

koikas acoustics PTY LTD

CONSULTANTS IN NOISE & VIBRATION

Commercial 1 (Unit 27)

+612 9587 9702

DELIVERING SOUND ADVICE

637-645 Forest Road

office@koikasacoustics.com

Bexley NSW 2207

www.koikasacoustics.com

ABN: 12 058 524 771

ACOUSTICAL REPORT

PROPOSED EXTENSION AND REFURBISHMENT OF

PITTWATER HOUSE SCHOOLS

70 SOUTH CREEK ROAD, COLLAROY NSW

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Approved by	Adam Semple, MAAS Senior Consultant
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Client	Pittwater House Schools C/- Neeson Murcutt Architects Pty Ltd Attention: Kirsty Hetherington / Frances McLennan Email: kirsty@neesonmurcutt.com / frances@neesonmurcutt.com Phone: (02) 8203 1870
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ACOUSTICAL REPORT
PROPOSED EXTENSION AND REFURBISHMENT OF
PITTWATER HOUSE SCHOOLS
70 SOUTH CREEK ROAD, COLLAROY NSW

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1.0 INTRODUCTION

Koikas Acoustics Pty Ltd has been engaged by Pittwater House Schools to prepare an acoustic report to accompany an application to Northern Beaches Council for a proposed extension and refurbishment of buildings and facilities within Pittwater House Schools at 70 South Creek Road, Collaroy.

This report is prepared to assess what acoustical implications may arise for surrounding residents as a result of the proposed building removals, building extensions, and facility modifications. A secondary component of the report is to provide preliminary design advice with respect to acoustical conditions within proposed new or modified classrooms such as controlling room reverberation and limiting noise transfer between adjoining noise-sensitive rooms/learning areas.

The primary basis for the assessment is to review the potential increased noise exposure for local residents on account of the removal, additions, and relocation of school buildings/facilities. Any potential noise increase should not result in an unacceptable impact that would reduce existing noise amenity. Where noise is found to increase to a level that is deemed unacceptable, appropriate noise mitigation measures are to be advised.

As a means of providing guidance on acceptable noise exposure levels for neighbouring residents, reference is made to:

- NSW EPA Noise Policy for Industry 2017 guidelines
- Noise criteria established through the Land and Environment Court of NSW (NSW LEC) proceedings with respect to childcare centre noise emission
- Previous NSW LEC judgement regarding noise from schools adjacent to residences
- NSW EPA Road Noise Policy (RNP)

Recommendations for acceptable acoustical conditions within classrooms are taken from:

- NSW Department of Education Facilities Standards and Guidelines (EFSG)
- Guideline for educational facilities (AAAC)
- AS2107-2016 Acoustics – Recommended design sound levels and reverberation times for building interiors



2.0 THE PROPOSAL

Pittwater House Schools is located at 70 South Creek Road, Collaroy. The school occupies a large sloping site with an area of approximately 34,400m². The primary access point is from South Creek Road. A secondary frontage exists along Westmoreland Avenue that provides further access to the school.

The school has places for 1000 students ranging from pre-school through to primary and secondary school age. It generally offers single-sex classes in a co-educational environment.

To summarise, the proposal seeks to:

- Remove a number of temporary demountable-type structures and ancillary cottages
- Partial-removal of areas within existing main school buildings
- Provide small extensions and upgrades to existing General Learning Areas (GLA's)
- Construct new buildings to accommodate student learning resource, faculty and support staff, creative arts
- Modify the existing southern staff parking area and create a new, separate staff parking area along South Creek Road adjacent to the Air Force Barracks
- Introduce a new school drop-off and pick-up zone

The proposal does not seek to alter the existing number of students in the school or any of the existing operational parameters of the school such as hours, the facility uses, etc.

The architectural designs related to the proposal have been prepared by Neeson Murcutt Architects Pty Ltd. Plans and design issued to Koikas Acoustics for reference throughout this report are DA Issue plans, dated 9 October 2019. This report and the recommendations included herein are made with direct reference to these plans.



3.0 SITE AND SURROUNDS

The school is zoned in an R2 Low-Density Residential area as defined in the Warringah LEP 2011 and as such the local area is predominantly residential in context. The following properties surround the school premises:

- A single residential dwelling is located at 74 South Creek Road adjacent to the school maintenance yard and existing staff car park
- Residential dwellings located along South Creek Road south of the school
- Residential dwellings located along Parkes Road west of the school
- Residential dwellings located along Westmoreland Avenue north of the school

Figure 1 identifies the above.



Figure 1. Aerial view of the school and surrounding properties

4.0 NOISE MONITORING SURVEYS

4.1 AMBIENT/BACKGROUND NOISE LOGGING

Existing external ambient noise levels were measured by installing three sound level meter data loggers around the site at locations representing the surrounding residential neighbourhoods.

- Logger 1 was installed adjacent to South Creek Road.
 - A Type 2 precision Noise Sentry instrument was used for the survey
 - The microphone was situated approximately 1.2m above the natural ground
 - This meter measured ambient noise levels representative for residential premises along South Creek Road

- Logger 2 was installed in the rear yard of 19 Parkes Road.
 - A Type 1 precision Svantek 977 instrument was used for the survey
 - The microphone was situated approximately 1.5m above the natural ground
 - This meter measured ambient noise levels representative for residential premises along Parkes Road

- Logger 3 was installed adjacent to Westmoreland Avenue.
 - A Type 1 precision Svantek 949 instrument was used for the survey
 - The microphone was situated approximately 1.5m above the natural ground
 - This meter measured ambient noise levels representative for residential premises along Westmoreland Avenue

Each instrument was set-up to measure A-frequency and 'Fast' time-weighted noise levels. Noise level data was stored within the logger memory at 15-minutes intervals for the deployment period that was between 12 September 2019 and 25 September 2019.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drift was observed for the meters.



BOM (Bureau of Meteorology) weather records for the Terrey Hills weather station indicate that inclement weather conditions may have affected the recorded noise data between the 17 and 19 September 2019. The surveys were extended so that sufficient ambient noise data was recorded to allow a statistically reliable derivation of ambient noise levels.

Summarised results of each noise survey are provided below for the 'daytime period' (as defined in the NSW EPA NPfI) during which time the school operates.

- South Creek Road LA90 Rating Background Level 46dB
- Parkes Road LA90 Rating Background Level 40dB
- Westmoreland Avenue LA90 Rating Background Level 42dB



Figure 2. Noise logger locations

4.2 SCHOOL ACTIVITY NOISE

Operator attended measurements were taken during break times at the school in the three main areas where students congregate. These areas are shown in Figure 3.



Figure 3. Main active recreation areas – locations of noise monitoring

All measurements were taken with NTi Audio XL2 sound level meters set to A-weighting and fast time response. Measurement instrumentation is currently NATA certified and was field-checked before and after the surveys with a Larson Davis CAL200 precision acoustic calibrator. No system drift was recorded.

A summary of the surveyed school noise levels follows.

Table 1. Attended school noise survey results						
Location	Measurement condition	Noise levels [dB]				
		L _{Amax}	L _{Aeq}	L _{A1}	L _{A10}	L _{A90}
Main Oval	Fixed point in the centre of the oval	88	68	77	71	60
	Fixed point at the north end of the oval	82	65	74	68	56
	Fixed point at the west side of the oval	86	68	80	71	59
Junior school	Spatial average	93	72	84	74	58
	Fixed point – southern boundary	76	61	71	64	53
Junior/pre school	Spatial average	80	66	77	70	55
	Fixed point – southern boundary	76	62	74	64	54

5.0 ACOUSTICAL PLANNING GUIDELINES

5.1 NOISE EMISSION FROM THE SCHOOL

The following reference material is considered appropriate for this assessment when considering the acoustical implications of the proposal in terms of noise exposure for residential receivers.

5.1.1 NSW EPA Noise Policy for Industry 2017

The NSW EPA Noise Policy for Industry 2017 (NPfi) provides guidelines for the measurement and assessment of noise generated by premises and activities scheduled under the Protection of the Environment Operations Act 1997 (POEO Act 1997). This typically relates to industrial and extractive sites, however, it is also generally applied for commercial premises. Although a school is not a 'scheduled' premises under the Act, nor does it classify as an industrial/extractive/commercial site, the guidelines for determining intrusive noise impacts may be referenced for context regarding potential noise impacts generated by the school use to neighbouring residential premises.

Intrusive noise is defined in the NPfi as being 5dB above the background noise level, where the source noise is assessed as an $L_{Aeq\ 15\text{-minutes}}$. The guidelines do allow a further increase above the identified intrusive noise level (background + 5) where a noise event is of sufficiently short duration and only occurs once in a typical assessment period.

For noise attributed to children utilising outdoor play areas during break times, it is expected that applying the intrusive noise criteria with a correction for short duration noise could provide a reasonable basis for assessing any intrusive qualities of the noise.

Noise from any mechanical plant and equipment that is to be installed as part of the proposal is recommended to be limited to 5dB above the background level in accordance with the intrusive noise criteria. Adopting a limit of 5dB above the background level for mechanical plant noise is standard practice throughout most Local Government Areas (LGA) in Sydney.

5.1.2 Planning criteria typically applied for CCC outdoor play areas

Given that the primary source of concern regarding noise generated by the school will be the use of the outdoor activity areas during break times, further guidance on acceptable noise levels can be referenced from noise assessment criteria established through NSW LEC proceedings in NSW regarding children occupying outdoor play areas in childcare centre facilities.



The noise criteria were developed and adopted during proceedings before the NSW LEC in the case of Northside Motessori vs Ku-ring Gai Council. It has since been widely used by acoustical consultants and the NSW LEC in establishing suitable acoustical planning levels for childcare centre development.

Noise emission from the use and occupation of childcare centre must not exceed 10dB above the background noise level for the first two hours during which the outdoor play area is in use, and must not exceed 5dB above the background level thereafter. Noise levels are assessed as an LAeq 15-minutes at the most noise-affected location within any affected residential property boundary.

5.1.3 Historical NSW LEC judgment

Although Koikas Acoustics does not necessarily agree with the position taken by the court in the matter of Meriden School vs Pedavoli (2009 – NSWLEC 183), it should be noted that the court found that noise generated by children playing in outdoor areas of a school was not considered to be ‘offensive’ where that noise was measured to be up to 18dB above the background noise level, and therefore, did not constitute a breach of the POEO Act 1997.

The position of the court was that as the school was operating in accordance with its conditions of consent, any noise attributed to ‘normal activities’ from the school is not offensive.

5.2 ACOUSTICAL QUALITIES OF GENERAL LEARNING AREAS

Reference material used for establishing suitable performance criteria for internal acoustical conditions within classrooms, library areas, and administrative areas includes the following:

- NSW Department of Education Facilities Standards and Guidelines (EFSG)
- Guideline for educational facilities (AAAC)
- AS2107-2016 Acoustics – Recommended design sound levels and reverberation times for building interiors

Each of the above documents adopts similar acoustic performance criteria within specific areas of education facilities. A summary of appropriate internal acoustical performance criteria for new or modified rooms in the school is included in Table 1 below.



Table 2. Acoustical performance standards for rooms

Room type	Internal noise level LAeq [dB]	Reverberation time RT60 [sec]	Speech intelligibility STI
Teaching space – Primary school	35	<0.5	>0.6
Teaching space – Secondary school	35	<0.6	>0.6
Library	35	<0.6	>0.6
Creative arts	35-40	<0.6	>0.6
Administrative areas	35	<0.6	>0.6

Wall and floor partitions that separate the above areas from other school areas should be able to achieve a Weighted Sound Reduction Index (R_w) of no less than 55 and a Weighted Standardised Impact Sound Pressure Level (L_{nTw}) not more than 55.



6.0 ASSESSMENT OF RESIDENTIAL NOISE EXPOSURE

6.1 NOISE DURING BREAK TIMES

The acoustical impact of the proposed works is assessed/analysed in terms of what effect the proposed works will have on existing noise exposure for residents surrounding the school premises. Where the proposed new work will not alter the existing noise levels generated from the school, or should they reduce, it is determined that the development will not result in adverse noise impact.

A CadnaA noise model was prepared to simulate noise emission from outdoor recreational areas that are used during school break times. During on-site inspections, Koikas Acoustics had identified three main areas where students would congregate during break times, being:

- The Main Oval (predominantly used by students of the senior school)
- A landscaped play area between M Block and neighbouring buildings along Parkes Road (predominantly used by students of the junior school)
- A small grassed area at the south-eastern corner of the school site along South Creek Road (predominantly used by students of the junior school)

Each area is shown in Figure 3.

The noise predictions are based on computer simulation (CadnaA) of the site and the surrounding area. The program predicts noise levels to receiver points based on source sound power levels, source-receiver distances, the presence of any acoustic shielding objects, and the effects of acoustic absorption of the ground and other elements. Noise propagation calculations are determined in accordance with *ISO 9613 Acoustics – Attenuation of sound during propagation outdoors*. In accordance with the sound propagation algorithms adopted in the ISO standard, the output of the noise model is a downwind sound pressure level which constitutes an assessment of noise-enhancing weather conditions.

Two simulations were prepared, one reviewing the current noise levels at neighbouring residential properties and the second reviewing future noise levels once the new and modified buildings are constructed. It should be noted that under both simulation conditions, it has been assumed that all three of the identified outdoor active recreation areas are occupied (worst-case scenario). In the 'future' simulation, students occupying the small area at the south-eastern corner of the school



adjacent to South Creek Road are assumed to be relocated centrally within the school grounds in the area formerly occupied by D Block buildings.

Area sources were used in the simulations to represent students in each of the outdoor recreation areas. The sound power levels attributed to each of the area sources were calibrated to coincide with the noise levels measured during the attended surveys conducted at the school. As a guide, the following sound power levels were applied:

- Main Oval: LAeq sound power level of 105-106dB
- Junior school area (west): LAeq sound power level of 98dB
- Junior school area (south): LAeq sound power level of 92dB

A total of 37 receiver locations were investigated in Parkes Road, Westmoreland Avenue, and South Creek Road. Detailed noise levels for the 'existing' and 'future' simulations, along with associated noise contour maps are provided as an Appendices to this report. The following is a summary of the simulations:

- The proposal will not alter existing noise exposure levels for properties on Parkes Road.
- The proposal will not alter existing noise exposure levels for properties on Westmoreland Avenue.
- The proposal will result in a nett decrease in noise exposure levels for properties on South Creek Road.

As the proposed works will not result in a material increase in noise exposure for neighbouring residential properties on account of students occupying outdoor active recreation areas, Koikas Acoustics is satisfied that the proposal will not be of detriment to the existing noise level amenity of the area.

6.2 NOISE FROM PARKING AREAS

The modification of the existing staff parking area on South Creek Road and the inclusion of a new staff parking area and internal school drop-off/pick-up zone must not generate unacceptable noise impact for surrounding residential receivers.



6.2.1 Assessment criteria

This assessment has adopted an assessment criterion based on the intrusive noise limits adopted by the EPA. The intrusive noise limit is defined as being 5dB above the background level. Daytime background noise levels along South Creek Road have been surveyed at LA90 46dB. The project intrusive noise limit becomes LAeq 15 minutes 51dB.

6.2.2 Assessment methodology

The parking areas and new drop-off/pick-up zone were included in a CadnaA model of the site.

The reconfigured existing parking area and new staff parking area are defined in the model under the 'Parking lot' module. The parking lot module calculates an area sound power level for the car park in accordance with the methodology of LfU-Study 2007 (Bavarian study of noise emission from car parking areas). The LfU-Study 2007 calculation methodology considers the LAeq sound power level of a single vehicle undertaking normal parking activity* over a 1-hour period. The overall noise emission level is then corrected to account for the number of total parking movements per parking space per hour, the parking area type, ground surface etc.

** Normal parking operations include entering/leaving the parking area, searching for a parking space, doors opening and closing and engines starting.*

Vehicles entering and leaving the new drop-off/pick-up zone were modelled as moving point sources in the CadnaA model. Sound levels attributed to each car movement were based on measurements of cars in parking areas conducted by Koikas Acoustics. Incidental noise events such as car doors opening and closing and car engines starting were also modelled.

6.2.3 Design parameters

The following calculation parameters were considered in the noise model:

- 51 car spaces are provided in the reconfigured parking area along South Creek Road. It is expected that 51 parking movements could occur during peak hour.
- 34 car spaces are provided in the reconfigured parking area along South Creek Road. It is expected that 34 parking movements could occur during peak hour.
- 40 cars may access the new drop-off/pick-up area during peak hour.
- +1dB is applied for the bitumen/grasscrete parking surface of the new staff parking area.



- A 1.8m high barrier is installed along common boundaries with the neighbour at 52 South Creek Road. The proposed barrier is to taper down to 1.2m high at the South Creek Road boundary to allow sufficient sight lines for oncoming traffic. The barrier should be graded from 1.2m to 1.8m high as steeply as allowed, and must not exceed a distance of 6.5m, to ensure sufficient acoustical benefit from the barrier.
- The existing boundary fence between 74 South Creek Road and the reconfigured car park is to remain.
- To model a worst-case scenario, it is assumed that all parking areas are in use at the same time.

6.2.4 Predicted receiver levels

Predicted receiver levels due to the use of the car parks and new drop-off/pick-up zone are assessed at the most noise-affected residential receiver locations along South Creek Road. These locations are summarised as follows:

- Residential dwelling at 74 South Creek Road, adjacent to the reconfigured staff car park
- Residential dwelling at 52 South Creek Road, adjacent to the proposed new staff car park
- Residential dwelling at 53 South Creek Road, opposite the proposed new staff car park
- Residential unit block at 55-59 South Creek Road, opposite the proposed new drop-off/pick-up zone
- Residential dwelling at 63 South Creek Road, opposite the reconfigured staff car park

The output of the noise model is shown in the CadnaA layout attached in Appendix A. It is shown that noise levels attributed to the parking areas and drop-off/pick-up zone are not in excess of the applicable intrusive noise limits. The predicted receiver levels presume that a new 1.8m high screen/noise barrier is installed along common boundary with 52 South Creek Road. The model predicts that without the proposed noise barrier, parking area noise levels could exceed the applied noise criteria.

To summarise, noise levels are predicted to be within $L_{Aeq, 15 \text{ minutes}}$ 39-43dB at neighbouring residential receiver locations. This is lower than the existing daytime background noise level, and well below the applied intrusive noise limits.



6.2.5 Recommendations

Noise barriers are to be installed along common residential boundaries shared with the school car parking areas.

All noise barrier material/s should have sufficient weight to negate sound transmission through the barrier. In this regard, the barrier material should have a surface density of not less than 15-20kg/m². Suitable materials could be 9mm fibre cement sheets, masonry, or proprietary modular wall panels.

Between the new car park and 52 South Creek Road, the barrier is to reach a minimum height of 1.8m after being graded from an initial height of 1.2m at the South Creek Road boundary. The barrier transition from 1.2m high to 1.8m high should not exceed a distance of 6.5m from the South Creek Road boundary.

Between the existing car park and 74 South Creek Road, the existing barrier height is to be at least maintained, and preferably raised to a height of 1.8m. The barrier construction/materials will need to be upgraded in accordance with the minimum specifications identified above.

6.3 MECHANICAL PLANT AND EQUIPMENT

The installation of new mechanical plant and equipment such as air conditioning condensers units must not generate noise at nearby noise-sensitive premises that unacceptably impact residential noise amenity. The assessment recommends adopting the intrusive noise limit as the project noise criteria related to mechanical plant noise.

As derived from the existing daytime background noise levels surveyed in South Creek Road, Parkes Road, and Westmoreland Avenue, the following project noise criteria would apply to any new mechanical plant and equipment that is installed as part of the development proposal:

- South Creek Road LAeq 15 minutes 51dB (46 + 5)
- Parkes Road LAeq 15 minutes 45dB (40 + 5)
- Westmoreland Avenue LAeq 15 minutes 47dB (42 + 5)



The design and selection of mechanical plant and equipment are yet to be completed. It is not typical for this work to be completed at the development application stage, but rather prior to the construction certificate stage. As no design or selection is available, it is not possible to determine residential noise exposure.

However, it is the opinion of Koikas Acoustics that there is sufficient scope within the development to accommodate mechanical plant units in locations that are well shielded from noise-sensitive areas of surrounding development. A final review of mechanical plant noise should be completed prior to construction.



7.0 ASSESSMENT OF CLASSROOM ACOUSTICS

Evaluating the internal acoustical quality of the classrooms and separating partitions (walls/floors) considers guidelines provided by the NSW Department of Education, AAAC guidelines, and AS2107-2016. Four specific acoustical components are reviewed herein:

1. Ambient noise levels in classrooms
2. Reverberation times in classrooms
3. Speech intelligibility in classrooms
4. Sound insulation between adjoining rooms

7.1 AMBIENT NOISE LEVELS IN CLASSROOMS

New classrooms, faculty areas, and the junior school library are predominantly located along South Creek Road. A review of current ambient noise levels in this area as surveyed by Koikas Acoustics indicates that the prevailing L_{Aeq} noise levels are 61-62dB. To meet the recommended indoor ambient noise levels for classrooms of L_{Aeq} 35dB, the façade must provide up to 27dB of noise reduction.

The level of noise reduction that is achievable through a building façade is typically determined by its acoustically 'weakest' element. In a building that is designed with masonry external walls and a concrete roof slab, the weak element is the windows. It is generally accepted that indoor noise levels will be 10dB lower than external noise levels where windows or doors to that room are open. It is expected that indoor ambient noise levels would exceed the recommended guideline levels should classroom windows be left open.

Closing the windows will increase the noise reduction performance of the façade to a level that is dependent upon the type and thickness of glass used for the windows. Standard 4mm thick float glass windows can result in a noise reduction of 20-24dB. This is not sufficient to achieve the project requirement.

It is recommended that installed windows are to be minimum 6.38mm laminated glass with Q-lon or approved fin-type acoustic seals. Typical masonry type external wall and roof constructions will be acceptable.



7.2 REVERBERATION TIMES IN CLASSROOMS

Controlled reverberation times in classrooms is important in creating and maintaining an efficient learning environment that allows students to clearly hear what teachers are saying. The guidelines generally recommend reverberation times of around 0.5-0.6 seconds.

With external walls and windows being typically hard surface finishes that are highly reflective to sound, and commercial carpets also having relatively low sound absorption, reverberation control is often provided via acoustic ceiling tiles, with perforated plasterboard or fibre cement set ceilings with absorption installed above, or with sound absorption panels fixed to wall surfaces.

Until greater detail is known with respect to final room sizes and surface finishes, final design on absorption surfaces coverages and material/product selections cannot be produced.

At this preliminary stage, it is recommended to allow for the following in rooms/areas deemed critical for reverberation control (classrooms, meeting rooms, library areas, administrative areas):

- Acoustic ceiling tiles capable of achieving an NRC rating of no less than 0.7 where a typical commercial grid-type ceiling system is installed.
- Perforated plasterboard or fibre cement ceilings where a set ceiling is proposed. The perforations should allow for an open area of at least 16% and 50mm thick fibreglass absorption installed above in the ceiling cavity.

7.3 SPEECH INTELLIGIBILITY

Ensuring good speech intelligibility is critical for learning areas and other noise-sensitive spaces such as meeting rooms and some administrative areas. Speech intelligibility is dependent upon the speech level, the background noise level in a room, and the reverberation time. High levels of speech intelligibility exist where speech levels are high, background levels are low, and the room reverberation time is short.

Koikas Acoustics expects that where the recommended acoustic treatments proposed to control room reverberation are installed, speech intelligibility will meet the design objective of 0.6.



7.4 SOUND INSULATION BETWEEN ADJOINING ROOMS

Educational facilities guidelines recommend that walls and floors separating noise-sensitive areas should be insulated to prevent excessive noise transfer between rooms.

The guideline for wall acoustic performance is to achieve an R_w of no less than 55.

Floor partitions should be able to achieve an R_w of no less than 55 and an L_{nTw} of no more than 55.

Koikas Acoustics has based their recommendations on the following design assumptions:

- Steel framed internal wall partitions
- Minimum 200mm thick concrete slab floors between floor levels of multi-storey buildings

7.4.1 Partition walls

A number of options exist for wall partitions capable of achieving the required R_w ratings. Options are provided for standard single stud walls and staggered stud walls.

- Single stud – 92mm framing with studs spaced at 600mm centres, 75mm thick glasswool insulation in the stud cavity (minimum density 11kg/m³), 2 layers of 16mm Fyrchek MR plasterboard each side.
- Single stud – 92mm framing with studs spaced at 600mm centres, 75mm thick glasswool insulation in the stud cavity (minimum density 11kg/m³), 1 layer 6mm Ceminseal and 1 layer of 16mm Fyrchek plasterboard each side.
- Staggered stud – 92mm tracks with 64mm studs spaced at 600mm centres each side, 75mm thick glasswool insulation in the stud cavity (minimum density 11kg/m³), 2 layers of 13mm Soundchek plasterboard each side.
- Staggered stud – 92mm tracks with 64mm studs spaced at 600mm centres each side, 75mm thick glasswool insulation in the stud cavity (minimum density 11kg/m³), 2 layers of 13mm Fyrchek plasterboard each side.



Partition walls that are required to be acoustically rated should extend to the underside of the concrete soffit. Any penetrations in the wall to accommodate building services should be accurately sized to minimise air gaps around the penetrating element. All air gaps should be filled with a mastic type sealant.

Where partition walls cannot extend through the ceiling cavity and to the underside of the concrete soffit, the ceiling design must be able to achieve the same acoustic rating as the partition wall so that flanking noise via the ceiling space does not affect the sound insulation rating between rooms.

7.4.2 Floor/ceiling partitions

The build-up of the floor system that separates a noise-sensitive room on the ground floor from another room on the 1st-floor must be able to meet the airborne (R_w) and impact (L_{nTw}) ratings. The following construction is predicted to meet both acoustical ratings:

Table 3. Floor partition recommendations	
Description	Recommendation
Floor cover and underlay	Option 1: Carpet on carpet underlay such as Dunlop Duralift 7 Option 2: Acoufelt Carpet Tiles with Quietback Option 3: Selected tiles on 5mm thick rubber acoustic underlay Option 4: Selected timber floorboards on 5mm thick rubber acoustic underlay
Structural floor slab	200mm concrete
Ceiling cavity depth and insulation	200mm ceiling cavity with 75mm thick glasswool insulation (density 11kg/m ³)
Ceiling lining material	Mineral fibre ceiling tiles
Notes	
1.	Rubber acoustic underlays can be sourced from suppliers such as Regupol, A1 Rubber, Uniroll, Damtec.

The recommended floor systems are designed to achieve the required airborne and impact sound insulation ratings. Where the ceiling cavity is greater than 200mm in depth the acoustic ratings of the floor system are expected to improve.

The above recommendations are only preliminary to provide a guide as to what may be required when the design progresses to a more finalised stage. Koikas Acoustics recommends conducting a review of the acoustical ratings of both the floors and walls prior to finalising the design and specification.



8.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustic report for the proposed extension and refurbishment to buildings and facilities within Pittwater House Schools at 70 South Creek Road, Collaroy. The acoustic report is to accompany a development application being submitted to the Northern Beaches Council.

The assessment reviews the potential of the development to result in adverse noise impacts to residents surrounding the school. The focus is to maintain existing acoustic amenity for the area and where new sources of noise are introduced into the school facility, that they are of a level or are suitably treated such that residential noise amenity is maintained.

In addition to reviewing noise emission from the school, additional recommendations are provided with respect to the acoustical qualities of the new learning areas and administration facilities.

Acoustic planning guidelines have been referenced from current documentation published by Standards Australia, the NSW EPA, DECC, AAAC, Department of Education, and also from referencing typical acoustical criteria that are both widely used in acoustical assessments throughout Sydney and that have been previously adopted by the LEC NSW.

The included recommendations are based on designs prepared by Neeson Murcutt Architects.

The conclusions reached in this report should assist Council in making their determination of the proposal in terms of compliance with the necessary acoustic design requirements. A further detailed acoustic report may be required for the CC submission should the designs be amended.

Of the assessed components of noise, the following conclusions have been reached:

1. The removal, extension and refurbishment of school buildings and the anticipated relocation of outdoor recreation area/s are not expected to alter the existing noise levels generated during school break times. In fact, there is the potential for a marginal reduction in noise exposure for residents along South Creek Road on account of the new drop-off/pick-up zone meaning that an existing outdoor recreation area will need to be relocated further within the school grounds.



2. Noise from the reconfiguration of the existing staff parking area, the inclusion of a new staff parking area, and the inclusion of the new drop-off/pick-up zone, all along South Creek Road can comply with standard noise assessment criteria provided that noise barriers are constructed along common boundaries shared with neighbouring residential properties at 52 and 74 South Creek Road.
3. It is the expectation of Koikas Acoustics that there is sufficient scope within the school premises and building designs to incorporate acoustically compliant mechanical plant and equipment. A review of noise generated by any new mechanical plant and equipment should be conducted once the final locations and equipment selections are made. At the current application stage and without detailed design information, a detailed assessment cannot be conducted.
4. Classrooms, faculty areas and other noise-sensitive rooms within the school can be suitably treated to allow for desirable acoustical qualities provided that windows are of suitable glass type, thickness, and sealing, ceiling areas are treated with absorptive materials to control room reverberation, and that wall/floor partitions are constructed of materials conducive to insulating against the transmission of sound between rooms.

In our professional opinion, there is sufficient scope within the proposed building design to accommodate the acoustical design requirements. By including the recommended acoustic treatments that are identified in this report, it is anticipated that the proposed extension and refurbishment of the school will not adversely impact existing noise amenity for surrounding residential premises.



APPENDIX A

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APPENDIX A



**** NOISE SOURCES ****

EXISTING SCHOOL LAYOUT

- ~ Students on Main Oval during lunch break
- ~ Students in Junior School lunch areas

NOTES:

1. Noise levels shown are LAeq 15 mins
2. Receiver points at 1.5m above ground

PRINT DATE: 04.10.2019

VERSION: 3757 Existing - all school - v1

- Area Source
- Building
- Barrier
- Ground Absorption
- Contour Line
- Receiver

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB

**** NOISE SOURCES ****

FUTURE SCHOOL LAYOUT

- ~ Students on Main Oval during lunch break
- ~ Students in Junior School lunch areas

Note: assume that the southern junior school lunch area, removed to accommodate the new drop-off/pick-up zone, will be relocated to where D Block was previously.

NOTES:

- Noise levels shown are LAeq 15 mins
- Receiver points at 1.5m above ground

PRINT DATE: 04.10.2019

VERSION: 3757 Future - all school - v1

- Area Source
- Building
- Barrier
- Ground Absorption
- Contour Line
- Receiver

- > -99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB





**** NOISE SOURCES ****

- CAR PARKS AND DROP-OFF/PICK-UP**
- ~ Reconfigured existing staff car park
51 spaces and 51 movements (peak hr)
 - ~ New staff car park
34 spaces and 34 movements (peak hr)
 - ~ New drop-off/pick-up zone
40 movements (peak hr)

- NOTES:**
1. Noise levels shown are LAeq 15 mins
 2. Receiver points at 1.5m above ground

PRINT DATE: 23.10.2019

VERSION: 3757 parking - v3

- Point Source
- - - Line Source
- Parking Lot
- Building
- Barrier
- Ground Absorption
- Contour Line
- Receiver

- > 99.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB
- > 85.0 dB