5.13 SF₆ usage and containment

SF₆ used in electrical equipment is a potent greenhouse gas, therefore its use shall be considered only after other suitably proven and less environmentally harmful insulating or arc quenching media have been found to be unsuitable.

SF₆ equipment used in any substation shall have a leak rate in accordance with AS 62271.1 High-voltage switchgear and control gear. In selecting SF₆ equipment to be used, designs with the lowest mass of SF₆ shall be given preference.

Generally, SF₆ equipment shall be capable of being subjected to a vacuum of 1-millibar. This requirement will enable the extraction of SF₆ from equipment during maintenance. The Asset Engineering Manager shall be consulted for approval of equipment that does not meet this requirement. Further guidance can be found in company standard SMI 122 Use and handling of sulphur hexafluoride (SF₆).

5.14 Preventing graffiti

Anti-graffiti measures shall be undertaken to reduce the effect of vandalism. Where any of these measures are undertaken, their effects on the environment shall be assessed.

5.15 Aesthetics

When the design of the substation is being prepared, it shall take into consideration the environment into which it will be established. The aesthetics of the substation shall be considered using:

- colour
- grey coloured bushings
- screening with trees and bushes to hide protrusions - balanced with security and bushfire resilience needs refer to Environmental Management Standard EMS 0005 Substation Landscaping; and
- construction methods that consider the potential aesthetic impact of the site.

Refer also to:

- Company Policy (Network) 9.2.5 Network Asset Design
- Substation Design Instruction SDI 510 Major Substation Building Design
- Substation Design Instruction SDI 524 Fencing and perimeter security at zone and transmission substations, and switching stations and
- Substation Design Instruction SDI 529 Light and power.

¹ Currently recommended by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)

6 Authorities and Responsibilities

Listed below are the positions or groups of positions that have specific authorities and responsibilities associated with this policy/procedure.

General Manager Future Grid and Asset Management has the authority and responsibility for:

- approving major changes to this standard in accordance with ENG 0002;
- making all decisions concerning compliance with this standard
- delegating any of these authorities and responsibilities to the Head of Engineering Design.

Head of Engineering Design and **Head of Sustainability** have the authority and responsibility for:

- approving minor changes to this standard in accordance with ENG 0002;
- making recommendations to the General Manager Future Grid & Asset Management for major changes in respect to this standard.

Head of Property has the authority and responsibility for complying with the land acquisition requirements of this document.

Sustainability Systems and Assurance Manager has the authority and responsibility for keeping the content of this instruction up to date.

Environmental Services Manager and Environmental Specialists: have the authority and responsibility for the business in meeting environmental requirements of this standard.

Project managers (delivery) have the authority and responsibility for:

- meeting the requirements of this instruction within their area of responsibility
- overseeing that Endeavour Energy employees and/or contractors engaged to perform the work have appropriate qualifications
- obtaining waste disposal dockets/waste data on a regular basis for all waste disposed of during the substation construction.

Project Managers (planning) responsible for:

- complying with all appropriate environmental legislation
- initiating the appropriate level of environmental impact assessment to align with the type of development proposal
- checking that the formal Environmental Impact Assessment document is prepared, risks identified have been adequately addressed, and the EIA is included in the overall design/work package
- checking that the consent conditions contained in the Notice of Determination and/or Environmental Management Plan prepared for the project is appropriate and reasonable, and is communicated to workers on site and
- checking that any Notice of Determination for the development is formally approved and distributed to the project management staff responsible for overseeing the project.

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Endeavour Energy employees and/or contractors are responsible for:

- meeting the requirements of this instruction
- working in accordance with local and statutory requirements and
- working in accordance with Endeavour Energy's Electrical Safety Rules and systems when conducting works associated with this instruction.

