

Sydney Football Stadium

Demolition Noise & Vibration Sub-Plan

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1 EXECUTIVE SUMMARY

The Management Plan outlines the development of controls and safeguards that would be applied to all activity on the Sydney Football Stadium site during the demolition phases. The objective of these controls is to ensure that all work is carried out in a highly controlled and predictable manner that will minimise emissions and protect the amenity of the sensitive receivers surrounding the site including residential, commercial, educational and places of worship.

This review has been conducted in accordance with Condition of Consent B14 of Application SSD 9249. Further reviews will be undertaken through the demolition, excavation and construction period, as required, in response to revised methods and equipment, as well as in response to the monitoring and evaluation of actual impacts. This management plan outlines the procedures that would be adopted by the contractor during the detailed demolition phase only. Further assessments will be conducted for excavation and construction stages. Condition of Consent B14 has been addressed as follows:

Condition	Where addressed
B14. The Construction Noise and Vibration Management Sub-Plan (CNVSMP) must address, but not be limited to, the following:	
a) be prepared by a suitably qualified and experienced noise expert;	This report has been prepared by Acoustic Logic Consultancy
b) be submitted to Council and EPA prior to being finalised (evidence of this consultation will be provided to the Department);	Provided under separate cover
c) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009) and the relevant provisions of Australian Standard 2436 - 2010 Guide to Noise Control on Construction and Maintenance and Sites;	Section 4 contains recommendations to achieve noise management levels in with the EPA Guideline and relevant Australia Standard
d) describe the measures to be implemented to monitor and manage high noise generating works such as concrete crushing, mulching etc., in close proximity to sensitive receivers;	Concrete crushing to be addressed for CC2; section 4 contains recommendations for managing high noise generating equipment relevant to this CC.
e) incorporate all reasonable and feasible noise mitigation measures for the development so that the project construction noise targets provided in the Noise and Vibration Impact Assessment Report and the Addendum Noise and Vibration Impact Assessment Report prepared by ARUP dated 5 June 2018 and September 2018 for all residential and nonresidential receivers including the Kira Child Care Centre, University	See section 4 for noise management and section 6 for community liaison.

of Technology Sport Sciences Faculty Building are maintained at all times. The noise from the construction works must not exceed 75dB (A) LAeq(15min) at these receivers at any time in accordance with these reports;	
f) ensure that least noisy feasible and reasonable construction methods are used throughout the project;	See section 4
g) include strategies that have been developed with the community for managing high noise generating works;	See section 4 regarding management methodologies and section 7 for community liaison
h) include measures and strategies to consult with and avoid, mitigate and manage potential impacts on the Kira Child Care Centre;	See section 4 regarding management methodologies
i) include details of management measures to avoid any adverse vibration impacts on the nearby following heritage items during demolition (excluding demolition soft-strip): i) Member's stand, SCG; and ii) Lady's Member Stand, SCG	See section 5 for vibration monitoring
j) include details of management measures to protect the archaeological heritage items including Busby's Bore in accordance with the requirements of condition Schedule 3 B6;	See section 5 for vibration monitoring
k) describe the community consultation undertaken to develop the strategies in condition Schedule 3 B14(g);	See section 7
l) include strategies that are proposed to be developed in case of noise exceedance above the predicted limits; and	See section 4 regarding management methods and section 5 regarding monitoring
m) include a complaints management system that would be implemented for the duration of the construction.	See section 7
B29. Details of intra-day respite periods for highly intrusive demolition activities, including the use of jackhammers, rock breakers, concrete and demolition saws, chainsaws, excavators, mulchers, vibratory rollers and the concrete crusher must be provided, prior to the commencement of such activities, in consultation with the Kira Child Care Centre, University of Technology Sport Sciences Faculty Building. The details of the agreed intra-day respite periods and a schedule of fortnightly (or any other agreed timescale) discussion with the above sensitive receivers to verify	See section 4.3

the appropriateness of the proposed respite periods, must be submitted to the Planning Secretary with the CNVMSP. The provision of intra-day respite period must take into account the following requirements of the Interim Construction Noise Guidelines :

a) all works with high noise emission be undertaken after 8am; and

b) all works with high noise emission be undertaken over continuous periods not exceeding 3 hours with at least a 1 hour respite every three hours.

Note: 'continuous' means any period during which there is less than an uninterrupted 60-minute respite between

temporarily halting and recommencing any of the intrusive and annoying work referred to in Interim Construction Noise

Guideline section 4.5.

2 INTRODUCTION

This document presents the demolition noise and vibration management techniques that will be used to manage noise and vibration from the demolition of the existing structures.

3 PROJECT DESCRIPTION

3.1 GENERAL

The proposal is to construct a new stadium on the site of the existing Allianz Stadium within Moore Park. It is proposed that the existing Allianz Stadium is completely demolished and the new Sydney Football Stadium be constructed in its place.

3.2 THE SITE AND POTENTIALLY MOST IMPACTED RECEIVERS

The nearest potentially affected residential receivers are to the north of the site, across Moore Park Road. Other sensitive receivers include the UTS Sports Science Department located within Moore Park Building 1 in addition to the Kira Child Care Centre, which is located across Moore Park Road to the north.

These receivers represent the nearest potentially affected locations for demolition noise emissions from the Sydney Football Stadium site.

The area the proposed demolition plan is presented in Figure 1.

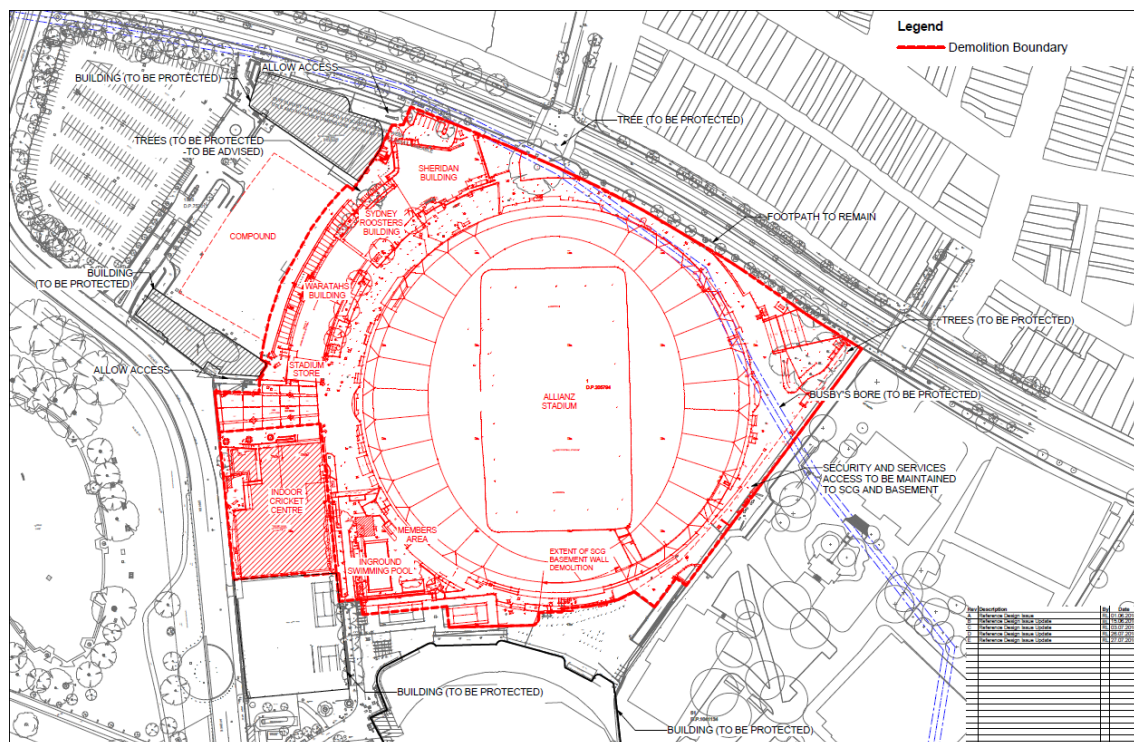


Figure 1 – Sydney Football Stadium Site

3.3 HOURS OF WORK

Hours of construction are to be in accordance with Condition of Consent C5-C8:

Construction Hours

C5. Construction works, including the delivery of materials to and from the site, may only be carried out between the following hours:

- a) between 7 am and 6 pm, Mondays to Fridays inclusive;*
- b) between 8 am and 1pm, Saturdays; and*

No construction work may be carried out on Sundays or public holidays.

C6. Construction works on the days when events occur at SCG land must be undertaken in accordance with the following requirements unless prior approval is granted by the Sydney Coordination Office and Transport Management Centre within TfNSW and Roads and Maritime Services:

- a) construction or associated works must cease at least two hours prior to an event;*
- b) no construction works are to be undertaken during an event; and*
- c) no construction works are to be undertaken for at least two hours after the completion of an event.*

C7. Activities may be undertaken outside of the hours in condition Schedule 3 C5 if required:

- a) by the Police or a public authority for the delivery of vehicles, plant or materials; or NSW Government 32 Sydney Football Stadium Department of Planning and Environment (SSD 9249)*
- b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or*
- c) where the works are inaudible at the nearest sensitive receivers; or*
- d) where a variation is approved in advance in writing by the Planning Secretary or her nominee if appropriate justification is provided for the works.*

Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

*C8. All noisy demolition works are subject to intra-day respite periods as approved by the Planning Secretary in accordance with Schedule 3 condition B29.**

**Note: condition B29 does not require approval of respite periods by the Planning Secretary.*

3.4 NOISE EMISSION MANAGEMENT LEVELS

Background noise monitoring, noise emission management levels and predicted noise emissions from demolition equipment have been presented in ARUP report *Noise and Vibration Impact Assessment (2018-06-05 - AC01-v5_SFSR_Noise and Vibration Impact Assessment, Arup, June 2018)* and *AC02-v3_SFSR_NVIA Addendum*.

4 DISCUSSION OF SITE WORKS AND RECOMMENDATIONS

The following site specific treatments are being proposed at this stage, however these will be reviewed during the course of the works, as required by the staging of the project and through consultation with impacted stakeholders:

4.1 GENERAL RECOMMENDATIONS

- Where practicable, positioning major static plant as far as possible from sensitive receivers. The strategic positioning of these items can result in noise levels not exceeding the noise affected management level around the site.
- Where possible the maintaining of buffer/separation zones at various stages of the works between the key noise generating activities and receptors such as the Kira Child Care Centre should be adopted.

4.2 HAMMERING

Hammering in close proximity to the northern boundary has the greatest potential for impact on the Rugby Australia building, the Kira Child Care Centre and the residents to the north. The highly affected noise management level is not expected to be exceeded, and monitoring is proposed throughout the construction period to ensure this.

Hammering should be undertaken as follows:

- Hammering should only be undertaken where non-percussive extraction method is not feasible or reasonable.
- Where hammering is undertaken it should be performed according to the following:
 - Using the smallest equipment as is practical provides benefits in terms of the noise/time to complete balance. (In other words a smaller hammer may be quieter but may result in significantly extended period of operation, leading to no overall benefit.)
 - Using hammers with low-noise heads or wrapping the head to minimise radiated noise.
 - The location of this equipment around the site should be varied throughout the day such that noise is shared between the receivers.
 - The local community should be informed via a liaison committee (or other method as appropriate) as to the nature, period and times of hammering. Community response may be used to formulate impact minimisation strategies. For example, hammering close to the Rugby League Australia Building can be avoided during sensitive periods which will be determined through consultation with the operators (including UTS).

4.3 DEMOLITION RECOMMENDATIONS

With respect to respite periods, the recommendations of condition B29 should be implemented:

B29. Details of intra-day respite periods for highly intrusive demolition activities, including the use of jackhammers, rock breakers, concrete and demolition saws, chainsaws, excavators, mulchers, vibratory rollers and the concrete crusher must be provided, prior to the commencement of such activities, in consultation with the Kira Child Care Centre, University of Technology Sport

Sciences Faculty Building. The details of the agreed intra-day respite periods and a schedule of fortnightly (or any other agreed timescale) discussion with the above sensitive receivers to verify the appropriateness of the proposed respite periods, must be submitted to the Planning

Secretary with the CNVMSP. The provision of intra-day respite period must take into account the following requirements of the Interim Construction Noise Guidelines:

a) all works with high noise emission be undertaken after 8am; and

b) all works with high noise emission be undertaken over continuous periods not exceeding 3 hours with at least a 1 hour respite every three hours

As per the Arup construction noise assessment, the only activity predicted to be within the highly noise affected management level is the University of Technology Sydney Rugby Australia and NRL building during the ancillary building demolition (76dB(A)), a predicted exceedance of only 1dB. During these works, excavator mounted hydraulic hammers should be limited to 8am-11am and 12pm to 3pm. All other activities associated with the demolition of the ancillary buildings are predicted to be below the highly noise affected management level of 75dB(A).

Demolition activities are typically the loudest construction activities on site. Given the close proximity to existing developments such as the Rugby League Australia building and UTS, strict adherence with noise affected management levels will not be possible at all times.

With respect the respite periods, which are required in an exceedance of 75dB(A) consultation has been undertaken with Rugby Australia and UTS. The consultation demonstrated that there is no preferred time of day for a one-hour respite period. The consultation to date has highlighted:

UTS / Rugby League Australia:

- Most sensitive period is during exam times, however arrangements can be made if required for exams to be held at main campus.
- Research activities vary in times throughout the day and there is no set time each day where respite would be suitable.
- 9am-5pm is standard staff and student hours on site.
- Agreement to remain in close contact during the works to manage any impacts.

4.4 GENERAL MITIGATION METHODS THAT WOULD BE APPLIED TO MANAGE NOISE/VIBRATION EMISSIONS

The procedures that will be applied to regulate noise and vibration impacts are summarised in the following flow chart.

These methods will be implemented on a case by case basis should noise emissions exceed 75dB(A) at the residential properties or Kira Child Care (see Section 5 for monitoring). Currently, no noise emissions from the site are predicted to exceed 75dB(A), with noise levels of 66dB(A) being predicted as the loudest noise emission from hydraulic hammers mounted on excavators immediately adjacent to the northern boundary.

4.5 NOISE CONTROL METHODS

The determination of appropriate noise/vibration control measures will be dependent on the particular activities and demolition appliances. This section provides an outline of available methods.

4.5.1 Selection of Alternate Appliance or Process

Where a particular activity or demolition appliance is found to generate noise levels that exceed the criteria, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying out this activity by use of pneumatic hammers or pulverising techniques lower levels of noise will result.

It is proposed to use “low noise” hydraulic hammers either proprietary hammers, retro-fitted encased hammers or pulverising techniques.

4.5.2 Acoustic Barriers

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Placing barriers at the source cannot effectively attenuate equipment which is on the move or working in rough or undulating terrain.

Barriers can also be placed between the source and the receiver. The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where the barrier does not obstruct line of sight, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 12mm plywood would be acceptable for the barriers.

It is proposed to utilise portable carpet faced plywood barriers to screen the affected receivers from hammering point wherever practicable.

4.5.3 Silencing Devices

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

4.5.4 Material Handling

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

4.5.5 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to reduce the sound levels emitted. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

4.5.6 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Loading of these vehicles should occur as far as possible from any sensitive receiver.

4.5.7 Introduction of Construction Joints

Construction joints will prevent the direct transmission of vibration from work spaces to sensitive spaces. It is noted that transmission of vibration may still occur via other connections and less direct structural paths.

4.5.8 Strategic Positioning of Processes On-Site

Where practicable, particular processes or activities can be located in particular positions on site to minimise noise to surrounding sensitive receivers.

For example, stationary plant may be positioned where direct line of sight shielding can be achieved using natural barriers, or may maximise the distance to the nearest sensitive receiver. This may also be applicable to the demolition of building structures where the façade closest to residential receivers is left until last to provide barrier screening for the demolition of the other parts of the building.

4.5.9 Combination of Methods

In some cases it may be necessary that two or more control measures be implemented to minimise noise emissions.

4.5.10 Establishment of Direct Communication with Affected Parties

In order for any construction noise management programme to work effectively, continual communication is required between all parties that may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process that allows for the adjustment of control methods and criteria for the benefit of all parties.

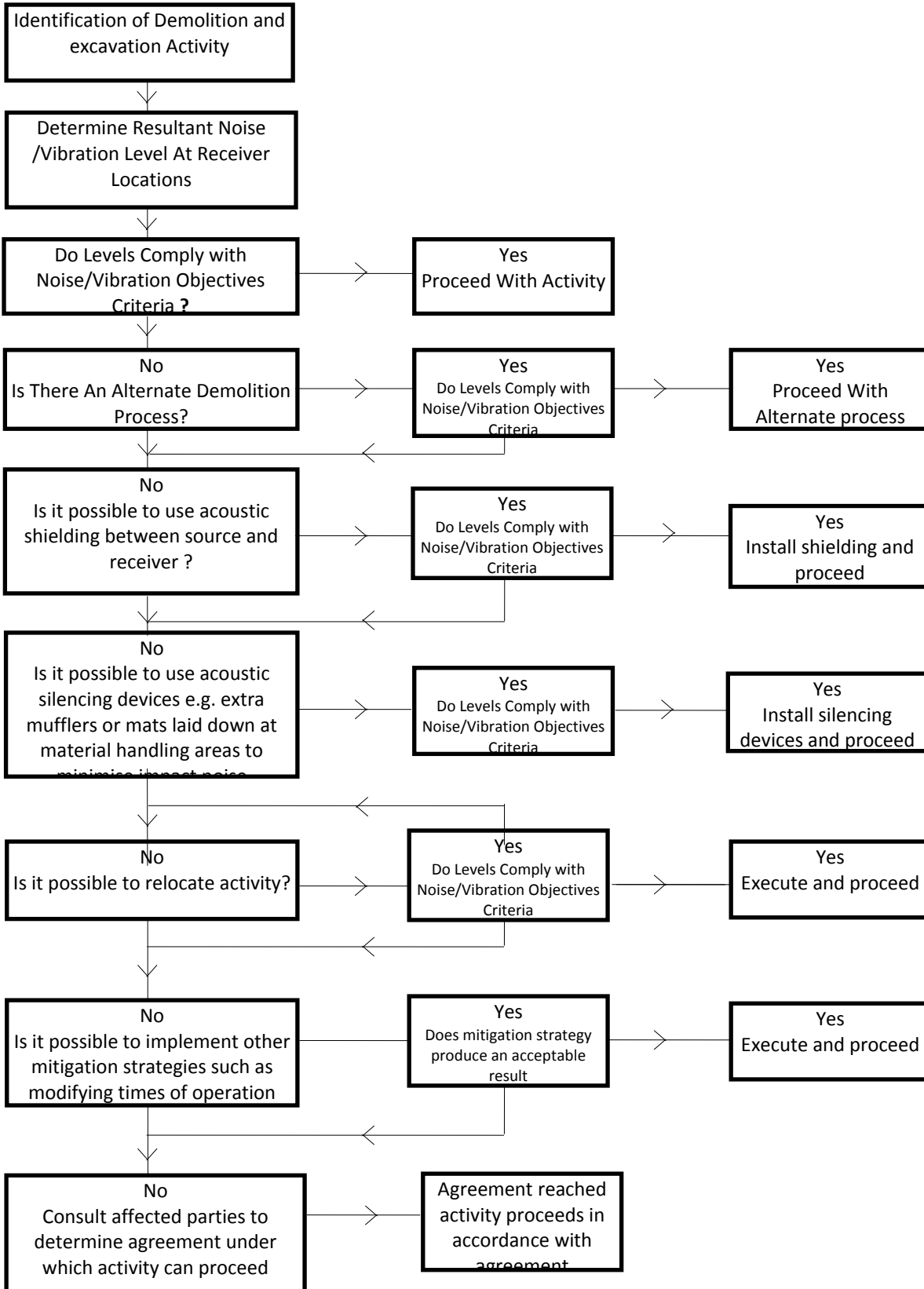
The objectives of the consultation process are to:

- Inform and educate the groups about the project and the noise controls being implemented.
- Increase understanding of all acoustic issues related to the project and the options available.
- Identify group concerns generated by the project, so that they can be addressed.

4.5.11 Management Training

All site managers should be made aware of noise and vibration limits, applicable control measures and methods. They should ensure that all agreed noise and vibration measures are carried out by employees and sub-contractors.

CONTROL OF NOISE FLOW CHART



5 MONITORING

It is proposed to undertake a programme of noise and vibration monitoring to comply to monitor noise and vibration levels within at critical locations around the site.

The monitoring would consist of attended monitoring (to confirm noise/vibration predictions, to identify safe working distances or methods and in response to complaints) and unattended monitoring in order to provide a historical record of emissions, to provide vibration alarms and to identify exceedences where complaints are made.

Vibration loggers, positioned in locations representative of sensitive receivers, would be used to provide a record of vibration levels and to provide alarms if vibration limits are exceeded. Installation of noise loggers would be undertaken for recording purposes in case of complaints and to monitor progress of the works.

Two unattended noise monitors are currently proposed for the site. It is proposed that the monitors be located:

- On the opposite side of Moore Park Road at the residential receivers; and
- Kira Child Care Centre

The locations satisfy the requirements of Condition C20, noting that one monitor would sufficient given that both the Child Care Centre and the residential properties are at the same offset from the site, and will receive almost identical noise levels from the site.

Three unattended vibration monitors are currently proposed for the site during the demolition phase of the stadium. These locations are:

- Members / Ladies Stand of the SCG; (5mm/s PPV)
- 2 x Busby's Bore (3mm/s PPV); and
- Rugby League Australia (10mm/s PPV)

5.1 RESPONSE TO VIBRATION ALARMS

The following general procedure should be adopted in zones where only unattended logging is required in response to alarm events. During the course of demolition where a monitor alarm is activated the following action shall be undertaken:

- Monitoring alarms shall be managed using in built paging systems as part of the unattended vibration monitoring equipment. An SMS notification shall be sent upon an exceedence of the vibration trigger level to relevant site personnel.
- Where the exceedence of the amenity vibration targets is minor and does not occur for a greater than 5 minute interval per hour then the activities should continue but care should be taken to minimise vibration.
- If minor exceedences occur for greater than 5 minutes, or if single events occur that exceed 10mm/s then the following should occur:
 - Investigate if there may be sources of extraneous vibration.
 - If not, all vibration producing works in the vicinity of the alarm shall immediately be stopped.

- The cause of the exceedence shall be investigated and if the cause is seen as a single event that is unlikely to be repeated continue with works.
- If the cause of the event is likely to occur again, or if another alarm is triggered, then the acoustic consultant should be advised and further action taken before works recommence.

One of two courses of action can then follow:

1. If attended monitoring is established the activity can continue with the attended monitoring confirming that even if the alarm level is exceeded the works can proceed provided the vibration limit is not exceeded.
2. Work practices are modified and attended monitoring used to confirm vibration emission levels.

6 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

6.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continuous communication is required between all parties which may be potentially impacted upon, Lendlease and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups about the project and the noise controls being implemented;
- Increase understanding of all acoustic issues related to the project and options available;
- Identify group concerns generated by the project, so that they can be addressed; and
- Ensure that concerned individuals or groups are aware of and have access to the Complaints Register which will be used to address any construction noise related problems should they arise.

An additional step in this process is to produce a newsletter informing nearby residents of upcoming activities that are likely to generate higher noise/vibration levels.

6.2 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration criteria occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;
- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held.

All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

The investigation of a complaint shall involve where applicable;

- noise measurements at the affected receiver;
- an investigation of the activities occurring at the time of the incident;
- inspection of the activity to determine whether any undue noise is being emitted by equipment; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

6.3 CONSULTATION ALREADY CONDUCTED

Community consultation has already been undertaken, with meetings being undertaken with the most affected receivers as follows:

6.3.1 Kira Child Care / Sydney Water - 25 January 2019

Attendees:

Kira/Sydney Water:

Jordan Martins – Director (Kira)

Jennifer Green - Practice Manager (Kira)

Pierre Eid - Property Manager (Sydney Water)

INSW/LL

Robert Watts

Craig Scannel

6.3.2 UTS - 24 January 2019

Attendees:

UTS

Aaron Coutts

Glen Rabbitt

Fiona Scott

Danielle Buhagiar

Shaun O'Mara

SFSR

Rob Watts

Nick Johnston

Craig Scannel

6.3.3 Outcomes

It is proposed to keep regular contact with the surrounding receivers as per the requirements of Condition C48, B9 and B10 in addition to the regime of monitoring listed in Section 5. In the event of a recorded exceedance of the 75dB(A) noise affected management level at any receiver, the site practice will be identified and addressed on a case by case basis. It is noted that demolition noise levels are predicted to be 50-65dB(A), well below 75dB(A) at the residential receivers and Kira Child Care Centre.

6.4 CONTINGENCY PLANS

Where non-compliances or noise complaints are raised the following methodology will be implemented.

1. Determine the offending plant/equipment/process
2. Locate the plant/equipment/process further away from the affected receiver(s) if possible.
3. Implement additional acoustic treatment in the form of localised barriers, silencers etc. where practical.
4. Selecting alternative equipment/processes where practical
5. If necessary, setup noise/vibration and dust monitoring devices at locations representing the nearest noise/vibration and dust affected receivers and provide data for each complain time period. Analysis is required to determine suitable mitigation measures.

Complaints associated with noise /vibration and dust generated by site activities shall be recorded on a Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager to the general public and their contact telephone number.

7 CONCLUSION

A demolition noise and vibration sub plan has been developed that will be used by the contractor to monitor and manage impacts from the Sydney Football Stadium construction activities.

The assessment of noise and vibration emissions indicates that:

- For at least part of the site demolition period, some processes are likely to generate noise levels that will require additional management according to the procedures outlined in the sub plan, however all noise emissions are predicted to comply with the Highly Noise Affected Management Level of 75dB(A) Leq as per Condition of Consent B14e at residential receivers and the Kira Child Care Centre. A marginal exceedance (1dB) is predicted for works demolition works immediately adjacent to Rugby League Australia, and respite periods have been incorporated in order to ameliorate adverse impacts. Adoption of the elements of the Noise and Vibration Management Plan will ensure that noise and vibration impacts will be minimised.
- Monitoring is required safeguard existing structures immediately adjacent to the site.

The Sub plan outlines the development of controls and safeguards that would be applied to all activity on the site. The objective of these controls is to ensure that all work is carried out in a highly controlled and predictable manner that will minimise emissions and protect the amenity of the sensitive receivers surrounding the site.

The controls and safeguards implemented as a result of the analysis recommended in the Plan would be reviewed at a number of stages as required to respond to local conditions, revised methods and equipment, as well as in response to the monitoring and evaluation of actual impacts. This management plan outlines the procedures that would be adopted during the planning and execution phases by the contractor.

Further reviews would be undertaken through the demolition and construction period, as required, in response to revised methods and equipment, as well as in response to the monitoring and evaluation of actual impacts.

Prepared by



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