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1 Summary

This chapter summarises the construction and execution aspects of the Employer's Requirements as issued to the Contractors. The Employer's Requirements specify the methods, processes, systems and controls (in the form of management plans) that the Contractors must comply with to deliver the Project objectives. The Employer's Requirements also reinforce Snowy Hydro's expectation that the Contractors will not only deliver the Project efficiently and effectively, but in alignment with Snowy Hydro values.

1.1 Introduction

The Employer's Requirements, as defined by the key construction and execution obligations on the Contractors, apply to the Civil and Electrical & Mechanical (**E&M**) main contracts unless otherwise noted.

The Employer's Requirements were issued to the Civil and E&M contractors in the course of the tender process conducted in Q2/Q3 2018 (See Supporting Chapter Two - Procurement).

1.2 Scope and exclusions

Contractor involvement in the Project is governed from engagement through to handover by requirements and expectations, which are met by a series of connected approved management plans, outlined within this chapter.

Several topics mentioned here are described in more detail in other chapters.

1. **'Contractors were required to'** - means the document or activity was a Tender deliverable;
2. **'Contractors will'** - means the deliverable or activity will occur post-award; and

3. Any following reference to the Employer should be read as a reference to Snowy Hydro.

See *Supporting Chapter Three - Contracts and Legal* for how the Employer's Requirements fit into the structure of the Civil and E&M contracts. See Supporting *Chapter Twelve - Facilities* for the technical aspects of the Employers' Requirements. Not all Project Execution Requirements are described in this chapter. See other chapters as noted individually below.

1.3 Management plans

Contractors will submit a detailed Project Execution Plan (***PEP***) and associated subplans. Each Contractor submitted a pro forma or first draft of the PEP with their tender. Contractors are expected to align their execution approach with Snowy Hydro's values.

In preparing the PEP and all other management plans, the Contractors were required to address compliance with the conditions of the Approvals and the Employer's Requirements in detail.

The Civil Contractor is responsible for management and control of the Site, is engaged by the Employer and accepts the engagement as the Principal Contractor for the execution of the Project.[1]

The Civil Contractor is also responsible for supply and management of services (as detailed below) for the whole of the Project Works through to commissioning and handover of the Works.

1.4 Health, safety and security

Contractors have given safety the highest priority by aligning their safety management systems with Snowy Hydro's principles and providing a detailed Health and Safety (***H&S***) management plan and policy. Each shortlisted contractor provided a history of demonstrated and documented compliance with the safety objectives and a detailed and comprehensive Health and Safety Management Plan (***HSMP***) outlining the implementation of regulations and the associated governance tools to maintain them. The Contractors will submit a detailed and comprehensive HSMP prior to commencing any Works.

The HSMP will define, outline or detail as appropriate:

1. The Contractor's H&S management systems, interfaces and integration with subcontractors and other contractors on the site;
2. 'Cardinal' rules;
3. Safety culture;
4. Emergency readiness and management;
5. H&S risk management;

[1] Note that 'Principal Contractor' has a defined meaning both under the Contract and under NSW legislation (see *Chapter One*).

6. The Contractor's WHS organisation and the roles and responsibilities for WHS management;
7. Currency of the HSMP;
8. Monitoring and reporting H&S performance; and
9. Incident management.

1.5 Environment and approvals

Snowy Hydro's overall Project approach to Environment and Approvals is described in *Supporting Chapter Eleven - Environment, permits and approvals.*

Contractors will prepare comprehensive management plans, obtain necessary permits and approvals, and prepare a comprehensive Construction Environmental Management Plan (***CEMP***) and required subplans.

The Contractor will:

1. Prepare comprehensive management plans in consultation and for review, to requirements and any conditions of the Approvals;
2. Identify and obtain all consents, permits, approvals and authorisations other than the Employer's Approvals and the Lease, and do all things required to transfer them to the Employer, to the extent legally permitted; and
3. Comply with and ensure the Works comply with all consents, permits, approvals and authorisations, including the Approvals and the Lease.

The Contractor will provide a comprehensive CEMP for each phase of the Project that is consistent with best industry practice and the conditions of the Approvals.

The Contractor will ensure that the CEMP is maintained and resubmitted as necessary to the Employer until the Date of Completion of the Works.

In addition, as a sub-set to the CEMP, the Contractor will produce management plans that address a range of matters including the following:

1. Biodiversity;
2. Heritage;
3. Noise, vibration and blasting;
4. Excavated rock and disposal;
5. Soil;
6. Geodiversity;
7. Contaminated land;
8. Waste;
9. Surface water and groundwater;
10. Public safety;
11. Community consultation and complaints; and
12. Decommissioning and site rehabilitation.

The Contractor will provide an Environmental Management Strategy for each phase of the Project that is consistent with best industry practice and the conditions of the Approvals.

1.6 Risk management

Snowy Hydro's Project approach to risk management is described in *Supporting Chapter Seventeen - Risk management.* The Civil Contractor will conduct a risk workshop, communicate key risks and proposed mitigations, and undertake agreed risk mitigations. The Contractors will apply *AS/NZS 31000:2009 Risk Management Principles and Guidance*.[2]

1.7 Construction

The Contractors will produce a Construction Management Plan (***CMP***) which will detail all aspects of the construction of the Works in line with the Contractor's PEP. The CMP will need to be in sufficient detail to satisfy the requirements of the relevant regulatory authorities and comply with all conditions of the Approvals.

The plan will cover:

1. Construction planning and methods in each area;
2. Inclusion of subcontractors;
3. Sourcing of materials and equipment; and
4. Quality control and schedule.

The Contractors will also provide detailed method statements for each major section of the Works giving more specific details to the construction techniques and sequencing proposed and also the interface required between the Civil and E&M contractor where appropriate.

The Contractors were also given detailed requirements including:

1. Standards and quality;
2. Access and site coordination;
3. Construction methods and materials;
4. Testing of materials;
5. Use of the Site;
6. Temporary works;
7. Materials testing;
8. Control of water;
9. Surface excavation and earthworks;
10. Underground excavation;
11. Concrete production;
12. Instrumentation;
13. Building construction;
14. Structural steelwork;

[2] (Standards Association of Australia 2009)

15. Road and bridge construction;
16. Underwater excavation; landscaping; and
17. Explosives.

1.8 Human resources and industrial relations

Contractors must ensure their personnel are performing and complying with Snowy Hydro's expectations as defined by the agreements and regulations. Planning, recruiting and mobilising the construction workforce is the Contractor's responsibility.

The Contractors' workforce will be accommodated in suitably-located construction camps, with Fly-in/Fly-out (***FIFO***)/Drive-in/Drive-Out (***DIDO***) arrangements. The workforce will work 24/7 with a variety of potential rosters.

It is the responsibility of the Contractor to determine contractual agreements, remuneration packages and working conditions applicable to the construction workforce in accordance with Australian employment standards.

The Contractor's Personnel will be solely the responsibility of the Contractor. Industrial agreements covering the Project workforce will be established by the Contractors. Snowy Hydro will rely on the experience and knowledge of the Contractors to ensure that these agreements reflect contemporary practice. The Employer expects that the Works will be completed with no or minimal disruptions due to employment or industrial relations issues.

The Contractors will work closely with the Employer and each other to align HR/IR policies and procedures across the Project. The Contractors were required to produce comprehensive HR and Workplace Relations Management Plans.

1.9 Information management

The Conditions of Contract (see *Supporting Chapter Three*) and the Project Execution Requirements set out the Contractors' obligations in respect of documents. The Contractors were required to provide and implement an Information Management (***IM***) plan, prior to any works commencing, and subject to the Employer's review and approval.

Snowy Hydro sees value in the adoption of Building Information Management (***BIM***). As at FID, Snowy Hydro has taken its BIM planning to a conceptual level only, with the expectation that the Contractors will have clear views and recommended approaches in this space.

Snowy Hydro's requirements for BIM will apply to both Civil Works and E&M Contractors.

Snowy Hydro intends to achieve a number of strategic priorities and objectives through BIM, including:

1. Supporting the design, construction and operation delivery to reduce risk and improve efficiencies;
2. Ensuring both Civil and E&M Contractors have a common understanding of and compliance with Snowy Hydro's requirements;
3. Providing the models to demonstrate compliance with these requirements. Including statutory information requirements, regulations and standards;
4. Providing accurate as-built digital records that can be integrated for operations with existing Scheme assets; and
5. Creating an Asset Information Model (***AIM***) suitable to enhance and integrate with asset management and maintenance systems.

The Contractors were required to develop and implement a BIM Execution Plan (***BEP***) based on the Employer's Information Requirements (***EIR***). This will cover requirements to execute BIM efficiently through all phases of the Project, including the contractual alignment, the model uses, meetings and milestones, model collaboration and coordination, and model standards and quality assurance. This BEP will form part of the final Project IM plan developed in collaboration with the Contractors.

After the Commencement Date, but before the commencement of detailed design, the Employer and the Contractor will agree in detail the systems, tools, protocols and standards that the Contractor will apply to BIM.

1.10 Procurement and logistics

It is expected that the Contractors will maintain full control over their supply chain for the term of the Project. The Contractors' approach to transport, logistics and materials control is tightly bound to their preferred construction methodology, particularly given the significant volumes of material that must be moved for the Project.

1.11 Project controls

The project controls function centralises and analyses progress data from contractors and internal departments (such as accounts payable) to monitor, support and report on the management of status, risk, change, deliverables, and other information affecting the Project, within the Project's governance framework. See *Supporting Chapter Fourteen - Project controls*.

1.12 Design management

Contractors will undertake design work within a Design Management Plan they will submit to the Employer for approval. The plan will detail the Contractors' scope, resources, design processes, design procedures, quality, change control and coordination with the overall IM process.

The Contractors' design process will include a 'Safety-in-Design' process that meets the requirements of the Safe Work Australia *Safe Design of Structures Code of Practice.*[3]

The design will generally seek to:

1. Eliminate major hazard risks;
2. Minimise lifecycle cost;
3. Meet compliance obligations;
4. Have reliability, risk and safety as fundamental;
5. Consider redundancy, diversity, robustness and failure tolerance;
6. Consider maintainability and safety in operation; and
7. Be supported by appropriate studies, modelling and analysis.

The Contractors will hold regular design review meetings that the Employer will attend.

1.13 Quality management

The Contractors will be required to have comprehensive quality systems and a Quality Management Plan to provide Snowy Hydro with evidence that the Employer's Requirements have been met.

The Contractor will be required to keep current and supply to Snowy Hydro a complete set of 'as-built' records and drawings, Operation and Maintenance Manuals.

Throughout the life of the project, the Owner's Team will regularly inspect Works, Plant and Materials at appropriate points, and may maintain an ongoing presence for high-criticality work.

The Contractors will be required to establish and clearly follow inspection and test procedures, and deal with any nonconforming product or service.

The Contractors will appoint a Quality Manager with appropriate experience in managing the quality aspects of projects similar to the Works.

The Contractors will arrange for an external quality audit to be undertaken in accordance with the Quality Management Plan.

The Contractors will maintain records clearly identifying the source and condition of all Plant, Materials and equipment used for the construction of the Works.

1.14 Interface management

The Civil Works Contractors were required to produce an Interface Management Plan to be agreed with the Employer and the E&M Contractor Representative.

[3] (Safe Work Australia 2012).

Details of the requirements for the plan are included in the Interface Deed (see *Supporting Chapter Three*).

1.15 Role of the Civil Contractor in managing services

The Civil Contractor will provide management services. These include:

1. Security;
2. Road construction and maintenance;
3. Rehabilitation of the Site as required;
4. Traffic management; and
5. Accommodation camps.

The Civil Contractor will operate the services from as soon as practicable after the commencement date until takeover. The Contractor will provide all necessary staff, labour, services and materials to provide the services. The Contractor will operate any temporary services until they are no longer needed, or replacement permanent services are operational, as required.

1.16 Commissioning, ramp-up and handover

See *Supporting Chapter Nineteen - Operations Readiness*.

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2 Management plans

2.1 Overview

Contractors were required to submit a detailed Project Execution Plan (***PEP***) and associated sub-plans within eight weeks of award. Each Contractor submitted their Revision A of the PEP with their tender. Contractors are expected to align their execution approach with Snowy Hydro's values.

In preparing the PEP and all other management plans, the Contractors were required to address in detail compliance with the conditions of the Approvals and the Employer's Requirements.

The Civil Contractor is responsible for management and control of the Site and is engaged by the Employer and accepts the engagement as the Principal Contractor for the execution of the Project (including the E&M Contractor's Activities).[4]

The Civil Contractor is also responsible for supply and management of services (as detailed elsewhere) for the whole of the Project Works through to commissioning and handover of the Works.

[4] Note that 'Principal Contractor' has a defined meaning both under the Contract and under NSW legislation (see *Chapter One*).

2.2 Deliverables

The Contractors will provide a detailed PEP, describing their approach to the Project and how they intend to manage the Works to completion.

The Project is working (at a minimum) to the Employer's Values (Safety, Teamwork, Ownership, Agility, Decency and Courage). Contractors will align their execution strategy with these values. Of critical importance is the belief that the Project can be completed with Zero Harm to people and the environment. Contractors will indicate how they intend to create and sustain Health, Safety and Environmental (***HSE***) Values in support of this.

The Contractors were required to prepare a set of comprehensive management plans. These plans must meet the requirements of the Employer and all conditions of the Approvals.[5] In preparing the PEP and all other management plans, the Contractors were required to address in detail compliance with the conditions of the Approvals and the Employer's Requirements.

The overarching principles of the PEP include:

1. Health and Safety;
2. Environment, Planning and Approvals;
3. Community and Stakeholders;
4. Management of risk;
5. Application of expertise and experience; and
6. Maintenance of budget and schedule through dedicated project controls.

The Contractors were required to provide details of their senior management structures and indicate how their governance structure and project management team will be structured in support of these principles.

2.3 Additional responsibilities of Civil Contractor

The Civil Contractor is responsible for management and control of the Site and is engaged by the Employer and accepts the engagement as the Principal Contractor for the execution of the Project (including the E&M Contractor's activities).

The Civil Contractor is also responsible for supply and management of services (as detailed elsewhere) for the whole of the Project Works through to commissioning and handover of the Works. As such, the Civil Contractor's PEP needs to address how the Civil Contractor will successfully carry out this role while maintaining good relations with the Employer, the E&M Contractor and subcontractors, and all other affected parties.

[5] See *Supporting Chapter Three* for treatment of Approvals risk and *Supporting Chapter Twelve* for Approvals obligations.

3 Health, safety and security

3.1 Overview

Safety is a paramount consideration for the successful completion of the Project. Contractors have given safety the highest priority by aligning their safety management systems with Snowy Hydro's principles and requirements and providing a detailed H&S management plan and policy. Each shortlisted contractor provided a history of demonstrated and documented compliance with the safety objectives and a detailed and comprehensive Health and Safety Management Plan outlining the implementation of regulations and the associated governance tools to maintain them. The Contractors will submit a detailed and comprehensive HSMP prior to commencing any Works.
The HSMP will define, outline or detail as appropriate:

1. The Contractor's H&S management systems, interfaces and integration with subcontractors and other contractors on the site;
2. 'Cardinal' rules;
3. Safety culture;
4. Emergency readiness and management;
5. H&S risk management;
6. The Contractor's WHS organisation and the roles and responsibilities for WHS management;
7. Currency of the HSMP;
8. Monitoring and reporting H&S performance; and
9. Incident management.

The Civil Contractor will be the Principal Contractor for the Project duration, including for the E&M Contractor's works. The Civil Contractor must ensure that the E&M Contractor's health and safety systems align completely with the Civil Contractor's HSMP.

The Civil Contractor will be responsible for the security of the whole of the Works. The Contractor will produce a detailed security management plan.

3.2 Health and safety management

Safety is a paramount consideration for the successful completion of the Project. This section describes the Contractors' obligations for health and safety. See *Chapter One - Health and Safety* for the regulatory context and Snowy Hydro's obligations.

3.2.1 Safety principles

To ensure the highest level of safety performance, the Contractor's safety management systems will be aligned with the Employer's belief that 'all incidents

are preventable'. The principles are design, control, commitment and support. Through the preparation of the H&S management plan and policy and the implementation of safety management systems, the Contractors will:

1. Ensure the management of safety during the planning and carrying out of the Works is of the highest priority;
2. Ensure all health and safety risks are either eliminated or minimised so far as is reasonably practicable;
3. Acknowledge (as required) that ensuring the health, safety and welfare of:
    a. Their employees and Subcontractors' employees;
    b. Any other persons (including Subcontractors) engaged or employed to complete the Works; and
    c. Members of the public, affected by the Works
    d. is essential in the undertaking and completion of the Works; and
4. Ensure all persons employed by them and Subcontractors have received appropriate training and induction prior to commencing Works on Site, and properly supervised during the Works.

Each shortlisted contractor provided a history of demonstrated and documented compliance with the safety objectives and a detailed and comprehensive Health and Safety Management Plan outlining the implementation of regulations and the associated governance tools to maintain them.

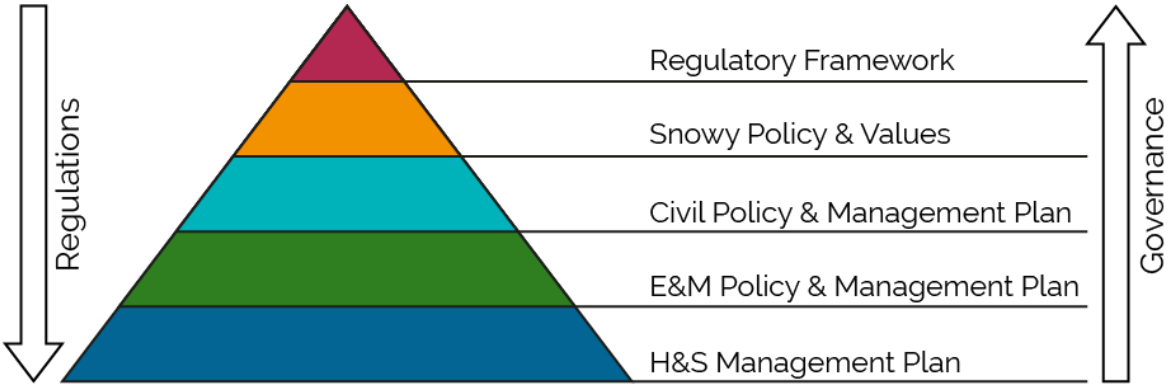

Figure 1: Responsibility Chart

3.2.2 Health and Safety Policy

The Contractors were required to provide a Health and Safety Policy statement including their commitment to the Project's health and safety objectives, and a strategy with regard to all safety aspects of the Works.

3.2.3 Health and Safety Management Plan (HSMP)

The Contractors will submit a detailed and comprehensive HSMP prior to commencing any Works. Snowy Hydro has a duty to provide to the Principal Contractor information that it holds in relation to hazards and risks at, or in the

vicinity of, the workplace where the Project construction work will be carried out (see *Chapter One*).

The Contractors will ensure an audit of the HSMP is undertaken by an independent Workplace Health and Safety (***WH&S***) Auditor prior to submission to ensure the HSMP when implemented complies with the requirements of WH&S Laws, the Employer's Requirements and the EPC contract.

The HSMP will define, outline or detail as appropriate:

1. The Contractor's H&S management systems and safe systems of work;
2. How the HSMP will integrate into all other management plans for the Project;
3. How the HSMP will interface with those plans of the subcontractors and other contractors employed on the site;
4. An overarching set of 'cardinal' rules to apply for the duration of the Project, aligned to the Employer's 'Life Saving Rules';
5. How the Contractor will establish the required safety culture for the Project, and what H&S initiatives are proposed to promote and maintain a positive project health and safety culture for the duration of the Project;
6. What emergency management plans and processes will be developed and how they will be implemented including:
    a. How the Employer, emergency service providers, local agencies, subcontractors and other stakeholders will be consulted and involved;
    b. How key roles and responsibilities will be identified and managed to maintain constant preparedness for possible events or situations;
    c. What training will be undertaken to cater for all foreseeable incidents or scenarios
    d. How credible project-specific scenarios will be dealt with;
    e. Details on evacuation plans;
    f. How the emergency response plans will be reviewed and revised to cater for changes in project situations, and scope of work; and
    g. How the plan will be tested through desktop and actual exercises.
7. How H&S risk management will be undertaken throughout the Project life cycle; including:
    a. What processes will be used for hazard and risk identification;
    b. Processes for developing and implementing safe work method statements (**SWMS**);
    c. Processes for developing and updating project health and safety risks; and
    d. Details on controls to be implemented for all key health and safety risks in particular critical risks associated with the project geography, climate, and underground works.
8. How risks associated with fitness for work will be managed and aligned with the Employer's approach across the existing business;
9. The Contractor's WH&S organisation and the roles and responsibilities for WH&S management during the Works;

10. The Contractor's behaviours and relationship with the Employer and Safework NSW;
11. How training will be developed and managed;
12. How the Contractor will address WH&S requirements and how they will manage the works in accordance with these requirements;
13. How the Contractor's H&S management system complies with all requirements of the relevant WH&S Laws;
14. How H&S consultation and communication will be undertaken to ensure WH&S information, hazards and risks are communicated to all workers and visitors;
15. How the Contractor will ensure currency of the HSMP, relevant to the phase of the Project and in response to any significant change or event;
16. How safety performance will be monitored, tracked and communicated;
17. How contraventions of any health and safety policies, responsibilities, safety rules or standards will be managed, aligned with the Employer's approach;
18. How incidents will be managed, including reporting, response, notification and corrective action;

Snowy Hydro expects the Contractors to:

1. Ensure the preparation and implementation of SWMS in connection with the performance of the Works in accordance with the HSMP and WH&S Laws;
2. Provide the Employer with access to any documentation relevant to workplace health and safety on reasonable request;
3. Ensure that WH&S compliance audits are undertaken as required;
4. Review safety behaviours and safety culture across the Project at all times and seek to refresh existing policies and procedures, or bring in new ideas;
5. Ensure that the HSMP is maintained and resubmitted as necessary to the Employer until the Date of Completion of the Works; and
6. Ensure that upon the occurrence or threatened occurrence of a WH&S incident, they undertake the required (by the Employer and regulation or statute) notifications, investigations, reports and responses.

3.2.4 Role of the Principal Contractor

The Civil Contractor will be the Principal Contractor for the Project duration, including for the E&M Contractor's works. The Civil Contractor must ensure that the E&M Contractor's health and safety systems align completely with the Civil Contractor's HSMP.

3.3 Security

3.3.1 General

The Civil Contractor will be responsible for the security of the whole of the Works, from Commencement through to Completion and Commissioning of the whole of the Works.

3.4 Management Plan Requirements

The Contractor will produce a detailed security management plan that includes:

1. Fencing;
2. Access control;
3. CCTV surveillance;
4. Personnel;
5. Site rules;
6. Code of conduct for the security company;
7. Luggage screening;
8. Security of any fuel and other hazardous material stores;
9. Security for all explosives magazines;
10. Manual and electronic tagging for all personnel accessing the underground works;
11. Induction processes for all personnel working on the site as well as visitors to site;
12. Limited site induction for all visitors to the site who will be accompanied at all times;
13. Supply, distribution, control and recovery of security badges which will have photo ID; and
14. Provision and management of electronic security access control system, including during commissioning and through ramp-up to full handover of the Project.

3.4.1 Security resources

The Employer's Requirements instruct the Contractor to subcontract the supply of security personnel to a recognised security services provider.

4 Environment and approvals

4.1 Background

Snowy Hydro's overall Project approach to Environment and Approvals is described in *Supporting Chapter Eleven - Environment, permits and approvals*.

The Employer is responsible for obtaining the required Employer's Approvals as defined in the Conditions of Contract (See *Supporting Chapter Three*).

The Employer is responsible for obtaining a lease and/or other access rights to those areas required for construction of the Project (***Lease***) that are located inside the KNP.

4.2 Requirements

The Contractor will:

1. Prepare comprehensive management plans in consultation and for review, to requirements and any conditions of the Approvals;
2. Identify and obtain all consents, permits, approvals and authorisations other than the Employer's Approvals and the Lease, and do all things required to transfer them to the Employer, to the extent legally permitted;
3. Comply with and ensure the Works comply with all consents, permits, approvals and authorisations, including the Approvals and the Lease.

4.3 Construction Environmental Management Plan

The Contractor will provide a comprehensive CEMP for each phase of the Project that is consistent with best industry practice and the conditions of the Approvals, including the *Guideline for the Preparation of Environmental Management Plans* and the *Environmental Management Plan Guidelines* as amended or replaced from time to time.[6]

The CEMP will include:

1. A description of activities to be undertaken (including the scheduling of works);
2. Details of environmental policies, guidelines and principles to be followed;
3. A schedule for compliance auditing;
4. A program for ongoing analysis of the key environmental risks arising from the approved activities, including an initial risk assessment undertaken before the commencement of the works;
5. Details of how the activities described in (1) will be carried out to:
    a. Meet the performance outcomes stated in the conditions of the Approvals, and
    b. Manage the risks identified in the risk analysis undertaken in accordance with (4);
6. An inspection program detailing the activities to be inspected and the frequency of inspections;
7. A protocol for managing and reporting any:
    a. Incidents, and
    b. Non-compliances with this approval and with statutory requirements;

[6] (Department of Infrastructure, Planning and Natural Resources (DIPNR) 2004); (Department of the Environment 2014).

8. Procedures for rectifying any non-compliance with the Approvals identified during compliance auditing, incident management or at any time during works;
9. A list of all the CEMP sub-plans required under the Approvals;
10. A description of the roles and environmental responsibilities for relevant employees and their relationship with the environmental representative;
11. An outline of the training and induction for employees, including contractors and Subcontractors, in relation to environmental and compliance obligations under the Approvals; and
12. The process for periodic review and update of the CEMP and all associated plans and programs, including triggers for review.

Where documentation has been amended the Contractor will resubmit or notify amendments as applicable.

The Contractor will ensure that the CEMP is maintained and resubmitted as necessary to the Employer until the Date of Completion of the Works.

In addition, as a sub-set to the CEMP, the Contractor will produce management plans that address a range of matters including the following:

1. Biodiversity;
2. Heritage;
3. Noise, Vibration and Blasting;
4. Excavated Spoil and Disposal;
5. Soil;
6. Geodiversity;
7. Contaminated Land;
8. Waste;
9. Surface Water and Groundwater;
10. Public Safety;
11. Community Consultation and Complaints; and
12. Decommissioning and Site Rehabilitation.

The Contractor will provide an Environmental Management Strategy for each phase of the Project that is consistent with best industry practice and the conditions of the Approvals. This strategy will include:

1. The strategic framework for environmental management of the Project;
2. Identification of the statutory approvals that apply to the Project;
3. Roles, responsibilities, authorities and accountabilities of all key personnel involved in the environmental management of the Project;
4. Procedures to:
    a. Keep the local community and relevant agencies informed about the operation and environmental performance of the Project;
    b. Receive, handle, respond to, and record complaints;
    c. Resolve any disputes that may arise;
    d. Respond to any non-compliance;
    e. Respond to emergencies; and

5. A clear plan of monitoring for the Project.

5 Risk management

Snowy Hydro's Project approach to risk management is described in *Supporting Chapter Seventeen - Risk management*.

Before commencing any work on site the Civil Contractor will convene a risk workshop facilitated by a subject matter expert (***SME***) and attended by the Contractor, Employer, and E&M Contractor. The workshop will identify and categorise all risks anticipated throughout the Project through to Completion including a review of the existing risk review carried out by the Employer.

The Contractor will utilise the Employer's risk matrix of likelihood and consequence ratings, and then rate all of the risks, with the aim of then identifying all risks categorised as major and above and identifying a risk owner within one of the three parties.

The Contractor will apply *AS/NZS 31000:2009 Risk Management Principles and Guidance.*[7]

The Contractor should consider as a minimum the following sources of risks:

1. Natural disasters such as bushfire;
2. Underground incidents;
3. Dealing with hazardous material including naturally occurring asbestos (***NOA***);
4. Excavated rock management issues;
5. Planning issues;
6. Community issues including traffic interfaces;
7. Procurement delays;
8. Quality issues;
9. Labour shortages;
10. Labour relations;
11. Construction issues;
12. Weather, particularly cold weather impacts;
13. Access issues;
14. Health and safety issues;
15. External factors affecting the project;
16. Environmental incidents; and
17. Polluted or dirty water from runoff, construction and other sources.

The Contractor should assess all risks, considering at a minimum:

1. Health and safety;
2. Environment;
3. Communities;

[7] (Standards Association of Australia 2009)

4. Reputation;
5. Schedule;
6. Cost; and
7. Quality.

For all Contractor-owned risks, the Contractor will communicate all identified risks and detailed, quantified risk mitigation strategies. The Contractor will identify a Risk Manager within its site organisation who will follow up with risk owners to ensure that risk mitigations are identified and activated in a timely manner

The Contractor will regularly conduct formal risk reviews at intervals no less than 6 months, or in response to a serious incident. The Contractor will conduct the review in a workshop attended by the Contractor, Employer, E&M Contractor and an SME.

The Employer may instruct the Contractor to implement all necessary steps to mitigate identified risks within a fixed timeframe if the Contractor has not already done so.

6 Construction

6.1 Overview

The Contractors will produce a Construction Management Plan (***CMP***) which will detail all aspects of the construction of the Works in line with the Contractor's PEP. The CMP will need to be in sufficient detail to satisfy the requirements of the relevant regulatory authorities and comply with all conditions of the Approvals.

The plan will cover:

1. Construction planning and methods in each area;
2. Inclusion of subcontractors;
3. Sourcing of materials and equipment; and
4. Quality control and schedule.

The Contractors will also provide detailed method statements for each major section of the Works giving more specific details to the construction techniques and sequencing proposed and also the interface required between the Civil and E&M contractor where appropriate.

The Contractors were also given detailed requirements including:

1. Standards and quality;
2. Access and site coordination;
3. Construction methods and materials;
4. Testing of materials;
5. Use of the Site;
6. Temporary works;
7. Materials testing;

8. Control of water;
9. Surface excavation and earthworks;
10. Underground excavation;
11. Concrete production;
12. Instrumentation;
13. Building construction;
14. Structural steelwork;
15. Road and bridge construction;
16. Underwater excavation; landscaping; and
17. Explosives.

6.2 Management plan

6.2.1 General

Unless noted otherwise below these requirements apply to both the Civil Contractor and the E&M Contractor. Where there is a reference to the provision of facilities for the Employer, such facilities will be provided by the Civil Contractor.

The Contractors will produce a Construction Management Plan (***CMP***) which will detail all aspects of the construction of the Works in line with the Contractor's PEP. The CMP will need to be in sufficient detail to satisfy the requirements of the relevant regulatory authorities and comply with all conditions of the Approvals.

The first version of this plan was provided with the tender submission and will be revised as and when information and Approvals conditions are issued.

The overarching consideration for all works on the project will be zero harm to people and the environment, and consideration of these will be shown in all aspects of construction planning. As the works are all within the KNP, due consideration will have to be taken of public use of roads and facilities within the park.

The plan will cover construction planning and methods in each area; inclusion of subcontractors; sourcing of materials and equipment; quality control and schedule; and will detail as a minimum:

1. Construction of all temporary and permanent roads, site roads, and laydown areas ***(Civil only);***
2. Construction offices and buildings including all facilities required by the Employer;
3. Construction workshops and stores including all facilities required by the Employer;
4. Segment production facilities, storage areas and proposed methods for transportation of segments; ***(civil only)***
5. Erection of accommodation camps; ***(civil only)***
6. Laydown areas ***(note that civil contractor will do all initial site preparation)***
7. Concrete batching plants ***(civil only);***

8. Quarries and sites for supply of concrete aggregates; ***(civil only)***
9. Types of excavation to be carried out on surface or underground; ***(civil only)***
10. Design, installation and testing of all support and linings to surface and underground excavations; ***(civil only)***
11. Design, installation, O&M of all underground temporary ventilation; ***(civil only)***
12. Design, installation, O&M of all underground water management systems; ***(civil only)***
13. Design, supply, installation, operate and maintenance of underground services;
14. Provision of and maintenance of all construction transport and equipment for both surface and underground works;
15. Design supply and installation of all structural concrete works in the Machine Hall, Transformer Hall, and other underground chambers;
16. Design, supply, fabrication on and off-site, transport, installation of all built-in items, steel linings, concrete protection;
17. Design, supply, fabricate on and off-site, transport to site, transport underground and installation, testing and commissioning of all mechanical equipment; pipework and ducting; structural support work; electrical equipment;
18. Disposal of all types of excavated material including any Acid-Forming Material (***AFM***) and any other hazardous materials, all in accordance with the relevant regulations and Planning Conditions; ***(civil only)***
19. Rehabilitation and landscaping all in accordance with relevant regulations and Planning
    Conditions. ***(Civil only)***
20. Any land outside the the boundaries of the Site (if any) that the Contractor requires (under a lease arrangement or otherwise) to carry out the Works.

The foregoing will describe in detail how the construction of the Works will be carried out. The Contractors will also provide detailed method statements for each major section of the Works giving more specific details to the construction techniques and sequencing proposed and also the interface required between the Civil and E&M contractor where appropriate. As a minimum the following sections will be covered in detail:

1. Intake structures at Tantangara and Talbingo;
2. Headrace tunnel;
3. Headrace mid-adit access (if required);
4. Headrace surge tank arrangement, including expansion chambers (if required);
5. Headrace valve chamber and distributor tunnels;
6. Pressure shafts;
7. High pressure and penstock tunnels;
8. Draft tube tunnels;
9. Collector tunnels;

10. Tailrace tunnel;
11. Bifurcation chambers;
12. Tailrace surge tank arrangement and expansion chamber;
13. Machine hall and transformer cavern;
14. Gas-Insulated Switchgear (***GIS***) cavern;
15. Main access tunnel (***MAT***);
16. Emergency, Cable and Ventilation Tunnel (***ECVT***);
17. Construction adits;
18. Access roads;
19. Permanent power;
20. Water and wastewater;
21. Power;
22. Communications;
23. Causeway;
24. Wharf; and
25. Excavated rock/Material placement.

The method statements will be submitted to the Employer not less than 20 business days prior to the commencement of the activity to which the particular method statement relates.

The method statements will include:

1. Detailed account of how the related works will be undertaken;
2. Sequence drawings or flow chart of activities;
3. Requirements for any Temporary Works;
4. Detailed description of advance exploratory investigations to assess geological conditions including frequency of probing and method of analysis;
5. Risk assessment to identify potential hazards and the measures to be taken to remove or minimise those hazards;
6. Detailed program for the works covered by the method statement;
7. Required resources with respect to any Plant, Materials and labour;
8. Detailed procedures for the protection and maintenance of all permanent equipment and installations through transport to the Project site; transport into the underground chambers; installation; and commissioning and handover
9. Specialist installation techniques and/or equipment;
10. Specialist on-site fabrication;
11. Third-party or Employer hold and inspection requirements;
12. Testing and commissioning;
13. The effects on any interfacing or adjacent works; and
14. Environmental compliance

6.3 Requirements

This section summarises the construction requirements as detailed in the Construction Requirements. Refer to this document in the supplementary information to this chapter for more detail.

6.3.1 Standards and quality

Contractors were instructed that:

1. All materials and equipment shall be in compliance with the appropriate international or national standards current at the time of contract signature unless otherwise agreed by the Employer.
2. All the design, manufacture, provision, installation and construction of all permanent works shall comply with accepted standards, regulations and all statutory regulations. Wherever possible, plant and materials specified to conform to a specified standard or equivalent standard shall be clearly and indelibly marked with the reference specified.
3. The Contractor shall, before and during construction, specify all materials necessary for the construction of the Contractor's design to fulfil the minimum quality requirements for the project.
4. All materials and items of the works shall be of good quality and be suitable for operating under the local climatic and environmental conditions with due regard to the minimum specified service life.

6.3.2 Access and site coordination

Contractors will:

1. Coordinate their work with that of other contractors employed by the Employer at the site as required;
2. Allow the Employer, and other contractors the use of roads, scaffolding and other temporary works or services;
3. At every place of work, provide proper drainage, lighting and ventilation for the Employer's inspection of the works;
4. Not unreasonably withhold access to the Employer or other contractors engaged at the site; and
5. Allow the Employer access to the works to inspect the works.

6.3.3 Construction methods and materials

1. Where requested the Contractor shall submit to the Employer for review, full
details concerning the methods, environmental management, WH&S management, equipment and materials proposed for a section of the work or installation.
2. Such method statements will be reviewed continuously by the Contractor during the works and updated or revised as appropriate. The Contractor

will advise the Employer when any substantial changes are to be made to the method statement.

3. If, however any equipment, appliances, types or quality of temporary works such as scaffolding, forms, safety provisions, environmental controls, etc., are in the opinion of the Employer, either unsafe or unsuitable, the Employer will instruct the Contractor to replace or modify the item or items concerned.

6.3.4 Testing of materials

All materials and plant shall be of new manufacture.

The works shall be executed in a controlled and workmanlike manner and shall be designed to recognised international standards for the class of duty specified.

Unless otherwise stated or accepted by the Employer, all testing shall be carried out and interpreted in strict accordance with the methods specified in the relevant standards.

The Contractor will furnish all designated information about the materials, equipment and work, which the Contractor proposes to incorporate in the works, including copies of orders and material or equipment lists if requested.

Before placing an order for materials for incorporation in the works, the Contractor shall submit to the Employer, if requested, the names and details of the suppliers and sample materials for the Employer to test. The Employer may direct the Contractor to test materials.

The Contractor will notify the Employer where materials and equipment are manufactured or stored to facilitate inspection and dispatch.

The Employer will test materials if it chooses, with the Contractor's assistance. But the Contractor must still make all necessary tests. The Employer may accept a certificate from an accredited third-party testing laboratory, a manufacturer's type certificate, a mill certificate or service record, if appropriate and all test and other requirements are met.

Unless otherwise specified, all proprietary materials shall be used and placed in strict accordance with the relevant manufacturer's instructions.

6.3.5 Use of the Site

General

Specific areas have been designated as working areas, quarrying operations, borrow pits, excavated material dumps, offices, workshops, camps, storage, batch plants, etc and will be fenced. Additional or alternative site areas shall be subject to the prior consent of the Employer. All permanent works shall be located within the Site.

The site boundary will be fenced, with additional security fencing around buildings and sensitive facilities. All roads external to the fenced-off areas of the site shall be deemed to be public roads and subject to applicable laws and regulations.

The Contractor shall not use the site for any purpose other than that of executing the Works or for that purpose for which it has been designated and shall confine operations to within these areas.

Natural materials and structures

Earth, stone, gravel and sand, and all other materials excavated or existing on the site or the access roads, shall not become the property of the Contractor but will be at their disposal only so far as such materials are suitable for use in the works. Existing structures on the site or the access roads shall remain the property of the Employer and, except as and to the extent required elsewhere in the contract, shall not be interfered with by the Contractor in any way.

Rights of way

Any existing rights of way, tracks or roads running through the site shall be diverted around the site or closed to prevent unauthorised access. Such rights of way, tracks or roads shall be kept open at all times except for short periods when construction activities (such as surface blasting) require closure for safety reasons.

6.3.6 Temporary works

General

Temporary works will be within the project boundaries. The Contractor is entirely responsible for temporary works and care of the Site. The Contractor will reinstate the ground after temporary facilities are removed (including fencing).

Electricity supply

The Employer will supply the electric power network connection points at 33 kV to the site at Tantangara Reservoir, Lobs Hole and the Plateau. The Contractor will be responsible for entering into connection agreements with the local network service providers during construction.

All services installed by the Contractor will be underground. Some distribution cables will be retained for permanent power.

Site preparation

Site preparation comprises clearing, grubbing and removal of refuse, surface vegetation and topsoil. The Contractor will submit its plans for review before the start of site preparation. The Contractor will conform to applicable codes, standards and regulations.

The Contractor will:

1. Identify and protect plant life and features to be retained;
2. Preserve vegetation and minimise impact outside cleared areas;
3. Identify waste and salvage areas for removed materials;
4. Preserve markers and monuments; and
5. Dispose of and stockpile materials as specified.

6.3.7 Materials testing

The Contractor will:

1. Establish, staff and maintain a materials testing laboratory accredited to ISO 17025;[8]
2. Maintain a database of test results, which will be submitted monthly and provided in full with the operations and maintenance manuals;
3. Ensure any laboratory used for off-site testing is also accredited to ISO 17025.

6.3.8 Control of water

The Contractor will:

1. Prepare a soil and water management plan;
2. Design, construct and maintain all diversion and protective works for water drainage and ingress protection;
3. Remove all such works unless otherwise specified on completion;
4. Design, construct and maintain all necessary dewatering systems;
5. Design, construct and maintain water and soil control facilities to prevent discharge of water containing pollutants or suspended materials in accordance with the principles detailed in the Construction Requirements;
6. Discharge water only where it cannot re-enter the works or cause erosion, pollution or nuisance to anyone;
7. Dispose of waste oil appropriately;
8. Implement any required pollution control measures before any work;
9. Comply with regulatory tests for any effluent discharged into watercourses;
10. Regularly test effluent/discharge quality as specified;
11. Design and construct fuel and hazardous material storage to relevant standards, including:
    a. Collection of drainage in sumps;
    b. Management of contaminated soil;
    c. Oil skimming facilities and disposal of oil;
    d. Design, construction and operation of sedimentation ponds and disposal of sediment;
12. Construction and maintenance of silt fences.

[8] (International Organization for Standardization 2017)

6.3.9 Surface excavation and earthworks

The Contractor will:

1. Protect threatened flora species and trees marked for preservation during clearing and road construction;
2. Remove and stockpile topsoil for reuse in landscape treatment;
3. Dispose of other stripped and excavated material in appropriate disposal areas, demarcated as necessary;
4. As far as practicable reuse suitable excavated material in the works;
5. Undertake staged excavation until suitable foundation is reached, within the specified lines, grades and dimensions;
6. Undertake local surface excavations including trenches, pits and footings;
7. Backfill where required to address seams, cavities or other defects, including areas below the general level of foundations where over-excavated or permeable or eroded features are present;
8. Take all necessary precautions to preserve completed works or material outside excavations;
9. Monitor and minimise ground vibration;
10. Prepare a management plan and take all necessary precautions against exposure to Naturally Occurring Asbestos (***NOA***) and acid metalliferous mine drainage (***AMD***) (see *Supporting Chapter Eleven* for further discussion of these two issues);
11. Use pre-splitting and blasting methods approved by the Employer;
12. Clean off foundations for inspection where required;
13. Obtain and place backfill and gravel as specified.

6.3.10 Protection and support of surface excavations

The Contractor will:

1. Protect excavated surfaces from deterioration using the methods specified;
2. Support excavations against structural failure using the materials and methods specified;
3. Carry out soil conservation measures at the locations and using the methods specified.

6.3.11 Drainage

The Contractor will design, excavate, protect and maintain a system of drains of the types and with the protection methods specified.

6.3.12 Underground excavation

General

All underground elements must meet the specified requirements.

Excavation inspection, geological mapping and selection of excavation support

The Contractor will:

1. Regularly inspect all underground excavation works in accordance with an underground inspection plan, including geological mapping and logging;
2. Agree on ground classification and excavation support at each advance as defined in the GBR;[9]
3. Perform probe drilling (drill & blast) and probe drilling/geophysical methods (TBM) as applicable to assess ground conditions and review and agree on any rock support measures;
4. Submit investigations for review by the Employer;

General terms

The Contractor will:

1. Only carry out temporary excavation works with prior approval and with backfill and restoration;
2. Systematically perform scaling and cleaning prior to applying support or sprayed concrete;
3. Reuse excavated materials or dispose of them according to the requirements;
4. Comply with noise and vibration requirements.

Lighting, communication and service pipes

The Contractor will:

1. Comply with the *Code of Practice - Tunnels under construction* for lighting;[10]
2. Install both a main and emergency communications system;
3. Install and furnish all necessary service pipes and accessories.

Ventilation

The Contractor will:

1. Design, furnish, install and maintain a ventilation system. The system will meet the requirements of the *Guide for tunneling work* and *Code of Practice - Tunnels under construction*.[11] The Employer will review the design. An independent verifier will verify the design;
2. Provide measurement equipment and measure contaminant concentrations both systematically and as directed;
3. Take additional ventilation measures if measurements do not meet requirements;
4. Show proof that diesel-powered equipment meets requirements, and not use gasoline or LPG-driven engines underground; and

[9] See *Supporting Chapter Thirteen* (technical) and *Supporting Chapter Three* (contractual).
[10] (Workcover NSW 2006).
[11] (Safe Work Australia 2013).

5. Install and respond to a lightning detection and alarm system for any portal used to access a working face during drilling and blasting operations.

Survey and alignment

The Contractor will:

1. Be responsible for meeting indicated and required tolerances;
2. Submit a setting out method statement and make checking opportunities, readings and calculations available to the Employer; and
3. Monitor the work and address deviations.

Care of water

The Contractor will:

1. Provide temporary flood protection works, settlement ponds and other contamination prevention measures;
2. Submit design and full details for flow measurement and dewatering;
3. Collect and drain construction water and groundwater to discharge points, with a system including:
    a. A complete dewatering system;
    b. Adequate pumping capacity;
    c. Protection of water-sensitive materials and plastic concrete;
    d. Installation of permanent drainage measures; and
    e. Flow and discharge measurement.

6.3.13 Underground excavation by drill and blast method

The Contractor will:

1. Obtain all necessary licences, comply with regulations and requirements of external agencies, and conform to the relevant standards and codes of practice;
2. Submit a blast management plan and give advance notification of any blast;
3. Meet requirements for blasting technique; and
4. Repair any damage caused by blasting.

6.3.14 Tunnel excavation by tunnel boring machine (TBM)

The TBM(s) and backup machinery will:

1. Comply with applicable standards;
2. Be designed, constructed and operate to the stated requirements for each TBM type (main beam, single shield or double shield) and general requirements;
3. Allow the Contractor to explore ground conditions ahead of the face, and collect the specified information for communication to the Employer;
4. Have all necessary equipment to:
    a. Install required temporary and permanent ground support solutions;

   b. Keep personnel safe while operating and installing ground support;
   c. Automatically detect and suppress fires.
5. Be monitored by CCTV;
6. Include a laser guidance steering system;

The Employer will inspect and observe no-load testing at the TBM manufacturer's site before shipping. The Contractor must not abandon the TBM underground without the Employer's approval.

6.3.15 Protection and support of underground excavations

The Contractor will:

1. Furnish, test, install and maintain temporary and permanent ground support as required and specified to ensure safety and the stability of underground excavations; and
2. Provide adequate instrumentation to validate ground support condition and performance.

The Contractor may:

1. Undertake emergency ground support measures without prior approval.

6.3.16 Drilling and grouting in underground works

The Contractor is expected to use its judgement/expertise in selecting drilling and grouting methods and materials. But the Contractor will:

1. Submit a detailed drilling and grouting method statement;
2. Keep daily records and provide daily reports;
3. Submit detailed logs, results and notifications of:
   a. Drill holes;
   b. Water-soluble drilling water additives; and
   c. Pressure test results.
4. Provide a monthly report;
5. Undertake all types of drilling and manage water ingress as specified;
6. Keep the specified records;
7. Manage and test leakage, water inflow and water pressure as specified;
8. Use casing only as specified;
9. Manage and deliver drill cores to the Employer as specified;
10. Undertake grouting using equipment, materials and methods as required and specified; and
11. Train personnel and provide seminars on grouting procedure.

6.3.17 Concrete production and construction

The Contractor will:

1. Supply, install and operate a suitable plant for the required quality and volumes of shotcrete for the works, as proposed at tender;

2. Manufacture and supply all concrete in accordance with AS 1379;[12]
3. Supply and maintain a cooling plant to deliver mixing water at the required temperatures and quantities;
4. Install, maintain and operate a communications system accessible to the Employer;
5. Manufacture, test and place concrete in the appropriate conditions and to the applicable standards, design mix and properties;
6. Test, transport, store, handle and use cement and supplementary cementitious materials to the applicable standards;
7. Supply, manufacture, test and use aggregate to the applicable standards, design mix and properties;
8. Construct, transport, place, cure and erect the following by the applicable agreed methods and to the required standards and tolerances:
    a. Concrete structures;
    b. Formwork;
    c. Precast and prestressed units;
    d. Precast concrete segments for tunnelling; and
9. Manufacture, supply, deliver and apply shotcrete by the applicable agreed methods and to the required standards and tolerances.

6.3.18 Embankment construction

This section is relevant to the rockfill embankment leading to the intake gate structure at Talbingo.

The Contractor will:

1. Include settlement allowance in the final profile;
2. Excavate and prepare foundations to requirements;
3. Obtain general fill from TBM tunnel excavated material where possible, and place material to the requirements;
4. Obtain filter material from TBM process, excavations or approved sources, test, place and compact to requirements;
5. Obtain riprap material from excavations or approved sources, test, place and compact to requirements; and
6. Submit a proposed quarrying method and operate a rock quarry to obtain materials.

6.3.19 Instrumentation

The Contractor will:

1. Undertake all necessary activities to make instrumentation and associated infrastructure operational to requirements at the earliest practicable time;
2. Submit details of proposed instrumentation and its installation program prior to procurement;
3. Prepare surveys and as-built drawings of installed instruments;

[12] (Standards Australia 2018).

4. Procure, test, store, install and calibrate all instruments, ancillary equipment, parts, fittings and tools to requirements and specifications;
5. Implement a global instrumentation reference system (***GIR***);
6. Protect installed instrumentation as required;
7. Care for and maintain instrumentation during construction;
8. Read and monitor instrumentation from installation until taking over at the required frequency;
9. Submit all functional test records to the Employer;
10. Undertake an excavation performance review (***EPR***) if and when indicated;
11. Conduct geotechnical monitoring meetings;
12. Furnish O&M manuals for all instrumentation;
13. Supply, install and survey all surface movement points;
14. Install an automatic data acquisition system (***ADAS***), portable readout units and associated computer hardware and software.

6.3.20 Building construction

The Contractor will, generally:

1. Neatly finish edges and surfaces around pipes, conduits and fittings;
2. Not commence finishing work until required conditions have been met;
3. Prepare trial panels for plastered, tiled or painted finishes;
4. Single-source tiles and floor sheeting of a given type;
5. Plate chromium-plated items to requirements;
6. Prevent contact between dissimilar metals;
7. Protect concrete, fittings and finishes;
8. Furnish and install materials and finishes to requirements;
1. Submit shop drawings and samples when required.

6.3.21 Corrosion protection and coatings

The Contractor will:

1. Furnish, prepare and apply all material for cleaning, corrosion protection, and coating of all surfaces to requirements;
2. Submit samples and information for review where required;

The Contractor may use different products if they meet requirements.

6.3.22 Structural steelwork

The Contractor will:

1. Fabricate, weld, erect and test structural steel and associated fittings and finishings in accordance with the applicable standards and requirements;
2. Submit shop drawings if required;
3. Submit all structural steelwork documentation as requested or required by the Contract;

4. Store and handle materials to requirements at all times including materials supplied by others;
5. Use materials of the applicable standards;
6. Not change shop drawings after submittal.

6.3.23 Road and bridge construction

The Contractor will:

1. Design, construct and maintain new access roads and take over and upgrade existing access roads where required;
2. Construct roads, bridges and associated infrastructure in accordance with NSW Roads and Maritime Services (Roads and Maritime) Specifications.

6.3.24 Underwater excavation

The Contractor will:

1. Perform all underwater excavation work required for the construction of the inlet approach channels to the intake structures of the power waterway to requirements;
2. Use an excavator, suction dredging or other suitable means;
3. Comply at all times with the CEMP;
4. Submit a detailed method statement before commencement;
5. Dispose of excavated material in designated disposal areas;
6. Confirm approach channels are to requirements before demobilising dredging equipment;
7. Dispose of vegetation to requirements;
8. Undertake surveys and submit survey results to the Employer as required;
9. Remove silt from the channel prior to taking over.

6.3.25 Landscaping

The Contractor will:

1. Submit a project-specific landscape management plan (***LMP***);
2. Collect native vegetation seed within the site and KNP;
3. Establish, operate and maintain an on-site nursery;
4. Protect any trees identified for protection;
5. Time works to requirements;
6. Undertake weed control to requirements;
7. Manage other aspects of landscaping, including:
    a. Vegetation clearing;
    b. General site preparation;
    c. Slope stabilisation;
    d. Topsoil management and placement;
    e. Compost;
    f. Mulch;
    g. Treatment to permanent spoil and waste areas;

h. Grass stabilisation and native seed application;
i. Planting;
j. Fences and barriers;
k. Drainage; and
l. Maintenance.

6.3.26 Explosives

The Contractor will:

1. Bear full responsibility for obtaining and maintaining licenses, approvals for its handling, storage and use of explosives by ensuring compliance with the conditions imposed through those licenses by the relevant Authorities, and will provide documentary evidence to the Employer of compliance; and
2. Develop a Blast Management Strategy (***BMS***) to requirements.

7 Human resources and industrial relations (HR/IR)

7.1 Overview

The Contractors will be accountable for ensuring that their own employees and subcontractors comply with the standards as iterated in the Employers Requirements, and follow contemporary practice in Industrial agreements. Contractors must ensure their personnel are performing and complying with Snowy Hydro's expectations defined by the agreements and regulations.

The contracts negotiated with the Principal Contractor will consider and address clauses which hold the contractor accountable to the desired standard and provide sufficient rights for Snowy Hydro to satisfy itself that the Contractor is not exposing Snowy Hydro to employment-related, industrial relations or reputational risk.

7.2 Contractor workforce planning

7.2.1 Overview

Planning, recruiting and mobilising the construction workforce is the Contractor's responsibility.

This section will outline current assumptions for the staffing requirements of the contractor workforce focusing on:

1. Defining the peak of the workforce during the Project; and
2. Defining the headcount on the Project during the various phases of work.

The intent of gathering a clear view of the size of the contractor workforce on-site during the Project is to understand the potential accommodation requirements and any other relevant planning needs.

7.3 Contractor workforce levels

This section describes the construction workforce expected to be present on-site.

The Contractors' workforce will be accommodated in suitably-located construction camps, with Fly-in/Fly-out (***FIFO***)/Drive-in/Drive-Out (***DIDO***) arrangements. This approach will limit the environmental and community impacts of a sudden and temporary population influx.

Due to the current expectations of remote workers, the camp facilities requirements will include quality downtime amenities for the Contractors' workforce.

The workforce will work 24/7 on a variety of potential rosters. Details of the exact rosters will be determined post-tender award and upon negotiation of the Project Agreement.

The largest movement of contractor workforce numbers will be evident during the second and third year of the Project when the construction phase commences in earnest. The infrastructure of the communities, campsites and other areas where this workforce may impact will need to be in place ahead of time, carefully managed and operated to ensure minimal damage and disruption as per contract conditions.

In later years, the workforce decreases as the Project moves from construction into commissioning and handover of the Facilities. The workforce numbers will continue to decrease gradually until the Principal Contractors have both fully demobilised. The remaining workforce numbers on the Project will consist of the Owner's Team and essential Contractor personnel (eg supporting any required post-completion activities).

7.3.1 Labour types (Construction)

It is the responsibility of the Contractor to determine contractual agreements, remuneration packages and working conditions applicable to the construction workforce in accordance with Australian employment standards.

7.4 Camp and other accommodation

Camp quality and facilities are critical to good employee/industrial relations. Of particular importance is the trade-off among workforce satisfaction, affordability, transience and productivity.

Other factors considered included the ability of the camp to scale up and down according to demand, and being located appropriately to minimise unproductive time while also minimising impact on the Kosciuszko National Park (***KNP***).

The Civil Contractor will be both the constructor and operator of the camps on behalf of Snowy Hydro, the E&M Contractor, and other contractors and visitors.

The camp will be sized to accommodate all workers and camp staff, even when on shift, without hot-bedding, and with limited spare capacity. Accommodation will be air-conditioned single-person quarters with ensuites.

Personnel will park off-site and use a bus shuttle service to move on-site (limiting fatigue and vehicle movements within the Park).

Buildings will be transportable modular-type (no permanent construction), and will be removed on completion, with the site fully rehabilitated. [13]

7.5 End of roster travel

Many of the workforce will be employed on FIFO/DIDO arrangements and, travel at the commencement and completion of swings.

Given the remoteness of the site, travel times for personnel working FIFO/DIDO who return to their home base may be significant, and thus negatively impact the attractiveness of the Project for personnel based anywhere other than the mainland East Coast of Australia.

Road travel time from the Project site (nominally Lobs Hole) to Canberra (the nearest airport offering high-frequency services) is in the order of 3-4 hours.

[13] Note that this assumption may be reconsidered given factors such as legacy considerations for KNP and preserving optionality for future expansions.

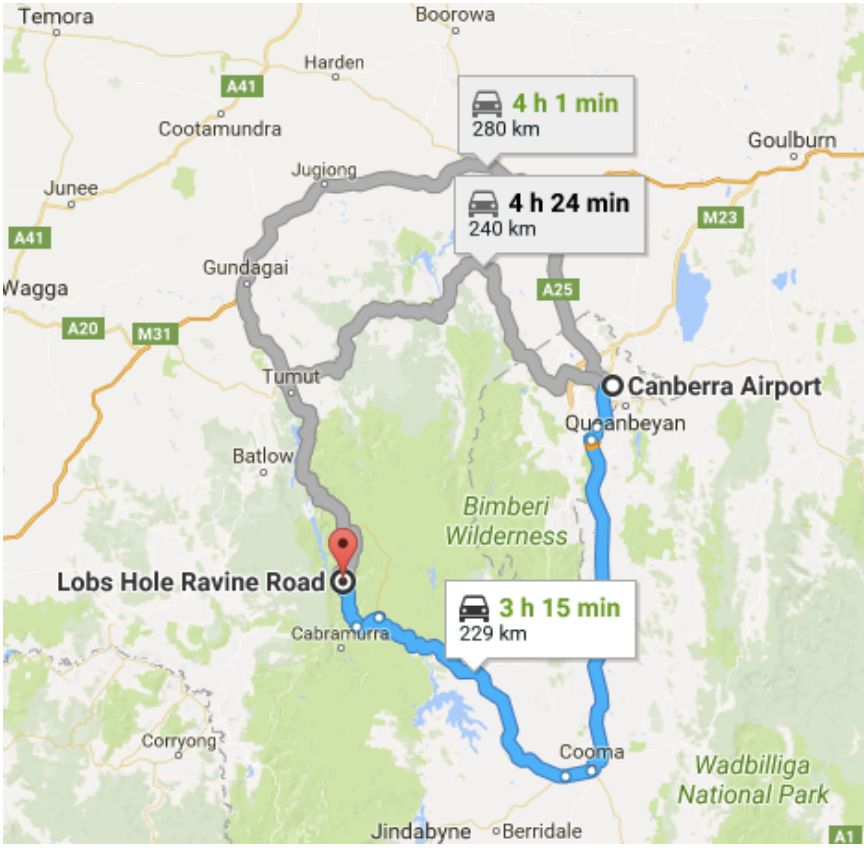

Figure 2: Road travel options - Work sites to Canberra (Google Maps)

In managing the safety risks, social, and environmental impacts associated with the expected high volume of road traffic, Contractors must consider a range of mitigation strategies, including alternative rosters, mass transport (eg buses) or the option of running charter flights from Cooma

7.6 Overview

The contracts negotiated with the Principal Contractors will need to consider and address clauses which hold the Contractor accountable to the desired standard and provide sufficient rights for Snowy Hydro to satisfy itself that the Contractor is not exposing Snowy Hydro to reputational, employment-related or industrial relations risk.

The key issues and risks of concern to Snowy Hydro include:

1. Employee relations with Snowy Hydro employees (both employed in the Project and in existing operations).
2. Employee relations with the contractor workforce;
3. Establishment of a Project agreement; and
4. Code for the Tendering and Performance of Building Work (***Building Code 2016***).

7.7 Building Code 2016 obligations

All Contractors will be required to be in compliance with the Building Code.

7.8 Employee relations (contractor workforce)

7.8.1 Overview

The Contractor's Personnel will be solely the responsibility of the Contractor.Snowy Hydro will maintain minimal involvement in interactions with the contractor workforce. Snowy Hydro will ensure all reports of issues or compliance breaches in respect to the contractor workforce are raised directly with nominated personnel within the Contractor's management team. While the Principal Contractors will be responsible for their workforces, some specific considerations have been made regarding direct impacts on the Project:

1. In accordance with the Contractor's obligation to comply with applicable laws, Contractor personnel are to be employed according to the minimum employment standards as defined by the appropriate laws relevant within NSW and the Commonwealth;
2. A mechanism must be provided for the Contractor to advise Snowy Hydro of personnel performance issues perceived to be impacting the Project or Snowy Hydro directly. The specific process for reporting will be determined in consultation with the Contractor; and
3. The Contractor must take all reasonable steps to enforce adherence to all designated Project policies, procedures and codes of conduct including expectations of behaviour when on-site, in KNP or in the nearby communities.

It is assumed compliance with policies and code of conduct breaches will be managed by the Contractors through their relevant contract administration process and handled through similar mechanisms by which other contractual violations occur. This approach will place full responsibility for conduct with the Contractors while providing a mechanism for addressing non-compliance. Decisions on termination or other disciplinary procedures will be entirely those of the Contractor.

The Principal Contractor workforce will introduce different unions on-site. Managing the union's relationship is the sole responsibility of the Principal Contractor. Snowy Hydro will continue to engage with its unions on a regular basis to ensure they are informed of Project status and Snowy Hydro remains informed on the sentiment of personnel on collective agreements allowing for early identification of any unforeseen issues.

7.8.2 Establishment of a Project Agreement

Industrial agreements covering the Project workforce will be established by the Contractors. Snowy Hydro will rely on the experience and knowledge of the Contractors to ensure that these agreements reflect contemporary practice.

7.9 Human Resources (HR) Management Plan

7.9.1 General

The Contractor will have thorough selection and rejection criteria for employment of personnel and subcontractors based on previous experience and knowledge of individual or subcontractors' experience and work history.

7.9.2 Personnel and resources

The Contractors will employ suitably qualified and experienced HR personnel to ensure a harmonious, efficient working culture on the Project through to completion. The Contractors will make best efforts to retain these people throughout the duration of the Project and if not then to replace them with equivalent people.

The Contractor's proposed personnel and HR organisation structure were submitted with the tender and were being evaluated as at FID.

7.9.3 HR Management Plan

The Contractors were required to produce a comprehensive HR Management Plan that includes:

1. Sourcing and recruitment strategy;
2. Contracts of employment;
3. Pre-employment medicals;
4. Onboarding of personnel;
5. Training and competencies;
6. Proposed rosters;
7. Mental and physical wellbeing of individuals and the provision of Employer Assistance Programs; and
8. Disciplinary and grievance procedures.

7.10 Workplace Relations Management Plan

7.10.1 General

The Employer expects that the Works will be completed with no or minimal disruptions due to employment or industrial relations issues. The Employer requires effective management of employment and industrial relations issues and risks to be a priority during both the planning and carrying out of the Works.

The Employer expects that the Contractor's management of employment and industrial relations matters in connection with the Works:

1. Aims to achieve a stable working environment;
2. Promotes safe, productive, and efficient work practices to achieve the timely completion of the Works;
3. Provides flexible work practices that support minimising disruption to nearby communities;
4. Minimises lost time and disruption;
5. Ensures ongoing compliance with all Industrial Relations Laws and Commonwealth requirements such as the Building Code;[14]
6. Does not compromise the successful completion of the Works on time and at an acceptable cost; and
7. Will be in the best interests of the Project.

7.10.2 Organisation

The Contractors will include in their organisation structures a suitably experienced and qualified IR Manager and sufficient administrative staff and assistants to manage all IR issues on the Project through to Completion.

7.10.3 Other Parties

The Contractors will work closely with the Employer and each other to align HR/IR policies and procedures across the Project.

The Civil Contractor will arrange monthly IR meetings with the Employer and the E&M Contractor to discuss any IR related issues on the Project, or elsewhere in the Contractors' organisations or within Australia, that may impact on the Project. Such meetings will be used to plan any necessary actions that may be required from the Parties to prevent any possible impact on the Project.

At the first meeting the Parties will nominate members from both on and off-site, including any consultants or specialists, that will form an IR Action Group. The Contractor, in conjunction with the Action Group, will draw up an IR Action Plan to be used in the event of an IR incident. The plan will be approved by the Employer within 90 working days of Commencement of the Works.

In the event of an IR Incident on site that threatens to impact the whole of the site the Contractor will convene the IR action group composed of relevant members from the Contractor, the Employer and the E&M Contractor with support from the Contractor's off-site experts.

7.10.4 Workplace Relations Management Plan (WRMP)

Obligations in relation to the WRMP

The Contractors were required to:

[14] (2016).

1. Ensure that the WRMP complies with applicable industrial relations laws, and the requirements;
2. Ensure that the WRMP demonstrates how employment and industrial relations issues and risks related to the Works are managed; and
3. Prepare, submit and resubmit a WRMP to the Employer for review.

Content of the WRMP

The Contractors were required to ensure that the WRMP is a single document for the whole of the Works and includes:

1. Workplace arrangements and compliance;
2. Productivity measures – measuring productivity:
3. The approaches that have been, or will be, adopted to develop and maintain a productive workforce;
4. How productivity will be objectively measured, monitored and recorded on the Project;
5. Other parties and lines of communication;
6. Workplace relations risk and past experience; and
7. Building Code compliance.

Updating the WRMP

The Contractor will review, and if necessary amend or update, the WRMP periodically or when triggered by a specified event.

7.10.5 Monthly IR Report

The Contractors will prepare and submit to the Employer a monthly IR report from the Commencement Date until the issue of the Performance Certificate, identifying any issues that have arisen in the previous calendar month that have or could give rise to non-compliance or notification obligations.

8 Information management (IM)

8.1 Context

Information management (***IM***) will be a central part of the Project. It is essential that all aspects of the work are of the required quality to ensure that the high performance and longevity of the completed Facilities are maintained and that unplanned maintenance and repair is minimised for the lifetime of the asset. It is also essential that information generated and obtained in the course of the Project is captured in a structured way to inform the future operation of the Facilities.

However IM requires a collaborative approach.

A comprehensive IM and control system will be needed to ensure the appropriate processes are followed and records are kept.

8.2 General requirements

The Conditions of Contract (see *Supporting Chapter Three*) set out the the Contractors' obligations in respect of documents. Additional obligations on the Contractors are set out in the Employer's Requirements and summarised here.

The Contractors will:

1. Supply all information deliverables to the Employer; progressively throughout the Project.
2. Comply with all information conventions agreed with or specified by the Employer;
3. Supply all information to the Employer in digital format only;
4. Maintain their own comprehensive IM and control system to ensure the appropriate processes are followed and records are kept;
5. Implement and maintain systems and processes to ensure information is secured from unauthorised access, modification or destruction;
6. Attend and participate in any regular and ad-hoc meetings organised by the Employer regarding IM items;
7. Make available any information that the Contractor is required to keep on the Site electronically, indexed and appropriately tagged with metadata to facilitate the right of access by the Employer's personnel;
8. Render all necessary assistance to the Employer, at their cost, in accessing any required information and ensure all information will be readily available to the Employer on demand.

8.3 Contractor's IM plan

The Contractors were required to provide and implement an IM plan, prior to any works commencing, and subject to the Employer's review and approval, that meets the following requirements:

1. Provide an overview of the Contractor's IM methodologies, including document control;
2. Detail and describe how the Contractor will address the Employer's IM requirements;
3. Describe how information will be managed during the Project;
4. Demonstrate how the Contractor has considered *SA/SNZ HB 168:2017 Document Control* in the preparation of their plan,[15] and how the Contractor intends to use the guidance provided in that handbook; and
5. Define Contractor roles and responsibilities for IM during the Project, including handover.

This IM plan will be considered a live document which may be continuously improved throughout the Project. All changes will be reviewed and approved by the Employer prior to implementation.

[15] (Standards Australia 2017).

8.4 Building IM (BIM)

As previously noted in the Feasibility Study Report, Engineering Data Management (***EDM***) is trending towards a whole-of-asset perspective on information where information captured during the design and construction process is incorporated in a developing model of the operating asset, in operation, the complete maintenance, design and construction history of an asset is readily available. While BIM is emerging as a recognised approach in this space, many challenges remain.

As at FID, Snowy Hydro has taken its BIM planning to a conceptual level only, with the expectation that the Contractors will have clear views and recommended approaches in this space.

Snowy Hydro's requirements for BIM will apply to both Civil Works and E&M Contractors.

It is important to the Employer to achieve a number of strategic priorities and objectives through BIM, including:

1. Supporting the design, construction and operation delivery to reduce risk and improve efficiencies;
2. Ensuring both Civil and E&M Contractors have a common understanding of and compliance with Snowy Hydro's requirements;
3. Providing the models to demonstrate compliance with these requirements. Including statutory information requirements, regulations and standards;
4. Providing accurate as-built digital records that can be integrated for O&M with existing Scheme assets; and
5. Creating an Asset Information Model (***AIM***) suitable to enhance and integrate with asset management and maintenance systems.

For shared benefit of BIM, the Contractors were required to align their aspirations with those of the Employer, including:

1. Improved accuracy and consistency of design information;
2. Improved multidisciplinary design coordination and reduced variations during construction;
3. More efficient visual communication of design intent for better informed decision making;
4. Provision of models and information that will support O&M;
5. Improving visual communication and optimisation of construction phasing and sequencing;
6. Improved cost certainty and predictability;
7. Design brief & scope extraction & clarification; and
8. Creation of an AIM.

The Contractors were required to develop and implement a BIM Execution Plan (***BEP***) based on the Employer's Information Requirements (***EIR***). This will cover requirements to execute BIM efficiently through all phases of the Project,

including the contractual alignment, the model uses, meetings and milestones, model collaboration and coordination, and model standards and quality assurance. This BEP will form part of the final Project IM plan developed in collaboration with the Contractors.

The Contractors were further required to provide all information to the Employer produced to the level of development (***LOD***) specified in the Project Execution Requirements. This will be proposed at elemental level by the Contractor and agreed with the Employer prior to 3D virtual models being produced.

The processes and approach to project delivery are to be to the principles of *PAS 1192-2:2013 Information Modelling maturity Level 2* and will be detailed in a Master Information Delivery Plan (***MIDP***) outlining how information is shared and managed in a Common Data Environment (***CDE***).

The Employer understands that an ISO BIM Standard is currently being developed and may choose to adopt it or some aspect(s) of it when it is published.[16] The Contractor's BEP will, as a minimum:

1. Propose a strategy for creating and updating the BIM AIM;
2. Propose how the BIM AIM will be handed over to the Employer;
3. Propose the asset information data set to be captured on site; and
4. Propose their methodology for capture.

After the Commencement Date, but before the commencement of detailed design, the Employer and the Contractor will agree in detail the systems, tools, protocols and standards that the Contractor will apply to BIM.

The BIM AIM will include all geometry and physical characteristics needed to describe the entire project.

As part of the BIM AIM, the Contractors will develop and maintain their own Geographical Information System (***GIS***) or other geospatial model of the Site so that as the Contractor's works progresses, the Contractor progressively builds an as-built geospatial model of the Site to inform future plant operations.

The Contractors will ensure that existing models can be integrated into and compatible with their model. The systems, structure, format and handover requirements for this model will be agreed between the Employer and the Contractor prior to the commencement of site activities. The Contractors were required to make relevant parts of this model available to the E&M contractor for the purposes of survey and setout. Following completion of the MPDT, the Contractor and Employer will agree model accuracy tolerances for each element to inform and rationalise necessary sight surveys and model reconciliation.

The BIM AIM will be supplied progressively via the CDE throughout the Project with the final handover provided at an agreed time with the Employer. This final

[16] See (International Organization for Standardization).

handover of the AIM and associated information will be able to be integrated into the Employer's asset management framework and systems.

Further to the Conditions of Contract, the Contractors will maintain the AIM in accordance with BIM requirements up to and reflecting the execution of the as-built status of the Works. By this time, the BIM AIM will be updated to the as-built condition to the tolerances agreed to within the BEP as developed by a suitable BIM authoring platform. All as-built records will be published from the AIM.

9 Procurement and Logistics

9.1 Overview

It is expected that the Contractors will maintain full control over their supply chain for the term of the Project. The Contractors' approach to transport, logistics and materials control is tightly bound to their preferred construction methodology, particularly given the significant volumes of material that must be moved for the Project.

There are specific areas, though, where Snowy Hydro intends to have a more active involvement.

9.2 Licences, Permits and Approvals

The Contractors are expected to import significant volumes and value of equipment and materials into Australia. Items to be imported may include tunnelling equipment (including potentially TBMs and raise bore rigs), structural steel and rebar, and many of the major E&M equipment items.

While the Contractors are expected to be fully competent to manage temporary import and export of equipment, they may require assistance from Snowy Hydro as the final recipient of the permanent equipment to be installed.

In establishing the Owner's Requirements, Snowy Hydro will set clear obligations on the Contractors in respect of importation of permanent equipment, particularly for accurate reporting of duty due and paid, tracking and reporting of GST, obtaining and passing on the benefits of tariff concessions, and reporting against the AIPP.

The Contractor will be expected to regularly report on manufacturing, testing, inspection, release and shipment progress for manufactured plant and materials.

9.3 Access and traffic

Under the EPC contract, site access and traffic management are typically the contractor's responsibility. As described in *Chapter Thirteen*, a significant amount of access road development (including some river crossings) will be required in

order for the Contractor to access the Site. While many of these roads will be essentially private roads, at least some will be public or shared-use. During execution of the Works, traffic management on the construction site and on the public roads will be the responsibility of the Civil contractor.

Snowy Hydro must be kept fully informed of the Contractor's plans for the use of public roads, or anywhere public amenity may be impacted by the Project, in order to manage external affairs and stakeholder engagement.

Snowy Hydro expects:

1. All vehicles used for the movement of freight will be inspected and approved by the Contractor;
2. The Contractor will plan off-site traffic movements to minimise risk and disruption to local communities; and
3. Where road transport is unavoidable, the Contractor will use every reasonable means to ensure that it prevents any roads, bridges, power lines and other structures communicating with or on the routes to the Site from being damaged by any of its traffic, and will select routes, choose and use vehicles and restrict and distribute loads so that extraordinary traffic arising from the moving of equipment, plant and material to and from the Site will be limited as far as is reasonably possible and no unnecessary damage caused.

Transport, logistics and material control will be within the scope of the EPC Contractors. This includes management of trucking in and out of KNP and people logistics. Due to the scale of the project, the Civil Contractor will look to minimise non-value-add movements of materials and maximise quality control.

9.4 Ownership of plant and materials and care of the works

Snowy Hydro has no intention to take ownership or assume responsibility for any of the Contractor's Equipment or Temporary Works. The Contractor will be responsible for removal of all plant at the end of the Project .

A further consideration is to determine the appropriate International Chamber of Commerce (***ICC***) Incoterms® to be applied to goods in transit.[17]

9.5 Staging and laydown

Contractors are expected to make extensive use of staging and laydown facilities to manage the significant volumes of materials entering and leaving the sites. Key considerations include:

1. Use of off-site staging and consolidation sites;
2. Proximity to work fronts;
3. Minimisation of clearance of undisturbed land;
4. Minimisation of new road construction; and

[17] See https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-rules-2010/.

5. Access onto main roads.

See *Supporting Chapter Thirteen - Facilities* for more discussion of temporary construction facility requirements.

The Contractors were required to provide a detailed procurement and logistics management plan including:

1. Identification and assessment of suppliers, vendors, and manufacturers;
2. Procurement and selection process to be followed;
3. Inclusion of local content where applicable;
4. Employer information as required;
5. Detailed manufacturing schedules;
6. Scheduling deliveries to meet the Project programme;
7. Advice to Employer of all abnormal or heavy loads that may impact on local traffic and/or communities;
8. Import-related permits, licenses, approvals and concessions;
9. Detailed real time tracking of all major components, plant, and equipment;
10. Specific installation or construction requirements as required; and
11. Interim payment schedules if required.

9.6 Australian Industry Participation

In line with the *Australian Jobs Act 2013*, the Employer has lodged an Australian Industry Participation Plan (***AIPP***) with the Australian Industry Participation Authority (Refer to *Supporting Chapter Two - Procurement*).

In order to support the Employer's compliance with their plan, the Contractors will assist the Employer to prepare periodic Compliance Reports for the Project phase and, if required, the operations phase of the Project. The Contractors' procurement activities will form a large part of the reportable activities for the Project.

The Contractors are required to familiarise themselves with the relevant portions of the Employer's AIPP, and to report on relevant activities as required.

9.7 Subcontractor Management Plan

The Contractors were required to provide with their tender a detailed schedule indicating:

1. Sections of work to be subcontracted;
2. Proposed subcontractors to be used if already decided or a list of proposed subcontractors to be considered for each section of work if not already decided;
3. Approximate value of each section of work to be subcontracted;
4. Approximate numbers of subcontractor employees for each section of work;

5. Detailed procurement procedure to be used for identification and selection of subcontractors;
6. The means by which the Contractor will incorporate local content and AIP Plan obligations in their Subcontractor selection process (see specific AIP Plan obligations above);
7. The means by which the Contractor will manage their security of payment obligations in respect of their Subcontractors;
8. The Contractor's processes for managing claims and administering Subcontracts;
9. The Contractor's performance management approach, including their policies and procedures for removal or replacement of non-performing Subcontractors.
10. The means by which the Contractor will ensure that subcontractors work in accordance with the HSMP and are part of the safety culture on the Project;
11. The means by which the Contractor will ensure that subcontractors work in accordance with all applicable laws, regulations, Approvals and with the Project CEMPs.

The Contractors were required to retain all records of the subcontractor selection and appointment processes and provide them to the Employer as requested.

The Contractors will keep the Employer informed of the appointment of any subcontractors, and will ensure that the Subcontractor Statements for any Subcontractor where the Contractor is a Principal Contractor (as defined in the relevant legislation) are remitted with the Contractor's progress claims in the proper form.

10 Project controls requirements

The project controls function centralises and analyses progress data from contractors and internal departments (such as accounts payable) to monitor, support and report on the management of status, risk, change, deliverables, and other information affecting the Project, within the Project's governance framework. See *Supporting Chapter Fourteen - Project controls*.

11 Design Management

11.1 Overview

Contractors will undertake design work within a Design Management Plan they will submit to the Employer for approval. The plan will detail the Contractors' scope, resources, design processes, design procedures, quality, change control and coordination with the overall IM process.

The Contractors' design process will include a 'Safety-in-Design' process that meets the requirements of the Safe Work Australia *Safe Design of Structures Code of Practice.*[18]

The design will generally seek to:

1. Eliminate major hazard risks;
2. Minimise lifecycle cost;
3. Meet compliance obligations;
4. Have reliability, risk and safety as fundamental;
5. Consider redundancy, diversity, robustness and failure tolerance;
6. Consider maintainability and safety in operation; and
7. Be supported by appropriate studies, modelling and analysis.

The Contractors will hold regular design review meetings that the Employer will attend.

11.2 Design Management Plan

The Contractors were required to prepare a Design Management Plan describing the framework to which the Contractor's Design will be prepared and submitted to the Employer, including details on scope, resources, design processes, design procedures, quality, change control and coordination with the overall IM process.

The Contractors will submit to the Employer, for review and approval, the Contractor's Design Management Plan, which will include the following:

1. Details of the Contractor's principal design engineers, including roles and responsibilities;
2. Details of the design scope of work, including breakdown of the design into work packages;
3. Design schedule, outlining the stages of design, and including Key Milestone dates for design outputs;
4. Integration of the design preparation and submission activities with the Contractor's overall IM Plan;
5. Method statements describing the Contractor's design processes, procedures and management system, including design coordination with other contractors employed by the Employer, if applicable;
6. Quality assurance measures, including design verification and audit processes;
7. Proposed form of design certification;
8. Detailed program outlining how the design outputs will meet the Employer's compliance, reliability, availability, maintainability and maintenance program requirements;
9. CAD and BIM management;
10. Design change management; and

[18] (Safe Work Australia 2012).

11. Communication procedures with respect to design issues, including design coordination with other contractors employed by the Employer, if applicable.

11.3 Safety-in-Design

The Contractors will include in their design a 'Safety-in-Design' process that meets the requirements of the Safe Work Australia Safe Design of Structures Code of Practice which will be applied throughout the lifecycle across all civil, structural, electrical, mechanical and environmental aspects of design.

11.4 General Design Philosophy

The following outlines key design requirements that will be met through the Contractor's design and design process:

1. The design will aim to eliminate major hazard risks;
2. The design will aim to minimise lifecycle costing;
3. The design will meet the Employers compliance obligations;
4. The principles of reliability, risk and safety will be fundamental to the design process;
5. Redundancy and failure tolerance will be used to achieve the required levels of systems function and performance.
6. Diversity will be applied where duty-standby or normal/emergency systems can be impacted by common cause failures.
7. Robustness will be covered by the design using adequate factors of safety, and the use of proven, reputable manufacturers.
8. All designs will take into account the requirement for the use of technology and Prescriptive maintenance.
9. Single points of failure and vulnerabilities of safety and operational critical systems will be self monitoring with the status known locally and remotely and displayed in real time.
10. Rotable/plug and play type assemblies will be designed into the system, to enable quick change-out from the system as whole assemblies while the remaining system is still in service or through bypassing.
11. All components and assemblies can be removed and replaced safely using the existing mechanical aids;
12. The design of components will be such that excessive deflections and vibrations do not occur;
13. All parts of the generating unit will be designed to withstand, without damage or deformation, runaway speed at full head for not less than five consecutive minutes;
14. Stress analysis, deflection analysis, fluid analysis and nodal vibration analysis using methods such as Finite Element Analysis (***FEA***) and Computational Fluid Dynamics (***CFD***) and other methods will be performed for major components, or heavily stressed components.

15. Fatigue life analysis and fracture mechanics analysis will be undertaken to identify critical defect sizes. The Contractors will provide full documentation of the methods used and data showing correlation between typical results obtained with the method and comparable test data.
16. The designer will include and verify in their design of steel structures a corrosion allowance commensurate with the equipment design life for all steel surfaces subject to immersion, wetting or high humidity.

11.5 Design Stages

The Contractor's design of the Works will be carried out by the Contractor in at least three (3) design stages and will include the following:

1. **Basic Design** - performed before the start of any construction work to demonstrate that the design complies with the Contract, to verify design interfaces, and to form the basis for all subsequent design;
2. **Detailed Design** - performed before the construction of the Works to establish the final technical design for the Works; and
3. **Construction, manufacturing and erection design** - performed before execution of the related part of the Works, to provide details necessary for construction, manufacturing and erection.

11.6 Reliability, Availability and Maintainability Study

The Contractors will carry out a reliability, availability and maintainability (***RAM***) study for the Project. The RAM study will provide evidence that the Design meets the Employer's Requirements by providing a model to predict the performance of the Project reliability and availability over a 25-year life.

The study will highlight the vulnerabilities that could impact the overall reliability and availability of the Project and recommend improvements where necessary.

The study will be in the form of a reliability block diagram (***RBD***) model of the entire Project (including the breakdown of systems, subsystems and equipment as necessary) in an 'as maintained' state, detailing series and parallel relationships, single points of failure, as well as common cause failures.

The modelling data used will be from a reliable source, applicable to the operating context and equipment proposed. The Contractors will provide evidence of suitability of data source.

The RAM study will be used to determine the specific system, subsystem and component redundancy for each piece of equipment to maintain function in the event of a failure, unless a stipulated minimum requirement from the Employer is a higher amount.

The Contractors will present the RAM study at the design review meetings.

11.7 Other Studies

Other required studies include:

1. Generator performance standards due diligence studies (some of these are Electromagnetic Hazards (***EMH***));
2. Protection coordination studies (LV, MV, HV schemes) (mainly electrical but some mechanical and hydraulic);
3. Earth potential rise (***EPR***) (electrical);
4. Unit and station control system factory system test;
5. Insulation coordination (lightning, switching, Electromagnetic Compatibility (***EMC***)) (electrical);
6. Electromagnetic Fields (***EMF***) (particularly the ECVT);
7. Harmonic studies (resonance, filters, dampers) (some of these are EMH);
8. Switching studies (surges, ringing, trv etc);
9. Transient phenomena (from the MH side);
10. Short circuit study;
11. Load-flow study;
12. Power and voltage stability studies; and
13. Power quality study (this has an overlap with harmonic study).

The Contractors will prepare and submit during detailed design, for Employer approval, the following studies:

1. Load-flow analysis;
2. Short circuit analysis;
3. Protection coordination study;
4. Insulation coordination study;
5. Harmonic analysis;
6. Power quality analysis;
7. Voltage and power stability study;
8. Earthing study; and
9. Electromagnetic Transient study.

11.8 Design Review Meetings

The Contractors will arrange a time suitable for both parties, and the Employer will attend Design review meetings for all parts of the Works, as the case may be, to review and present the:

1. Basic Design Documents;
2. Detailed Design Documents; and
3. Construction, Manufacturing and Erection Design Documents.

Design reviews will be conducted in accordance with AS IEC 61160-2008 (Design review).

Hazard and Operability (***HAZOP***) studies will be conducted in accordance with AS IEC 61882:2017.

The Contractor's principal engineer responsible for the design of the equipment being reviewed will be present at the design review meetings for the entire period of the meeting to present and discuss the design.

The Employer may reasonably request additional design review meetings to ensure the Contractors' Documents are fully understood.

The Contractor will facilitate design review meetings for all parts of the Works. Design Reviews will be conducted in accordance with *AS IEC 61160-2008 Design Review*.

The Contractor's principal engineer responsible for the design of the equipment being reviewed will be present at the design review meetings for the entire period of the meeting to present and discuss the design.

11.8.1 Structure of design review meetings

Design reviews will be conducted at the three key stages of design:

1. Basic design;
2. Detailed design; and
3. Construction, manufacturing and erection design.

Within each of these stages of design, the content presented to the Owner's team will be focusing on:

1. **Maintainability** - The review for maintainability will address issues during the project's design phase associated with completing expected maintenance tasks, including factoring reliability and maintenance considerations into the design basis and establishing processes ensuring minimal impacts associated with maintenance.
2. **Operability** - This review, similar to maintainability, focuses on minimising post-startup lifecycle costs of a plant and addresses plant operation, logistics and support issues during a project's design phases.
3. **Hazard and operability** (***HAZOP***) - Operations will participate in the HAZOP workshop. HAZOP reviews ensure critical safety and operating characteristics are addressed for safe and proper functioning of the completed asset. Hazard and operability (HAZOP) studies will be conducted in accordance with *AS IEC 61882:2017*.

12 Quality Management

12.1 Overview

The Contractors will be required to have comprehensive quality systems and a Quality Management Plan to provide Snowy Hydro with evidence that the Employer's Requirements have been met.

The Contractor will be required to keep current and supply to Snowy Hydro a complete set of 'as-built' records and drawings, Operation and Maintenance Manuals.

Throughout the life of the project, the Owner's Team will regularly inspect Works, Plant and Materials at appropriate points, and may maintain an ongoing presence for high-criticality work.

The Contractors will be required to establish and clearly follow inspection and test procedures, and deal with any nonconforming product or service.

The Contractors will appoint a Quality Manager with appropriate experience in managing the quality aspects of projects similar to the Works.

The Contractors will arrange for external quality audit to be undertaken in accordance with the Quality Management Plan.

The Contractors will maintain records clearly identifying the source and condition of all Plant, Materials and equipment used for construction of the Works.

12.2 Quality assurance

The Contractors will be required to have comprehensive quality systems to provide Snowy Hydro with evidence that the Employer's Requirements have been met. Contractors will be required to demonstrate their certification to and compliance with the appropriate version of AS/NZS 9001 and related quality management standards.

The Contractors will be fully responsible for the quality control of their own work and of their subcontractors, consultants and suppliers.

Contractors are expected to use a requirements management and traceability approach with appropriate, established systems and controls. The Contractors will be required to implement and maintain a quality assurance system in accordance with the Contract. Snowy Hydro will periodically audit compliance.

12.3 Site data

Snowy Hydro may consider developing a Geographical Information System (***GIS***) or other geospatial model of the Site so that as the Civil Contractor's drilling and

development progresses, Snowy Hydro can progressively build a geospatial model of the Site to inform future plant operations.

12.4 As-built documents

The Contractor will be required to keep current and supply to Snowy Hydro a complete set of 'as-built' records and drawings. Snowy Hydro will need to set out in the Owner's Requirements its expectation for how these as-builts should be produced.

12.5 Operation and maintenance manuals

The Contractor will be expected to progressively supply Operation and Maintenance Manuals. See Supporting *Chapter Nineteen - Operations readiness* for more detail in this area.

12.6 Inspection

Throughout the life of the Project, the Owner's Team will regularly inspect Works, Plant and Materials at appropriate points. These inspections will be carefully planned so as not to disrupt the Contractor's progress. For high-criticality work (such as offshore fabrication of machines), Snowy Hydro may embed Owner's Team representatives at the work site on an ongoing basis.

12.6.1 Procedures

The Contractors will be required to establish and clearly follow inspection and test procedures:

1. Inspection and testing requirements are to be identified, planned, coordinated and implemented to verify that the specified requirements are met;
2. All construction work is to be implemented in accordance with an approved Inspection and Test Plan (***ITP***), as necessary.
3. Records of inspections and tests are to clearly show a pass or fail and are to be maintained to provide evidence of compliance to specified requirements.
4. For products and services that do not comply, a non-conformance report (***NCR***) is to be prepared and actioned accordingly.

12.6.2 Control of nonconforming products

The Principal Contractors have the responsibility to identify any nonconforming product and services within their area of responsibility.

Any product found to be nonconforming shall be prevented from inadvertent use or installation.

The product shall be identified and the non-conformance documented and analysed to determine the best method of rectification and action necessary to prevent recurrence.

12.6.3 Testing and rejection

A comprehensive ITP will be included in the Owner's Requirements. All results would be recorded and certified by the Contractor for the factory tests conducted on the materials, plant, equipment, systems and facilities and copies provided to the Engineer within a reasonable time period following completion. Snowy Hydro may appoint a certifying agency to witness tests, oversee any defects rectification and certify, or otherwise validate the Contractor's certificates.

Certain elements will require Non-destructive Testing (***NDT***) during manufacture and the Contractor will be required to carry them out in accordance with the relevant standards and contract, in particular any forging, casting, rolling or fabrication.

Once equipment has reached site, it is expected that the Contractors would conduct the tests at Site in accordance with the Contract. They would be responsible for all equipment and personnel required to carry out the tests at Site, including the provision, installation and removal of all test instruments, the connection and disconnection of plant items and obtaining of all records.

12.7 Quality Management System

The Contractors were required to include the following requirements as part of their Quality Management System:

1. The Contractors will implement, observe and maintain a quality management system, which will, as a minimum, meet the requirements set out in AS/NZS ISO 9001:2016,[19] to demonstrate the Contractor's compliance with the requirements of the Contract during the execution of the Works (***QM System***). The Employer will be entitled to audit any aspect of the Contractor's Quality Management System;
2. Details of all procedures and compliance documents in relation to the Quality Management System will be submitted to the Employer for information before each design and execution stage of the Works is commenced;
3. As part of the Quality Management System, the Contractors will develop a Quality Management Plan, setting out all the requirements of the Quality Management System (see requirements below);
4. The execution of the Works will be divided into work packages and activities and, for each work package and activity, the Contractors were required to indicate the following in the Quality Management Plan:

[19] (ISO 2016).

a. The Contractor's proposed quality plan which will meet the requirements of ISO 9001:2016, and will specifically address the following:
    i. Applicable quality procedures;
    ii. Inspection and test plan(s);
    iii. Proposed witness and hold points
    iv. Test records and certificates to be provided; and
    v. Non-compliance procedures.
b. Pro forma examples of specified documents.
c. The management of quality records will align with the IM requirements specified in this document.

12.8 Quality Management Plan

The Contractors were required to include the following requirements as part of their Quality Management Plan.

12.8.1 General

1. The Contractors will prepare and submit the Quality Management Plan to define the Contractor's Quality Management System to ensure and demonstrate that the Works conform to the requirements of the Contract;
2. The Quality Management Plan will cover all aspects of the Works to be performed under the Contract;
3. The Quality Management Plan will provide procedures for the design, construction and handover of the Works, and for the testing, review and procurement of Materials to be used in the Works, whether on or off the Site. The Quality Management Plan will set out the requirements for providing documentary evidence that specified tests and inspections have been undertaken and that specified test results have been achieved.
4. The Quality Management Plan will address specifically how the Contractor will monitor and verify all aspects of fabrication and assembly of major plant components undertaken within Australia or in offshore locations;
5. The Contractors will prepare an organisation chart, together with a description of the responsibilities and necessary authority given to the relevant Contractor's Personnel, for the implementation of the Quality Management Plan;
6. The Contractors will report on the implementation, monitoring and performance of the Quality Management Plan in each monthly progress report;
7. The Contractors will submit the Quality Management Plan to the Employer, for review in accordance with the Contract;
8. The Quality Management Plan will be updated, as necessary, to incorporate all changes to the Contractor's procedures that have been approved by the Employer;
9. The Quality Management Plan will make reference (where appropriate) to other Contractor's Documents to illustrate the main tasks within the Works,

their subdivision and the reporting structure to be established for the Works;
10. The Contractors will prepare all charts, submission schedules and the proposed content and format of all quality control certification systems to demonstrate that the Contractor will meet their obligations under the Contract.

12.9 Quality Manager

1. The Contractors will appoint a Quality Manager with appropriate experience in managing the quality aspects of projects similar to the Works.
2. In addition to the Quality Manager, the Contractors will ensure that relevant construction engineers and other Contractor's Personnel at the Site and at offshore locations are appointed to assist the quality manager in the management of quality and production of quality records.
3. The Quality Manager, in conjunction with the Contractor's Personnel in charge of construction management, will be responsible for ensuring compliance with the quality procedures, quality standards and applicable Laws.

12.10 Quality audit

1. The Contractors will arrange for external quality audit to be undertaken in accordance with the Quality Management Plan. Such external audit will be conducted at intervals of not greater than twelve (12) months.
2. Upon request, the Employer will be given access, in conjunction with or through the Contractor, to carry out quality audit, reviews or surveillance, or to ascertain the effectiveness of the Quality Management System put in place by the Contractor.
3. The Employer will be entitled to carry out audit of the Quality Management System.
4. The Contractors will undertake internal quality audit at intervals of not greater than six (6) months.
5. Copies of all quality audit results, reports and corrective action documents will be submitted to the Employer for information.

12.11 Quality Records and Reports

1. The Contractors will maintain records clearly identifying the source and condition of all Plant, Materials and equipment used for construction of the Works, along with any relevant test results, design drawings, and the place and time of delivery to store or to the Site;
2. The Contractors will be able to demonstrate traceability of all component items of the Works.
3. Quality records will be electronically referenced to the BIM model in accordance with the IM section of this document;

4. Quality records will be available for evaluation by the Employer during the term of the Contract and will include all pertinent Subcontractor records;
5. The Contractors will maintain the quality records (test and works quality) for a period of five (5) years from the date of issue of the Completion Certificate; and
6. The Contractors will submit monthly quality reports as evidence that the Works comply with the quality requirements of the Contract, including an updated register of all the quality records held, and a cumulative status register of all non-compliances.

12.12 Inspections

The Employer will be given access, in conjunction with or through the Contractor, to all laboratories, factories and other facilities, plus any necessary equipment required for quality control tests to verify that the quality requirements of the Contract are being achieved.

12.13 Inspection and Test Plans

12.13.1 General

All equipment, materials and components will be subject to type, sample and routine tests and inspection while in the process of and upon completion of manufacture.

The Contractor may offer type test results for identical equipment in lieu of the type tests specified; in which case the specified type tests may be waived by the Employer. If type tests for identical equipment are offered in lieu of the specified type tests, the Contractors will provide evidence to the satisfaction of the Employer that the equipment tested was similar to the Contract equipment.

The Contractors will submit evidence to the Employer that the instruments used for the tests during manufacture have been calibrated, prior to the test, at an approved testing laboratory.

The Employer may observe and participate in the tests during manufacture.

12.13.2 Submission of programmes, plans and procedures

The Contractors will prepare and submit the following to the Employer at least 90 days prior to the commencement of manufacture:

1. Plans and procedures in approved format for each inspection and test during manufacture, detailing the extent and nature of the tests, including the factory acceptance tests (***FAT***); and
2. Proposed overall programme for the inspections and tests during manufacture.

12.13.3 Inspection and test plan content

Detailed ITPs will be prepared by the Contractor for all Work. Each manufacturing or installation inspection and test plan will include the following information:

1. Inspection and test activity description, including an itemised list of sequential inspection and test activities, leading to completion of all factory inspections and tests, and achievement of readiness for shipment of the respective material and/or equipment;
2. Reference to the applicable approved drawings;
3. Control and/or reference documents, including specifications, from which the activity description is derived;
4. Acceptance criteria, including the proposed range of values for which the related inspections and/or tests will be deemed to be acceptable;
5. Verification documents and checklists, including 'pass/fail' criteria, with which to record the results of the respective inspections and/or tests; and
6. Inspection and test activity control points, including identification as to whether the particular test activity is a 'Surveillance', 'Review', 'Witness', or 'Hold' point for the Contractor and/or Employer.

The Employer may propose alterations to the draft ITPs. The Contractors will review and accept proposed alterations; the final ITP will be provided to the Employer for their acceptance prior to commencing any works.

12.13.4 Notification of readiness for inspections and tests

The Contractors will notify the Employer in writing prior to the respective date, of the date and location at which any material and/or equipment will be ready for inspection and/or testing during manufacture. To the fullest extent possible, the Contractors will submit, together with their notice, any routine test reports undertaken by the manufacturer with respect to the material and/or equipment to be inspected and/or tested in the presence of the Employer.

12.13.5 Test results and reports

The Contractor will make available all documentation including but not limited to, test certificates, material certificates, inspection record sheets, as they become available for review by the Employer.

A finalised reporting package will be provided by the Contractor to the Employer on completion of the Works.

Test results will be recorded by the Contractor for the factory tests conducted on the materials, plant, equipment, systems and facilities. The test results will be certified by the Contractor.

Copies of all factory test results, test certificates and test reports will be submitted to the Employer for information.

12.13.6 Non-destructive examination during manufacture

The Contractors will, in advance of the commencement of forging, casting, rolling or fabrication, submit to the Employer details of their planned non-destructive examination.

Throughout manufacture of the various components, quality control checks may be made periodically by the Employer.

12.13.7 Electrical equipment tests during manufacture

All control wiring and equipment, will be subject to withstand voltage tests.

All relays and instruments will be routine and batch tested in accordance with the relevant IEC Standard. In addition, solid state relays will be tested in accordance with IEC 60255-151 (Measuring relays and protection equipment - Part 151: Functional requirements for over/under current protection).

All contactors and motor starters will be type and routine tested as appropriate, to verify compliance with the Contract.

All cubicles and switchgear will be subject to inspection during manufacture and on completion to verify compliance with the Contract, including surface finish and insulation resistance. 400 V switchgear and associated current and voltage transformers will be routine tested in accordance with the requirements of the relevant IEC standards.

All small transformers will be type and routine tested in accordance with the relevant standard.

All monitoring, control and protection systems will have operational tests carried out at the factory before dispatch to prove that all components operate together as a system and that all operating sequences and device responses comply with the Contract.

All cables will be routinely tested to ensure compliance with the relevant standards.

13 Interface Management

The Civil Works Contractor and the E&M Contractors were required to both be parties to the EPC Interface Deed to be entered into on or around the date of this Contract (Interface Deed).

The Civil Works Contractors were required to produce an Interface Management Plan to be agreed with the Employer and the E&M Contractor Representative. Details of the requirements for the plan are included in the Interface Deed (see *Supporting Chapter Three*).

14 Role of civil contractor in managing services

14.1 Overview

The Contractor will commence operating the services as soon as practicable after the commencement date and will cease operating the services on issue of the taking over certificate for the entire Works.

The extent of the services will meet the requirements of the works and the site, and such other work as may be carried out by or for the Employer on the site.

The Contractor will provide all professional, administrative, supervisory and technical staff and all labour, communications, chemicals, test equipment, transport, plant, equipment, materials, furniture, tools, instruments, fuel, spare parts and the like required for the proper and efficient operation of the services.

Where temporary services are provided by the Contractor that will be ultimately replaced by permanent systems, the Contractor will continue to operate and maintain the temporary services until such time as the permanent system has been fully commissioned and is fully operational, and until the need for the temporary services has ceased. Such services include:

1. Underground ventilation;
2. Underground lighting;
3. Underground drainage, pumping, and water treatment;
4. Provision of potable water to all sites;
5. Provision of power to all sites; and
6. Communications.

The Contractor will be appointed as the Principal Contractor for the whole of the Project from the commencement of the Works through to the completion of the whole of the Works including all landscaping, rehabilitation, and site clearance. See *Chapter One - Health and safety* for a discussion of the regulatory framework for the Principal Contractor role.

The role and responsibility of the Principal Contractor is clearly detailed in the Contract and further expanded in the Employer's Requirements.

The E&M Contractor will be required to work under the Civil Contractors' HSMP and safety management system with respect to the Principal Contractor requirements under the work health safety act and regulations.

Further to their duties in terms of Health and Safety the Contractor will also be responsible for providing and managing services across the whole of the Project (Management Services). These Management Services include:

1. Security of the Works. This includes supply and installation of security fencing to the whole of the Site plus the provision of a third-party security contractor;

2. Construction and maintenance of all access roads, site roads, laydown areas, quarries, construction camp and office areas, and all other areas requiring preparation prior to construction works commencing, including helicopter landing pads at appropriate areas of the Works and at the site of the medical clinic for use in emergency evacuations;
3. Removal, rehabilitation, landscaping, revegetation, etc. of all areas of the Works as indicated by the Employer to the standards laid out in the Planning Conditions, the Conditions of Contract, and the relevant sections of the Employer's Requirements;
4. Traffic Management as detailed in the relevant section of the Employer's Requirements; and
5. Design, supply, erection, operation, maintenance and removal on completion of the Works of accommodation camps for Contractor personnel, Employer personnel, E&M contractor personnel, subcontractor personnel and visitors all in accordance with the relevant sections of the Employer's Requirements , including the provision of portions of the accommodation as required for the Exploratory Works.

14.2 Accommodation camps

The accommodation camps and related facilities will conform in planning, layout, design and construction with the standards and workmanship requirements of modern community developments recently implemented in Australia, and will also conform with all relevant Australian legislation and statutory regulations pertaining to such developments.

The planning of the accommodation camps will be done in a way to provide comfortable living and a good quality life to the residents. The plan will aim to make the accommodation camps self-sufficient in all possible aspects, and the units are to be grouped in residential clusters with public communal facilities in an accessible quarter of the site(s).

The Contractors will undertake detailed site analysis and site assessments prior to zoning and conceptualisation of the design.

Safety and security of the users will be a primary consideration in the planning and design of the accommodation camps and related facilities both internally and externally. While planning the site, the Contractors will give due consideration to the conservation of the environment. The plan should as far as possible preserve natural features including topography and vegetation. Cutting and filling may be adopted to create level areas and for making public spaces appealing and interesting.

The Contractors will construct the accommodation camps and related facilities on an area or areas within the site boundaries approved by the Employer.

The Contractor will provide all personnel plant and equipment required for:

1. Administration;

2. Room allocation and management;
3. Security;
4. Cleaning;
5. Laundry;
6. Catering;
7. Waste disposal;
8. Medical services;
9. Facility management; and
10. Maintenance.

The Contractors will provide catering services for the Contractor's personnel, Employer's personnel, and other contractors employed by the Employer to suit the working hours and scheduled meal times. The Contractors will provide meals for everyone and provide a system for charging consistent for all personnel.

Food transport, storage, cooking, provision of potable water and waste disposal will be subject to the approval of the applicable Health authorities in NSW and the Employer, and will be in accordance with the Contractor's Health and Safety management plan.

The Contractors will provide and maintain all services required for the operation of the accommodation camps and related facilities including:

1. Electrical;
2. Potable water;
3. Sewage and wastewater;
4. Industrial water; and
5. Lighting;
6. Roads and streets;
7. Drainage;
8. Busing/transport for personnel of all contractors to and from the accommodation to the work sites;
9. Offices for the Employer;
10. Medical clinic, ambulances, first aid stations and other medical/paramedic support/facilities;.
7. Electrical reticulation;
8. Waste collection;
9. Fuel storage and distribution;
10. Personal Protective Equipment (***PPE***);
11. Communications;
12. Emergency control centre;
13. Underground ventilation; and
14. Vehicle wash bays.

15 Traffic Management

15.1 Overview

The Project will be carried out almost exclusively within KNP. The Contractors will make every effort to reduce vehicle numbers and trips in and out of the park and between work sites by carefully managed planning of all trips. Use of private vehicles should be kept to a minimum and no private vehicles will be allowed at any accommodation sites. The Contractors will make adequate Park and Ride arrangements, vehicle pooling and ride sharing to keep numbers of vehicles to a minimum.

The Contractors will be responsible for the management of traffic and control of vehicles and pedestrians around the work site. The Contractors will produce a comprehensive traffic management plan that covers the work sites and all access roads back to their connection to any main highway.

15.2 Traffic Management Plan Requirements

Safety is the highest priority and all traffic plans and personnel/ vehicle interactions will be organised in a fashion that supports safe working conditions. The traffic management plan will include as a minimum:

1. Project vehicle specifications and pre-mobilisation inspections for all surface mobile equipment (***SME***);
2. Daily pre-start inspections for SME;
3. Provision and staffing of access gates/booms;
4. Determination of appropriate speed limits for Project-specific roads;
5. Posting and enforcement of speed limits;
6. Identification and implementation of any public safety measures in areas where there is interface between Project and public traffic;
7. Management of Project-induced traffic delays and diversions;
8. Provision and maintenance of all traffic signage including speed limits and cautionary signs;
9. Control of traffic on single lane roads, with the identification of designated passing bays;
10. Demarcation of haulage routes to segregate haul trucks and other vehicles;
11. Coordination of all heavy/abnormal load deliveries from the point of departure from the public roads/highways;
12. Coordination of all traffic and deliveries to the site and return truck trips off the site to maintain a balance of traffic on the roads at all times;
13. Demarcation of all pedestrian walkways on the site including demarcated pedestrian crossing points on internal site roads. The intent will be wherever possible to separate people and vehicles/ plant;
14. Demarcation of vehicle parking bays;

15. Movement of personnel to and from accommodation facilities to the work sites;
16. Scheduling of heavy vehicle movements to reduce impact on local road users, particularly during peak tourist seasons;
17. Snow clearance on all Project-specific roads and access roads to maintain safe driving conditions;
18. Exclusion and separation zones;
19. Potential light vehicle/ heavy vehicle interfaces;
20. Rights of way;
21. Breakdown and recovery procedures;
22. Escort procedures;
23. Procedures for delivery drivers and private vehicles;
24. Radio protocols;
25. Provision for snow chain fitting bays on Project-specific roads;
26. Transportation of dangerous goods and hazardous substances;
27. Specific rules for all traffic entering underground worksites.

16 Commissioning, ramp-up and handover

See *Chapter Twenty-Three - Operations Readiness*.

17 Bibliography

1. Department of Infrastructure, Planning and Natural Resources (DIPNR). Guideline for the Preparation of Environmental Management Plans. 2004.
2. Department of the Environment. Environmental Management Plan Guidelines. 2014.
3. International Organization for Standardization. ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories [Internet]. International Organization for Standardization; 2017 Nov. Report No.: ISO/IEC 17025:2017. Available from: https://www.iso.org/home/standards/popular-standards/isoiec-17025-testing-and-calibra.html
4. International Organization for Standardization. ISO/DIS 19650-1.2 Organization of information about construction works -- Information management using building information modelling (under development) -- Part 1: Concepts and principles. SO/TC 59/SC 13; Report No.: 19650-1.2.
5. ISO. AS/NZS ISO 9001:2016 Quality management systems - Requirements [Internet]. SAI Global; 2016. Report No.: 9001. Available from: https://infostore.saiglobal.com/en-au/Standards/AS-NZS-ISO-9001-2016-100998_SAIG_AS_AS_212202/
6. Safe Work Australia. Safe Design of Structures Code of Practice [Internet]. Safe Work Australia; 2012. Available from: https://www.safeworkaustralia.gov.au/system/files/documents/1702/safe_design_of_structures2.pdf
7. Safe Work Australia. Guide for Tunnelling Work. Safe Work Australia; 2013.

p. 90.
8. Standards Association of Australia. Risk Management: Principles and Guidelines : AS/NZS ISO 31000:2009. 2009.
9. Standards Australia. SA/SNZ HB 168:2017 Document control. SAI Global; 2017.
10. Standards Australia. AS 1379-2007 (R2017) - Specification and supply of concrete [Internet]. SAI Global; 2018 Dec. Available from: https://infostore.saiglobal.com/en-au/Standards/AS-1379-2007-127850_SAIG_AS_AS_270197/
11. Workcover NSW. TUNNELS UNDER CONSTRUCTION - CODE OF PRACTICE 2006 [Internet]. Workcover NSW; 2006. p. 88. Available from: http://www.safework.nsw.gov.au/__data/assets/pdf_file/0007/52873/Tunnels-Under-Construction-Code-of-Practice.pdf
12. Code for the Tendering and Performance of Building Work 2016 [Internet]. 2016. Available from: https://www.legislation.gov.au/Details/F2017C00668

