Visy Smithfield Plastics Facility
Visy
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Construction Noise and Vibration Impact Assessment

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Prepared for

Visy

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1.0 Introduction

1.1 Background

Visy Smithfield (Visy) have submitted a development application (DA) to Holroyd City Council for the proposed addition of a plastics facility to the existing operations at Visy site, located at 6 Herbert Place, Smithfield, NSW.

AECOM Australia Pty Ltd (AECOM) has been commissioned by Visy to undertake a qualitative Construction Noise and Vibration Impact Assessment (CNVIA), to investigate the potential for adverse environmental and community impacts from noise and vibration associated with the construction of the proposed plastics facility.

This report has been prepared in general accordance with the NSW Office of Environment and Climate Change's (OEH) Interim Construction Noise Guideline (ICNG).

The scope of this study is as follows:

- Review the likely construction methodology associated with the proposal – equipment to be used, scheduled progression of construction activities, location of activities, etc;
- Identify noise sensitive receivers with the potential to be impacted by construction activities;
- Establish appropriate construction noise and vibration management levels and objectives;
- Determine maximum indicative noise impacts at the nearest sensitive receivers for the major construction activities;
- Review the potential impacts of construction noise and vibration in relation to identified sensitive receivers; and
- Determine broad mitigation measures, if required, including silencing treatment of mechanical and mobile plant, management of mechanical and mobile plant, community notification and/or other noise mitigation and management measures in accordance with the qualitative assessment method outlined in the Interim Construction Noise Guidelines issued by OEH.

The acoustic terminology used in this report is explained in Appendix A.

1.2 Site description

The Visy site is located at 6 Herbert Place, Smithfield, NSW as shown in Figure 1. The site is bounded by the Cumberland Highway to the west, industrial properties to the north and east and Long Street Park to the south. The nearest residential receivers are located approximately 350 m to the south of the site.

The existing site consists of a:

- Material recycling facility (MRF) where recycled products are delivered by truck and sorted;
- Paper mill, where paper from the MRF is pulped and remade into paper; and
- Cardboard facility where corrugated cardboard is produced and labelled;

1.3 Plastic facility development description

Visy proposes to develop a plastics facility in the north western corner of their existing site to recycle PET and HDPE plastics as shown in Figure 1. The proposed plastic facility is to be located at an existing warehouse building. The facility will cover approximately 12,000 m^2 and will be composed predominantly of colorbond steel and precast concrete panels.

The proposal involves the refurbishment of an existing building located at 6 Herbert Place, Smithfield sufficiently to allow Visy to establish its plastic mill at this location. Installation of a number of equipment at the south end and

within the building, the construction of a pipe bridge and water recycling plant also form integral parts of this development.

The construction phase of this proposal is approximately 4-6 months with the majority of the noise related activities (the Construction Noise address in this report) anticipated to be completed with 3-4 weeks of their commencement.

Figure 1 Location plan

2.0 Scope of noise generating works

Below is a summary of the proposed construction methodology, this information has been provided by Visy personnel.

2.1 Internal area within the existing building

Scope of works includes:

- Cut and remove part of the existing concrete slab on ground – approximately 1500 m^2, or 225 m^3 of concrete (average depth of existing concrete slab = 150 mm);
- Excavate in natural ground and stock pile excavated materials for stock pile on site for re-use – approximately 1500 m^2 or 600 m^3 (average depth of excavated ground = 400 mm);
- Construct new reinforced concrete slab on ground, chemical slab/bund walls, trenches, pits and machine foundations – approximately 1500 m^2, or 450 m^3 of concrete (average depth of excavated ground = 300 mm),as per the architectural and structural drawings and specifications.

Equipment used for the above works are those listed in Table 3.

2.2 External areas

2.2.1 The existing path and sheds immediately south of south wall

Scope of works includes:

- Cut and remove part of the existing concrete slab on ground – approximately 200 m^2, or 30 m^3 of concrete (average depth of existing concrete slab = 150 mm);
- Demolish existing covered steel sheet metal sheds – approximately 1 tonne of steel and 100 m^2 of steel sheet metal cladding;
- Excavate in natural ground for pad and pile foundation for various new equipment including silos, transformers and the like – approximately 160 m^3 (average depth of excavated ground = 400 mm);
- Construct new reinforced concrete pad and pile foundations for various equipment including silos, transformers and the like as per the architectural and structural drawings and specifications – approximately 160 m^3 (5m wide x 80 m long x 0.4 m average depth); and
- Relocation of a fire hydrant line approximately 10 m. The hydrant line will now run parallel with the south side of the internal road on the south side of the proposed plastics facility.

Equipment used for the above works are those listed in Table 3.

2.2.2 Eastern wall

Scope of works includes:

- Cut and remove part of the existing steel metal clad wall sufficient to allow the construction of 2 penetrations of approximate size of 1 m x 1m and 6 m x 4 m respectively for conveyor entry and a new roller door – approximately 25 m^2 of steel metal clad and 0.500 tonnes of structural steel/purlin;
- Demolish existing covered steel sheet metal sheds – approximately 1 tonne of steel and 100 m^2 of steel sheet metal cladding; and
- Construct a new electrical roller door as per the architectural and structural drawings and specifications – approximately 6 m x 4m.

Equipment used for the above works are those listed in Table 3.

2.2.3 Northern wall

Scope of works includes:

- Cut and remove part of the existing steel metal clad wall sufficient to allow the construction of 2 x 200 mm diameter penetrations – approximately area = negligible.

Equipment used for the above works are those listed in Table 3.

2.2.4 Remove existing trees - South east corner of TPC Building

Scope of works includes:

- Cut 2 existing gum trees to allow the construction of the new pipe bridge; and
- Replant 2 trees of the same species and age as part of the new DA.

Equipment used for the above works are those listed in Table 3.

2.2.5 New pipe bridge from the power station to south east corner of the existing TPC building and from the existing pipe bridge to Visy Paper Number 3 & 6 Water Treatment Plant

- Excavate in natural ground (bore) for 18 off 10 m deep 600 – 900 mm diameter piles foundations for the new pipe bridge columns – approximately 80 m^3 of natural ground;
- Construct a new reinforced concrete pile foundations for the new pipe bridge columns – approximately 80 m^3 (18 piles x 10 m deep x 600 - 900 mm diameter); and
- Construct (install) structural steel columns and truss beams for the new pipe bridge – approximately 18 columns at 8 m high.

Equipment used for the above works are those listed in Table 3.

2.2.6 New water Tank on northern side of the existing TPC building

Scope of works includes:

- Excavate in natural ground for pad foundation for the new water tank – approximately 10 m^3 (5 m wide x 5m long x 0.4 m average depth); and
- Construct new reinforced concrete pad footing for the new water tank as per the architectural and structural drawings and specifications – approximately 10 m^3 (5 m wide x 5 m long x 0.4 m average depth).

Equipment used for the above works are those listed in Table 3.

2.2.7 Widening of the existing road north east of the existing TPC building

Scope of works includes:

- Cut & remove part of the existing concrete slab on ground – approximately 400M2 (10M wide X40M long X0.300M ave depth) or 120M3 of concrete,
- Construct a new reinforced concrete slab on ground for the new road widening – approximately 400M2 (5M wideX60M longX0.300M ave depth), or 120M3 of new reinforced concrete slab on ground

Equipment used for the above works are those listed in Table 3.

2.2.8 New Water Treatment Plant (WTP) – south east corner of the existing TPC building

Scope of works includes:

- Excavate in natural ground to allow for the construction of the new reinforced concrete slab on ground and bund walls for the new WTP – approximately 400 m^2 (12 m wide x 20 m long x 0.6 m average depth) or 144 m^3 of natural excavated ground; and
- Construct a new reinforced concrete slab on ground and bund walls for the new WTP – approximately 400 m^2 (12 m wide x 20 m long x 0.35 m average depth) or 85 m^3 of reinforced concrete.

Equipment used for the above works are those listed in Table 3.

2.2.9 **Roof**

Scope of works includes:

- Remove of part of the existing metal roof at 5 locations to allow the installation of top hats and extractor fans installations – approximately 250 m of steel sheet metal and 0.500 tonnes of structural steel (10 m x 10 m);
- Construct 2 new top hats and install 3 new extractor fans as per the architectural and structural drawings and specifications – approximately 350 m^2 of steel metal cladding and 5 tonnes of structural steel; and
- Construct 1 new access caged ladder at the south face of the TPC building, install floor grates and fail safe anchor points to allow access and maintenance of the top hats and extractor fans – approximately 1 x 10 m caged ladder, 200 m^2 of aluminium floor grates and fail safe anchorage points.

Equipment used for the above works are those listed in Table 3.

2.3 Sensitive land uses and construction hours

2.3.1 Sensitive land uses

Except on the southern side of the building subject to this proposal, there are no sensitive land uses within the vicinity of the project subject to this proposal. That is there are no schools, hospitals, places of worships, recreational areas, commercial premises such as TV & film studios, research facilities, entertainment spaces, temporary accommodation (eg caravan and camping areas), child care centres, restaurants, office premises and retail spaces.

On the northern and western side this development boarders Cumberland High Way and Herbert Place. On the eastern side it boarders an industrial power station which is around 100 m away from the eastern face of the existing building. The existing Visy Paper Mills Number 3 and 6 are located around 500 m to south east face of the building subject to this development.

The only sensitive land use within the vicinity of the project area is a residential area which lies at approximately 350 m from the existing building's southern face.

2.3.2 Working days and hours

Subject to the final approval by the Holroyd City Council of the working days and hours, the applicant request the following working days and hours during the construction to be approved:

Work Type	Requested working days and hours
Normal Construction	Monday to Friday 7 am to 6 pm
	Saturday 8 am to 1 pm

The applicant does not anticipate that any works will be carried out outside those requested herein.

3.0 Construction noise and vibration management levels and objectives

3.1 Construction noise management levels

In July 2009 the NSW Department of Environment, Climate Change and Water (DECCW) (now the Office of Environment and Heritage (OEH)) published the *Interim Construction Noise Guidelines (ICNG, 2009)* for use in construction noise assessments.

Under the OEH policy a construction noise management plan is required to be compiled by the Contractor, prior to construction commencing. Noise Management Levels (NMLs) must be set for the standard working hours periods (refer to **Table 1**), and must be complied with where feasible and reasonable. Work that is proposed outside of standard working hours, as defined in the *ICNG*, generally requires strong justification.

The noise management plan should detail the '*best practice*' construction methods to be used, presenting a reasonable and feasible approach. The plan should identify the extent of the residential area affected and assess the impact on residents. The plan should detail any community relation programs that are planned. For example the program may include prior notification for particularly noisy activities, letter box drop regarding out of hours construction work to be undertaken and a 24 hour contact phone number for residents to call should they have any complaints or questions.

The *ICNG* defines what is considered to be feasible and reasonable as follows:

"Feasible

> *A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.*

Reasonable

> *Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure."*

The *ICNG* recommends that a quantitative assessment is carried out for all *'major construction projects that are typically subject to the EIA process'*.

Predicted noise levels at nearby sensitive receivers (e.g. residential, sensitive commercial premises) are compared to the levels provided in Section 4 of the *ICNG*. Where an exceedance of the noise management levels is predicted the *ICNG* advises that the proponent should apply all feasible and reasonable work practises to minimise the noise impact.

3.1.1 Noise management levels

Noise management levels for residential receivers are set using the information in **Table 1**.

Table 1 Noise at residences using quantitative assessment

Time of day	Management level, $L_{Aeq\ (15min)}$ [1]	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL[2] + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the

Time of day	Management level, $L_{Aeq\ (15min)}$ [1]	How to apply
		hours that the very noisy activities can occur, taking into account: Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL[2] + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Note 2: Rating Background Level.

3.1.2 Noise management levels for other sensitive receivers

Noise management levels for other sensitive land uses, such as schools, places of worship etc. are shown in **Table 2**.

Table 2 Construction noise management levels – Sensitive land uses other than residential

Land use	Noise management levels, $L_{Aeq\ (15\ min)}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS/NZS 2107:2000 for specific uses.

Criteria for industrial and commercial premises are shown below:

- Industrial premises: external $L_{Aeq\ (15min)}$ 75 dB(A).
- Offices, retail outlets: external $L_{Aeq\ (15min)}$ 70 dB(A).

3.2 Construction vibration objectives

The effects of vibration in buildings can be divided into three main categories; those in which the occupants or users of the building are inconvenienced or possibly disturbed, those where the building contents may be affected and those in which the integrity of the building or the structure itself may be prejudiced.

3.2.1 Human perception vibration

Guidance in relation to acceptable vibration levels for human comfort are provided in OEH's "Assessing Vibration: a technical guideline" (February 2006). This document is based on the guidelines contained in BS 6472-1992.

The DECCW guideline provides three assessment methods, depending on whether the vibration is continuous, impulsive or intermittent. The preferred and maximum values are provided in **Table 4.3.**

Continuous vibration: normally be generated by fixed plant items such as generators, fans and the like where the vibration emissions continue uninterrupted (usually throughout the daytime or night-time period).

Impulsive vibration: normally be generated by short duration (i.e. less than 2 second) events with no more than three occurrences in an assessment period. A typical example would be ground compaction by dropping a large mass. Higher levels are allowed for impulsive vibration, however if more than three impulsive vibration events occur during the assessment period, the more stringent intermittent objectives are applied.

Intermittent vibration: can be defined as interrupted periods of continuous vibration (e.g. vibratory rolling, heavy truck passbys or rockbreaking) or continuous periods of impulsive vibration (e.g. impact pile driving). Higher vibration levels are allowed for intermittent vibration compared with continuous vibration on the basis that the higher levels over a shorter period of time. (*Source: TCA CNS, 2010*).

Therefore, vibration levels at sensitive receiver locations must be controlled so as to prevent discomfort and regenerated noise, and in some extreme cases, structural damage.

For the proposed plastics facility, the nearest residential receivers (vibration sensitive) are located approximately 350 m from the proposed development site. At such distances, the risk of discomfort, regenerated noise and structural damage impacting residential receivers is extremely low and needs not to be considered further.

Vibration levels on residential receivers due to additional traffic generated by the proposed development during the construction phase are considered insignificant. This is due to the small number of additional heavy vehicles forecast during the construction phase of the project, approximately 10 trucks per day. Therefore, from a vibration perspective, the issue of impacts caused by the construction of the Plastics facility need not be considered further.

4.0 Construction noise and vibration assessment

4.1 Construction noise impact assessment

A qualitative assessment method has been used as a guide to assess the noise impacts level in accordance with ICNG guidelines. The proposal would fall under the definition of "…short-term infrastructure maintenance…", due to the duration of noise generating activities not exceeding 3 - 4 weeks and the fact there are no sensitive land uses within 350 m of the proposed development site.

The assessment of the construction noise is based on the noise generated by the proposed construction equipment. Table 3 presents the sound power levels (SWL) of construction equipment planned to be utilised on this development. In addition, Table 3 presents predicted construction noise levels at nearest residential receivers, located approximately 350 m from the proposed plastics facility. The predicted noise levels only take into consideration hemispherical distance propagation, ground and air absorption and shielding from any intervening structures have not been considered. Therefore, the predicted construction noise levels at nearby residential receivers are considered to be conservative. It is also important to note that a number of the proposed construction activities will be conducted inside the existing building, which would further attenuate construction noise levels.

Table 3 Construction equipment noise emission levels

Equipment	Equipment sound power level[1] – dB(A)	Distance to nearest residential receiver	Predicted sound pressure level L_{Aeq} - dB(A)
Air compressor	109	350	50
Backhoe	102	350	43
Concrete pump	106	350	47
Concrete vibrator	97	350	38
Mobile crane	100-106	350	41 - 47
Impact wrench	105	350	46
Jack hammer	108	350	49
Jack Hammer on Hoe	112	350	53
Pile driver (auger)	103	350	44
Pneumatic hand tools	108	350	49
Roller	103-109	350	44 - 50
Circular saw	110	350	51
Road saw	110	350	51
Portable demo saw	110	350	51
Chain saw	110	350	51
Truck (Rigid or Articulated)	98-108	350	39 - 49
5 tonne excavator	94	350	35
Truck mounted drill rig	103-108	350	44 - 49

Notes: The above sound power levels are based upon the Australian Standard AS2436-1981, "*Guide to Noise control on construction, maintenance and demolition sites*", the UK Department for Environment, Food and Rural Affairs (DEFRA) and AECOM's database.

4.1.1 Discussion of results

As presented in Section 4.1 the predicted construction noise levels at nearby residential receivers are considered conservative. The predicted noise levels presented in Table 3 indicate that the maximum construction noise levels at nearby residential receivers would be 51 dB(A).

AECOM has recently undertaken attended noise measurements around the residential receivers located south of the Visy site. The attended noise monitoring was conducted between 1:30 pm and 4.00 pm on Wednesday 21 September 2011, 15 minutes attended noise monitoring samples were conducted at each location. The results of the attended measurements are presented in Appendix A.

The results of the noise measurements indicate that the current ambient noise levels in the vicinity of the southern residential area range from 48 – 63 dB(A). The ambient noise environment is dominated by natural sounds (e.g. birds, insects, etc) distant traffic and noise emission associated with the operations of the existing Visy facility.

Therefore, the predicted construction noise, ranging from 35 to 51 dB(A) will be similar to or below the current ambient noise levels experienced in the residential area.

4.2 Construction traffic noise

Visy has forecast trip generation volumes during the construction phase to be approximately 10 trucks per day during standard construction hours. Construction vehicles will access the Visy site via Cumberland Highway. The existing traffic volumes on Cumberland Highway are in the order of 58000 AADT (source RMS Traffic Volume Data for Sydney Region 2002). The increase in noise as a result of construction traffic would be inconsequential (less than 0.1dB(A)). Therefore, the issue of impacts caused by the construction traffic need not be considered any further.

4.3 Vibration assessment

Vibration intensive works are proposed to occur during the concrete breaking, and demolition activities.

The safe working distances that relate to cosmetic/structural damage and human discomfort for the proposed works are presented in Table 4 below. The recommended mitigation measures are considered sufficient to mitigate the effects of human discomfort due to vibration intensive activities.

If works are scheduled to occur near a building, within the safe working distance for cosmetic damage, works should not proceed unless attended vibration measurements are undertaken at the commencement of the works. A permanent vibration monitoring system should be installed, to warn operators (via flashing light, audible alarm, SMS etc) when vibration levels are approaching the cosmetic damage objective. It may also be advisable to carry out dilapidation surveys of the affected properties.

If works are scheduled to occur near a building, within the safe working distance for human response but outside the safe working distance for cosmetic damage, it is considered that the additional measures highlighted in section 5.5 will be sufficient to mitigate the impact of vibration at nearby residential receivers and therefore vibration monitoring will not be required at these properties.

Table 4 Recommended safe working distances for vibration intensive plant

Plant	Rating/Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15-20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (> 18 t)	25 m	100 m
Small Hydraulic Hammer	(300 kg – 5-12t excavator)	2 m	7 m

Plant	Rating/Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Medium Hydraulic Hammer	(900 kg – 12-18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1,600 kg – 18-34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2–20 m	20 m
Pile Boring	≤ 800 mm	2 m	N/A
Jackhammer	Handheld	1 m nominal	Avoid contact with structure

5.0 General noise and vibration management and mitigation strategies

The *Interim Construction Noise Guideline* (ICNG) accepts the fact that construction often results in excessive noise, albeit on a temporary basis, and where physical mitigation options are limited, stresses the importance of community engagement in a frank and upfront manner.

The ICNG recommends that the contractor demonstrate best practicable means of controlling noise and include noise mitigation measures in the construction management plan to minimise the noise impact at sensitive receivers. This may include the work practices described below:

5.1 Construction hours

Limit construction work to standard construction hours.

5.2 Standard mitigation measures

All construction activities associated with the development of the plastics facility will be subject to the standard noise and vibration mitigation measures described below:

The contractor will, where reasonable and feasible, apply best practice noise mitigation measures including:

- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers;
- Avoiding the coincidence of noisy plants working simultaneously close together and adjacent to sensitive receivers would be avoided, where practicable;
- Where possible, equipment with directional noise emissions would be orientated away from sensitive receivers;
- Locate noisy plant away from potentially noise affected neighbours or behind barriers, such as sheds or walls.
- Loading and unloading would be carried out away from sensitive receivers, where practicable;
- The selection of site access points would take into account the proximity of noise sensitive receivers;
- Maintenance work on construction plants with the potential to generate noise impacts would be carried out away from noise sensitive receivers and confined to standard daytime construction hours, where possible;
- Relocate any vibration generating plant and equipment away from noise and vibration sensitive receivers in order to minimise any potential vibration impacts;
- Use lower vibration generating items of excavation plant and equipment e.g. smaller capacity rockbreaker hammers, wherever possible;
- Turn off plant that is not being used;
- Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy; and
- Arrange the work site to minimise the use of movement alarms on vehicles and mobile plant.

5.3 Local road traffic – heavy vehicles noise mitigation

The following mitigation measures are proposed in order to minimise the impact of from heavy vehicles on local roads for the criteria at residential receiver locations:

- All trucks would be fitted with mufflers and any other noise control equipment in good working order.
- As far as practical and safety consideration, truck drivers would avoid:
    - Heavy acceleration and braking;
    - Compression braking;
    - Reversing as far as practicable;
    - High speeds;
    - Pick-ups and deliveries outside standard construction hours and
    - Idling outside noise sensitive receivers.

- Truck routes to and from the worksite will be via major roads where possible.

5.4 Reversing alarms

The potential noise impact associated with reversing alarms will be managed and minimised via a combination of proactive driver/operator training and operational procedures. The following mitigation strategies will be undertaken, taking into account that WorkCover OH&S requirements would need to be satisfied with respect to safety surrounding construction vehicles.

- The primary means for minimising reversing alarm noise would be through a dedicated effort on the part of all construction equipment drivers to minimise, wherever feasible, the amount of reversing of their vehicles;
- Wherever feasible, turning circles would be created at the end points of vehicle work legs, which would allow trucks to turn and avoid the need for reversing;
- Emphasis would be placed during driver training and site induction sessions on the potential adverse impact of reversing alarms and the need to minimise their use;

5.5 Noise mitigation measures

Community notification

Notification of affected residences can be one of the most effective ways of managing construction noise impacts.

For residential properties where noise levels from the construction works are likely to exceed the noise management levels it is recommended that letterbox drops are considered. Letter box drops should occur a minimum of 7 days ahead of proposed construction works.

6.0 Conclusion

This report assesses the potential noise and vibration impact from the construction phase of the proposed plastics facility at Visy Smithfield site. .

Construction noise has been assessed in accordance with the OEH's ICNG guidelines. Sensitive receivers have been identified from aerial imagery and they are located approximately 350 m from the constriction works.

The proposed duration of noisy construction activities will only occur for only 3 – 4 weeks and is therefore considered to be short-term works. Consistent with the requirements of the ICNG, a qualitative (rather than a detailed quantitative) assessment was undertaken to determine the potential noise impacts on nearby sensitive receivers.

Considering the short period of noisy works and the distance to nearby residential receivers, the proposed construction works would not result in significant noise impacts on nearby sensitive receivers.

Vibration from the proposed works has been assessed, and recommended distances to ensure compliance with the maximum allowable vibration limits for residential receivers have been provided. The works would be planned by choosing the most appropriate sized equipment to ensure construction occurs within the safe working distances provided.

General work practices have been provided for consideration in order to manage the impact of construction noise on nearby residential receivers.

Appendix A

Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:
	0dB(A) Threshold of human hearing
	30dB(A) A quiet country park
	40dB(A) Whisper in a library
	50dB(A) Open office space
	70dB(A) Inside a car on a freeway
	80dB(A) Outboard motor
	90dB(A) Heavy truck pass-by
	100dB(A) Jackhammer/Subway train
	110 dB(A) Rock Concert
	115dB(A) Limit of sound permitted in industry
	120dB(A) 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period
L_{min}	The minimum sound pressure level measured over the measurement period
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.

Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L90 sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 “Acoustics – Glossary of terms and related symbols”, the OEH’s NSW Industrial Noise Policy and the OEH’s Interim Construction Noise Guideline.

Appendix B

Attended noise measurements

Reference (AECOM report 60193928.RPT03.03, issued 8 February 2012)

Appendix B Attended noise measurements

Table B1 Short term ambient noise monitoring results - daytime

Location	Description/ Address Date/Time	Ambient Noise Levels, $L_{A10\ (15\ minute)}$, dB(A)	EPL 4100 Noise Limits, $L_{A10\ (15\ minute)}$, dB(A)	Compliance with Noise Limits	Comments
1	11 Kiola Street 21 Sept 2011 1:18 pm	Measured 51 Approximate site contribution 45	51	Yes	**General environment** Birds dominate the noise environment - 49-63 dB(A) Plane - distant Traffic – distant Light wind **Noise associated with the Visy plant** Reversing beeper Occasional bang, metal on concrete – 49 dB(A)
2	31 Chisholm Street 21 Sept 2011 1:45 pm	Measured 50 Approximate site contribution 45	53	Yes	**General environment** Birds dominate the noise environment - 47-60 dB(A) Plane - distant Traffic – distant Light wind **Noise associated with the Visy plant** Reversing beeper – 43 dB(A) Occasional bang, metal on concrete – 46 dB(A)
3	31 Alt Street 21 Sept 2011 2:05 pm	Measured 51 Approximate site contribution 48	53	Yes	**General environment** Birds dominate the noise environment - 47-57 dB(A) Traffic – 50-58 dB(A) Light wind Water noise in creek **Noise associated with the Visy plant** Occasional bang, metal on concrete – 49 dB(A) Dozer moving inside the undercover waste yard – 48 dB(A) Constant plant noise – 45-48 dB(A) Reversing beeper – 47 dB(A) Horn 'toot' – 52 dB(A)

Location	Description/ Address Date/Time	Ambient Noise Levels, $L_{A10\ (15\ minute)}$, dB(A)	EPL 4100 Noise Limits, $L_{A10\ (15\ minute)}$, dB(A)	Compliance with Noise Limits	Comments
4	48 Solo Crescent 21 Sept 2011 2:22 pm	Measured 54 Approximate site contribution 52	53	Yes	**General environment** Birds – 48-53 dB(A) Plane - Distant **Noise associated with the Visy plant** Constant plant noise – 50-52 dB(A) Reversing beeper – 50 dB(A) Pressure release – 50-55 dB(A) (5 in 15 minutes) Dozer – 50-55dB(A) Siren/Bell Occasional bang, pallet lowered on to the ground
5	58 Solo Crescent 21 Sept 2011 2:44 pm	Measured 54 Approximate site contribution 51	53	Yes	**General environment** Birds – 50-53 dB(A) Water noise in creek Truck noise – breaking and accelerating **Noise associated with the Visy plant** Constant plant noise – 51 dB(A) Occasional bang, pallet lowered on to the ground – 52-54 dB(A) Pressure release – 53 dB(A) (4 in 15 minutes) Reversing beeper
6	Southern site boundary	Approximate site contribution 50	70	Yes	The site contribution level is based upon the measurement taken at location 2.
7	South eastern site boundary	Approximate site contribution 57	70	Yes	The site contribution level is based upon the measurement taken at location 4.

Notes:

The occasional bang mentioned in this table is the sound of metal contacting with concrete which could be a waste bin being lowered to the ground or the sound of a front end loader scoop coming into contact with the ground.