Sydney Opera House

Theatre Machinery Project
Joan Sutherland Theatre

Construction Management Plan

Version 1.4: Final
June 2016

Document Verification

Date	Status	Prepared By	Consultation	Version
May 2016	Draft	YH		1.0
19 May 2016	Draft	YH	Mark Ayto	1.1
25 May 2016	Draft	YH	Dan Keary, Michael Woodland	1.2
8 June 2016	Draft	YH	SEARs response	1.3
23 June 2016	Final	YH	For approval	1.4

Approved

_____

Project Manager

_____

Date

Table of Contents

1 Introduction 4

2 Project Description 4

3 Project Area 5

4 Construction 5

4.1 Construction Methodology..... 5

4.1.1 Removal and Replacement of Overhead Theatre Machinery……5

4.1.2 Removal and Replacement of the Grid …….....6

4.1.3 Upgrade and Modify the Rear Lifts ……6

4.1.4 Space Reconciliation Beneath the Stage ……..…….....6

4.1.5 Associated Builder's Works ……...…….7

4.2 Construction Duration and Timing ……...7

4.3 Workforce ……....7

4.4 Construction Equipment ……8

5 Waste Management ……8

6 Other Considerations ……..……....10

6.1 Safety and the Public …….....10

6.2 Noise and Vibration ……....11

6.3 Access and Traffic ……..11

6.4 Air Quality ……11

7 Future Plans ……12

7.1 Construction Environmental Management Plan ……...12

7.2 Safe Work Method Statement ……13

8 Conclusion ……...14

Appendix A – DA Drawings ……15

1 Introduction

The Sydney Opera House (SOH) proposes to upgrade all the theatre machinery and associated infrastructure in the Joan Sutherland Theatre. This is a critical major maintenance project driven by the fact that the existing theatre machinery has reached end of life. This upgrade also requires the replacement of the grid – the infrastructure which supports the overhead stage machinery.

During construction, it will be necessary to close the theatre for 7 months. The remainder of the Opera House will remain operational during this time. Business integration operational plans are in development to ensure the success of the project while allowing day to day business as usual activities to continue throughout the remainder of the Opera House.

This report addresses the key construction activities, waste management and safety aspects of the project. The identified methodology, procedures and details described in this report are indicative, and will be refined by the Contractor engaged to undertake the project prior to commencing construction. This methodology has been developed to provide a basis for assessment of the environmental impacts of the project.

2 Project Description

This project primarily addresses the ongoing issue of diminishing reliability of the flying system over the stage and the rear lifts. This lack of reliability presents an increasing potential for a system failure which will result is a ‘show stop’ – this is a situation where equipment failure means that the performance cannot continue and the show must be stopped to sort out the problem. Equipment failure also presents a substantial safety concern for performers and/or operating crew.

As the theatre will be closed for 7 months there is scope for some additional upgrade and maintenance projects to be undertaken during this time.

The project scope is:

- Removal of the existing theatre machinery and grid
- Modification of the grid space and installation of the new grid
- Installation of the new flying system above the stage
- Upgrade and modify the rear lifts
- Reconcile space beneath the stage

- Upgrade Auditorium rigging

3 Project Area

The whole of the project area is contained within the Joan Sutherland Theatre. The only impact on external areas will be the delivery and/or collection of materials to the Opera House site.

The project area includes:

- The grid, stage and under stage
- The orchestra pit
- The scenery dock – this will be a staging area for deliveries and storage of materials awaiting removal
- The auditorium as required to facilitate installation of rigging systems and access to the stage and orchestra pit

Construction hoardings will be provided by the contractor engaged to undertake the project in order to delineate their construction zones. Where required these hoardings will be acoustic to assist with noise control.

4 Construction

The following construction methodology and associated details and procedures are indicative and will be refined by the Contractor engaged to undertake the project prior to commencing construction. This methodology has been prepared by Sydney Opera House to provide a basis for assessment of the environmental impacts of the project.

4.1 *Construction Methodology*

The project works can be described in the following components:

- Removal and replacement of overhead theatre machinery
- Removal and replacement of the grid

- Upgrade and modify the rear lifts
- Space Reconciliation beneath the stage
- Associated builder's works

4.1.1 Removal and Replacement of Overhead Theatre Machinery

These works involve removal of the existing flying system and replacement with new powered winches, cables, head battens and control systems; replacement of manual counterweight lines with powered systems; replacement of the Portal Lighting Bridge; upgrades to auditorium rigging systems to facilitate lighting bars, speaker positions and the surtitle screen.

4.1.2 Removal and Replacement of the Grid

These works involve the removal of the existing grid floor; modification to the grid structure to enable installation of suitable decking and load carrying beams to support the new chain hoists and point hoist diverter pulleys required for the new flying system.

4.1.3 Upgrade and Modify the Rear Lifts

These works involve replacement of the drive and control systems for the rear lifts and the upgrade of safety features to enable crew to ride on the lifts.

4.1.4 Space Reconciliation Beneath the Stage

These works involve the removal of the existing revolve machinery and structure; assessment and repurposing of the resulting free space including installation of appropriate fire compartmentalisation; replacement of the Orchestra Pit Lift.

4.1.5 Associated Builder's Works

These works involve demolition and removal of redundant machinery and infrastructure; modification to the existing structure to facilitate the installation of new equipment; removal of redundant services and adaption of existing services and installation of new services; the construction of masonry and partition walls as required.

4.2 *Construction Duration and Timing*

The project is scheduled to take 7 months and the closure of the Joan Sutherland Theatre has been planned accordingly for the second half of 2017. As many enabling works as possible will be done prior to this closure to ease the time pressure.

As the project is wholly contained within the Joan Sutherland Theatre works will generally not be audible outside of the building and therefore will be scheduled to occur outside standard construction hours. Due to the daily operations of Sydney Opera House noisy work shifts will be scheduled overnight. To achieve the works within the planned closure the following shift pattern will be programmed:

- 18:00-23:30 – planning and quiet activities which are compatible with live performances occurring in other venues within the site
- 23:30-10:30 – works which would otherwise be disruptive to SOH operations
- 10:30-18:00 – no major noise but general construction

The carrying out of internal works outside standard construction hours is consistent with previous approvals granted for works on the site and is crucial to the delivery of the project within the closure timeframe.

The delivery and collection of building materials and equipment will be managed so as not to unreasonably impact on the amenity of the patrons of Sydney Opera House and the surrounding neighbours.

4.3 *Workforce*

The size of the workforce is dependent on the specific construction methodology and sequencing employed by the Contractor engaged to undertake the works and is unable to be identified at this stage. An indicative peak construction workforce is estimated to be approximately 100 persons.

4.4 *Construction Equipment*

A definitive list of proposed construction equipment is not currently available as this would be dependent on the specific methodology and sequencing used by the Contractor engaged to undertake the works. The following is an indicative list of the equipment that may be used during construction:

- Jackhammers
- Concrete saws
- Mobile crane
- Semi-trailers for delivery of materials
- Dump trucks for removal of rubble
- Concrete trucks
- Concrete pumps
- Concrete vibrators
- Cherry pickers and Elevated work platforms

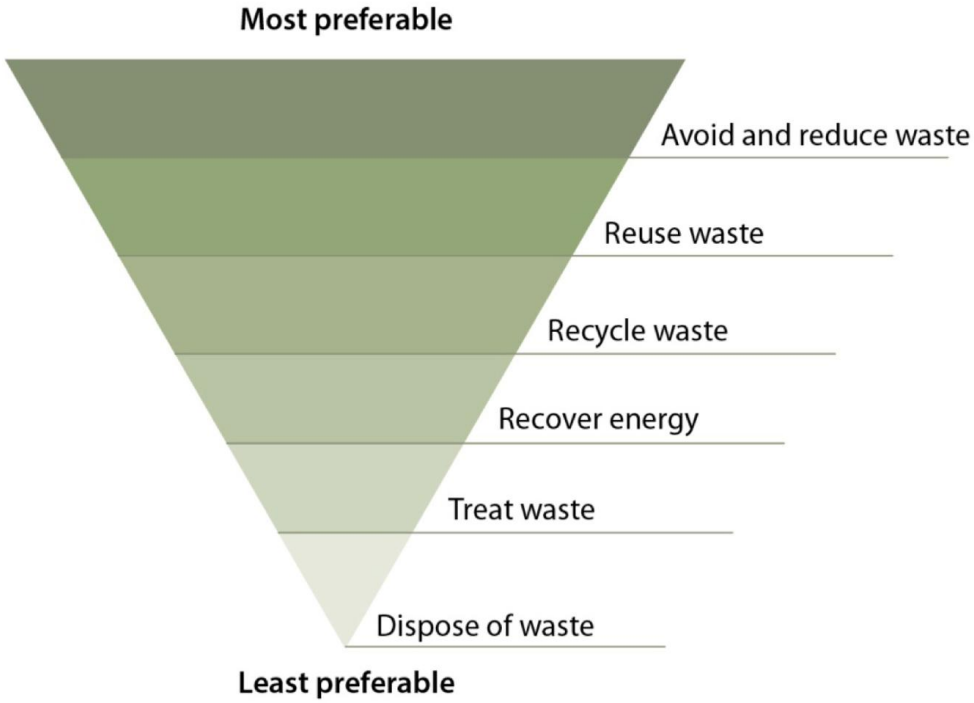
5 Waste Management

It is expected that the following wastes will be generated during construction:

- Brick / concrete materials
- Steel and steel cable
- Lighting, fittings and electrical equipment
-
- Redundant winches, control equipment and dimmers
- Services waste such as bits of wiring, pipe cut offs and sheet metal cut offs
- General waste from construction activities such as packaging, scraps and paper

The management of waste will be in accordance with relevant NSW legislation and the principles of the waste management hierarchy as set out in the NSW 'Waste Avoidance and Resource Recovery Strategy 2014-21'. The figure below illustrates the hierarchy for management of wastes.

Figure 1 – The Waste Hierarchy



Sydney Opera House maintains a Hazardous Materials Register which documents all asbestos contaminated materials (ACM), hexavalent chromium and lead paints within the building. Dealing with hazardous materials is managed by the Sydney Opera House Asbestos Risk Management Plan (Hibbs & Associates Pty Ltd 2013) and the Sydney Opera House Hazardous Materials Action Plan (2015). Removal and disposal of any hazardous materials will comply with all relevant laws, regulations and guidelines including, but not limited to, Protection of the Environment Operations Act 1997, Protection of the Environment Operations (Waste) Regulation 2014 and Protection of the Environment Operations (Illegal Waste Disposal) Act 2013.

A fully detailed Waste Management Plan will be developed by the Contractor engaged to undertake the project. The plan will be framed using the waste management hierarchy principles outlined above. The plan will be prepared prior to construction

commencing and will be consistent with the Waste Avoidance and Resource Recovery Act 2001 and the 'Waste Classification Guidelines'.

The plan will:

- Identify requirements for waste avoidance, reduction, reuse and recycling
- Provide procedures for handling, stockpiling and reuse of wastes
- Provide procedures for disposal of hazardous materials
- Identify disposal sites as well as transport options

6 Other Considerations

Other considerations which will be relevant during the construction period include:

- Safety and the Public
- Noise and Vibration
- Access and Traffic
- Air Quality

6.1 *Safety and the Public*

The Opera House is to continue operations as normal during the construction period. As the works will be confined to within the Joan Sutherland Theatre, and deliveries and removal of materials will be via the new underground loading dock, there will not be any interface between the public and the works on site. Construction hoardings and sealed off areas around the worksite will ensure no interface with Sydney Opera House staff and performers.

Ensuring the safety of the public, SOH staff and performers will be a key factor in the staging and planning of construction activities. Prior to commencing construction the Contractor engaged to undertake the works will prepare a fully detailed works staging strategy which addresses appropriate access and ensures safety.

6.2 *Noise and Vibration*

Given that the construction activity is confined within the Joan Sutherland Theatre there is very little chance of noise and vibration impacting the external site or neighbours.

Prior to commencing construction the Contractor engaged to undertake the works will engage their own noise and vibration consultant to prepare a Noise and Vibration Management Plan and determine where noise and vibration loggers will need to be placed to monitor construction activity. This consultant will provide ongoing monitoring throughout the construction.

6.3 *Access and Traffic*

Deliveries and removals from site will be via the underground loading. This will ensure no interface with pedestrian across the site. Construction vehicles will utilise Macquarie Street to access the site. Planning will ensure that wherever possible these vehicle movements are within standard construction hours (typically 7am – 6pm). The increase in vehicle movements on Macquarie Street is anticipated to be 20-30 vehicles per day outside peak hours.

Prior to commencing construction the Contractor engaged to undertake the works will develop an Access and Traffic Management Plan.

6.4 *Air Quality*

The project has the potential to generate dust from demolition works. Measures will be taken to ensure that the dust is localised within the construction zone. A dust management plan will be prepared by the Contractor engaged to undertake the works prior to commencing construction.

Construction plant and equipment selected will be suitable for an internal construction environment to ensure no impact on air quality within the work site.

7 Future Plans

Prior to commencing construction the Contractor engaged to undertake the works will prepare in conjunction with SOH the following documents:

- Construction Environmental Management Plan
- Safe Work Method Statement

7.1 *Construction Environmental Management Plan*

The Construction Contractor will have an accredited Environmental Management System in line wih the requirements of the *NSW Government Environmental Management System Guidelines.*

A Construction Environmental Management Plan will be prepared and implemented. The plan will outline environmental management practices and procedures to be followed during site preparation and construction. The plan will cover the environmental protection practices, resources and sequence of activities required to comply with relevant environmental legislation, conditions of any applicable licence, approvals and permits.

The plan will be prepared in accordance with Guideline for Preparation of Environmental Management Plans (DIPNR 2004) and include:

- A description of activities to be undertaken on the site during site preparation and construction stages of the project
- Statutory approvals and other obligations that would be fulfilled during site preparation and construction
- Details of how the environmental performance of the site preparation and construction works will be monitored, and what actions will be taken to address adverse environmental impacts. In particular the following environmental performance issues will be addressed:
    - Measures to minimise impacts to heritage
    - Measures to minimise the discharge of sediment and other pollutants to land and/or water drainage systems during construction
    - Measures to monitor and control noise emissions during construction and commissioning

- Measures to manage traffic and site access during construction

- A description of roles and responsibilities for all relevant employees involved in the construction of the project

- Complaints handling procedures during construction

7.2 *Safe Work Method Statement*

A Safe Work Method Statement will be provided explaining the delivery and installation of the project whilst ensuring the surrounding heritage fabric. An indicative description of the methodology likely to be adopted to construct the works is provided in this report and referred documentation. This is based on the available stage of the design documents.

Once the detailed schematic documentation is complete the Contractor engaged to undertake the works will develop a detailed safe work method statement which addresses the various activities to be undertaken during the construction phase, and ensures the safety of the site fabric, construction personnel and all relevant stakeholders.

8 Conclusion

This report provides and indicative construction methodology and associated procedures, which identify how the project may be constructed and how the various environmental issues may be addressed.

The methodology and procedures are indicative and will need to be refined by the Contractor engaged to undertake the works. To this effect, a detailed Construction Environmental Management Plan and a Safe Work Method Statement will be prepared by the Contractor prior to commencing construction and implemented during the site preparation and construction phases.

Appendix A – DA Set Drawings