WWRNAG

Waverton Wollstonecraft Rail Noise Action Group
25/10 Carr St
Waverton, 2060 NSW
Ijlinks48@gmail.com

Submission to "Sleep Health Awareness in Australia" House of Representatives Parliamentary Inquiry – September 2018

Prepared by Ian Links

For the Waverton Wollstonecraft Rail Noise Action Group (WWRNAG)

30 November 2018

Table of Contents

Executive Summary

1 Introduction 1
1.1 Waverton Wollstonecraft Rail Noise Action Group (WWRNAG) 1
1.2 Sydney Trains Licence Conditions & WHO Guidelines 1
1.3 Measured Noise Levels 2
1.4 Contributors to “Pass-By” Rail Noise on W-W Curves 3
1.5 Sleep Deprivation 4
2 Jurisdictional Responsibilities 4
2.1 State Based Issues 4
2.2 Federal Based Issues 5
3 Impact of Rail Noise on Sleep 5
3.1 Sleep Measurement 5
3.2 Monitoring Rail Noise – Smart Phone Apps 5
3.3 Personal Experiences 6
3.4 Prevailing Attitudes 7
4 Recommendations 8

Executive Summary

The health impacts of noise generally (e.g. Sleep Health Foundation Study, Brain & Mind Centre), and Transport Noise (EU noise directives, many airport studies, WHO study etc.) are well documented and there is a growing awareness world-wide. The problem is well known and many countries have introduced measures to alleviate rail noise in urban areas eg Bay Area Rapid Transit (BART) in San Francisco, Singapore, Melbourne etc

The Waverton Wollstonecraft Rail Noise Action Group (WWRNAG) has been lobbying the NSW EPA, Sydney Trains, local Members and North Sydney Council for more than a decade to mitigate the impact of the rail noise on the Waverton Wollstonecraft Curves.

While this submission represents a unique situation (with the tightest curves on the Sydney suburban network, high population density in apartment blocks immediately adjacent to the rail line, unimpeded transfer of noise down valleys and very quiet background noise levels) it is representative of a wider rail noise issue across Australia.

The recent WHO publication "Environmental Noise Guidelines for the European Region (2018)" comprehensively documents the impact of rail noise on the community.

http://www.euro.who.int/en/publications/abstracts/environmental-noise-guidelines-for-the-european-region-2018

In the case of the affected Waverton Wollstonecraft residents the impact on sleep is extreme. The long term effects of sleep deprivation are undoubtedly contributing to loss of productivity and significant health impacts including a potential increase in cardiac disease. The changing demographics with increased numbers of families with young children living in units in the area exacerbates the long term cost to the community due to the potential impact on attentiveness at school and hence learning achievements.

The Waverton Wollstonecraft predicament clearly falls under the following Terms of Reference for the Inquiry:

> *1. The potential and known causes, impacts and costs (economic and social) of inadequate sleep and sleep disorders on the community.*

and

> *5. Current national research and investment into sleep health and sleeping disorders.*

While Sydney Trains and the NSW EPA have been actively researching the underlying causes of the rail noise and potential mitigation measures there

has been no attempt to quantify the health impact on residents. In the meantime, the noise levels have increased over the past decade.

The Waverton Wollstonecraft situation represents a unique opportunity to undertake research projects in a clearly defined area with a major rail noise induced sleep deprivation problem.

WWRNAG proposes the following research recommendations:

1. Noise mapping studies to determine the magnitude and extent of the rail noise impact.
2. Analysis of demographics of those affected from census data and local research (age group, gender, country of birth, employment status).
3. Analysis of health data to define long term health outcomes of affected versus control population.
4. Survey of impact on affected residents – sleep impacts – quantitative/ qualitative.
5. Development/evaluation of innovative procedures for investigating impact of noise on sleep e.g. Smart phone apps to monitor noise and sleep patterns. Are they accurate? Can they be used for low cost population surveys, noise mapping?
6. National review of rail noise regulations – are they consistent with International best practice and is there a consistent approach between States (and the Commonwealth)? Noise pollution is increasingly being recognised as having a major impact on the health and wellbeing of the population. While all jurisdictions have regulations aimed at mitigating noise levels, in many cases these are guidelines and hence not enforceable and often exceeded.
7. Review the impact of legislation/regulation/policy that perversely increase the exposure of sectors of the general community to rail noise. In many situations noise levels/impacts have been markedly increased by legislation/regulation/policy decisions eg "doors closing" announcements from trains, station announcements, horn blasting leaving stations and entering/exiting tunnels. The noise impact on the general population should be considered before such decisions are implemented.

Thank you for the opportunity to make this submission to the inquiry. WWRNAG members would be pleased to provide further information on request, including appearing at any proposed Public Hearings.

Yours Faithfully,

Ian J. Links

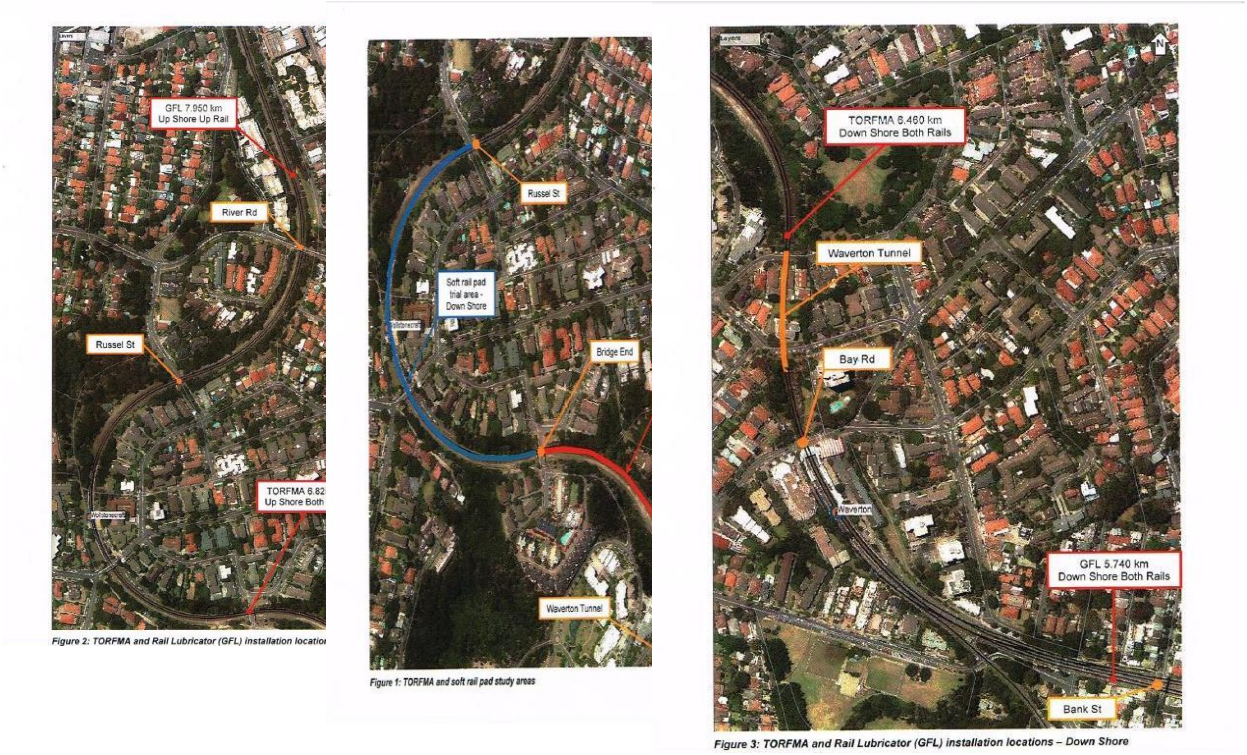
25/10 Carr St, Waverton, 2060 NSW
Ijlinks48@gmail.com
0457643292
For the Waverton Wollstonecraft Rail Noise Action Group (WWRNAG)

1 Introduction

1.1 Waverton Wollstonecraft Rail Noise Action Group (WWRNAG)

WWRNAG is an *ad hoc* community group founded in the mid-2000's to deal with rail noise which severely impacts residents on the Waverton Wollstonecraft (W-W) rail curves. Located on the North Shore suburban line between North Sydney and St Leonard's they comprise the tightest curves on the Sydney rail network with a radius as small as 201-205m as shown in Figure 1 WW Curves below

Figure 1 WW Curves



1.2 Sydney Trains Licence Conditions & WHO Guidelines

The network is operated and maintained by Sydney Trains (ST) within Transport for NSW (TfNSW) under an operating licence issued by the NSW EPA. The Licence specifies voluntary noise guidelines[1] . The licence states:-

> *L2 Noise limits*
>
> *Note: It is an objective of this licence to progressively reduce noise impacts from railway systems activities to the noise level goals of 65 dB(A)$L_{eq,}$ (day and evening time from 7am to 10pm), 60 dB(A)$L_{eq,}$ (night time from 10pm to 7am) and 85*

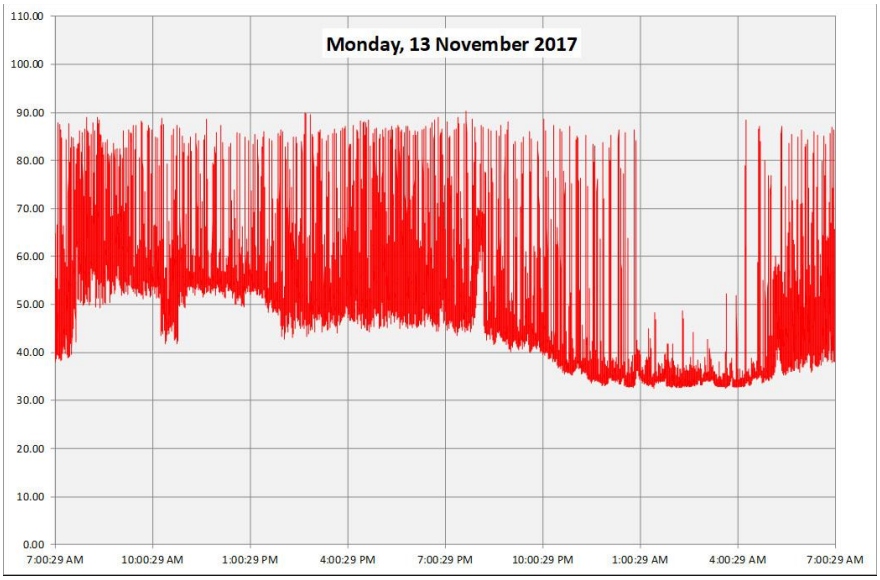
[1] EPA NSW, 'Environment Protection Licence 12208 Sydney Trains' <http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=75475&SYSUID=1&LICID=12208>.

dB(A) (24 hour) max pass-by noise, at one metre from the facade of affected residential receivers.

1.3 Measured Noise Levels

In fact, the noise levels reported by ST over the last decade and particularly during the Pollution Reduction Programs (PRPs) conducted in 2017 and 2018 (detailed reports available from the EPA) have consistently exceeded the target levels specified in the Operating Licence. Continuous monitoring by WWRNAG over the past 18 months has confirmed the night-time Leq

Figure 2 One day of Rail Noise - like every other day



levels are constantly above 69 dB with many individual trains >93 dB. Baseline background noise levels when trains aren't running for three hours in the middle of the night are below 40 dB. An example of one day of rail noise experienced in the area is set out in Figure 2 above.

In contrast, the recent WHO publication "Environmental Noise Guidelines for the European Region (2018)"[2] comprehensively documents the impact of rail noise on the community (pp49-60). Table 1 below is a reproduction of Table 22 from the WHO report which shows the percentage of the population "highly sleep-disturbed" (%HSD) for a range of night time noise levels. The association between railway noise and the probability of being sleep-disturbed was increased by a multiple of 3 for each 10 dB increase in noise.

[2] Weltgesundheitsorganisation and Regionalbüro für Europa, *Environmental Noise Guidelines for the European Region* (2018) <http://www.euro.who.int/en/publications/abstracts/environmental-noise-guidelines-for-the-european-region-2018>.

Table 1 Reproduction of WHO Table 22 The Association between Exposure to Railway Noise L_{night} and Sleep Disturbance %HSD

*L*night (dB)	%HSD	95% CI
40	2.1	0.79–3.48
45	3.7	1.63–5.71
50	6.3	3.12–9.37
55	10.4	5.61–15.26
60	17.0	9.48–24.37
65	26.3	15.20–37.33

The WHO parameters would indicate more than 35% of Waverton Wollstonecraft residents who are exposed to Leq(night) of 69dB experience High Sleep Deprivation. This analysis is supported by sleep measurements undertaken by WWRNAG members which record up to 11 wakeful periods in a normal night.

1.4 Contributors to "Pass-By" Rail Noise on W-W Curves

Extensive monitoring by ST has confirmed a difference in Leq of up to 30dB between the quietest and noisiest trains. WWRNAG has a saying "***If all the trains were as quiet as the quietest ones we wouldn't have a problem***!"

The "pass-by" noise generated by each train on the W-W curves is composed of three components:

1. Rolling noise – wheel on rails exacerbated by corrugation formation on rail and wheels. Mitigated by rail grinding and wheel resurfacing. This is a major contributor to the "Pass-By" noise and is affected by the train speed and weight, and increased passenger load (particularly in Peak Hour).
2. Wheel Squeal ("Top-of-Rail") - extremely irritating tonal (single frequency) high pitched "chalk on blackboard" sound generated by wheels sliding/sticking on the top surface of the rail as the train attempts to navigate the curve. It is due to high coefficient of friction and is mitigated by applying Top-of-Rail friction modifiers. Often exceeds 95-100dB adjacent to the track on the W-W curves. Tonal noise such as "Wheel Squeal" is generally allocated a 5dB penalty under international guidelines.
3. "Flanging" – the rasping, penetrating and highly disturbing noise produced by the wheel flange scraping on the rail face due to poor tracking of the train around the curves. A high percentage of trains on the W-W curves produce "Flanging" noise and while the dB levels are generally lower (85-90dB) than Wheel Squeal, usually a high proportion of wheel sets are involved leading to continuous impact on residents lasting 25-30 seconds per pass-by. "Flanging" is Non-Tonal (composed of a band of frequencies) and hence is more difficult to

characterise acoustically and is currently not penalised. It should be subject to a 5dB penalty as it is considered by most W-W residents as having the most corrosive impact on their lives.

This is all about **almost continuous intermittent noise** which is classified by studies as 'constant'. Disturbed sleep is the main complaint of those affected.

1.5 Sleep Deprivation

Sleep deprivation is the major night time health impact of the excessive, obtrusive and penetrating rail noise. Closing all external windows and doors partially reduces the impact, as does double glazing, but has the perverse outcome of markedly reducing ventilation. As a result, it is likely that many W-W residences/units fail to comply with Council ventilation by-laws/regulations on an ongoing basis. On hot nights in particular lack of ventilation and fresh air leads to restless sleep patterns.

As far as we are aware, NSW Health has no policy or commitment to investigation of or research into the impact of noise on health or sleep deprivation.

2 Jurisdictional Responsibilities

2.1 State Based Issues

Historically the noise impact on residents (and commuters) has progressively deteriorated, with the introduction of concrete sleepers to support continuous welded rail in the 1990's. This is cited by long term residents as coinciding with a dramatic increase in trains flanging/squealing as they attempt to navigate the curves.

More recently, factors include:

- Progressively heavier train sets – Tangara (introduced 1988-95 368 tonnes), Oscar Inter-urban (2006-12, 392t), Waratah (2011, 396t).
- Increased train numbers – 200/day in 2000's, 400/day in 2012, 600/day planned once North West Metro is operational in 2019 feeding into the North Shore Line. This makes it the busiest line on the suburban network.
- Faster trains
- Heavier passenger loads

There are currently >439 trains per day, with the first train at 4-39am and the last train at 12-55am..

Significant changes to the operating conditions of existing train routes should be subject to an Environmental Impact Study (EIS) so that mitigation measures can be identified and implemented to minimise the impact on residents..

2.2 Federal Based Issues

The Federal Government provides Infrastructure funding to the states (eg NSW North West Metro). Currently there is a requirement for an (EIS) on new rail projects but no EIS is required on the impact of changes to existing infrastructure eg increased trains on the North Shore Line (W-W curves) to take increased passenger load feeding in from the Epping-Chatswood rail link and the North West Metro. This should be a condition of Federal funding.

3 Impact of Rail Noise on Sleep

3.1 Sleep Measurement

WWRNAG has begun a sleep impact study of the influence of rail noise on neighbouring residents. Using the smart phone app "***SleepScore***", the group has collected sleep data on a number of people who live in close proximity to the train line.

A sleep score is a number between 0 and 100 which indicates the quality of sleep by combining a score for the various types of sleep experienced by a subject. The sleep score was developed by the Australian company ResMed and has been applied to a large number of people of all ages. The sleep score for an individual can be compared to the normal sleep score for the general population using the ResMed collected data. The SleepScore app records movements of a subject during the night by emitting and scanning a sonar-like sub-hearing sound. It reports sleep score, a detailed breakdown of sleep patterns and the number of times a subject is awoken.

Current data collected suggests a consistent sleep score between 10 and 20 points below the normal population scores. This lower score is driven by longer time to fall asleep and more frequent waking during the night. WWRNAG members participating in the SleepScore measurement have reported waking events between 8 and 11 times during the night, compared with a population average of less than 6 times. Both the lower Sleep Scores and the high frequency of waking events are highly correlated with train noise such as the high number of pass by events between 10:30 and 11:30 pm and the shock of the first train around 4:30am. The impact on health is easy to imagine.

3.2 Monitoring Rail Noise – Smart Phone Apps

WWRNAG has been utilising the SoundMeter (Faber Acoustical) iPhone app for the past 2 years to continuously monitor rail noise on the Wallumetta Curve (where ST has conducted the PRP monitoring in 2017 and 2018). The iPhone has been located 1m from the face of the residential building nearest the noise source, the internationally recommended monitoring location.

We have found this innovative low cost app to accurately reflect the noise levels recorded by ST using expensive and sophisticated equipment. This

finding is consistent with peer reviewed Acoustical studies.[3]. Such technology, if applied by large numbers of residents would be a very cost effective way of conducting widespread and on-going noise mapping.

In contrast ST has been reluctant to undertake ongoing monitoring other than for very short periods during the PRPs mandated by the EPA under their operating Licence.

3.3 Personal Experiences

There are numerous reports of long term and rental residents moving from W-W due to the impact of train noise on their sleep and social amenity.

The number of affected residents is unclear but based on complaints to ST, the EPA and WWRNAG it is substantial. The demographic changes occurring over the past decade, with the rail corridor proposed for high density development to cope with the increasing population in Sydney, it is clear that the numbers affected will increase markedly. The impact will be amplified by the increasing number of families with young children being raised in high rise unit blocks close to the railway. Noise rises unimpeded increasing the impact.

Victor – Long Term Wollstonecraft Resident: *" For the past 20 I have been communicating with Sydney Trains, the Local Member(s) and the Minister for Transport about the disastrous effect of rail noise on local residents. In the late 1990's the major problem affecting my sleep was "Wheel Squeal". In response to my correspondence, the matter was raised in the NSW Parliament (Hansard, 7 May 2003 P69) by the Hon. Jillian Skinner (Member for North Shore) as follows.*

"*I cannot imagine anything more debilitating than trying to go to sleep at night amid the constant squeal of wheels as trains hit the curve on a track that is not aligned and has various other problems*."

For a period in the mid 2000's the Wheel Squeal abated. Unfortunately 3-4 years ago, coinciding with the introduction of the Waratahs the noise reappeared, but as a rumble, probably attributable to build-up of corrugations on the top of rails. Since then the noise has only got worse. Currently I am woken each morning around 4-30am by the noise from the first train coming down the valley from the tight curve at Wollstonecraft Station, although I live several hundred metres away. I have put in acoustic glass to no benefit. I can't open doors or windows for ventilation at night, which severely impacts my amenity".

Judy – Long Term Wollstonecraft Resident: "*For the past 50 years I have lived a stone's throw from Wollstonecraft Station. I can't open windows or*

[3] Chucri A Kardous and Peter B Shaw, 'Evaluation of Smartphone Sound Measurement Applications (Apps) Using External Microphones—A Follow-up Study' (2016) 140(4) *The Journal of the Acoustical Society of America* EL327.

doors because of the unbearable noise. Station staff are forced to wear earplugs to protect their hearing. Despite all my complaints – nothing has changed. Sleeping is severely affected, particularly by the incessant flanging. Wollstonecraft Station is the worst affected curve on the whole network. Moving is not an option".

Brian – 5 year Wollstonecraft Resident: *" I live in a residential block adjacent to the Wallumetta Curve near Bridge End where ST has been conducting monitoring under the PRP. I thought that putting in double glazing would solve the problem but it did not deliver the outcomes promised. Because of the increased number of trains (>400 per day) with each lasting 25-30 seconds we have virtually* ***continuous intermittent noise*** *exposure."*

Ian – Family Unit at Waverton for 46 years: *" Since we moved into the unit overlooking the curve south of Waverton Station 8 years ago, we have been forced to sleep with all windows and doors closed, with no natural ventilation, particularly on hot nights. We very rarely have visitors over, we can't use the balcony and have to turn up the television to hear it over the train noise."*

Caroline – Resident of Waverton for 8 years: *"The noise is so bad that I sleep in the bathroom when I am staying with my friend Peggy (despite a bedroom being available – it is exposed to the train noise)."*

3.4 Prevailing Attitudes

The general attitude of those not affected (including Government authorities) is *"Why did you move near the rail line?"* and *"Why don't you move elsewhere?"* This is a lazy and selfish response and is indefensible for any level of government. It would require more than 10,000 people to move from an inner city suburb at a time when demand for housing is high.

That so-called argument can be made in respect of any urban problem, e.g. if there is a high violent crime rate in your suburb, why don't you move somewhere else, as if it is not the government's obligation to protect the public against violent crime.

The more important question is how Sydney Trains can continue to exceed EPA and World Health Guidelines on noise pollution with no constraints? How can Sydney Trains continue to increase the number of trains through a corridor which contains the tightest bends on the network, passes through a high density population area, already has more trains than any single line on the network and exceeds recommended noise guidelines for night time noise levels by a factor of 25 – all with no environmental impact study or noise mitigation?

The NSW government has created an EPA and part of its remit is to mitigate noise pollution.

We don't need yet more years of 'research' and 'trials' by ST and EPA. The scientific and engineering explanations of excessive train noise in W-W area and the things that can be done to lessen it are well known. What the NSW Government, the EPA and ST have failed to do is **undertake proper research into the health effects of that noise.**

4 Recommendations

WWRNAG proposes the following research recommendations:

1. Noise mapping studies to determine the magnitude and extent of the rail noise impact.

2. Analysis of demographics of those affected from census data and local research (age group, gender, country of birth, employment status).

3. Analysis of health data to define long term health outcomes of affected versus control population.

4. Survey of impact on affected residents – sleep impacts – quantitative/ qualitative.

5. Development/evaluation of innovative procedures for investigating impact of noise on sleep e.g. Smart phone apps to monitor noise and sleep patterns. Are they accurate? Can they be used for low cost population surveys?

6. National review of rail noise regulations – are they consistent with International best practice and is there a consistent approach between States (and the Commonwealth)? Noise pollution is increasingly being recognised as having a major impact on the health and wellbeing of the population. While all jurisdictions have regulations aimed at mitigating noise levels, in many cases these are guidelines and hence not enforceable and often exceeded.

7. Review the impact of legislation/regulation/policy that perversely increases the exposure of sectors of the general community to rail noise. In many situations noise levels/impact have been markedly increased by legislation/regulation/policy decisions eg "doors closing" announcements from trains, station announcements, horn blasting leaving stations and entering/exiting tunnels. The noise impact on the general population should be considered before such decisions are implemented.

END