

Intermodal Logistics Centre at Enfield

Modification Application No. 6 ECI Detailed Design Adjustments and Subdivision

Response to Submissions

Appendix A:
Submissions

Alison Tourle

Subject: FW: ILC - EM - E - Mod 6 DP&I comments

From: Mary Mikulandra [mailto:Mary.Mikulandra@planning.nsw.gov.au]
Sent: Thursday, 7 June 2012 3:39 PM
To: Prieto-Curiel, Ricardo
Subject: Re: Enfield

Dear Ricardo

As mentioned during our telephone discussion this afternoon, the Department is progressing with the review of Modification 6 for the Enfield ILC. It would be greatly appreciated if the following information would be provided to facilitate the Department's consideration of the Modification.

Noise

It is noted that the modification involves amendments to the northern and eastern noise walls. The supporting documentation does not include a detailed assessment of the noise impacts arising from the changes to the noise walls. Only a memo from AECOM has been included regarding predicted noise impacts.

In order for the Department to undertake a thorough consideration of the proposed changes to both of the noise barriers it would be appreciated if you would forward the complete noise assessment for the proposed changes. The noise assessment should address:

- the predicted noise levels (including L_{A1}) under the worst-case scenario and neutral meteorological conditions, for the day, evening and night-time periods;
- an assessment of predicted noise levels against condition 2.17 of the Project Approval, including the sleep disturbance criteria; and
- a description of the activities and equipment assessed in the noise assessment;
- the extent/ boundary of activities (e.g. in the case of the northern noise wall, where was the assumed northern most limit of container storage and what activities were assessed as occurring beyond this limit - the report simply states 'some materials storage' but no details are provided on what activities this encompasses).

In regards to noise impacts, the AECOM memo indicates that changes to the barriers are such that it would not increase noise levels predicted at nearby residences over those predicted in the Modification Application No. 4. In the case of sleep disturbance, it is noted that the AECOM noise assessment for Modification 4 refers to external noise levels of 60-65 dB(A) being unlikely to result in awakening reactions and such a level is in agreement with the screening criteria used at the EA stage. Page 21, Appendix E of the EA referred to recent research and a 65 dB(A) outdoor level as affording sleep protection. However, it then states that the ENCM approach (background level plus 15 dB(A)) is used for the purposes of the EA.

It should be noted that the noise limits for sleep disturbance in the Project Approval were not changed following consideration of Modification 4 to allow for an external sleep disturbance noise limit of 65 dB(A). Consequently, predicted noise levels (including sleep disturbance) for Modification 6 should be assessed against the criteria set out in condition 2.17 of the Project Approval, not the noise levels predicted for Modification 4. Where noise levels are found to exceed the criteria set out in the Project Approval, the assessment should identify the mitigation measures to be implemented and subsequent predicted noise impacts.

In addition, the noise assessment should address any changes in noise impacts resulting from changes to activities arising from amendments in the site layout.

Detention Basins

It is noted that the volume of detention basin B is to be reduced. It is understood that the detention basin includes a bioretention system. Details are required on whether the bioretention basin area within the detention basin would be consequently reduced and if so, the size of the amended area and percentage load reduction achieved in regards to TSS, TP and TN.

Toll Lease Area

Modification 6 includes the inclusion of the former Toll Lease Area into the ILC. Use of this site has not been previously assessed, with the EA clearly stating that the area is not part of the proposed development (refer Table 4-1, page 4-5 of the EA). Consequently, it should be noted that inclusion of the Toll Lease Area (if approved), does not include approval for the use of the site. Use of the site would require an assessment of the potential environmental impacts associated with the proposed use, and potential modification(s) to the Project Approval.

Please do not hesitate to contact me should you require clarification on any of the above matters.

Cheers
Mary

Mary Mikulandra
Infrastructure Projects
Major Development Assessment Unit
NSW Department of Planning & Infrastructure | GPO Box 39 | SYDNEY NSW 2001
T 02 9228 6593 F 9228 6355 E mary.mikulandra@planning.nsw.gov.au

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Your reference: Your email dated 14/6/12
Our reference: DOC12/24497
Contact: Sarah Deards 9995 6816

Mary Mikulandra
Infrastructure Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Ms Mikulandra

EPA comments regarding Enfield Intermodal Logistics Centre – Modification 6 (MP05_0147 MOD 6)

I refer to your email dated 14 June 2012, inviting the NSW Environment Protection Authority (EPA) to make a submission regarding the Modification Application for the Enfield Intermodal Logistics Centre (Modification 6). I note that the EPA was not consulted during the public exhibition period, but the Department of Planning and Infrastructure has provided the EPA with the opportunity to comment on the proposal.

The EPA has reviewed the Modification Application and Appendices and provided comments and recommendations regarding the key issues of shortening of the northern noise wall and the meteorological monitoring station (Attachment 1).

The EPA and Office of Environment and Heritage (OEH) are now separate agencies with distinct responsibilities. This letter covers EPA's response only. I have referred the Application documents to OEH for review regarding any impacts on green and golden bell frogs. OEH may therefore provide a separate submission addressing these issues.

If you wish to discuss any of the issues raised in this letter, please contact Sarah Deards on 9995 6816.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Jacinta Hanemann'.

22.6.2012

JACINTA HANEMANN
Unit Head Transport
Environment Protection Authority

Attachment 1: EPA comments regarding Enfield Intermodal Logistics Centre – Modification 6

Attachment 1: EPA comments regarding Enfield Intermodal Logistics Centre – Modification 6

Shortening of the Northern Noise Wall

The EPA notes that barrier optimisation modelling has been undertaken (Appendix A: Acoustic Memo), however sufficient detail has not been provided to enable the EPA to conduct a thorough review of the model. The Acoustic Memo indicates that previously predicted noise levels will not increase with the proposed changes to the noise barriers.

The EPA also notes that the proponent states that container handling will not be undertaken in the area surrounding the high voltage power line tower, but that this area is still included within the 'Empty Container Storage Area B' shown on Figure 3 of the Modification Application documents, and will be included as part of the lease for the Empty Container Storage Area B (page 13). The EPA is therefore concerned that there are currently no measures in place that will ensure that the area surrounding the high voltage tower will not be used for container handling or other noisy activities.

The EPA recommends that if the Project Modification Application is approved, the conditions of approval regarding noise limits remain unchanged. The EPA also recommends that any approval for the proposal also include a condition stating that container handling may not be undertaken in the area that will be affected by the removal of the noise wall. The EPA recommends that this area be marked on a map and referenced in this condition.

Meteorological Monitoring Station

The EPA has serious concerns regarding the proposal to remove the meteorological monitoring station once the site has been sealed. Project Approval Condition 2.17 requires operational noise monitoring to be undertaken to enable an assessment of compliance with specified maximum allowable noise contributions. These noise contributions are applicable under specific weather conditions. The EPA considers that a meteorological monitoring station located on the project site is the most accurate and appropriate source of meteorological data to enable operational noise monitoring to be undertaken. The EPA therefore recommends that the meteorological monitoring station remain on site and be maintained during operation of the intermodal facility.

The proponent has requested that relevant conditions of approval be modified to enable the use of Bureau of Meteorology data when the meteorological monitoring station is offline due to maintenance issues. The EPA has no objections to this proposal.

Alison Tourle

Subject: FW: Enfield Intermodal Logistics Centre - Modification 6

From: Ray Giddins [mailto:Ray.Giddins@environment.nsw.gov.au]
Sent: Wednesday, 27 June 2012 12:20 PM
To: Mary.Mikulandra@planning.nsw.gov.au
Cc: Lou Ewins
Subject: FW: Enfield Intermodal Logistics Centre - Modification 6

Mary

We spoke last week about this.

I have reviewed the documents and found that the only modifications that could possibly affect Green and Golden Bell Frog are modifications to the location and structure of a stormwater detention basin and noise walls near Coxes Creek. Even then, it appears that the modification will not reduce the amount of habitat for this species that will be available in the long term.

As long as correct pre-clearance surveys are carried out and exclusion fences are put in place, as I'm sure they were going to be for the original development, then OEH has no concerns regarding this modification.

Ray Giddins

Regional Biodiversity Conservation Officer
Metropolitan Branch
Office of Environment and Heritage

PO Box 668, Parramatta NSW 2124
Level 7, 79 George St Parramatta NSW 2150

Ph 99956811
Fax 99956900



STRATHFIELD COUNCIL SUBMISSION

Enfield Intermodal Logistics Centre, Modification Request (MP 05_0147 MOD 6)

This submission has been prepared by Strathfield Council in response to the public exhibition of Modification Request (MP 05_0147 MOD 6) for the Enfield Intermodal Logistics Centre.

Council has significant concerns in regard to several aspects of the Modification Request as outlined below.

Site Layout Changes

1. The Revised Site Layout (refer Attachment 5) for Modification Request No 6 does not indicate or label the 'Community and Ecological Area'. Council requests that the Site Layout Plan be amended to be consistent with the original 5/9/07 project approval for Enfield ILC ie. the precinct south of Coxs Creek including Mt Enfield, Tarpaulin Factory, Frog Ponds should all be labelled 'Community and Ecological Area' and coloured accordingly eg. light green.

The original approval is illustrated in Concept Layout (refer Attachment 1), from the Environmental Assessment which forms part of 'terms of approval' in the Project Approval. This clearly labels the 'Community and Ecological Area' and clearly indicates this area with green hatching to include all the land to the south of Coxs Creek including the Tarpaulin Factory and Mt Enfield area.

The 'Community and Ecological Area' is also clearly labelled and indicated in green colour on the 'Layout and Key Features' Plan (refer Attachment 3) which was prepared by Sydney Ports some time prior to the Modification No 1 approval. Whilst the January 2010 'Concept Layout Plan' (refer attachment 4) which was prepared subsequent to Modification No 1 & 2 also clearly labels and indicates in green colour the 'Ecological Heritage Community area with controlled access'.

It should also be noted that the Strathfield Draft LEP 2011 which was publicly exhibited from 31 January to 23 March 2012 includes the whole of the originally approved 'Ecological & Community and Heritage Area' as RE1 Public Recreation to suit and support this area, with main section of the Enfield ILC site zoned to General Industrial IN1.

2. Since the original approved Site Layout Plan, the amount of landscaped areas (not including 'Community and Ecological Area') along Cosgrove Road has gradually been reduced to the detriment of the sites landscape aesthetics, biodiversity opportunities and screening of the site from surrounding areas. This is particularly impacts the Cosgrove Road frontage of the site.

For instance Attachment 2 and Attachment 3 clearly indicate the amount of landscape area across the site (not including the 'Community and Ecological Area') in accordance with the Project Approval. However the gradual reduction in general landscape area is evident in Attachment 4 which appears to be as a result of Modification request No 1 & 2.

The general landscape area (not including the 'Community and Ecological Area') indicated in the Modification Request No 6 'Revised layout Plan' (refer attachment 5) clearly has been significantly reduced from the original approval and from previous modification requests. Council

requests that the further reductions in landscape area proposed in this modification request be refused and that opportunities to return the more consistent with the originally approved landscape areas be pursued.

3. ARTC Access Point - The fenced access track to the marshalling yards for rail maintenance 4m wide' (to north of Tarpaulin Factory) enters Cosgrove Road opposite residential properties. The truck movements generated by the planned ARTC rail line project will have detrimental impacts on the residential properties on the eastern side of Cosgrove Road. This impact would be reduced if the entry was located further north along Cosgrove Road. It is noted that Council did provide comment and issues for consideration (February 2010) in regard to the general concept of providing an access route for the ARTC, however this specific access point was not provided to Council to comment on.

Subdivision of ILC Precincts

1. The proposed subdivision pattern (refer Attachment 6) conflicts with the intent of the original approval for the southern section of the site becoming a 'Community, Heritage and Ecological Area'. The subdivision plan proposes to subdivide the 'Ecological & Community and Heritage Area' into three lots being: Lots 19, 20 and 25. There is no advantage or logical justification provided in the modification request to divide up the 'Ecological & Community and Heritage Area' which is a key component of the original Project Approval. Subdividing Lot 19, 20 and 25 undermines the preservation of this area especially as it creates potential opportunity for the sale or leasing, particularly of Lot 19 which includes the area at the corner of Punchbowl Road and the Tarpaulin Factory.

The subdivision that creates Lots 19, 20 and 25 is a considerable change that is not supported by Council because it potentially diminishes the amount of land originally dedicated in the original approval for community, ecological and heritage purposes. This precinct should be protected by retaining the land to the southern side of Coxs Creek as one lot. Operational issues for this area such as controlled access to the frog habitat and to the steeper areas of Mt Enfield and whether the Tarpaulin Factory remains on site or is relocated, do not impact on preserving this whole area as a 'Ecological & Community and Heritage Area'.

As discussed under the Site Layout Changes section, Councils Draft LEP 2011 as publicly exhibited includes the whole of the originally approved 'Ecological & Community and Heritage Area' as RE1 Public Recreation to support this area.

2. The gradual reduction in the general landscape area across the Enfield ILC, particularly along the eastern side of the site facing Cosgrove Road as outlined above under the Site Layout Changes section is a serious concern. The subdivision of the sites to the eastern section of the site limits the areas dedicated to general landscaping to Lot 21 (other than the Community & Ecological Area south of Coxs Creek) which is not an acceptable amount. Therefore Council does not support the subdivision layout in the present form unless more areas are dedicated to general landscape area to be more consistent with the original approval.

Inclusion of Former Toll Lease Area into the ELC

The full impacts from the proposed inclusion of the former Toll site such as contamination, whether pavement reconstruction is necessary and the drainage implications need to be considered in greater detail than outlined in the modification report. For instance the application indicates that if new pavement is necessary this would potentially generate around 1,300 additional truck movements over several weeks, however the potential traffic impact has not been considered in the report.

Noise Wall Adjustments

In relation to modification request No 6, acoustic report the following comments are made.

The AECOM detailed design acoustic assessment report of 30 September 2009 is based on computer modelling of base line assessments provided by another party at the environmental assessment stage. As a result Council is not in a position to question either the assessments provided or the modelling methodology but to simply comment on the conclusions

Council raises concern on the following issues

1. The reports conclusions Cl. 6 page 38 state "Modelling shows that the recommended mitigation measures allow the established intrusive and amenity noise criteria to be satisfied in the majority of assessment periods and at the majority of locations"
If criteria have been set they should be complied with all the time at all locations. What is the purpose of having criteria if they can nearly be met?
These criteria have been set to enable residents to maintain living amenity in their own dwelling all the time not for most of the time.
The size, scale, hours of operation and noise generating capacity of this development demands that adjacent residents are protected.
2. Councils power to address any noise complaints arising from the operation of the facility will be limited to referring the complaint to the Minister. This is another reason why the facility should comply as the adverse weather conditions or other factors which lead to breaches may be protracted.
3. The use of empty containers as sound barriers to replace the existing planned acoustic walls is opposed as these barriers are formed from temporary components of the facility. In periods of short supply or other reasons they may be used for their original purpose reducing the effectiveness of the barrier. Also as they are easily moved they may over time as a result of being taken and replaced result in the location of the barrier creeping out of position.
4. Using containers as sound walls is also unsightly particularly as they are painted with a variety of colours and signage and in addition they deteriorate over time and become even more unsightly. For these reasons Council is of the opinion that these barriers should be constructed of a permanent, durable and equally effective material that is more aesthetically pleasing.
5. Once established this facility whilst currently having a maximum design throughput has the potential for expansion beyond current foreseeable limits due to its strategic location, and the cost of duplication or relocation. For this reason all noise criteria should be met at all times
6. Whilst there is to be noise monitoring assessment at various annual throughput stages there also needs to be a commitment to immediately address and rectify issues not only at these stages but also address issues of concern to Council and residents as they arise.
7. The noise assessment report whilst assessing noise from a number of sources makes no mention of noise generated from shunting carriages. Depending on the length of the train and the state of the containers (empty or full) this can generate a sound that runs the length of the train (as successive carriages collide) over a longer period than a dropped container. Given the potential noise levels and impact on the surrounding residential precincts particularly at night, this should be assessed.

Meteorological Station

The proposed modification to the condition concerning the on-site monitoring station is not acceptable as constant operation of this station to needs remain a high priority. For instance the station is essential to providing related meteorological data that assists in the monitoring and addressing of dust issues, rather than rely on related data from other monitoring sites in the region such as Sydney Olympic Park or Bankstown. If an amount of offline time was to be established for emergency repairs to the station through a modified condition, then this amount of time would need to be restricted to a very short period.

Drainage Changes

An assessment of the modification proposal indicates that concerns raised regarding stormwater drainage issues in Council's submission in February 2006 still remain unresolved. Your attention is particularly drawn to the following issues:

1. The subject site is located in the upper Cooks River Catchment. Four major drainage culverts cross the site. Each of the four drains conveys stormwater runoff from upstream catchments through the site to discharge into tributaries of the Cooks River. Council's 600mm reinforced concrete pipe that drains the northern upper section of Roberts Road sub-catchment area is not included. The proposed project seeks to reshape the site in order to provide a suitable operational area for the Intermodal Logistic Centre. This reshaping has the effect of changing the catchment behaviour.
2. The Hydrology and Hydraulic Report prepared by SINCLAIR KNIGHT MERZ (SKM) in 1993 analysed each of the trunk drains crossing the new Marshalling Yards in terms of drainage capacity and flooding impacts. The report found that generally the trunk stormwater infrastructure was under capacity for events in excess of 10 year ARI event.

The culvert that is critically under capacity is Cox's Creek channel, which results in 134m³/s needing to flow overland through the Enfield Marshalling yards in the 100 year ARI event. Overland flow from upstream catchment would also add to this.

Additionally, the 1993 SKM report discussed significant flooding on the upstream side of Enfield Marshalling Yards where culverts commence. The Cooks River and Cox's Creek Flood Study completed by Council in 2010 and complaints from surrounding properties verify that flooding is common in the low points of Roberts Road and Wentworth Street.

Flooding in the above mentioned areas is due to the inadequate capacity of the downstream box culverts through the Enfield Marshalling Yards and blockage of the overland flow path by raised railway embankment along the western boundary of the Marshalling Yards.

3. The Intermodal Logistic Centre development also involves re-grading of the site so that more of the runoff tends to flow towards the southern end of the site and Cox's Creek. In general, the total amount of impervious surface of the site will significantly increase and a large proportion of the flow will be diverted to the main carrier of Cox's Creek which is already under capacity.
4. The development involves cut and fill modifications in sections of the floodplain that would normally be inundated during overland flows. This may potentially modify the overland flow path of Cox's Creek.
5. Surface runoff from upstream properties has not been catered for, obstructions that cause damming and backwater effects on the upstream properties are not permitted. Adequate surface flow paths shall be provided to convey all flows to the 1 in 100 year standard.
6. Raising of the surface ground levels above predevelopment levels is not acceptable as it will have adverse impact on the overland flow path and flooding of the site and adjoining properties.
7. The proposed method of stormwater runoff management outlined in SKM report and shown on Fig. 3 does not meet Council's standard requirements and is not acceptable. Stormwater runoff from each sub-catchment shall be collected and discharged to the existing downstream drainage culvert via the On-site Stormwater Detention Storage. Diversion of flows to southern end of the site and discharge of stormwater runoff to Cox's Creek, which is already under capacity, is not acceptable.

ATTACHMENTS

Attachment 1: Concept Layout (from Environmental Assessment (SKM) which forms part of 'terms of approval' in 5/9/07 Project Approval)

Attachment 2: Design Layout - Landscape (from Environmental Assessment (SKM) which forms part of 'terms of approval' in 5/9/07 Project Approval)

Attachment 3: Layout & Key Features (prior to Modification 1 & 2)

Attachment 4: Concept Layout Design (from Sydney Ports Presentation, Jan 2010 - subsequent to Modification 1 & 2)

Attachment 5: (Figure 3) Revised Site Layout (Mod 6) - 20/4/12

Attachment 6: Plan of Proposed Subdivision (Mod 6) – April 2012



Figure 3
Concept Layout

Attachment 1: Concept Layout (from Environmental Assessment (SKM) which forms part of 'terms of approval' in 5/9/07 Project Approval)



Figure 4-2d
Design Layout - Landscape

Attachment 2: Design Layout - Landscape (from Environmental Assessment (SKM) which forms part of 'terms of approval' in 5/9/07 Project Approval)

Intermodal Logistics Centre at Enfield

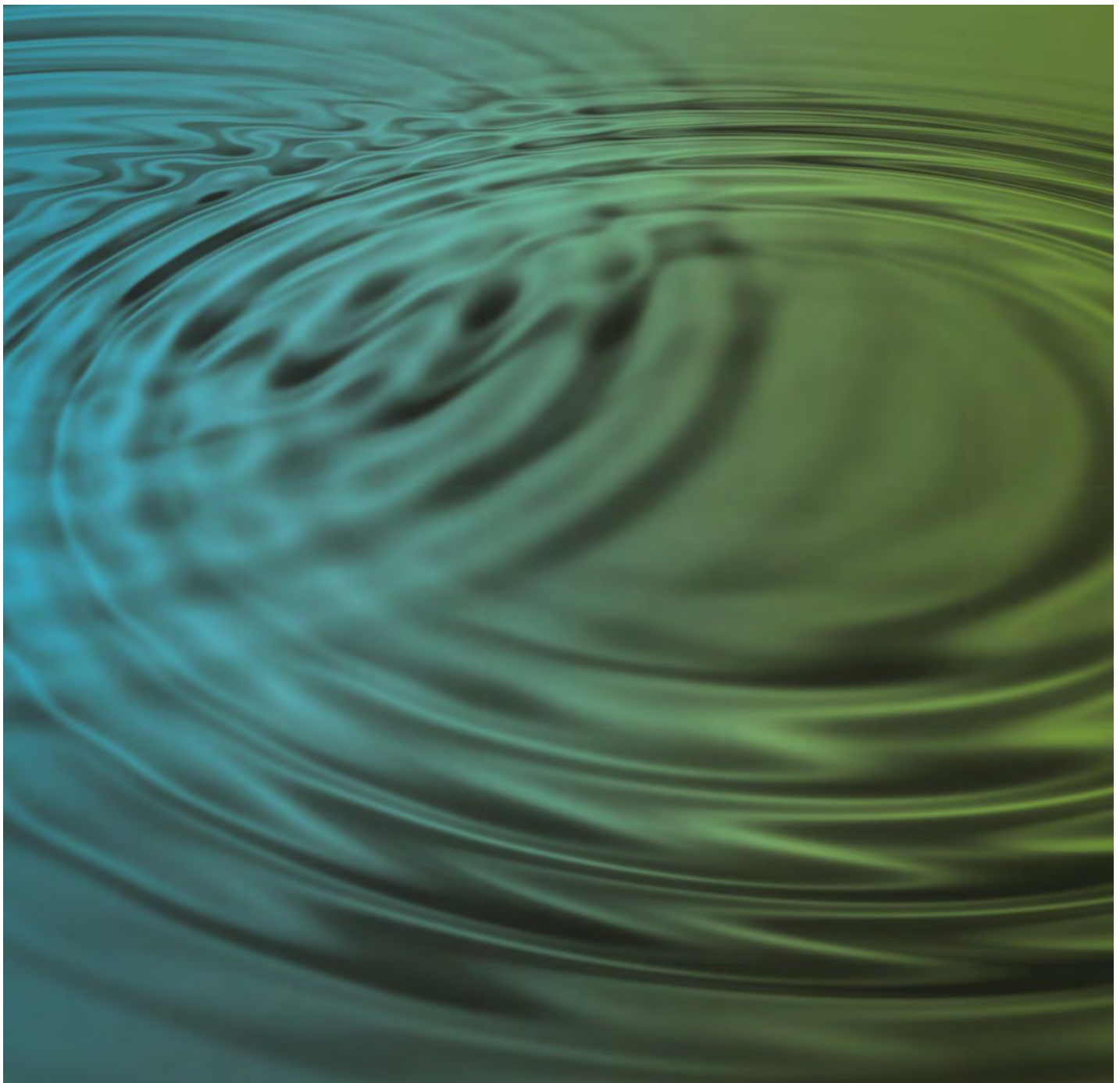
Modification Application No. 6 ECI Detailed Design Adjustments and Subdivision

Response to Submissions

Appendix B:
Noise Assessment

Enfield Intermodal Logistics Centre

Early Contractor Involvement - Acoustic Design



Enfield Intermodal Logistics Centre

Early Contractor Involvement - Acoustic Design

Prepared for

Sydney Ports Corporation

Prepared by

AECOM Australia Pty Ltd

Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia

T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com

ABN 20 093 846 925

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Quality Information

Document Enfield Intermodal Logistics Centre










Ref 60051533

Date 18 July 2012

Prepared by Geoff Lucas/Angus Leslie

Reviewed by Patrick Martinez

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
00	10/06/2009	For Review	Darren Jurevicius Principal Acoustic Engineer	
01	16/06/2009	Final	Darren Jurevicius Principal Acoustic Engineer	
02	18/06/2009	Client Edits	Darren Jurevicius Principal Acoustic Engineer	
03	21/07/2009	DoP submission	Darren Jurevicius Principal Acoustic Engineer	
04	10/08/2009	Client Edits	Darren Jurevicius Principal Acoustic Engineer	
05	24/08/2009	Cosgrove Barrier and Client Edits	Darren Jurevicius Principal Acoustic Engineer	
06	30/09/2009	Remove 'Commercial in Confidence'	Darren Jurevicius Principal Acoustic Engineer	
07	30/09/2011	Updated Site Elevations	Andy Jackson Principal Engineer	
08	4/07/2012	Draft. Updated for Client Review	Andy Jackson Associate Director	



09	16-Jul-2012	Draft. Updated with Client's Comments	Andy Jackson Associate Director	
10	18-Jul-2012	Final. Updated with Client's Comments	Andy Jackson Associate Director	

Table of Contents

Executive Summary	i
1.0 Introduction	1
2.0 Project Noise Criteria	4
2.1 Specific environmental conditions	4
2.2 Environmental monitoring and auditing conditions	6
3.0 Methodology and Modelling Assumptions	7
3.1 Modelling	7
3.1.1 Topography	7
3.1.2 Purpose-designed noise barriers	7
3.1.3 Buildings	7
3.1.4 Receivers	8
3.1.5 Meteorological conditions	8
3.2 Noise sources	9
3.2.1 Industrial noise sources	9
3.2.2 Metal 'clang' L_{A1} sound power levels	9
3.2.3 Heavy vehicle noise sources	9
3.2.4 Rail noise sources	10
3.2.5 Source quantities – heavy vehicles and equipment on site	10
3.2.6 Adopted sound power levels	10
4.0 Amendments to Approved Mitigation Measures	16
5.0 Results and Discussion	20
5.1 Outcomes without containers stacked in southern ECS A area	20
5.1.1 Intrusive and amenity outcomes	20
5.1.2 Sleep disturbance (L_{A1}) outcomes without temporary container stacking	27
5.2 Outcomes with containers stacked in southern ECS A area	28
5.2.1 Intrusive and amenity outcomes	28
5.2.2 Sleep disturbance (L_{A1}) outcomes with containers stacked in the southern ECS A area	33
5.2.3 Sleep disturbance discussion	34
6.0 Warehouses and LIC Operational Scenario	37
6.1 Introduction	37
6.2 Assessed scenario	38
6.2.1 Scenario A - Warehouses and ILC buildings not present, all southern noise sources	38
6.2.2 Scenario B – Warehouses and LIC buildings not present, noise sources only in northern third of southern ECS A area	40
7.0 Conclusions	42
7.1 Intrusive and amenity criteria noise assessment	42
7.2 Sleep disturbance noise assessment	42
Appendix A	
SoundPLAN Noise Contour Plots - No Southern Container Barriers - Daytime Period, Neutral Meteorological Conditions - L_{Aeq} 15 minute	A
Appendix B	
SoundPLAN Noise Contour Plots - With Southern Container Barriers - Daytime Period, Neutral Meteorological Conditions - L_{Aeq} 15 minute	B

Executive Summary

Changes to the Intermodal Logistics Centre (ILC) at Enfield, NSW have occurred as a result of the Early Contractor Involvement (ECI) process undertaken for the ILC development.

Although the function of the ILC site has not changed between the design presented in Modification No.4 and this application, there have been some Engineering and Value driven changes as part of the ECI design which have resulted in a slightly altered design. These are principally:

- The location of both major detention basins has changed and the catchments associated with each have been altered;
- The position of the low point and overland flow path in the Intermodal area has moved further East;
- The gradient in Empty Container Storage Area B has increased resulting in lower levels to the South of the new bridge;
- The internal road layout to the North of the bridge has been altered slightly in position;
- Vertical retaining walls have been replaced with batters;
- Optimisation of the northern and southern noise barriers; and
- Inclusion of Area G (former Toll Lease Area).

AECOM Australia Pty Ltd (AECOM) has undertaken an acoustic impact assessment associated with the proposed changes to the approved layout. The purpose of this study is to assess the ECI modifications to the ILC design to ensure that noise emissions from likely operations at the site continue to satisfy the noise emission criteria in the Project Approval with the noise control measures proposed in the previous Detail Design Acoustic Assessment report in place.

This ECI design stage acoustic assessment builds on the preceding acoustic assessments carried out by AECOM, which were based on the EA stage acoustic work conducted by others. The operational scenarios presented in this assessment are 'typical' operational scenarios consistent with the EA stage acoustic assessment.

The acoustic impact of alterations made to the ILC design since the Modification No. 4 acoustic study, as a result of the ECI changes, have been assessed. Namely, two scenarios have been modelled, one without containers stacked as noise barriers in the southern ECS A area and one with containers stacked as noise barriers in this area.

In summary, the modelling shows that container stacking arrangements in the ECS A and B areas allow the established intrusive and amenity noise criteria in Condition of Approval No 2.17 to be satisfied in the majority of assessment periods and at the majority of locations. There is a single residual exceedance predicted, under a single adverse wind condition with full site operations occurring, which is predicted to only be 1 dB(A). As such, this exceedance is considered marginal at most and inconsequential.

The acoustic impact associated with the revised site layout in the southern area and the modification of the L-Shaped barrier and the shortening of the northern extent of the northern barrier is as follows:

- No increase in the noise levels at sensitive receivers, due to operations within the ILC compared to the noise levels predicted in the noise assessment carried out as part of the Modification Application No. 4.

It is a recommendation of this report that:

- The measures recommended herein are incorporated into the design and construction of the Enfield Intermodal Logistics Centre; and
- The selected operator(s) of the site develops and implements an Operational Noise Management Plan in accordance with Minister's Condition 6.5 that includes the following measures as necessary and tailored in response to final operating and site layout scenarios, to meet the noise criteria in Condition of Approval No 2.17:
 - During daytime operations in southern ECS A area stacking containers as boundary barriers in the south-eastern (until Warehouses A and B are in place) and south-western corner of the ECS A area whenever the reach stacker operation is occurring in this area;

- Prior to night time operations in southern ECS A area, containers stacked as noise barriers (four high) with containers stacking a maximum of three high within 50 metres of the perimeter of the container noise wall;
- Prior to night time operations in the northern ECS B area containers can only be stacked three high if a purpose stacked container noise barrier (four high) is created between the relevant operational area and the nearest sensitive receivers in the Jean Street area; and
- No stacking of containers to occur during the night time to the north of the end of the noise barrier in the ECS B area.

The container stack heights referred to in this report were adopted for the purposes of modelling potential operational scenarios. It should be noted that the equivalent level of noise mitigation for containing stacking operations is achieved by blocking the 'clang' noise source with strategically-located purpose built container noise walls that are at least one container higher than the container stacks in operational areas. Therefore, the stack heights referred to in the report should not be considered as upper limits that would apply to operations.

Table 1 presents a summary of acoustic outcomes associated with 'typical' operational scenarios for the ILC site.

Table 1 Summary of design outcomes

Scenario	Operating conditions	Barriers	Buildings	Mitigation	Outcome				
	Reference in main report	Approved site layout	Warehouses LIC Buildings	Container noise barriers	Meteorological conditions				
					Exceedance of criteria - Location				
					Neutral	Westerly	North-Westerly	South-Westerly	South-Easterly
Wind speed					0 m/s	2.5 m/s			
Daytime intrusive	Section 3.2.6.1	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Post Warehouses A and B construction - No LIC Buildings 	No	3 dB(A) - Location A5	5 dB(A) - Location A5	4 dB(A) - Location A5	4 dB(A) - Location A5	1 dB(A) - Location A3 2 dB(A) - Location A5
				<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ 	No Exceedance	No Exceedance	No Exceedance	No Exceedance	No Exceedance
Daytime intrusive (Location A5 only)	Section 3.2.6.1 Normal operations	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Pre Warehouses A and B construction - No LIC Buildings 	No	3 dB(A) - Location A5	5 dB(A) - Location A5	5 dB(A) - Location A5	N/A	N/A
				<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ - Containers stacked in lieu of Warehouses 	No Exceedance	1 dB(A) - Location A5	No Exceedance	N/A	N/A
Daytime intrusive (Location A5 only)	Section 3.2.6.1 Northern third of southern ECS A area	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Pre Warehouses A and B construction - No LIC Buildings 	<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ - Containers stacked in lieu of Warehouses 	No Exceedance	No Exceedance	No Exceedance	N/A	N/A

Scenario	Operating conditions	Barriers	Buildings	Mitigation	Outcome				
	Reference in main report	Approved site layout	Warehouses LIC Buildings	Container noise barriers	Meteorological conditions Exceedance of criteria - Location				
					Neutral	Westerly	North-Westerly	South-Westerly	South-Easterly
Wind speed					0 m/s	2.0 m/s			
Daytime amenity	Section 3.2.6.2	Purpose-designed noise barriers	- Post Warehouses A and B construction - No LIC Buildings	No	No Exceedance	No Exceedance	No Exceedance	No Exceedance	No Exceedance
				- Containers stacked in southern ECS A area ¹	No Exceedance	No Exceedance	No Exceedance	No Exceedance	No Exceedance
Daytime amenity (Location A5 only)	Section 3.2.6.2 Normal operations	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	No	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
				- Containers stacked in southern ECS A area ¹ - Containers stacked in lieu of Warehouses	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Daytime amenity (Location A5 only)	Section 3.2.6.2 Northern third of southern ECS A area	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	- Containers stacked in southern ECS A area ¹ - Containers stacked in lieu of Warehouses	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Wind speed					0 m/s	2.5 m/s			
Night-time intrusive	Section 3.2.6.3	Purpose-designed noise barriers	- Post Warehouses A and B construction	No	3 dB(A) Location A3 4 dB(A) Location A5	2 dB(A) Location A3 5 dB(A) Location A5	3 dB(A) Location A3 5 dB(A) Location A5	1 dB(A) Location A3 5 dB(A) Location A5	4 dB(A) Location A3 2 dB(A) Location A5

Scenario	Operating conditions	Barriers	Buildings	Mitigation	Outcome				
	Reference in main report	Approved site layout	Warehouses LIC Buildings	Container noise barriers	Meteorological conditions				
					Exceedance of criteria - Location				
					Neutral	Westerly	North-Westerly	South-Westerly	South-Easterly
			- No LIC Buildings	- Containers stacked in southern ECS A area ¹	No Exceedance	No Exceedance	1 dB(A) - Location A3	No Exceedance	No Exceedance
Night-time intrusive (Location A5 only)	Section 3.2.6.3 Normal operations	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	No	4 dB(A) - Location A5	6 dB(A) - Location A5	6 dB(A) - Location A5	N/A	N/A
				- Containers stacked in southern ECS A area ¹ - Containers stacked in lieu of Warehouses	No Exceedance	1 dB(A) - Location A5	No Exceedance	N/A	N/A
Night-time intrusive (Location A5 only)	Section 3.2.6.3 Northern third of southern A ECS area	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	- Containers stacked in southern ECS A area ¹ - Containers stacked in lieu of Warehouses	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Wind speed					0 m/s	1.5 m/s			
Night-time amenity	Section 3.2.6.4	Purpose-designed noise barriers	- Post Warehouses A and B construction - No LIC Buildings	No	No Exceedance	No Exceedance	No Exceedance	No Exceedance	1 dB(A) Location A3
				- Containers stacked in southern ECS A area ¹	No Exceedance	No Exceedance	No Exceedance	No Exceedance	No Exceedance

Scenario	Operating conditions	Barriers	Buildings	Mitigation	Outcome				
	Reference in main report	Approved site layout	Warehouses LIC Buildings	Container noise barriers	Meteorological conditions				
					Exceedance of criteria - Location				
					Neutral	Westerly	North-Westerly	South-Westerly	South-Easterly
Night-time amenity (Location A5 only)	Section 3.2.6.4 Normal operations	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Pre Warehouses A and B construction - No LIC Buildings 	No	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
				<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ - Containers stacked in lieu of Warehouses 	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Night-time amenity (Location A5 only)	Section 3.2.6.4 Northern third of southern ECS A area	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Pre Warehouses A and B construction - No LIC Buildings 	<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ 	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Wind speed					0 m/s	2.5 m/s			
Sleep disturbance	Section 3.2.6.3	Purpose-designed noise barriers	<ul style="list-style-type: none"> - Post Warehouses A and B construction - No LIC Buildings 	No	6 dB(A) - Location A1 8 dB(A) - Location A3 6 dB(A) - Location A5	6 dB(A) - Location A1 6 dB(A) - Location A3 6 dB(A) - Location A5	6 dB(A) - Location A1 7 dB(A) - Location A3 5 dB(A) - Location A5	6 dB(A) - Location A1 6 dB(A) - Location A3 6 dB(A) - Location A5	6 dB(A) - Location A1 7 dB(A) - Location A3 5 dB(A) - Location A5
				<ul style="list-style-type: none"> - Containers stacked in southern ECS A area¹ 	6 dB(A) - Location A1 7 dB(A) - Location A3	6 dB(A) - Location A1 6 dB(A) - Location A3	5 dB(A) - Location A1 7 dB(A) - Location A3	6 dB(A) - Location A1 6 dB(A) - Location A3	6 dB(A) - Location A1 7 dB(A) - Location A3
				<ul style="list-style-type: none"> - Containers 	No	No	No	No	No

Scenario	Operating conditions	Barriers	Buildings	Mitigation	Outcome				
	Reference in main report	Approved site layout	Warehouses LIC Buildings	Container noise barriers	Meteorological conditions Exceedance of criteria - Location				
					Neutral	Westerly	North-Westerly	South-Westerly	South-Easterly
				stacked in southern ECS A area ¹ - Additional mitigation ²	Exceedance	Exceedance	Exceedance	Exceedance	Exceedance
Sleep disturbance (Location A5 only)	Section 3.2.6.3 Normal operations	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	- Containers stacked in southern ECS A area ¹	11 dB(A) - Location A5	11 dB(A) - Location A5	11 dB(A) - Location A5	N/A	N/A
				- Containers stacked in lieu of Warehouses - Containers stacked in lieu of Warehouses	No Exceedance	No Exceedance	No Exceedance	N/A	N/A
Sleep disturbance (Location A5 only)	Section 3.2.6.3 Northern third of southern ECS A area	Purpose-designed noise barriers	- Pre Warehouses A and B construction - No LIC Buildings	- Containers stacked in lieu of Warehouses	No Exceedance	No Exceedance	No Exceedance	N/A	N/A

Notes:

- 1) Southern ECS A area: Containers stacked as noise barriers (four high) in the southern ECS A area.
- 2) Containers stacked as noise barriers (four high) in the southern ECS A area and containers stacked a maximum of three high within 50 m of the perimeter of the purpose-stacked container noise wall.

- 3) The Environment Protection Authority document '*Noise Guideline for Local Government*' (DECCW, 2010) mentions "*An increase in 2 dB is hardly perceptible*". Therefore, the residual exceedance of 1 dB(A) is considered marginal at most, and inconsequential.
- 4) As discussed in section 5.2.3.1 the stacking of containers (when constructing noise walls) should be undertaken during the daytime. The noise associated with stacking of containers has been assessed in this section.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Sydney Ports Corporation (Sydney Ports) to undertake an acoustic impact assessment associated with the proposed changes to the approved layout and design of the Intermodal Logistics Centre (ILC) at Enfield, NSW. The changes have occurred as a result of the Early Contractor Involvement (ECI) process undertaken for the ILC project. The changes are summarised below and listed in Section 4 of this assessment.

The purpose of the study is to assess the ECI modifications to the ILC design to ensure that noise emissions from likely operations at the site continue to satisfy the noise emission criteria in the Project Approval with the noise control measures proposed in the previous Detail Design Acoustic Assessment report in place.

Previous acoustic assessments carried out for the ILC include:

- ILC at Enfield Environmental Assessment (SKM, 2005): Appendix E Noise and Vibration Assessment (Renzo Tonin);
- ILC at Enfield Preferred Project Report (SKM, 2006): Noise Technical Memorandum (Renzo Tonin, April 2006);
- ILC at Enfield Modification Application No. 4 (Sydney Ports, Aug 2009): Appendix A Detailed Design Acoustic Assessment. Document No 60051533 (AECOM, 2009);
- ILC at Enfield Modification Application No. 4 - Response to Stakeholders (Sydney Ports, Nov 2009): Appendix B Noise Memorandum (AECOM, Nov 2009); and
- ILC at Enfield Modification Application No. 4 - Supporting Information (Sydney Ports, March 2010): Appendix A Noise Memorandum (AECOM, March 2010).

Although the function of the ILC site has not changed between the design presented in Modification No.4 and this application, there have been some Engineering and Value driven changes as part of the ECI design which have resulted in a slightly altered design. These are principally:

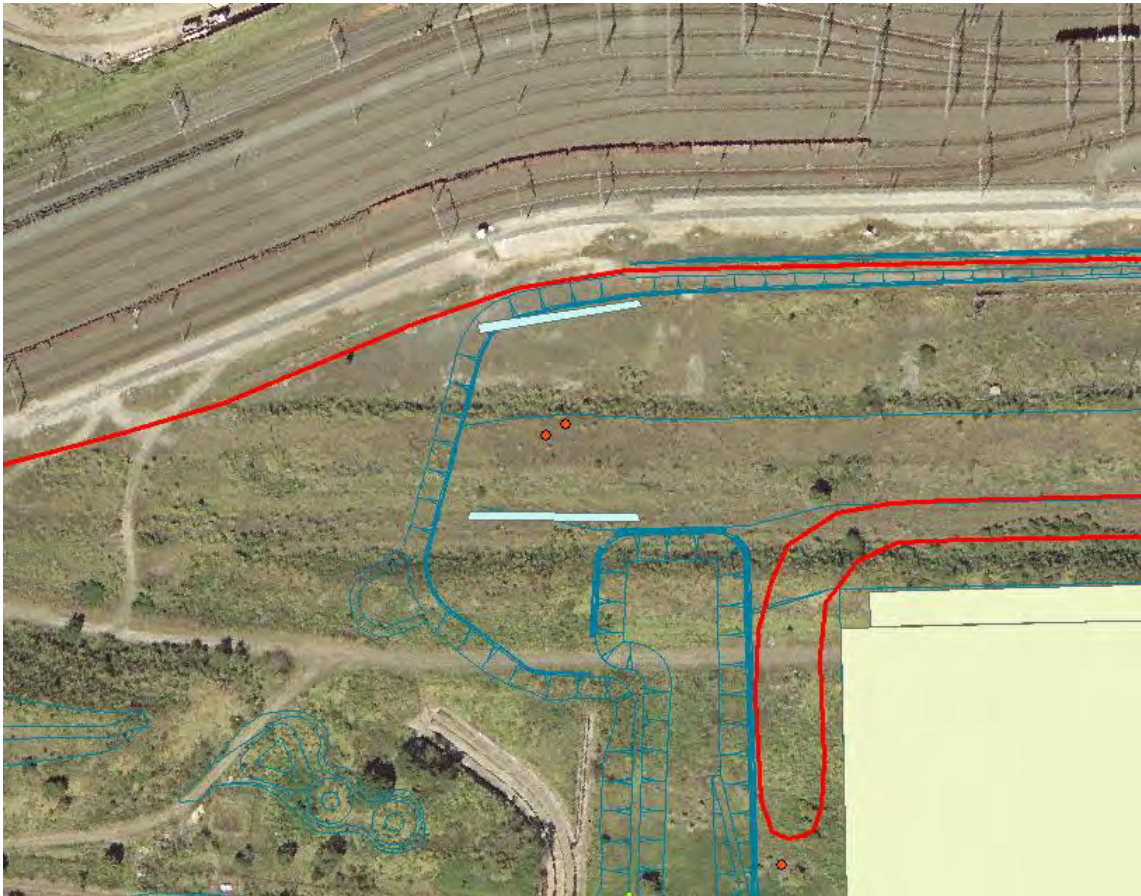
- The location of both major detention basins has changed and the catchments associated with each have been altered;
- The position of the low point and overland flow path in the Intermodal area has moved further East;
- The gradient in Empty Container Storage Area B has increased resulting in lower levels to the South of the new bridge;
- The internal road layout to the North of the bridge has been altered slightly in position;
- Vertical retaining walls have been replaced with batters;
- Optimisation of the northern and southern noise barriers; and
- Inclusion of Area G (former Toll Lease Area)

Optimisation of the northern (see Figure 3) and southern (see Figure 2) barriers has been undertaken to ensure that noise levels predicted at nearby residences do not increase over those predicted in the Modification Application No. 4. The southern L-shaped barrier has been modified to fit around the relocated stormwater detention basin D (see Figure 2). The southern barrier is proposed to be 77 m in total length, with the return section 17 m in length. The northern barrier has been shortened by approximately 20 metres as indicated in Figure 3. The height of both barriers remains at 5 m.

All modelling assumptions other than updated ground elevations are the same as those presented in the previous acoustic report (ILC at Enfield Modification Application No. 4 (Sydney Ports, Aug 2009): Appendix A Detailed Design Acoustic Assessment, Document No 60051533 (AECOM, 2009)), with the following exceptions:

- The reach stacker movement path has been extended north as indicated in Figure 3;
- An additional container 'clang' has been added near the northern path of the reach stacker as indicated in Figure 3. It has been assumed that no nighttime container operations will occur above two high unless a container wall at higher level is constructed on a previous daytime before the night-time operations are to be undertaken;

- A forklift or truck has been modelled moving in the area to the north of the reach stacker as indicated in Figure 3. One truck has also been modelled idling in the northern extent of the site. As the area north of the HV electrical tower is not conducive to container and pallet stacking (in the open) activities, no container 'clangs' have been modelled in this area. This does not preclude the use of the area for pallet stacking inside containers, storage and maintenance of plant, equipment, materials and containers (single level);
- The reach stacker, the stacked container barriers and the container clang located to the south of the site have been moved as shown in Figure 4; and
- Noise sources have been added to Area G (former Toll Lease Area). These noise sources include two container 'clangs', reach stacker movements and truck movements as shown in Updated



- Figure 5.

This ECI design stage acoustic assessment builds on the preceding acoustic assessments carried out by AECOM, which were based on the EA stage acoustic work conducted by others. The operational scenarios (e.g. equipment selection and activities locations) presented in this assessment are 'typical' operational scenarios consistent with the EA stage acoustic assessment.

It is understood that Sydney Ports is in discussions with potential operators of the ILC facility. Future operator(s) of the ILC will be responsible for ensuring that noise emissions from operations at the site continue to satisfy the noise emission criteria in the Project Approval.

The new operator(s) will therefore be responsible for 'testing' any revised scenarios (e.g. different equipment selection, different operational activities) compared to the ones presented in this assessment and ensure compliance with the development's noise criteria in Condition of Approval No 2.17.

An aerial photograph of the site with assessment locations relevant to this study identified is presented in Figure 1.

Figure 1 Aerial photograph of Enfield ILC site including assessment locations relevant to this study



Notes:

- 1) The receiver locations presented in Figure 1 are those used in the Environmental Stage reports prepared by others and also in the Project Approval.

2.0 Project Noise Criteria

Site specific noise criteria for the Enfield ILC project were derived during the Environmental Assessment (EA) stage of the project. The noise criteria have been conditioned in the ILC Project Approval dated 5 September 2007 ('Operation Noise' Condition 2.17) and are represented in Table 2 below. Conditions 2.18, 2.19 and 2.19A also relate to operational noise and are reproduced below.

2.1 Specific environmental conditions

Operation Noise

2.17:

The proponent shall design, construct, operate and maintain the project to ensure that the operational noise contributions from the project do not exceed the maximum allowable noise levels specified...below, at those locations and during those periods indicated. The maximum allowable noise contributions apply under:

- a) wind speeds up to 3 ms⁻¹
- b) temperature inversion conditions up to 3°C per 100 metres and wind speeds up to 2 ms⁻¹ (measured at 10 metres above ground level)

Table 2 Condition 2.17 – Maximum allowable noise contribution, dB(A)

Location ¹	Day		Evening		Night		
	L _{Aeq} ² (15 min)	L _{Aeq} ³ (period)	L _{Aeq} (15 min)	L _{Aeq} (period)	L _{Aeq} (15 min)	L _{Aeq} (period)	L _{A1} ⁴ (1-minute)
A1 Eastern end of Jean Street	54	54	54	49	48	42	58
A2 Eastern end of Ivy Street	53	52	52	51	47	45	57
A3 Wentworth Street (South)	49	52	47	53	42	38	52
A4 Western ⁵ end of Gregory Street	49	52	47	46	45	37	55
A5 Western end of Blanche Street	46	58	46	50	43	43	53
A6 40 Bazentin Street	46	58	45	54	41	39	51
A11 Begnell Park	-	50	-	50	-	50	-
A12 Matthews Park	-	50	-	50	-	50	-
A13 Greenacre Bowling Club	-	55	-	55	-	55	-
A14 Strathfield High School (Internal)	-	35	-		-	-	-
A15 St. Anne's Schools (internal)	-	35	-		-	-	-

- Note 1 The alpha-numeric references are those used in the EA stage reports prepared by others and also in the Project Approval Conditions.
- Note 2 The 15 minute criterion for each period refers the 'Intrusiveness' criterion, derived according to procedures set out in the Industrial Noise Policy.
- Note 3 The 'period' criterion for each period refers to the 'Amenity' criterion derived according to procedures set out in the Industrial Noise Policy.
- Note 4: The L_{A1} noise descriptor is an approximation of the maximum noise level and is used to assess the potential for sleep disturbance by reviewing its emergence above the prevailing background noise level. The EA stage report expands on the criteria derived for each residential receiver by noting that 'Where the emergence level is less than 65 dB(A), a (sleep disturbance criterion) value of 65 dB(A) (applies) outdoors'. Refer to Section 5.1.2.
- Note 5: The receivers at the western end of Gregory Street are potentially the most noise-affected of the receivers in Gregory Street (although by a very small margin, less than 1 dB(A)). The EA stage report called up the eastern end of Gregory Street.

2.18:

For the purpose of assessment of noise contributions specified under Condition 2.17 of this consent, noise from the development shall be:

- a) *measured at the most affected point on or within the site boundary at the most sensitive locations to determine compliance with $L_{Aeq(15\text{ minute})}$ and $L_{Aeq(period)}$ noise limits;*
- b) *measured in the free-field at least 3.5 metres from any vertical reflecting surface in line with the worst affected dwelling facade to determine compliance with the $L_{A1(1\text{ minute})}$ noise limits; and*
- c) *subject to the modification factors provided in Section 4 of the New South Wales Industrial Noise Policy (EPA 2000), where applicable.*

Notwithstanding, should direct measurement of noise from the development be impractical, the Proponent may employ an alternative noise assessment method deemed acceptable by the DECC (refer to Section 11 of the New South Wales Industrial Noise Policy (EPA 2000)). Details shall be submitted to the Director-General prior to the implementation of the assessment method.

2.19:

To avoid any doubt, the proponent shall ensure that locomotives located on the site and associated with the operation of the project do not cause an exceedance of the noise limits specified under condition 2.17 of this approval. This shall include, where necessary, measures to mitigate and manage noise associated with locomotive idling and any shunting operation occurring on the site.

2.19A:

The Proponent shall implement noise mitigation measures generally in accordance with the measures identified in the document listed in condition 1.1j). In relation to the north-western noise wall, the Proponent shall implement as part of the design and construction of this wall, mitigation measures to minimise potential reflective noise on its western face.

It is noted that the document listed in condition 1.1j) is Intermodal Logistics Centre at Enfield, Modification Application 05_0147 – Project Adjustments. Supporting Information to Modification Application prepared by Sydney Ports Corporation and dated 26 March 2010.

The measures identified in the Supporting Information report are summarised below:

In summary, until Warehouses A and B, or alternatively the buildings in the southern half of the LIC area are constructed, and before operations in the Southern ECS area is substantially commenced, Sydney Ports proposes the following temporary controls:

- *If operations are to occur across the entire Southern ECS, Sydney Ports will require the ECS operator to enter into a formal agreement to only operate behind a stack of shipping containers located along the*

eastern boundary of the Southern ECS site (stacked four high, effectively a 10.4m high barrier). The barrier would extend for an equivalent length as if Warehouses A and B existed, (i.e. approximately two-thirds of the length of the Southern ECS and commencing from a point approximately 20 m from the southern-most boundary of the Southern ECS area); or

- The operator would be required to enter into a formal agreement to restrict operations in the Southern ECS to the northern third of the Southern ECS.

2.2 Environmental monitoring and auditing conditions

Noise Auditing

Condition 3.3:

Within 90 days of the project reaching annual throughput of 50,000 TEU, 150,000 TEU and 250,000 TEU, or as may be directed or agreed by the Director-General, and during a period in which the project is operating under normal operating conditions, the Proponent shall undertake a program to confirm the noise emission performance of the project. The program shall include, but not necessarily be limited to:

- a) Noise monitoring, consistent with the guidelines provided in the New South Wales Industrial Noise Policy (EPA, 2000), to assess compliance with condition 2.17 of this consent;
- b) Methodologies, locations and frequencies for noise monitoring;
- c) Identification of monitoring sites at which pre- and post-project development noise levels can be ascertained;
- d) Details of any complaints received in relation to noise generated by the project;
- e) An assessment of night-time use of audible alarm systems;
- f) Details of any noise mitigation measures and timetables for implementation;
- g) A statement of whether the site is in compliance with the noise limits outlined in condition 2.17; and
- h) Recommendations and timetables for implementation for any reasonable and feasible additional measures necessary to ensure compliance with the relevant noise-related conditions of this approval.

Condition 3.4:

Within 28 days of conducting the noise monitoring referred to under condition 3.3 of this approval, the Proponent shall provide the Director-General with a copy of the report. If the noise monitoring report identifies any non-compliance with the noise limits specified under this approval, the Proponent shall detail what additional measures would be implemented to ensure compliance, clearly indicating who would implement these measures, when these measures would be implemented, and how the effectiveness of these measures would be measured and reported to the Director-General.

Condition 3.5:

Following consideration of the outcomes of the noise audits referred to under conditions 3.3 and 3.4 of this approval, the Director-General may require the Proponent to implement additional noise mitigation, monitoring or management measures to address noise associated with the project. The Director-General may require any or all of the measures proposed by the Proponent in the noise audit report, or other measures considered appropriate by the Director-General (including on-site and off-site acoustic treatments, noise bunding, noise walls or noise attenuation works for plant and equipment) to be implemented.

The Proponent shall implement the measures required by the Director-General within such period as the Director-General may specify.

3.0 Methodology and Modelling Assumptions

This ECI design stage acoustic assessment builds on the preceding acoustic assessments carried out by AECOM, which were based on the EA stage acoustic work conducted by others. The following design inputs are consistent with those adopted at the EA stage:

- Receiver locations;
- Sound power levels of plant and equipment;
- Heavy vehicle movements within the site;
- Location of equipment on site; and
- Full operation of the development.

Deviations from the inputs used at the EA stage have been implemented where:

- It has been Conditioned to do so (e.g.: moving trains as well as idling trains – refer Condition 2.19);
- Operating scenarios have been updated as a result of the design and ECI development phases; and
- Sydney Ports has advised AECOM of a greater probability of use of a certain item of container facility plant over another type; e.g.: reach stackers in lieu of gantry cranes.

One of the changes in modelling input is the ground topography, which, through civil design work during the ECI process, has advanced with respect to that used as the basis of computer noise modelling at the EA stage. Additionally, intervening buildings between the site and receiver locations which were not present in the EA stage model have been included in the current model.

3.1 Modelling

Computer noise modelling of the proposed development and likely operating scenarios have been undertaken using *Braunstein + Berndt GmbH 'SoundPLAN' V 7.0* software, using an implementation of the CONCAWE industrial noise modelling algorithm.

3.1.1 Topography

Topographical information has been provided by AECOM as follows:

- Civil design within the site boundaries (contours provided at 0.2 m intervals); and
- Topographical information beyond the boundaries of the site (contours provided at 2.0 m intervals).

The surface of the northern Empty Container Storage (ECS B) area, main unloading/loading area and southern ECS A area have been modelled using the 'ground absorption' function in SoundPLAN to replicate an acoustically 'hard' surface (i.e.: reflective), with an absorption coefficient of 0.1. This is on the basis that the ground surface in the majority of the ILC will be asphalt.

3.1.2 Purpose-designed noise barriers

As a starting point, purpose-designed noise barriers have been located in accordance with the approved site layout. These barriers have been refined to accommodate the noise emission from the revised ECI site layout.

3.1.3 Buildings

Buildings and other incidental (non-purpose designed) noise barriers have been incorporated into the model as follows:

- Existing buildings within the boundaries of the site that will remain after the ILC has been developed, for example the building located within the Toll lease (obtained from digital survey information and/or digitisation of aerial photography);
- Existing buildings beyond the site boundaries including industrial, commercial and residential buildings (obtained from digital survey information and/or digitisation of aerial photography);

- Proposed buildings within the ILC site boundary including warehouses and administrative buildings. The plan locations of these buildings has been provided electronically by the detailed design team at AECOM, whilst heights have been conservatively estimated or set at the heights permitted by the Project Approval (e.g.: Warehouses A and B are 12 m high – refer to Condition 1.6, 'Warehousing and Distribution'). The light industrial commercial (LIC) buildings associated with the Enfield ILC are not included in the model.

3.1.4 Receivers

Receivers have been placed in the computer noise model at the same locations detailed in the EA stage assessment. AECOM is not in possession of the previous noise model and, in cases where the EA stage description is inexact (e.g.: 'western end of', 'eastern end of'), the receiver has been placed at the most affected (often closest) location consistent with the location described.

Specifically, these locations are:

- 'Eastern end of Jean Street' - located at the Roberts Road facade of **3 Lawford Street**, Greenacre;
- 'Eastern end of Ivy Street' - located at the Roberts Road facade of **90 Roberts Road**, Greenacre;
- 'Wentworth Street (South)' – located at the northern facade of **2 Wentworth Street**, Greenacre;
- 'Western end of Gregory Street' – located at the western facade of **30 Therry Street**, Strathfield; and
- 'Western end of Blanche Street' – located at the western facade of **53 Blanche Street**, Belfield.

3.1.5 Meteorological conditions

AECOM has undertaken modelling of industrial noise emission from the site under the following adverse meteorological conditions:

- Wind at 1.5, 2.0 and 2.5 m/s from the west;
- Wind at 1.5, 2.0 and 2.5 m/s from the north west;
- Wind at 1.5, 2.0 and 2.5 m/s from the south west; and
- Wind at 1.5, 2.0 and 2.5 m/s from the south-east.

Note that:

- The wind speed is taken to be measured at 10 m above the ground;
- The wind speed of 1.5 m/s was found (during the Preferred Project Report (PPR)) to be '*the highest mean and median wind speed from all four seasons analysed from data obtained from the Lidcombe hourly wind data*¹;
- The Noise Technical Memorandum presented as Appendix F of the PPR stated, '*the noise model was corrected to have a wind speed of 1.5 m/s at night and 2 m/s in the day and evening (being the highest mean and median wind speeds per period from all four seasons analysed from data obtained from the Lidcombe hourly wind data); representing the wind speeds over most of a typical day, evening and night amenity assessment period, and 2.5 m/s wind speed assumed for most of the time during the day/evening/night 'intrusive' periods.*² Therefore not all wind speeds apply to all assessment periods; and
- The wind directions above are the four directions considered in the PPR (expanded from the original two directions considered in the original EA stage acoustic report).

¹ Refer to page 3 of the Renzo Tonin report dated 5 April 2006 presented as *Appendix F 'Noise Technical Memorandum'* from the EA stage Enfield ILC Preferred Project report by SKM.

² Refer to page 4 of the Renzo Tonin report dated 5 April 2006 presented as *Appendix F 'Noise Technical Memorandum'* from the EA stage Enfield ILC Preferred Project report by SKM.

3.2 Noise sources

3.2.1 Industrial noise sources

During the detailed design stage acoustic assessment, it has been determined that the most likely type of container moving equipment that will be used at the site is a reach stacker. Octave band sound power levels for this equipment are as per the EA stage assessments, presented in Table 3.

Additionally, the following sundry industrial noise sources were incorporated into the model:

- Metal 'clangs';
- Commercial power washer; and
- PA system (one location).

Octave band sound power levels for this equipment are as per the EA stage assessment, presented in Table 3 below.

3.2.2 Metal 'clang' L_{A1} sound power levels

At the EA stage, the potential for high-level short-duration noise events to cause sleep disturbance was assessed. It was determined that the predominant source of such events was the 'clangs' which can occur when containers are picked up and put down by lifting equipment (reach stackers). The L_{A1} sound power of such an event, (consistent with that in the EA stage report) is shown in Table 2.

3.2.3 Heavy vehicle noise sources

During the detailed design stage acoustic assessment, the following heavy vehicle noise sources have been incorporated into the model (within the Enfield ILC site):

- Idling trucks – large trucks idling; and
- Moving trucks – large trucks transporting 1-2 containers at low speed (up to 20 km/h).

Idling trucks have been modelled as a point source with the following octave band and overall sound power level (based upon corrected EA stage power levels, see table 2 note) as presented in Table 3.

Moving trucks have been modelled as line sources, with the sound power expressed as power per metre. This has been derived from the sound power of a moving truck and adjusted to account for:

- The number of trucks traversing the line source path in the assessment period;
- The proportion of the assessment period that the trucks are moving; and
- The length of the line source.

The adjustment has been applied using the following equation:

$$SWL_{\text{metre}} = SWL_{\text{truck}} + (10 \log_{10} (t_{\text{event}}/t_{\text{assessment}})) + (10 \log_{10} n_{\text{sources}}) - (10 \log_{10} l_{\text{line}})$$

Where:

SWL = Sound Power in dB (or dB(A))

t_{event} = duration of the event in seconds (s)

$t_{\text{assessment}}$ = duration of the assessment period in seconds (s)

n_{sources} = number of sources

l_{line} = length of the line source in metres (m)

The purpose of the adjustment is to capture all the noise energy from all the noise events during the assessment period (including any breaks in activity if appropriate) and spread the energy equally over the length of the line source/truck route. Note that the base sound power level used for a moving truck is consistent with that used for the EA stage assessment and is presented in Table 2.

3.2.4 Rail noise sources

During the detailed design stage acoustic assessment, the following rail traffic noise sources were incorporated into the model (within the site):

- Moving train (two locomotives), with the power based upon attended noise measurements previously undertaken (according to Australian Standard AS 2377:2002 – *Acoustics – Methods for the measurement of rail bound vehicle noise*) by AECOM of a heavily laden (gross weight 1040 tonnes) Class 81 locomotive accelerating on Notch 5; and
- Idling trains (two locomotives); the power level used is consistent with that used for the EA stage assessment.

The sound power levels for these sources are presented in Table 2

The sound power level tabled above for the moving train is the base power of one locomotive. The moving train has been modelled as a line source with two locos pulling away to the south, taking 425 seconds of a 900 second (15 minute) period to travel 1.769 kilometres within the site (i.e.: travelling at 15 km/h). The power per metre of the line source has been calculated using the same formula as for the heavy vehicle line sources (refer to Section 3.2.3).

3.2.5 Source quantities – heavy vehicles and equipment on site

Heavy vehicle numbers have been based upon traffic profiles for the site established at the EA stage (EA, Chapter 7, page 7-11 and 7-12, SKM, October 2005).

Most other industrial noise sources modelled on site are proportional in quantity to the number of truck movements during the relevant assessment period. An exception is the quantity of rail movements for the intrusive scenarios. The daytime and night-time intrusive scenarios are modelled with one idling train (two locomotives) and one moving train (two moving locomotives) in each. This is on the basis that there could be a pair of idling locomotives and a pair of moving trains on site during a busy 15 minute daytime period and also during a busy night-time 15 minute period.

This proportional increase or decrease in the quantity of sources can then be used to add or subtract noise energy in any given assessment period.

3.2.6 Adopted sound power levels

Table 3 Summary of adopted sound power levels

Source	Sound Power Level (SWL, dB) at Octave Band Centre Frequency, Hz									Overall SWL dB(A)
	32	63	125	250	500	1000	2000	4000	8000	
Reach Stacker	110	111	107	103	105	101	97	96	87	106
Metal 'Clang' ¹	88	91	91	82	82	80	73	67	60	84
Commercial Power Washer	86	86	87	87	88	87	87	86	85	94
PA System	85 dB(A) at 1 metre									93
Metal 'Clang' L _{A1}	120	123	123	114	114	112	105	99	92	116
Idling Truck	96 ²	94	98	92	91	92	91	86	82	97
Moving Truck (base power)	96	96	101	104	99	97	94	88	82	102
Moving Train	142	126	113	99	91	86	83	80	80	105

Source	Sound Power Level (SWL, dB) at Octave Band Centre Frequency, Hz									Overall SWL dB(A)
	32	63	125	250	500	1000	2000	4000	8000	
Idling Train	103	107	104	101 ³	98 ³	93 ³	89 ³	88 ³	90 ³	100 ³

Notes:

- 1) The power of the metal 'clang' is assumed to be normalised to 15 minutes.
- 2) The octave band values for an idling truck presented in the EA stage report, although reported as Linear values, appear to be A-weighted. Further, the 32 Hz sound power appears to have been duplicated from the 63 Hz value and as such, when made Linear, is very high (at 107 dB, or 11 dB greater than the equivalent value for a moving truck). AECOM has substituted the 32 Hz value with the octave band sound power of a moving truck (96 dB).
- 3) These octave band and overall values for the idling train taken from the EA stage assessment appear to be high in relation to the moving train power level, and also in relation to AECOM's measurements of other low speed rail manoeuvres. However, the values have been kept consistent with the EA stage power levels to permit a conservative (and consistent) assessment.

3.2.6.1 Daytime intrusive scenario

Table 7-4 of the EA shows that there are 103 heavy vehicle movements during the daytime 'peak 1 hour' (between 2:00 pm and 3:00 pm in the afternoon). This equates to 13 truck movements (rounded up to the nearest integer) *into* and 13 truck movements *out* of the Enfield ILC in any one 15 minute period in a 'peak' period and can be used to assess noise emission against the 'intrusive' daytime noise emission criteria. These movements are again distributed over the site in the same proportions as above:

- 60% (7.7) use the 2987 m truck route forming a complete loop from the site bridge to the ILC loading area and back across the bridge;
- 30% (3.9) use the 2548 m truck route forming a complete loop from the site bridge to Warehouses A and B and back across the bridge; and
- 10% (1.3) use the 2754 m truck route forming a complete loop from the site bridge to the ILC loading area and back to the bridge.

A summary of all the industrial noise sources, (rounded to the nearest 0.1) modelled on site during any one 15 minute period in this intrusive assessment period are as follows:

Table 4 Daytime intrusive scenario – Industrial source quantity summary

Source	Quantity, 15 minutes
Idling trucks (distributed over the site)	13
Moving trucks (distributed over three routes)	12.9
Reach stackers, northern ECS B area	1
Elevated 'clangs', northern ECS B area	6
Reach stackers, main loading area	2
'Clangs' at 4.1 m unloading train	6
Elevated 'clangs', main loading area	6
Reach stackers, southern ECS A area	1
Elevated 'clangs', southern ECS A area	6
Reach stackers, former Toll Lease Area	1
Moving trucks, former Toll Lease Area	3
Elevated 'clangs', former Toll Lease Area	3

Source	Quantity, 15 minutes
Idling train (two Class 81 Locomotives 600 m apart)	1
Moving train (two Class 81 Locomotives 600 m apart)	1

The daytime *intrusive* scenario has been used as the 'baseline' calculation. In this way it has been possible to run one 'physical' computer noise model and scale all the other less-energetical scenarios compared to the daytime intrusive scenario.

The purpose of identifying and reporting the equivalent number of sources/movements/events in any one 15 minute period is to reduce the number of sources that need to be modelled (thus allowing more efficient and timely modelling) but it is important to note that modelling the reduced number of sources in a 15 minute period provides exactly the same numerical outcome as modelling the actual (larger) number of events in a (longer) amenity assessment period.

3.2.6.2 Daytime amenity scenario

Based upon the traffic numbers presented in Table 7-4 of the EA report, it has been determined that:

- 1089 truck movements occur in the 15 hour period between 7:00 am and 10:00 pm (encompassing the Daytime and Evening INP periods); and
- This equates to 9.1 movements *into* and 9.1 movements *out of* the site in any one 15 minute period between 7:00 am and 10:00 pm.
- Of these movements:
 - 60% (5.4) use the 2987 m truck route forming a complete loop from the site bridge to the ILC loading area and back across the bridge;
 - 30% (2.7) use the 2548 m truck route forming a complete loop from the site bridge to Warehouses A and B and back across the bridge; and
 - 10% (0.9) use the 2754 m truck route forming a complete loop from the site bridge to the ILC loading area and back to the bridge.

The quantities of industrial noise sources, (rounded to the nearest 0.1 for a 15 minute period and the nearest integer for the 15 hour period) modelled on site during this amenity assessment period are summarised in Table 5:

Table 5 Daytime amenity scenario – Industrial source quantity summary

Source	Proportional Quantity, 15 minutes	Quantity, 15 hours
Idling trucks (distributed over the site)	9.1	545
Moving trucks (distributed over three routes)	9.1	1089 movements
Reach stackers, northern ECS B area	0.7	1 operating 70% of the time
Elevated 'clangs', northern ECS B area	4.2	508
Reach stackers, main loading area	1.4	2 operating 70% of the time
'Clangs' at 4.1 m unloading train	4.2	508
Elevated 'clangs', main loading area	4.2	508
Reach stackers, southern ECS A area	0.7	1 operating 70% of the time
Elevated 'clangs', southern ECS A area	4.2	508

Source	Proportional Quantity, 15 minutes	Quantity, 15 hours
Reach stackers, former Toll Lease Area	0.7	1 operating 70% of the time
Moving trucks, former Toll Lease Area	2	120
Elevated 'clangs', former Toll Lease Area	2	120
Idling train (two Class 81 Locomotives 600 m apart)	0.1	10
Moving train (two Class 81 Locomotives 600 m apart)	0.1	20 movements

The daytime *intrusive* scenario has been used as the 'baseline' calculation. In terms of acoustic energy, the daytime *amenity* scenario has been scaled by the following amounts compared to the daytime intrusive scenario:

- Heavy vehicle sources: -1.5 dB
- Industrial/Container facility sources: -1.5 dB
- Rail sources: -9.8 dB

3.2.6.3 Night-time intrusive scenario

Table 7-4 of the EA report shows that there are 57 heavy vehicle movements during the night-time 'peak 1 hour' between 6:00 am and 7:00 am in the morning. This equates to 7.1 truck movements *into* and 7.1 movements *out of* the Enfield ILC in any one 15 minute period in a 'peak' period and can be used to assess noise emission against the 'intrusive' night-time noise emission criteria. These movements are again distributed over the site in the same proportions as above:

- 60% (4.3) use the 2987 m truck route forming a complete loop from the site bridge to the ILC loading area and back across the bridge;
- 30% (2.1) use the 2548 m truck route forming a complete loop from the site bridge to Warehouses A and B and back across the bridge; and
- 10% (0.7) use the 2754 m truck route forming a complete loop from the site bridge to the ILC loading area and back to the bridge.

A summary of all the industrial noise sources, (rounded to the nearest 0.1) modelled on site during any one 15 minute period in this intrusive assessment period are as follows:

Table 6 Night-time intrusive scenario – Industrial source quantity summary

Source	Quantity, 15 minutes
Idling trucks (distributed over the site)	7.1
Moving trucks (distributed over three routes)	7.1
Reach stackers, northern ECS B area	0.6
Elevated 'clangs', northern ECS B area	3.3
Reach stackers, main loading area	1.1
'Clangs' at 4.1 m unloading train	3.3
Elevated 'clangs', main loading area	3.3
Reach stackers, southern ECS A area	0.6
Elevated 'clangs', southern ECS A area	3.3
Reach stackers, former Toll Lease Area	0.6
Moving trucks, former Toll Lease Area	2

Source	Quantity, 15 minutes
Elevated 'clangs', former Toll Lease Area	2
Idling train (two Class 81 Locomotives 600 m apart)	1
Moving train (two Class 81 Locomotives 600 m apart)	1

The daytime *intrusive* scenario has been used as the 'baseline' calculation. In terms of acoustic energy, the night-time *intrusive* scenario has been scaled by the following amounts compared to the daytime intrusive scenario:

- Heavy vehicle sources: -2.6 dB
- Industrial/Container facility sources: -2.6 dB
- Rail sources: -0.0 dB

3.2.6.4 Night-time amenity scenario

Based on a review of the traffic numbers presented in Table 7-4 of the EA report, it has been determined that:

- 131 truck movements occur in the 9 hour period between 10:00 pm and 7:00 am (encompassing the Night-time INP period);
- This equates to 1.8 movements *into* and 1.8 movements *out of* the site in any one 15 minute period between 7:00 am and 10:00 pm.
- Of these movements:
 - 60% (1.1) use the 2987 m truck route forming a complete loop from the site bridge to the ILC loading area and back across the bridge;
 - 30% (0.5) use the 2548 m truck route forming a complete loop from the site bridge to Warehouses A and B and back across the bridge; and
 - 10% (0.2) use the 2754 m truck route forming a complete loop from the site bridge to the ILC loading area and back to the bridge;

The quantities of industrial noise sources, (rounded to the nearest 0.1 for a 15 minute period and the nearest integer for the 9 hour period) modelled on site during this amenity assessment period are summarised in Table 7:

Table 7 Night-time amenity scenario – Industrial source quantity summary

Source	Proportional Quantity, 15 minutes	Quantity, 9 hours
Idling trucks (distributed over the site)	1.8	66
Moving trucks (distributed over three routes)	1.8	131 movements
Reach stackers, northern ECS B area	0.1	1 operating 14% of the time
Elevated 'clangs', northern ECS B area	0.8	61
Reach stackers, main loading area	0.3	2 operating 14% of the time
'Clangs' at 4.1 m unloading train	0.8	61
Elevated 'clangs', main loading area	0.8	61
Reach stackers, southern ECS A area	0.1	1 operating 14% of the time
Elevated 'clangs', southern ECS A area	0.8	61
Reach stackers, former Toll Lease Area	0.1	1 operating 14%

Source	Proportional Quantity, 15 minutes	Quantity, 9 hours of the time
Moving trucks, former Toll Lease Area	0.4	15
Elevated 'clangs', former Toll Lease Area	0.2	15
Idling train (two Class 81 Locomotives 600 m apart)	0.1	6
Moving train (two Class 81 Locomotives 600 m apart)	0.1	12 movements

The daytime *intrusive* scenario has been used as the 'baseline' calculation. In terms of acoustic energy, the night-time *amenity* scenario has been scaled by the following amounts compared to the daytime intrusive scenario:

- Heavy vehicle sources: -8.5 dB
- Industrial/Container facility sources: -8.5 dB
- Rail sources: -12.0 dB

4.0 Amendments to Approved Mitigation Measures

The noise mitigation measures proposed in the previous detailed design acoustic assessment (reference: 60051533.RPT01.07, 30 June 2011, AECOM) prepared as part of Modification Application 4 have been modified in the following ways:

- The southern-eastern L-shaped barrier has been modified to fit around the relocated stormwater detention basin D (see Figure 2) with a total length of 77 m (previously 90 m);
- The length of the north-western barrier has been reduced in its northern extent from approximately 390 to 370 metres in length based upon the assumption that there will be no noise intensive activities occurring in the area adjacent to and north of the HV electrical tower. Accordingly, the northern extent of the barrier has been reduced to align with the northern most point of the container stacking area (see Figure 3); and
- The stacked 40 foot shipping containers (purpose-stacked containers as noise barriers) in the southern part of ECS A area have been moved south in line with proposed operational activities, as shown in Figure 4.

No barriers have changed in height from the previous assessment.

Figure 2 Southern L-shaped barrier - Updated



Figure 3 Northern barrier - Updated

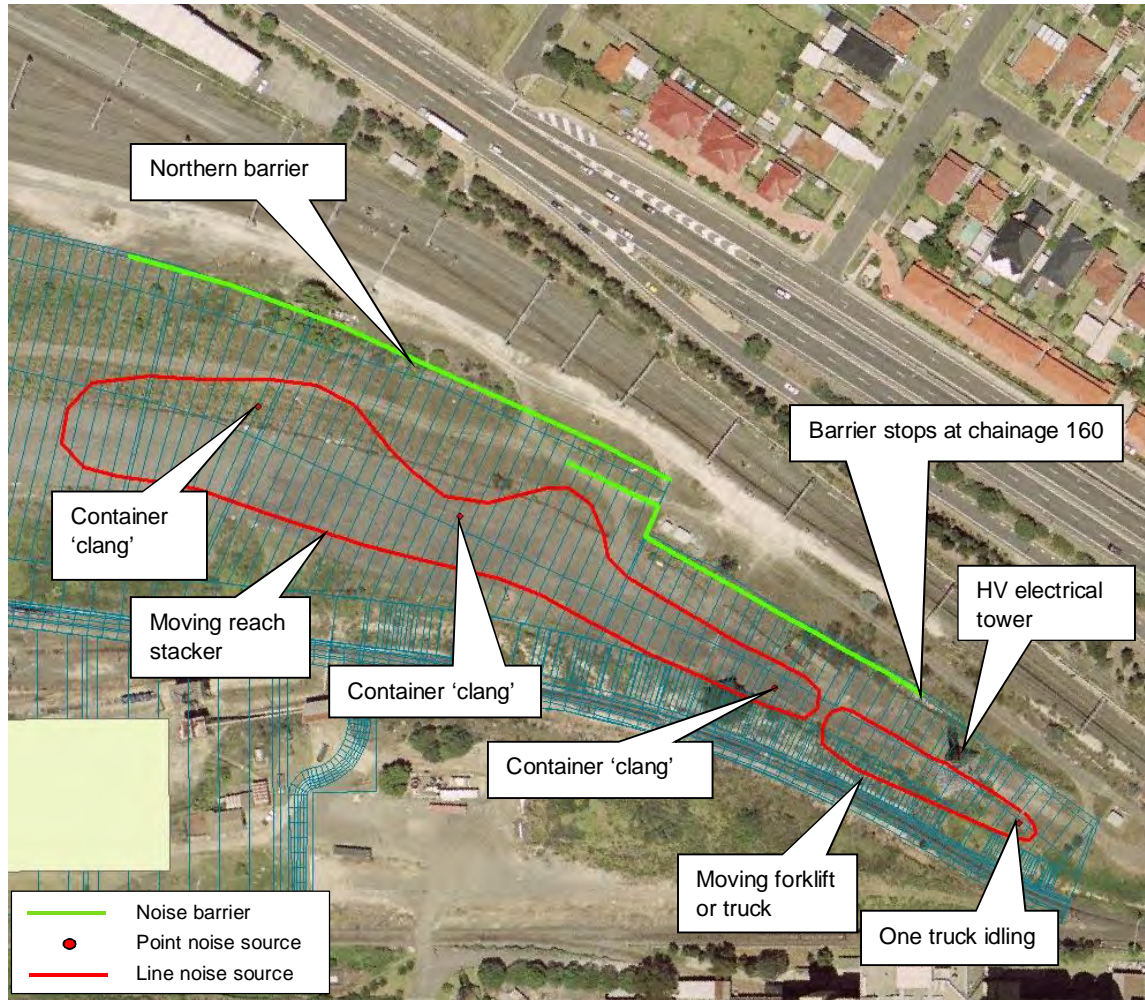


Figure 4 Stacked shipping containers - Updated

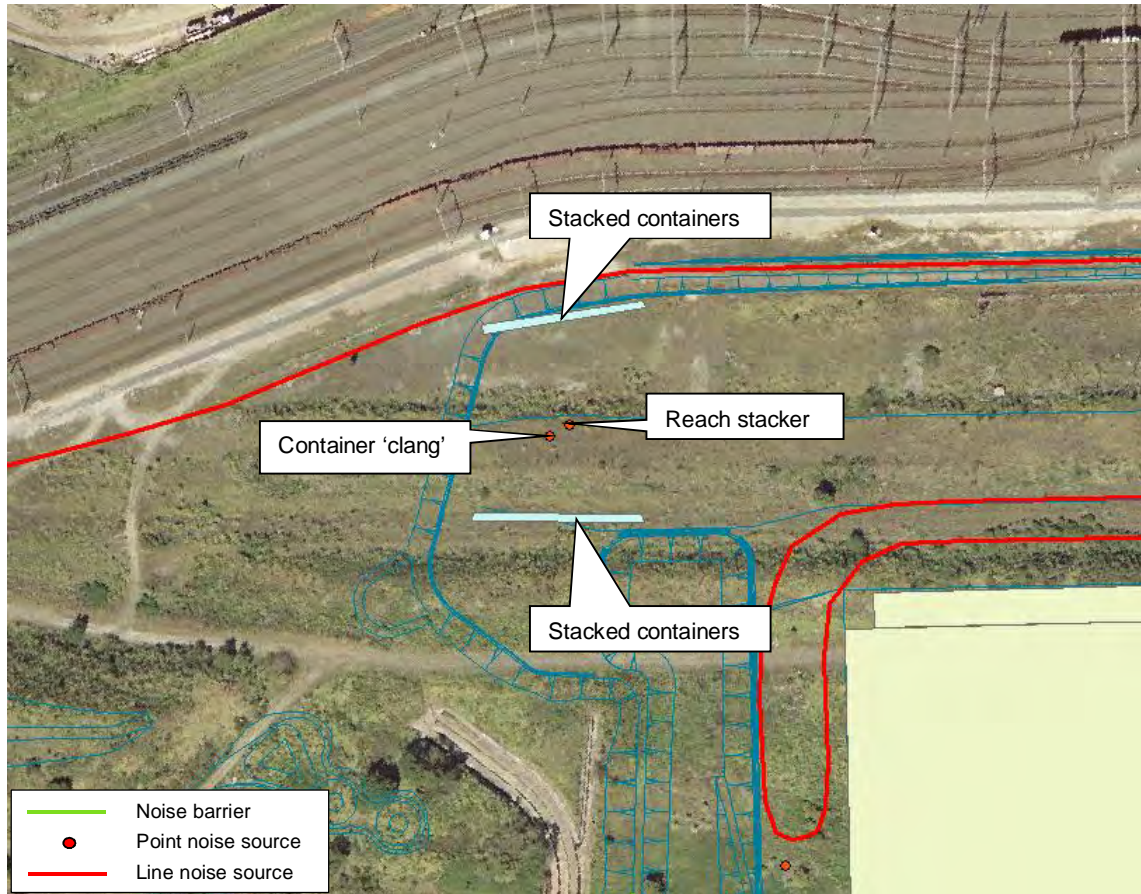
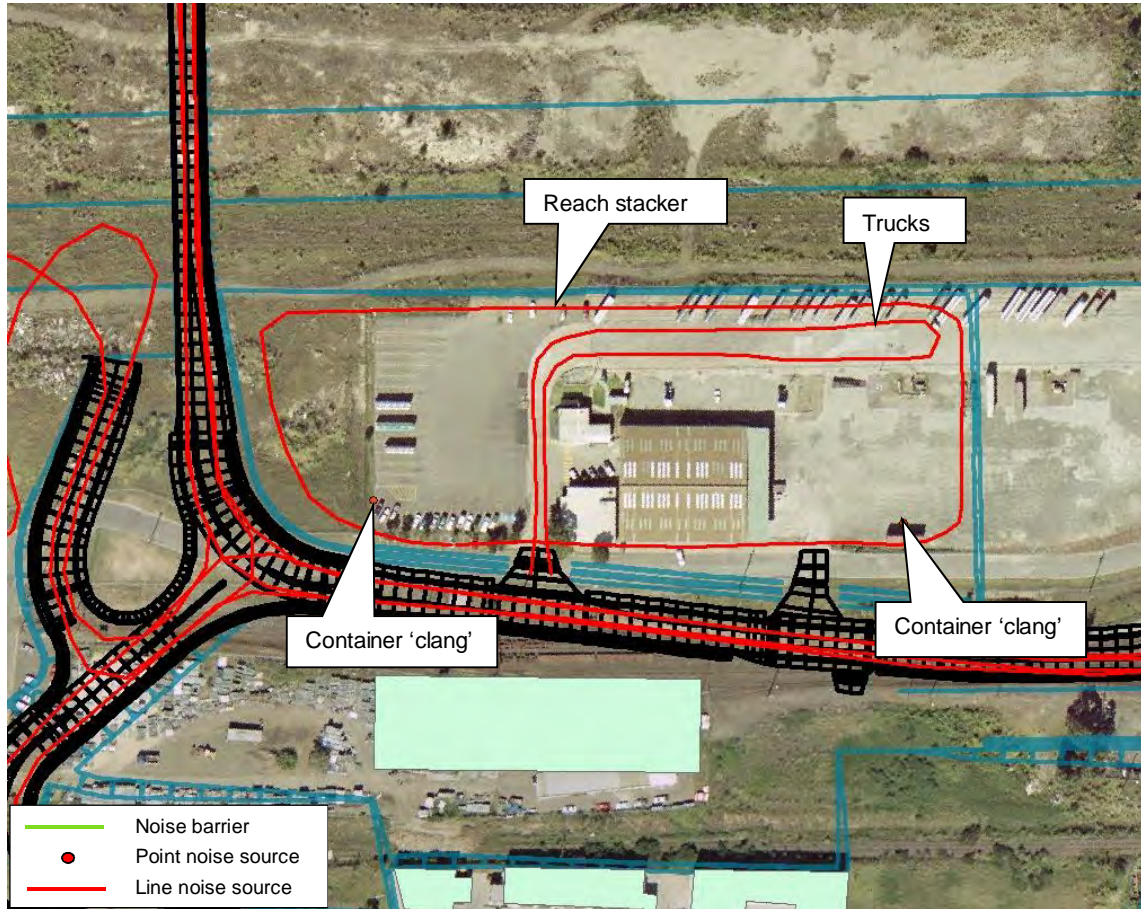


Figure 5 Area G (former Toll Lease Area)



5.0 Results and Discussion

The noise assessment has been undertaken namely for two operational scenarios:

- Without containers being stacked as noise barriers in the southern ECS A area; and
- With containers being stacked as noise barriers in the southern ECS A area.

5.1 Outcomes without containers stacked in southern ECS A area

5.1.1 Intrusive and amenity outcomes

The daytime intrusive scenario, as detailed in Section 3.2.6.1, has been modelled in SoundPLAN V 7.0 without containers being stacked as noise barriers in the southern ECS A area.

The model was run and used to provide Single Point Receiver (SPR) results at each of the relevant receiver locations. In addition, the model has been used to generate a noise contour plot ('Grid Noise Map' or GNM) for the daytime intrusive scenario (Refer to Appendix A). Based on the energetical corrections detailed in Sections 3.2.6.2, 3.2.6.3 and 3.2.6.4, the SPR results have been calculated for each of the daytime intrusive, daytime amenity, night-time intrusive and night-time amenity scenarios.

The results are presented in Table 8. Non-compliant results are shown in red type.

Table 8 Outcome without containers stacked in southern ECS A area – neutral meteorological conditions

Receiver	Location	Daytime ¹ intrusive, dB(A)			Daytime amenity, dB(A)			Night-time intrusive, dB(A)			Night-time amenity, dB(A)		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	48	54	0	46	49	0	46	48	0	40	42	0
A2	Eastern end of Ivy St.	41	52	0	39	51	0	39	47	0	32	45	0
A3	Wentworth Street (South)	47	47	0	45	52	0	45	42	3	38	38	0
A4	Western end of Gregory St.	41	47	0	39	46	0	39	45	0	32	37	0
A5	Western end of Blanche St.	49	46	3	47	50	0	47	43	4	40	43	0
A6	40 Bazentin Street	31	45	0	24	54	0	30	41	0	20	39	0
A11	Begnell Park	-	-	-	42	50	0	-	-	-	35	50	0
A12	Matthews Park	-	-	-	40	50	0	-	-	-	34	50	0
A13	Greenacre Bowling Club	-	-	-	36	55	0	-	-	-	29	55	0
A14	Strathfield High School (int)	-	-	-	19	35	0	-	-	-	-	-	-
A15	St. Anne's School (int)	-	-	-	29	35	0	-	-	-	-	-	-

Notes:

- 1) The daytime intrusive and daytime amenity criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 8 reveals that for the most part (with the previously recommended mitigation measures from the EA stage and under neutral meteorological conditions) likely operations at the site will satisfy the established noise criteria.

The exceptions to this trend are:

- The receiver(s) at the southern end of Wentworth Street (with criteria derived from unattended noise logging at 14 Wentworth Street) which experience an exceedance of up to 3 dB(A) during the night-time intrusive assessment period; and
- The receiver(s) at the western end of Blanche Street (with criteria derived from unattended noise logging at 43 Blanche Street) which experience an exceedance of up to 3 dB(A) during the daytime intrusive period and 4 dB(A) during the night-time intrusive period.

Table 9 Outcome without containers stacked in southern ECS A area –wind at 1.5 m/s, night-time amenity period

Receiver	Location	Westerly			North-westerly			South Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	38	42	0	38	42	0	39	42	0	41	42	0
A2	Eastern end of Ivy St.	29	45	0	31	45	0	29	45	0	33	45	0
A3	Wentworth Street (South)	37	38	0	38	38	0	36	38	0	39	38	1
A4	Western end of Gregory St.	35	37	0	33	37	0	35	37	0	32	37	0
A5	Western end of Blanche St.	42	43	0	41	43	0	42	43	0	39	43	0
A6	40 Bazentin Street	22	39	0	22	39	0	20	39	0	18	39	0
A11	Begnell Park	38	50	0	37	50	0	37	50	0	34	50	0
A12	Matthews Park	30	50	0	33	50	0	30	50	0	35	50	0
A13	Greenacre Bowling Club	25	55	0	29	55	0	24	55	0	29	55	0

Notes:

- 1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

Westerly

A review of Table 9 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s westerly wind conditions:

- No acoustically-significant changes.

North- Westerly

A review of Table 9 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s north-westerly wind conditions:

- No acoustically-significant changes.

South-Westerly

A review of Table 9 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s south-westerly wind conditions:

- No acoustically-significant changes.

South-Easterly

A review of Table 9 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s south-easterly wind conditions:

- The night time amenity predicted noise level at receiver(s) at the southern end of Wentworth Street increased to a marginal exceedance of 1 dB(A).

Table 10 Outcome without containers stacked in southern ECS A area –wind at 2.0 m/s, daytime amenity period

Receiver	Location	Westerly			North-westerly			South Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	44	49	0	45	49	0	46	49	0	48	49	0
A2	Eastern end of Ivy St.	35	51	0	38	51	0	35	51	0	40	51	0
A3	Wentworth Street (South)	43	52	0	44	52	0	42	52	0	46	52	0
A4	Western end of Gregory St.	42	46	0	40	46	0	43	46	0	38	46	0
A5	Western end of Blanche St.	49	50	0	48	50	0	49	50	0	46	50	0
A6	40 Bazentin Street	27	54	0	27	54	0	25	54	0	21	54	0
A11	Begnell Park	45	50	0	44	50	0	44	50	0	40	50	0
A12	Matthews Park	36	50	0	40	50	0	36	50	0	42	50	0
A13	Greenacre Bowling Club	31	55	0	37	55	0	30	55	0	36	55	0
A14	Strathfield High School (int)	19	35	0	15	35	0	23	35	0	23	35	0
A15	St. Anne's School (int)	33	35	0	31	35	0	33	35	0	28	35	0

Notes:

- 1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

Westerly

A review of Table 10 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s westerly wind conditions:

- No acoustically-significant changes.

North- Westerly

A review of Table 10 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s north-westerly wind conditions:

- No acoustically-significant changes.

South-Westerly

A review of Table 10 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s south-westerly wind conditions:

- No acoustically-significant changes.

South-Easterly

A review of Table 10 (and comparison with the neutral conditions in Table 8) reveals that under 1.5 m/s south-easterly wind conditions:

- No acoustically-significant changes.

Table 11 Outcome without containers stacked in southern ECS A area – wind at 2.5 m/s, daytime intrusive period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	46	54	0	47	54	0	48	54	0	50	54	0
A2	Eastern end of Ivy St.	37	52	0	40	52	0	37	52	0	42	52	0
A3	Wentworth Street (South)	45	47	0	47	47	0	45	47	0	48	47	1
A4	Western end of Gregory St.	44	47	0	42	47	0	45	47	0	40	47	0
A5	Western end of Blanche St.	51	46	5	50	46	4	50	46	4	48	46	2
A6	40 Bazentin Street	33	45	0	33	45	0	31	45	0	28	45	0

Notes:

- 1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 11 (and comparison with the neutral conditions in Table 8) reveals that under 2.5 m/s wind conditions:

Westerly

- The daytime intrusive exceedance at the western end of Blanche Street increases by 2 dB(A) from 3 dB(A) to 5 dB(A).

North-Westerly

- The daytime intrusive exceedance at the western end of Blanche Street increases by 1 dB(A) from 3 dB(A) to 4 dB(A).

South-Westerly

- The daytime intrusive exceedance at the western end of Blanche Street increases by 1 dB(A) from 3 dB(A) to 4 dB(A).

South-Easterly

- The daytime intrusive exceedance at southern end of Wentworth Street increased by 1 dB(A) from 0 dB(A) to a marginal 1 dB(A).
- The daytime intrusive exceedance at the western end of Blanche Street decreases by 1 dB(A) from 3 dB(A) to 2 dB(A).

Table 12 Outcome without containers stacked in southern ECS A area – wind at 2.5 m/s, night-time intrusive period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	44	48	0	44	48	0	46	48	0	48	48	0
A2	Eastern end of Ivy St.	35	47	0	38	47	0	35	47	0	40	47	0
A3	Wentworth Street (South)	44	42	2	45	42	3	43	42	1	46	42	4
A4	Western end of Gregory St.	42	45	0	40	45	0	42	45	0	38	45	0
A5	Western end of Blanche St.	48	43	5	48	43	5	48	43	5	45	43	2
A6	40 Bazentin Street	32	41	0	32	41	0	31	41	0	28	41	0

Notes:

- 1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 12 (and comparison with the neutral conditions in Table 8) reveals that under 2.5 m/s wind conditions:

Westerly

- The night-time intrusive exceedance at western end of Blanche Street increases by 2 dB(A) from 3 dB(A) to 5 dB(A); and
- The night-time intrusive exceedances at Wentworth Street (south) decreases by 1 dB(A) from 3 dB(A) to 2 dB(A).

North-Westerly

- The night-time intrusive exceedances at Wentworth Street (south) remains at 3 dB(A); and
- The night-time intrusive exceedance at western end of Blanche Street increases by 1 dB(A) from 4 dB(A) to 5 dB(A).

South-Westerly

- The night-time intrusive exceedances at Wentworth Street (south) decreases by 2 dB(A) from 3 dB(A) to 1 dB(A); and
- The night-time intrusive exceedance at western end of Blanche Street increases by 1 dB(A) from 4 dB(A) to 5 dB(A).

South-Easterly

- The night-time intrusive exceedances at Wentworth Street (south) increases by 1 dB(A) from 3 dB(A) to 4 dB(A); and
- The night-time intrusive exceedance at the western end of Blanche Street decreases by 2 dB(A) from 4 dB(A) to 2 dB(A).

5.1.2 Sleep disturbance (L_{A1}) outcomes without temporary container stacking

The potential for sleep disturbance is assessed only at residential receivers (A1 to A6) during the night-time period, against the criteria presented in the last column of Table 2.

A summary of the sleep disturbance outcomes under all the specified meteorological conditions without temporary container stacking is presented in Table 13.

Sleep disturbance has been considered under a 2.5 m/s wind condition for each receiver.

Non-compliant results are shown in red type.

Table 13 Sleep disturbance outcomes – no mitigation beyond EA stage recommendations

Receiver	Location	Sleep disturbance criterion $L_{A1(1 \text{ minute})}$, dB(A)	Highest predicted $L_{A1(1 \text{ minute})}$ noise levels, dB(A)					Greatest exceedance, dB(A)
			Neutral	Westerly	North-westerly	South-westerly	South-easterly	
A1	Eastern end of Jean St.	58	64	64	64	64	64	6
A2	Eastern end of Ivy St.	57	43	42	46	40	41	0
A3	Wentworth Street (South)	52	60	58	59	58	59	8
A4	Western end of Gregory St.	55	42	45	45	45	38	0
A5	Western end of Blanche St.	53	59	59	58	59	58	6
A6	40 Bazentin Street	51	34	36	36	34	31	0

With no additional mitigation beyond that proposed at the EA stage, L_{A1} noise events during the night-time period from elevated 'clangs' at 10.4 m above ground level (associated with picking up and putting down containers stacked four high) result in exceedances of up to 8 dB(A) above the 'Background plus 15 dB(A) criterion. It is noted that these exceedances would be lower if containers were not stacked as high and strategically-located stacks of containers (higher than the 'clang' source height) were located between the 'clangs' and receivers – refer to Section 5.2.3).

The NSW Environment Protection Authority (EPA) document Environmental Criteria for Road Traffic Noise (ECRTN) contains an assessment of sleep disturbance which represents the most recent NSW EPA advice on the subject of sleep disturbance due to noise events. Section B5 of Appendix B concludes, having considered the results of four research papers by *Pearson et al (1995)*, *Bullen et al (1996)*, *Greifahn (1992)* and *Finegold et al (1994)* with the statement, '*Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions*'. Therefore given that an open window provides 10 dB(A) noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions. This is in agreement with the screening criterion of 65 dB(A) used at the EA stage by others. **On this basis, the predicted L_{A1} noise levels from metal on metal 'clangs' as a result of operation at the Enfield site are unlikely to result in sleep disturbance.**

If control of these noise events is considered beneficial to the operation of the site, alternative mitigation measures should be considered, including management practices. Refer to Section 5.2.2.

5.2 Outcomes with containers stacked in southern ECS A area

5.2.1 Intrusive and amenity outcomes

The daytime intrusive scenario, as detailed in Section 3.2.6.1, has been modelled in SoundPLAN V 7.0 with containers being stacked as noise barriers in the southern ECS A area.

Table 14 Outcome with stacked containers - neutral meteorological conditions

Receiver	Location	Daytime ¹ intrusive, dB(A)			Daytime amenity, dB(A)			Night-time intrusive, dB(A)			Night-time amenity, dB(A)		
		Result	Criterion	Exceed.	Result	Criterion	Exceed.	Result	Criterion	Exceed.	Result	Criterion	Exceed.
A1	Eastern end of Jean St.	48	54	0	46	49	0	46	48	0	40	42	0
A2	Eastern end of Ivy St.	41	52	0	39	51	0	39	47	0	32	45	0
A3	Wentworth Street (South)	43	47	0	40	52	0	42	42	0	33	38	0
A4	Western end of Gregory St.	41	47	0	39	46	0	39	45	0	32	37	0
A5	Western end of Blanche St	44	46	0	42	50	0	41	43	0	35	43	0
A6	40 Bazentin Street	31	45	0	24	54	0	30	41	0	20	39	0
A11	Begnell Park	-	-	-	41	50	0	-	-	-	34	50	0
A12	Matthews Park	-	-	-	41	50	0	-	-	-	34	50	0
A13	Greenacre Bowling Club	-	-	-	35	55	0	-	-	-	28	55	0
A14	Strathfield High School (int)	-	-	-	19	35	0	-	-	-	-	-	-
A15	St. Anne's School (int)	-	-	-	29	35	0	-	-	-	-	-	-

Notes:

- 1) The daytime intrusive and daytime amenity criteria are based upon the lower (more stringent) of the daytime and evening criteria.
- Table 14 shows that the mitigation measures tested in the 'with mitigation' SoundPLAN noise model, (under neutral meteorological conditions and full site operations) allow the established noise criteria to be met in all assessment periods all locations. It is noted that exceedances without additional mitigation measures at Wentworth and Blanch Street have been removed.

In conclusion, noise levels with the additional recommended mitigation measures are predicted to meet the criteria at all representative receiver locations, however it is also recommended that noise emissions be managed by the implementation of an Operational Noise Management Plan (ONMP) in accordance with Minister's Condition 6.5.

Table 15 Outcome with stacked containers – wind at 1.5 m/s, night-time amenity period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	38	42	0	38	42	0	39	42	0	41	42	0
A2	Eastern end of Ivy St.	29	45	0	31	45	0	29	45	0	33	45	0
A3	Wentworth Street (South)	33	38	0	35	38	0	32	38	0	33	38	0
A4	Western end of Gregory St.	35	37	0	33	37	0	35	37	0	32	37	0
A5	Western end of Blanche St	37	43	0	37	43	0	35	43	0	33	43	0
A6	40 Bazentin Street	22	39	0	22	39	0	20	39	0	18	39	0
A11	Begnell Park	37	50	0	36	50	0	35	50	0	31	50	0
A12	Matthews Park	30	50	0	33	50	0	30	50	0	35	50	0
A13	Greenacre Bowling Club	25	55	0	29	55	0	24	55	0	28	55	0

Notes:

1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 15 (and comparison with the neutral conditions in Table 14) reveals that under 1.5 m/s wind conditions:

All wind directions

- No acoustically-significant changes are predicted during the night-time amenity period with the introduction of worst case wind conditions compared with the neutral meteorological condition.

Table 16 Outcome with stacked containers – wind at 2.0 m/s, daytime amenity period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	44	49	0	45	49	0	46	49	0	48	49	0
A2	Eastern end of Ivy St.	35	51	0	38	51	0	35	51	0	40	51	0
A3	Wentworth Street (South)	39	52	0	41	52	0	37	52	0	39	52	0
A4	Western end of Gregory St.	42	46	0	40	46	0	43	46	0	38	46	0
A5	Western end of Blanche St	44	50	0	44	50	0	42	50	0	40	50	0
A6	40 Bazentin Street	27	54	0	27	54	0	25	54	0	21	54	0
A11	Begnell Park	44	50	0	43	50	0	43	50	0	38	50	0
A12	Matthews Park	36	50	0	40	50	0	36	50	0	42	50	0
A13	Greenacre Bowling Club	31	55	0	36	55	0	30	55	0	35	55	0
A14	Strathfield High School (int)	19	35	0	15	35	0	23	35	0	23	35	0
A15	St. Anne's School (int)	33	35	0	31	35	0	33	35	0	28	35	0

Notes:

1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 16 (and comparison with the neutral conditions in Table 14) reveals that under 2.0 m/s wind conditions:

All wind directions

- No acoustically-significant changes are predicted during the daytime amenity period with the introduction of worst case wind conditions compared with the neutral meteorological condition.

Table 17 Outcome with stacked containers – wind at 2.5 m/s, daytime intrusive period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	46	54	0	47	54	0	48	54	0	50	54	0
A2	Eastern end of Ivy St.	37	52	0	40	52	0	37	52	0	42	52	0
A3	Wentworth Street (South)	43	47	0	44	47	0	42	47	0	43	47	0
A4	Western end of Gregory St.	44	47	0	42	47	0	45	47	0	40	47	0
A5	Western end of Blanche St	46	46	0	46	46	0	44	46	0	42	46	0
A6	40 Bazentin Street	33	45	0	33	45	0	31	45	0	28	45	0

Notes:

1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 17 (and comparison with the neutral conditions in Table 14) reveals that under 2.5 m/s wind conditions:

All wind directions

- No acoustically-significant changes are predicted during the daytime intrusive period with the introduction of worst case wind conditions compared with the neutral meteorological condition.

Table 18 Outcome with stacked containers – wind at 2.5 m/s, night-time intrusive period

Receiver	Location	Westerly			North-Westerly			South-Westerly			South-Easterly		
		Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed	Result	Criterion	Exceed
A1	Eastern end of Jean St.	44	48	0	44	48	0	46	48	0	48	48	0
A2	Eastern end of Ivy St.	35	47	0	38	47	0	35	47	0	40	47	0
A3	Wentworth Street (South)	42	42	0	43	42	1	41	42	0	42	42	0
A4	Western end of Gregory St.	42	45	0	40	45	0	42	45	0	38	45	0
A5	Western end of Blanche St	43	43	0	43	43	0	42	43	0	39	43	0
A6	40 Bazentin Street	32	41	0	32	41	0	31	41	0	28	41	0

Notes:

- 1) The daytime criteria are based upon the lower (more stringent) of the daytime and evening criteria.

A review of Table 18 (and comparison with the neutral conditions in Table 14) reveals that under 2.5 m/s wind conditions:

North Westerly

- The night-time intrusive exceedance at Wentworth Street (south) increases to a marginal 1 dB(A);

The Environment Protection Authority document '*Noise Guideline for Local Government*' (DECCW, 2010) mentions "*An increase in 2 dB is hardly perceptible*". Therefore, the residual exceedance (1 dB) at the eastern end of Wentworth Street (south), after treatment, under a 2.5 m/s westerly wind condition are considered marginal at most, and inconsequential.

Westerly, South Westerly, South-Easterly

- No acoustically-significant changes

5.2.2 Sleep disturbance (L_{A1}) outcomes with containers stacked in the southern ECS A area

The potential for sleep disturbance was assessed at residential receivers (A1 to A6) during the night-time period, against the criteria presented in the last column of Table 2.

A summary of the sleep disturbance outcomes under all the specified meteorological conditions (with additional mitigation measures) is presented in Table 19.

Sleep disturbance has been considered under a 2.5 m/s wind condition for each receiver.

Non-compliant results are shown in red type.

Table 19 Sleep disturbance outcomes – with stacked containers in ECS A area

Receiver	Location	Sleep disturbance criterion $L_{A1(1 \text{ minute})}$, dB(A)	Highest predicted $L_{A1(1 \text{ minute})}$ noise levels, dB(A)					Potential Greatest exceedance, dB(A)
			Neutral	Westerly	North-westerly	South-westerly	South-easterly	
A1	Eastern end of Jean St.	58	64	64	63	64	64	6
A2	Eastern end of Ivy St.	57	43	42	46	40	41	0
A3	Wentworth Street (South)	52	59	58	59	58	59	7
A4	Western end of Gregory St.	55	42	45	45	45	38	0
A5	Western end of Blanche St.	53	53	53	53	53	53	0
A6	40 Bazentin Street	51	33	36	36	34	31	0

With stacked containers in southern ECS A area, L_{A1} noise events during the night-time period from elevated 'clangs' at 10.4 m above ground level (associated with picking up and putting down containers stacked four high) result in exceedances of up to 7 dB(A) above the 'Background plus 15 dB(A) criterion. As anticipated, this represents no acoustically significant change from the 'no additional mitigation' scenario, (Refer to Section 5.1.2).

It is again noted that none of these noise events are predicted to result in L_{A1} noise levels greater than 65 dB(A) at any receiver and consequently (based on the findings of the ECRTN – refer to Section 5.1.2), sleep disturbance is unlikely to occur, irrespective of the prevailing background (L_{A90}) noise level.

The exceedances in Table 19, would be lower if containers were not stacked as high and strategically-located stacks of containers (higher than the 'clang' source height) were located between the 'clangs' and receivers. A suitable stack height would be three containers high where purpose-stacked containers (four high) at perimeter locations are strategically located. The contribution of 'clangs' at the top of the third container can be up to 7 dB(A) lower than the contribution of 'clangs' at the top of the fourth container in a stack, when working within 50 m of the perimeter container stacks. This margin would result in strict compliance with the night-time sleep disturbance criteria.

Table 20 presents the outcomes from lowering the 'clangs' (i.e. lowering the container stack heights).

Table 20 – Sleep disturbance outcomes – with additional mitigation

Receiver	Location	Sleep disturbance criterion $L_{A1}(1 \text{ minute}),$ dB(A)	Highest predicted $L_{A1}(1 \text{ minute})$ noise levels, dB(A)					Potential Greatest exceedance, dB(A)
			Neutral	Westerly	North-westerly	South-westerly	South-easterly	
A1	Eastern end of Jean St.	58	56	53	56	53	56	0
A3	Wentworth Street (South)	52	52	51	51	51	52	0
A5	Western end of Blanche St.	53	48	49	48	49	48	0

The results presented in Table 20 are based on the following assumptions/recommendations:

- Southern ECS A area: Containers stacked as noise barriers (four high) in the southern ECS A area and containers stack three high within 50 m of the perimeter of the purpose-stacked container noise wall.
- The predicted levels at receiver A1 (Eastern end of Jean St.) are based on stacked containers two high in the ECS B area. Similar results would be predicted with containers stacked three high where purpose-stacked containers (four high) at perimeter locations are strategically located to shield adjacent sensitive noise receivers.
- As discussed in section 5.2.3.1 the stacking of containers (when constructing noise walls) should be undertaken during the daytime. The noise associated with stacking of containers has been assessed in this section.

The predominant source of these L_{A1} noise events is the 'clangs' modelled at 10.4 m above ground, at the top of a stack of four containers. Modelling has shown that noise mitigation measures such as barriers will not control such noise sources to the point of compliance, as the noise source is significantly higher than any reasonable barrier. Further, the source and nature of the potential exceedance (i.e. night time 'clangs' at height during certain meteorological conditions) make such potential exceedance easily manageable through the implementation of the Operational Noise Management Plan required under Condition 6.5.

5.2.3 Sleep disturbance discussion

During the Environmental Assessment stage acoustic study *Preferred Project Report (Renzo Tonin and Associates, April 2006)*, it was found that whilst the 'Background plus 15 dB(A)' criterion was exceeded at some residential assessment locations under neutral and certain adverse weather conditions, the likelihood of sleep disturbance due to the operation of the ILC site was minimised by a number of mitigating factors including:

- 1) The night-time background noise level used for assessment of sleep disturbance is the Rating Background Level (RBL) which is most influenced by the quietest (lowest 10th percentile background) period during the night-time, typically 2 am to 4 am. The frequency of hourly truck movements at the ILC (and therefore movement of containers and resultant 'clangs') during this period is low, or even nil when considering the hours commencing 3 am and 4am (refer to EA stage report *Chapter 7 Road Traffic and Transport, SKM, October 2005*). The period during which the prevalence of container 'clangs' would be greater is the INP night-time 'shoulder' period, i.e.: 6 am to 7 am, during which there is a corresponding increase in background noise levels – in the order of 5 to 10 dB(A). This has a corresponding effect of diminishing the impact of 'clang' events by 5 to 10 dB(A).
- 2) An analysis of existing night-time maximum noise levels at all residential receivers A1 to A6 revealed that existing maximum noise levels exceeded both the predicted maximum noise levels due to ILC operation and the 'Background plus 15 dB(A)' criterion for each location. A repeat analysis of this for the newly predicted L_{A1} noise levels for the detailed design stage study is presented below in Table 21:

Table 21 Sleep disturbance outcomes – comparison with existing night-time maximum noise levels

Receiver	Location	'Background plus 15 dB(A)' criterion $L_{A1(1 \text{ minute})}$, dB(A)	Highest predicted $L_{A1(1 \text{ minute})}$ noise levels, dB(A)					Existing average L_{Amax} noise levels	
			Neutral	W	NW	SW	SE	Min	Max
A1	Eastern end of Jean St.	58	64	64	64	64	64	67	74
A2	Eastern end of Ivy St.	57	43	42	46	40	41	72	83
A3	Wentworth Street (South)	52	60	58	59	58	59	68	81
A4	Western end of Gregory St.	55	42	45	45	45	38	67	72
A5	Western end of Blanche St.	53	59	59	58	59	58	67	72
A6	40 Bazentin Street	51	34	36	36	34	31	67	77

This analysis shows that, similarly to the EA stage, the predicted L_{A1} noise levels due to ILC operation are consistently lower than existing L_{Amax} , (including existing average minimum L_{Amax}) noise levels. Consequently, it is considered that the potential for sleep disturbance is minimal, irrespective of the prevailing background noise levels.

Notwithstanding the above points, and the fact that the predicted L_{A1} noise levels satisfy the EPA ECRTN screening criterion of 65 dB(A), additional management measures will be put in place at the Enfield ILC site, including:

- 1) Preparation of a Noise Management Plan (in accordance with Minister's Condition 6.5);
- 2) On-site noise monitoring (in accordance with condition 3.3) will be implemented at different annual throughput stages (i.e. 50,000, 150,000 and 250,000 TEU) to determine ongoing compliance of noise emission from the site, including L_{A1} noise events during the night-time period; and
- 3) Implementation of any additional measures required by the Director-General to address any non-compliances with the noise limits in condition 2.17 identified during noise monitoring as required under condition 3.4.

5.2.3.1 Stacking containers at the southern and northern ECS areas during the day-time

In accordance with the requirements of condition 2.14A the stacking of boundary containers (required to create temporary noise barriers) must occur during the standard daytime period set out in condition 2.15. This activity will not result in exceedances of L_{A1} noise criteria as no such criteria exist for the daytime period. However, it is necessary to examine the potential for such stacking activity to exceed daytime L_{Aeq} 'intrusive' (i.e.: 'Background plus 5 dB(A)') criterion.

Additional acoustic assessment associated with stacking containers into noise barriers at the south-eastern and south-western corner of the southern ECS A area during the daytime and within the northern ECS B area indicates compliance with the L_{Aeq} 'intrusive' operational noise limits, refer to Table 22.

The assessment has been based on the following assumptions:

- 15 minute normalised sound power level for a container 'clang' is 84 dB(A);
- L_{A1} sound power level for a container 'clang' is 116 dB(A);
- Container stack length is 60 m;
- Number of containers long is five;
- Height of stack is four containers;
- Number of containers total 20;
- Number of 'clangs' to build stack is 40; and

- Stacking of the boundary containers (20 off) will take approximately 30 minutes, equivalent to 20 'clangs' during a worst-case 15 minute period.

Table 22 Daytime stacking of containers, predicted noise levels – with management mitigation measures

Receiver	Location	Limiting 'intrusive' criterion Day/Evening $L_{Aeq(15\text{ minute})}$, dB(A)	Predicted $L_{Aeq(15\text{ minute})}$ noise levels, dB(A)	'Intrusive' compliance
A1	Eastern end of Jean Street	54	50	Yes
A3	Wentworth Street (South)	49	45	Yes
A5	Western end of Blanche Street	46	43	Yes

6.0 Warehouses and LIC Operational Scenario

6.1 Introduction

It is understood that the Department of Planning (DoP) provided comments in relation to the ILC acoustic assessment presented in AECOM's report 60051533 MV001.REP.06 dated 30 September 2009 (attached to Sydney Ports' Modification Application report dated 31 August 2009) (Modification Application 5).

- The purpose of the following assessment is to address the DoP comments which relate to Operational noise levels under the scenario where Warehouses A and B and Light Industrial Commercial buildings (LIC) have not yet been constructed and the ILC and ECS A areas are operating. Specifically, this scenario examines operational noise levels at residential areas south-east of the ILC site, which are best represented by residential receiver location A5 – 'Western end of Blanche Street'. (Refer to Section 6.2).

Residential receiver location A5 is of primary interest to this study. However, it has been observed that other nearby residential receivers to the south-east and east of the ILC site (for example, receivers in Madeline Street) could be affected by the temporary absence of the warehouse buildings and comments are made regarding these receivers where appropriate.

The variability of the orientation of affected receivers also affects determination of the most relevant adverse wind condition. For this reason, north-westerly wind at 2.5 m/s has been considered with respect to residential receiver location A5 in Blanche Street and westerly winds at 2.5 m/s have been considered with respect to the Madeline Street receiver catchment area.

For reference, an aerial image identifying the southern portion of the currently undeveloped ILC site and the residential land use areas referred to in this assessment (to the south-east and east of the site) is presented in Figure 6:

Figure 6 ILC study area (south-east area)



6.2 Assessed scenario

6.2.1 Scenario A - Warehouses and ILC buildings not present, all southern noise sources

This section examines noise levels at residential receiver location A5 (i.e. the south-east residential catchment) under the scenario where Warehouses A and B and also the ILC buildings at the south east of the site adjacent to Cosgrove Road have not yet been built. The reason that only this receiver catchment is considered is because it is only these receivers that could be potentially affected by the presence or absence of this specific group of buildings.

Under this scenario it is important to note that typically the majority of noise sources (that were included in the original noise model) in the south end of the ILC site would also be absent, given that there are no warehouses to serve and that the facility is not operating at capacity. However, for the purposes of this assessment, all noise sources in the southern area have been retained in the noise model. This represents a conservative assessment to examine the potential necessity for noise controls under a worst-case scenario.

All noise sources in the centre of the site and the north of the site remain as per the original noise model.

The scenario above has been assessed using a computer noise model. Noise levels from the operation of the ILC under this scenario have been considered under three meteorological conditions, being neutral conditions, north-westerly and westerly wind at 2.5 m/s. These latter conditions represent worst-case scenarios.

In Table 23, results have been compared to the daytime and night-time intrusive and amenity criteria and also the sleep disturbance criterion (the latter under worst case meteorological conditions) for residential receiver location A5:

Table 23 Noise levels at residential receiver location A5 without Warehouses A and B or LIC buildings (with all southern ECS A area noise sources)

Scenario	Criterion	Result	Comment
Neutral conditions			
Daytime Intrusive	46	49	Exceedance of 3 dB(A)
Daytime Amenity	50	48	Complies
Night-time Intrusive	43	47	Exceedance of 4 dB(A)
Night-time Amenity	43	40	Complies
North-westerly wind 2.5 m/s			
Daytime Intrusive	46	51	Exceedance of 5 dB(A)
Daytime Amenity	50	49	Complies
Night-time Intrusive	43	49	Exceedance of 6 dB(A)
Night-time Amenity	43	42	Complies
Sleep Disturbance	53	64	Exceedance of 11 dB(A)
Westerly wind 2.5 m/s			
Daytime Intrusive	46	51	Exceedance of 5 dB(A)
Daytime Amenity	50	50	Complies
Night-time Intrusive	43	49	Exceedance of 6 dB(A)
Night-time Amenity	43	42	Complies
Sleep Disturbance	53	64	Exceedance of 11 dB(A)

Results presented in Table 23 show that under the scenario where Warehouses A and B and the light industrial buildings are absent and all ILC sources are operating as per the scenarios presented in Section 3.0, compliance is achieved for daytime and night-time amenity periods under neutral conditions. However, with no mitigation, there is a trend of non-compliance for intrusive periods (i.e. busy 15 minute periods) and under adverse source to receiver wind conditions.

It is therefore necessary to consider mitigation in the form of barriers between the ILC sources in the southern ECS A area and the catchment of receivers to the south-east and east. It is recommended that 'temporary' barriers in the form of stacked shipping containers are considered to mitigate the exceedances predicted in Table 23. Stacked shipping containers are considered appropriate as it is considered unreasonable to require the use of permanent barriers, as the exceedances will only occur until such time as Warehouse A and B buildings are constructed. After the 12 m high Warehouse buildings are constructed, they will provide equal or better noise mitigation than the stacked shipping containers for receivers to the south-east and east of the ILC site.

Therefore stacked shipping containers (stacked four high, i.e.: effectively a 10.4 m high barrier) have been included in the model and located where the western facades of Warehouses A and B are proposed; extending from the north-western corner of Warehouse B to the south-western corner of Warehouse A (continuous barrier). Given that the westerly wind condition has been demonstrated to be the controlling meteorological condition, the effectiveness of the barrier has been evaluated against the established criteria under this wind condition only. Results are presented in Table 24:

Table 24 Noise levels at residential receiver location A5 without Warehouses A and B or LIC buildings, with stacked shipping containers as mitigation

Scenario	Criterion	Result	Comment
Westerly wind 2.5 m/s			
Daytime Intrusive	46	47	Marginal exceedance (1 dB(A))
Daytime Amenity	50	45	Complies
Night-time Intrusive	43	44	Marginal exceedance (1 dB(A))
Night-time Amenity	43	38	Complies
Sleep Disturbance	53	49 ¹	Complies

Notes:

- 1) Compliance with the sleep disturbance criteria is based on the recommendations presented in Section 5.2.2 i.e. Southern ECS A area: Containers stacked as noise barriers (four high) in the southern ECS A area and containers stack three high within 50 m of the perimeter of the purpose-stacked container noise wall.

Noise levels at the Madeline Street receiver location have also been reviewed under the scenario with stacked shipping containers in place. Results are presented in Table 25:

Table 25 Noise levels at Madeline Street without Warehouses A and B or LIC buildings, with stacked shipping containers as mitigation

Scenario	Criterion	Result	Comment
Westerly wind 2.5 m/s			
Daytime Intrusive	46	43	Complies
Daytime Amenity	50	39	Complies
Night-time Intrusive	43	42	Complies
Night-time Amenity	43	33	Complies
Sleep Disturbance	53	52 ¹	Complies

Notes:

- 1) Compliance with the sleep disturbance criteria is based on the recommendations presented in Section 5.2.2 i.e. Southern ECS A area: Containers stacked as noise barriers (four high) in the southern ECS A area and containers stack three high within 50 m of the perimeter of the purpose-stacked container noise wall.

A review of Table 25 reveals that with the stacked shipping containers in place in the locations described above, noise emission from the site complies with the established project criteria for all assessment periods under the most adverse meteorological condition relevant to the assessment. It is noted that the sleep disturbance criterion is also satisfied with the stacked containers in place.

It is therefore recommended that stacked shipping containers stacked four high are an appropriate and effective noise mitigation method to control noise emission from the Enfield ILC until such time that Warehouses A and B are constructed in the southern part of the site.

The majority of receivers nearest to the ILC's eastern frontage are industrial in nature and would be classed as 'industrial' receivers according to the NSW Industrial Noise Policy. In this respect they would be subject to an industrial noise criterion of 70 dB(A) 'when in use' and results indicate daytime amenity noise levels below 70 dB(A) due to the operation of the container terminal and ECS A areas without Warehouses and ILC buildings.

In addition, the residential receivers further to the east of the industrial area (St Anne's School and western end of Gregory St) are located more than 600 m east of the terminal and ECS A area operational areas and shielded by existing industrial development and would therefore experience noise levels below their respective criteria. The absence of Warehouses and LIC buildings does not have any effect on land uses to the north and west of the site.

6.2.2 Scenario B – Warehouses and LIC buildings not present, noise sources only in northern third of southern ECS A area

As noted above in Section 6.2.1, typically, under the scenario where warehouses and LIC buildings are not present equipment is likely to operate in the northern third of the southern ECS A area only as the site would not be operating at capacity. This would minimise container handling distances (by being closer to the entrance to the ILC).

For completeness, this section assesses the scenario where sources are only operational in the northern third of the southern ECS A area. All sources in the centre and the north of the site remain as per the original model presented in Section 3.0.

This scenario has been computer noise modelled. Noise levels from the operation of the Enfield ILC under this scenario have been considered under two meteorological conditions, being neutral conditions and a north-westerly wind at 2.5 m/s. This latter condition represents a worst-case scenario when considering the location of residential receiver location A5 with respect to the remaining noise sources in the northern one-third of the southern empty container storage area and the central and northern sections of the site.

Results have been compared to the daytime and night-time intrusive and amenity criteria and also the sleep disturbance criterion (the latter under worst case meteorological conditions) for residential receiver location.

Table 26 Noise levels at residential receiver location A5 without Warehouses A and B or light industrial buildings (with operations only in the northern third of the southern ECS A area)

Scenario	Criterion	Result	Compliance
Neutral Conditions			
Daytime Intrusive	46	40	Yes
Daytime Amenity	50	37	Yes
Night-time Intrusive	43	39	Yes
Night-time Amenity	43	31	Yes
North-westerly wind 2.5 m/s			
Daytime Intrusive	46	43	Yes
Daytime Amenity	50	41	Yes
Night-time Intrusive	43	42	Yes
Night-time Amenity	43	34	Yes
Sleep Disturbance	53	49 ¹	Yes

Notes:

- 1) Compliance with the sleep disturbance criteria is based on the recommendations presented in Section 5.2.2 i.e. Southern ECS A area: Containers stacked as noise barriers (four high) in the southern ECS A area and containers stack three high within 50 m of the perimeter of the purpose-stacked container noise wall.

Results presented in Table 26 show that under the scenario where Warehouses A and B and the light industrial buildings are absent and sources in the centre and north of the site are operating as the scenarios presented in Section 3.0, compliance is achieved under all meteorological conditions and for all assessment periods.

It was observed that the absence of Warehouses A and B could result in higher operational noise levels at residential receivers to the east of the site, namely in the vicinity of Madeline Street, east of Jim Begnell Park. Calculation results show that under the scenario where Warehouses A and B have not yet been built, noise levels at the most potentially-affected receiver in Madeline Street are 1-2 dB(A) lower than at Blanche Street, and as such would comply with the project amenity, intrusive and sleep disturbance criteria derived from the Blanche Street unattended noise logging location from the Environmental Assessment stage.

7.0 Conclusions

7.1 Intrusive and amenity criteria noise assessment

This report presents the assessment methodology and outcomes of a detailed design assessment of industrial noise emission from the approved Enfield Intermodal Logistics Centre at Enfield, NSW.

Criteria to limit industrial noise emission from operations at this site have previously been derived based on noise monitoring of existing ambient noise levels conducted by others at the Environmental Assessment stage of the project.

Previous acoustic reports (60051533 MV001.REP.06 30 September 2009, and, 60051533.RPT01.07, 30 June 2011) have assessed the acoustic impact of proposed activities from the Enfield ILC, however since undertaking that assessment updated ground elevations have been proposed. In addition, the ECI process has resulted in some changes to the site layout and the location of the approved noise wall locations.

The acoustic impact of alterations made to the ILC design since the Modification 4 acoustic study, as a result of the ECI changes, have been assessed. These alterations have been modelled to examine noise emission from the site under neutral meteorological conditions as well as under the same adverse wind conditions considered at the EA stage (in the Preferred Project Report).

Two scenarios have been modelled, one without containers stacked as noise barriers in the southern ECS A area and one with containers stacked as noise barriers in this area.

In summary, modelling shows that the recommended container stacking arrangements in the ECS A area allow the established intrusive and amenity noise criteria to be satisfied in the majority of assessment periods and at the majority of locations. There is a single residual exceedance predicted, under a single adverse wind condition with full site operations occurring, which is predicted to only be 1 dB(A). As such, this exceedance is considered marginal at most and inconsequential.

The acoustic impact associated with the revised site layout in the southern area and the modification of the L-Shaped barrier and the shortening of the northern extent of the northern barrier (Figure 2) is as follows:

- No increase in the noise levels at sensitive receivers, due to operations within the ILC compared to the noise levels predicted in the noise assessment carried out as part of the Modification Application No. 4.

7.2 Sleep disturbance noise assessment

The potential for sleep disturbance due to metal-on-metal 'clangs' during the night-time period has been assessed. The modelling shows that the established 'Background plus 15 dB(A)' criterion can be met with container stacking arrangements tailored to meet the particular operational, site layout and time of operation. These arrangements would be set out within the Operational Noise Management Plan prepared by the relevant operator(s).

It is also noted that the frequency of potential 'clangs' during the night-time period is low, and nil in the hours commencing 3 am and 4 am. The period during which the prevalence of containers 'clangs' would be greater is the night-time shoulder period (i.e. the hour commencing 6 am), during which there is a corresponding increase in ambient background noise levels in the order of 5-10 dB(A). This has a corresponding effect of diminishing the impact of 'clang' events by 5 - 10 dB(A).

In addition, an analysis of existing maximum noise levels during the night-time period indicates that the predicted L_{A1} noise levels due to ILC operation are consistently lower than the existing L_{Amax} noise levels.

Consequently it is concluded that the potential for sleep disturbance is minimal, irrespective of the prevailing background (L_{A90}) noise level.

To ensure compliance with the requirements of condition 2.17 the following measures would be implemented:

- The commitment to implement an Operational Noise Management Plan in accordance with Minister's Condition 6.5;
- On-going noise monitoring/auditing at different annual throughput stages (i.e. 50,000 TEU, 150,000 TEU and 250,000 TEU) ; in accordance with Minister's Condition 3.3;

- Implementation of any additional measures required by the Director-General to address any non compliances with the noise limits in condition 2.17 identified during noise monitoring/auditing, as required under condition 3.4; and,
- Containing stacking measures, including limiting container stack heights and thus the 'clang' noise source height during the night-time period in combination with strategically-located perimeter container stacks.

The container stack heights referred to in this report were adopted for the purposes of modelling potential operational scenarios. It should be noted that the equivalent level of noise mitigation for containing stacking operations is achieved by blocking the 'clang' noise source with strategically-located purpose built container noise walls that are at least one container higher than the container stacks in operational areas. Therefore, the stack heights referred to in the report should not be considered as upper limits that would apply to operations.

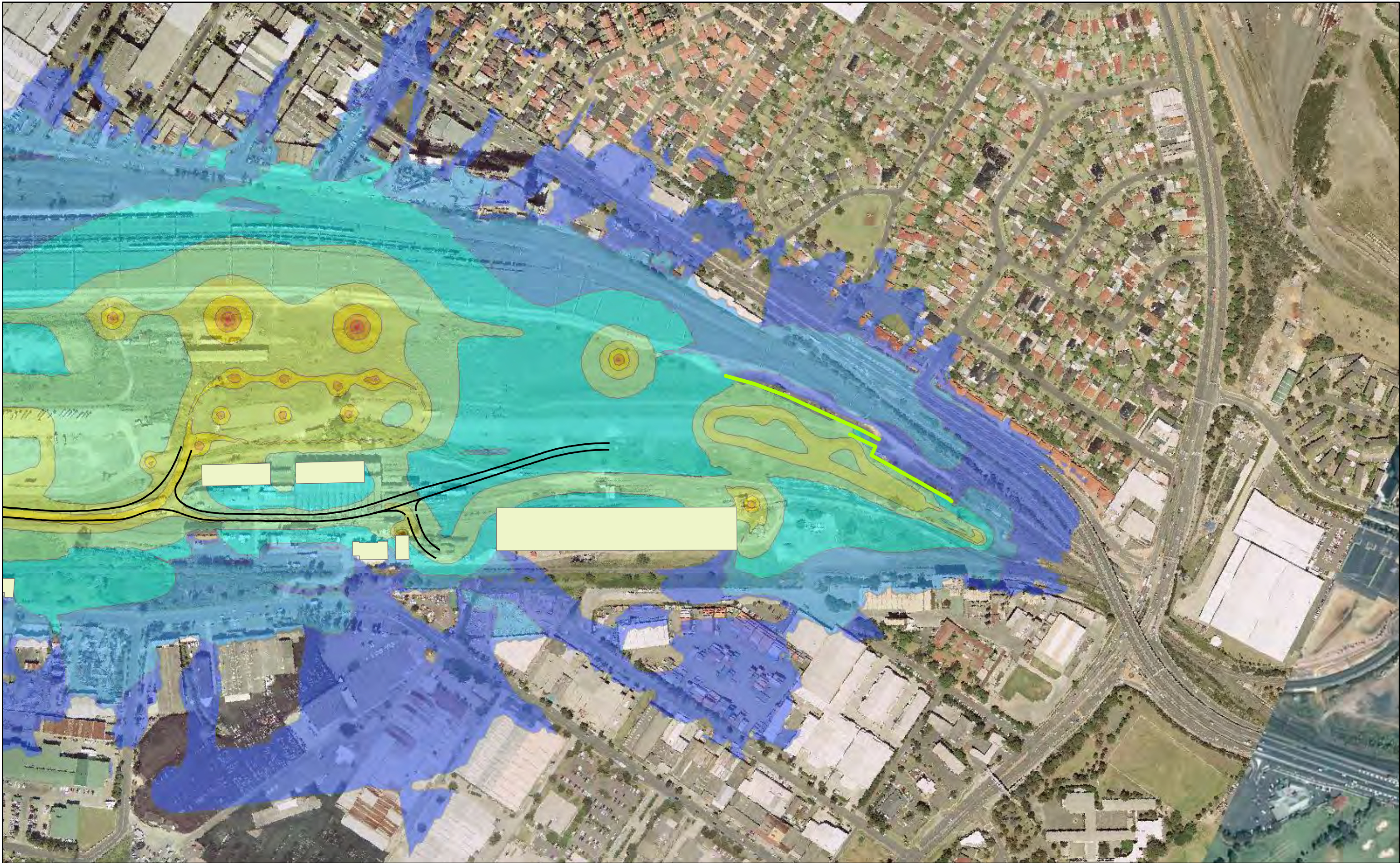
It is a recommendation of this report that:

- The measures recommended herein are incorporated into the design and construction of the Enfield Intermodal Logistics Centre; and
- The selected operator(s) of the site develops and implements an Operational Noise Management Plan in accordance with Minister's Condition 6.5 to mitigate and manage any residual noise issues.

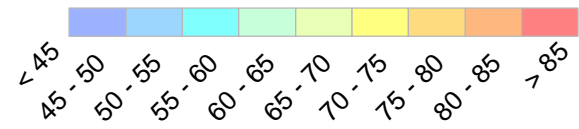
Appendix A

SoundPLAN Noise
Contour Plots - No
Southern Container
Barriers - Daytime Period,
Neutral Meteorological
Conditions - L_{Aeq} 15 minute

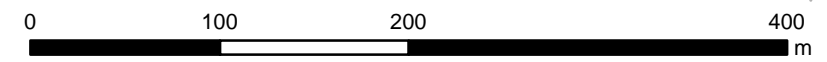
Appendix A SoundPLAN Noise Contour Plots - No Southern
Container Barriers - Daytime Period, Neutral
Meteorological Conditions - L_{Aeq} 15 minute



Legend
Sound Pressure Level, $L_{Aeq}(15\text{minute})$ dB(A)

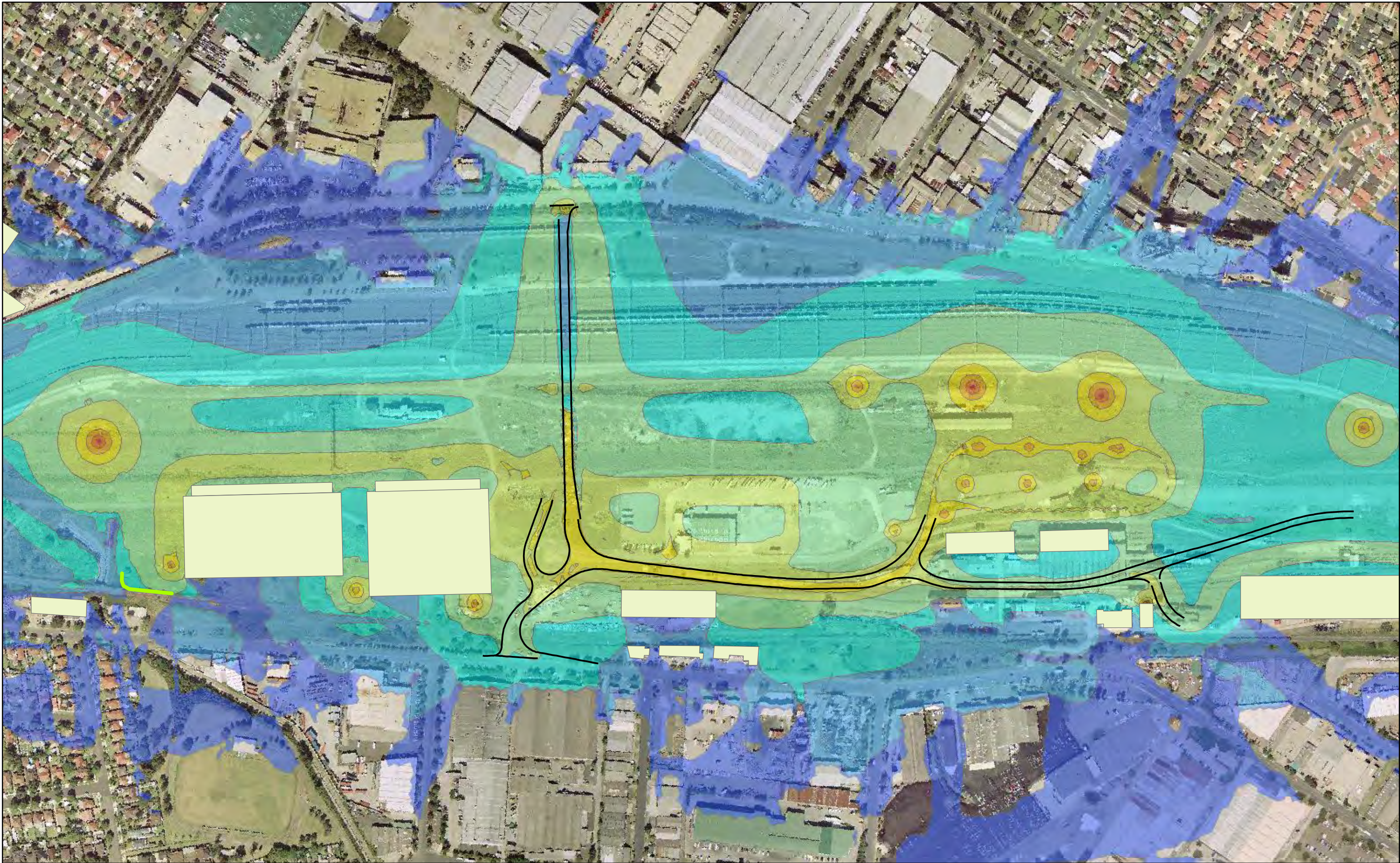


ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
NO STACKED CONTAINERS IN ECS AREA

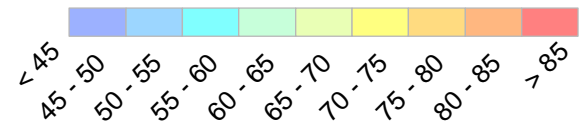


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Source:
Fig. 1



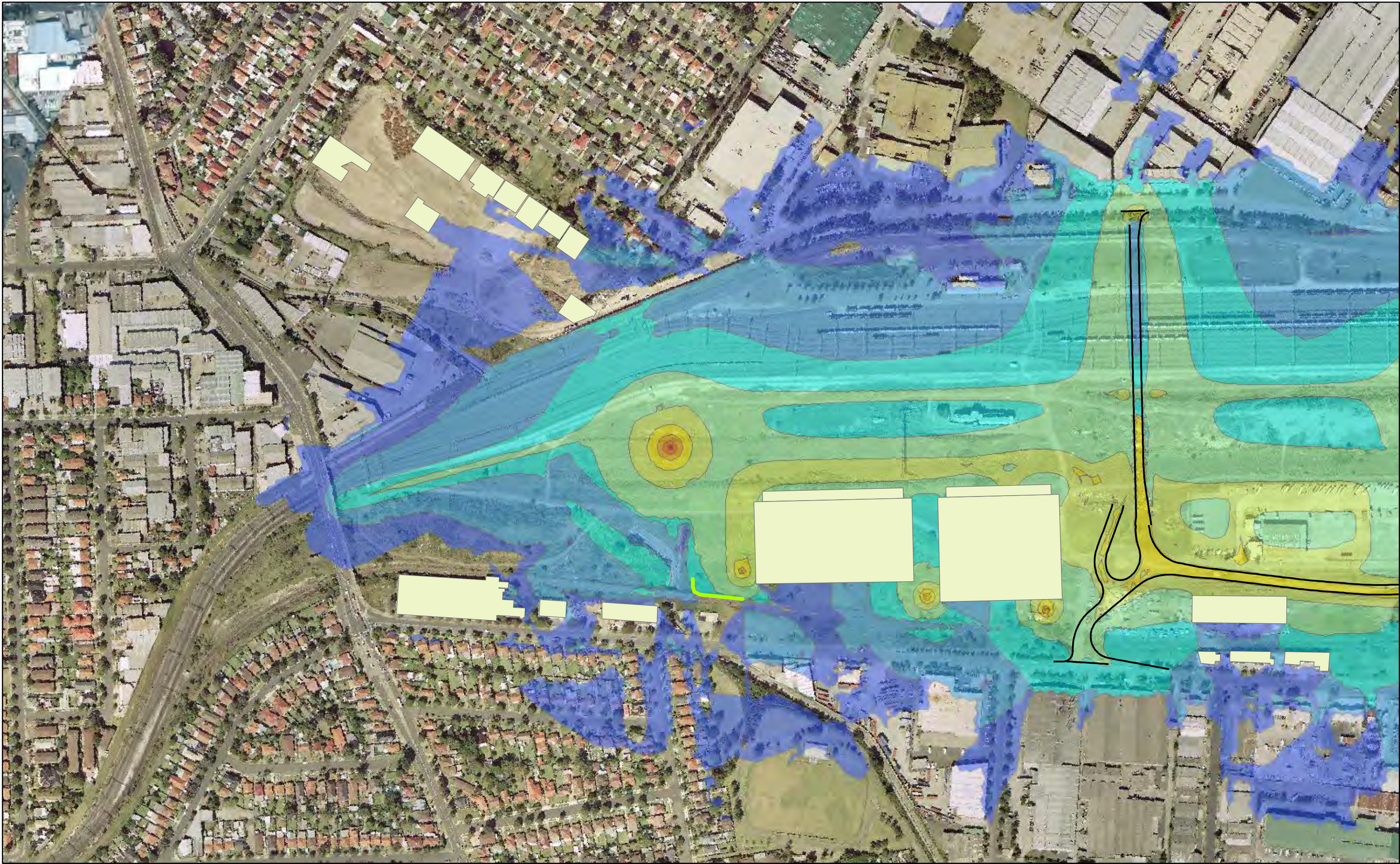
Legend
Sound Pressure Level, L_{Aeq} (15minute) dB(A)



ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
NO STACKED CONTAINERS IN ECS AREA
Source:



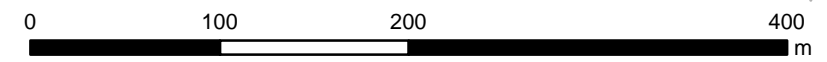
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Legend
Sound Pressure Level, LAeq (15minute) dB(A)



ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
NO STACKED CONTAINERS IN ECS AREA



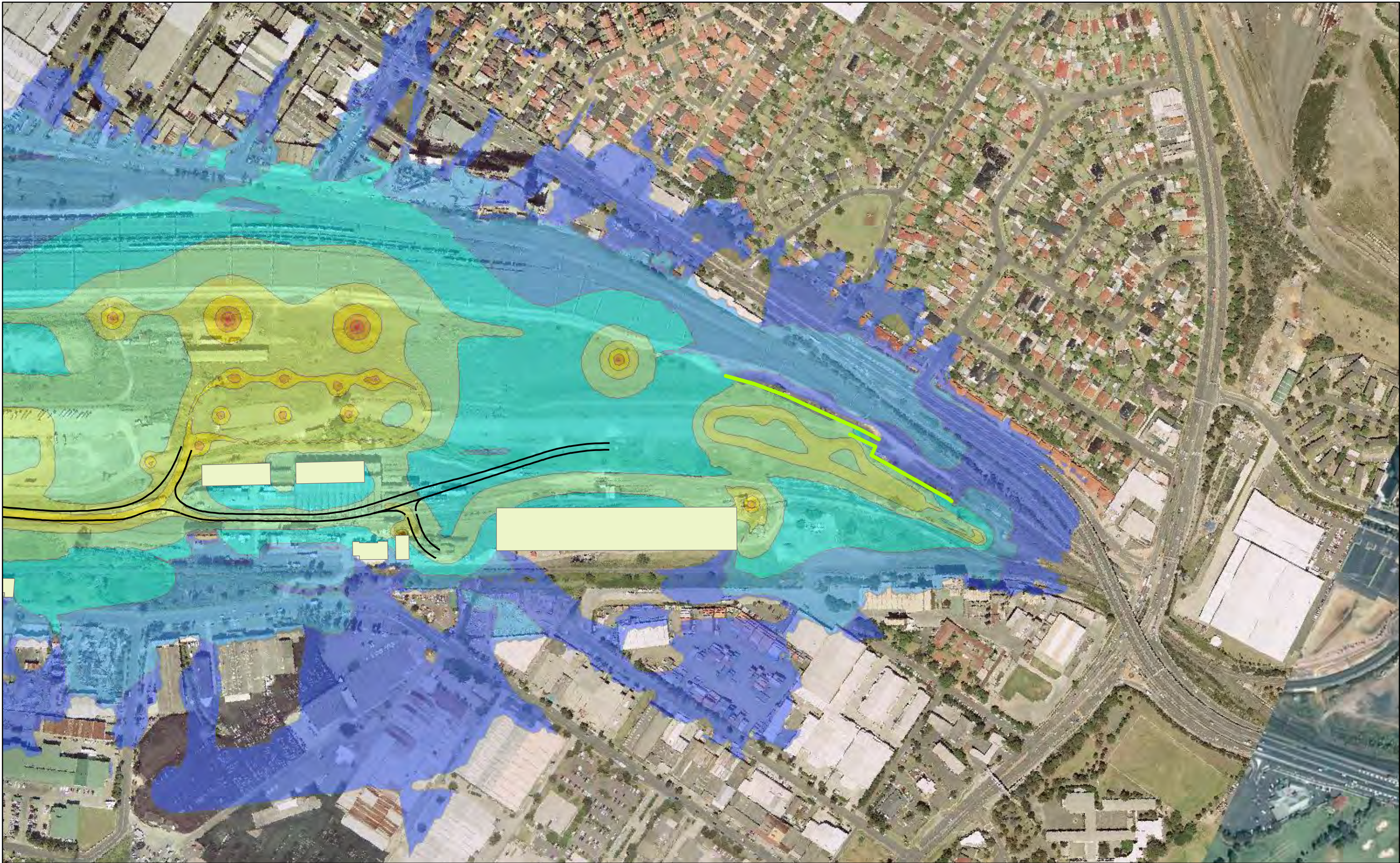
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Source:
Fig. 3

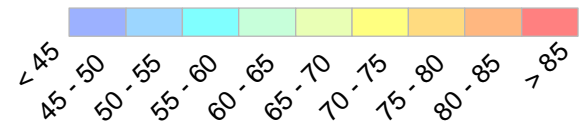
Appendix B

SoundPLAN Noise Contour Plots - With Southern Container Barriers - Daytime Period, Neutral Meteorological Conditions - L_{Aeq} 15 minute

Appendix B SoundPLAN Noise Contour Plots - With Southern
Container Barriers - Daytime Period, Neutral
Meteorological Conditions - L_{Aeq} 15 minute



Legend
Sound Pressure Level, L_{Aeq} (15minute) dB(A)

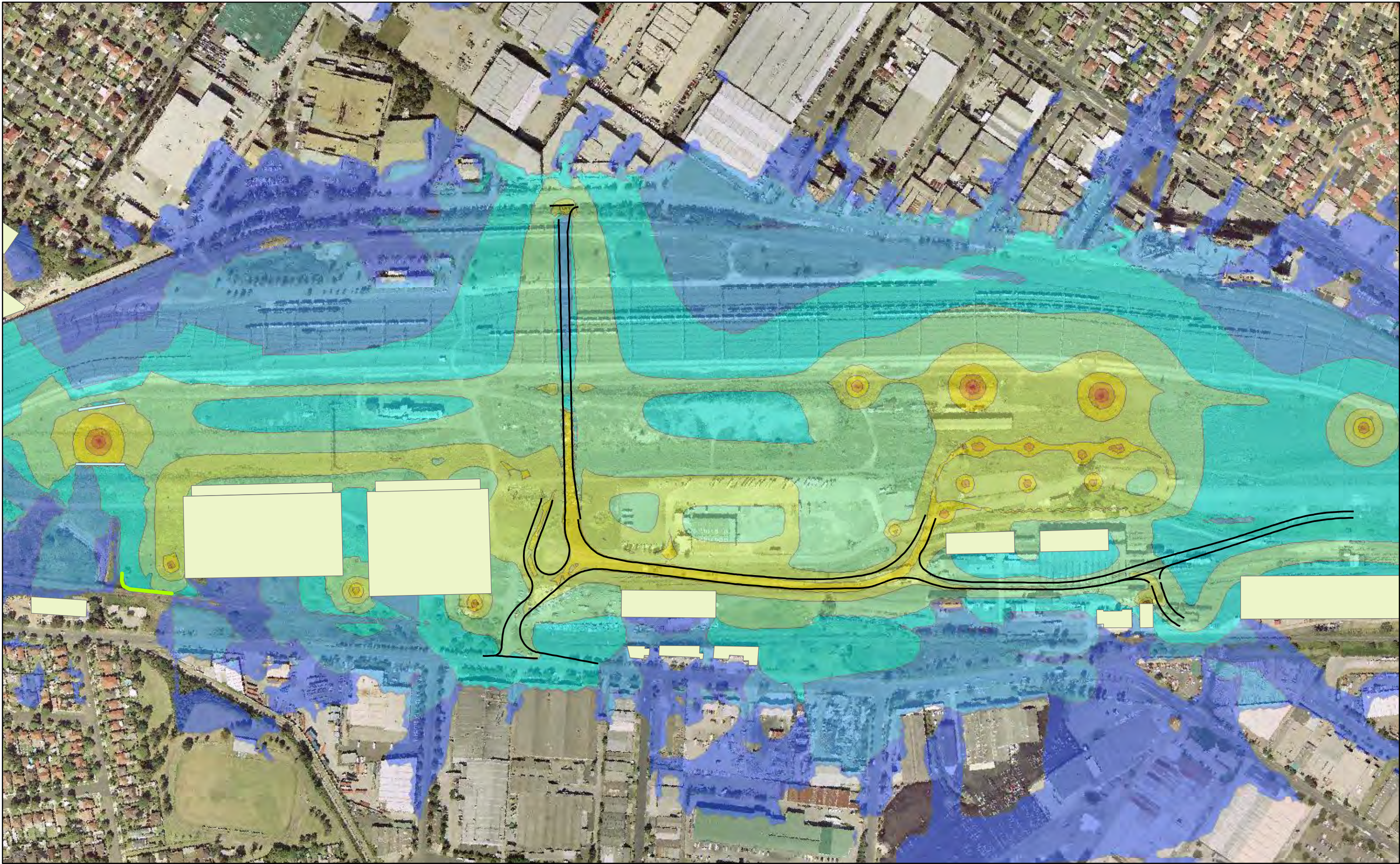


ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
STACKED CONTAINERS IN ECS AREA

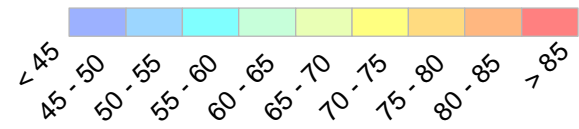
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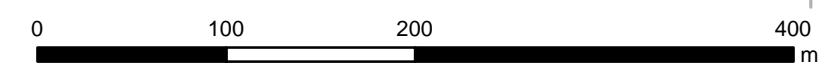
Fig. 1



Legend
Sound Pressure Level, L_{Aeq} (15minute) dB(A)

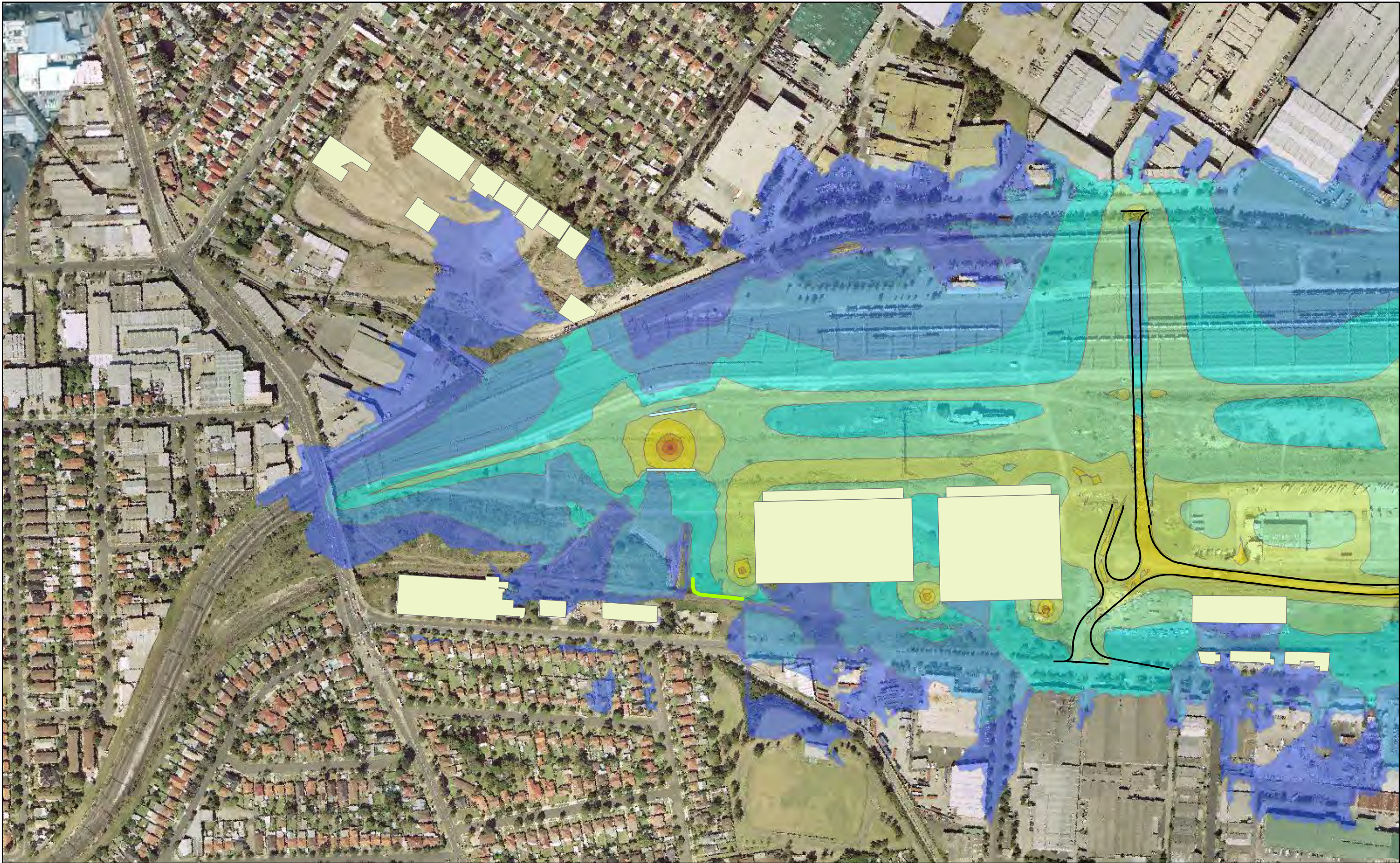


ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
STACKED CONTAINERS IN ECS AREA
Source:



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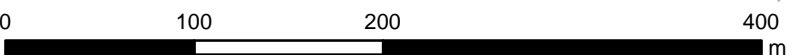
Fig. 2



Legend
Sound Pressure Level, L_{Aeq} (15minute) dB(A)



ENFIELD ILC DETAILED DESIGN ACOUSTIC ASSESSMENT
STACKED CONTAINERS IN ECS AREA



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Source:
Fig. 3