Appendix 1 – Plan showing location of sites

Appendix 2 – Location of existing access to BRRP

Appendix 3 – Summary of consultation feedback from ECan

Summary of Comments received in relation to Burwood Resource Recovery Park Limited

As at 7 August 2012

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Issue 1: Risks to human health: asbestos and other contaminated materials	
Discharge of hazardous substances to ground water. A few of the comments referred to the affect on ground water. 'I object to CRC130059, CRC130060, CRC130061, CRC130062 on the grounds of air quality to local residents, leaking of hazardous substances into ground water, ponds, underground water. I believe you will be creating an environmental hazard now for future generations. This toxic 'soup' should be disposed of outside the boundaries of urban living.' (28707) 'The site is too close to, housing as well as the proposed new subdivisions and the beach area. The bottle lake forest area is used by many for recreation. They should not be at risk from unspecified toxic waste and possible health problems from contaminates in the air plus chemicals leaching into the water table and beach. The East should not be a dumping area for everyone else's rubbish and contaminates.' (28746)	
Risk of Accidents. A couple of the comments referred to the possibility of spills and future disasters. 'I do not want any hazardous substance put here in case of any accidents which we know will happen and then result in health scares + property devaluation. Also I do not wish to be breathing in and smelling any contaminated air. There must be enough land well away from housing areas that these things can go to. Never to let any of the above or any other dangerous suggestions to go before Environment Canterbury again where it entails health risks or devaluation of property.' (28705)	
Damage to the environment. Numerous submitters commented on the effect to the environment in general. 'We are absolutely against CRC130059, CRC130060. We are also very concerned on CRC130060 and CRC130062 the potential damage and contamination to our environment.' (28708)	
Increase in pests. A couple of the comments mention the increase in pests.	

'I am opposing the consent due to the increase in vermin due to the waste etc requires immediate assessment + investigation prior to any future development.' (28714)	
Unknown Risk. Several of the comments mention a fear of the unknown risk. 'Object to hazardous substances – unknown health issues, same with contaminants in air (need to be clear on what the hazardous substances are, and what the contaminants are.' (28814)	
Alternative suggestions. The most common suggestion was the use of Kate Valley. 'Why can you not use Kate Valley which does not impact on residential communities or impact on the remaining re creational facilities in Eastern Christchurch.' (28704)	

Issue 2: Water	
Instability of water tables. A few people commented on the importance of the Christchurch water supply. The majority of the comments related to groundwater. 'The land here is fragile enough in my opinion and taking ground water or adding storm water to what has already proven to be an unstable area is madness. Discharging of contaminates to air near a public reserve and housing along with fine vegetative matter to trap it is equally madness also. I could of course pull these consents to infinite pieces but would just hope that my thoughts will be considered when deciding should potentially dangerous, contaminating and environmentally wrong practices be granted in a part of the city loved and used by many.' (28703) 'Concern over hazardous materials, discharge to air and water and use of groundwater. The Bottle Lake Forrest is for the enjoyment of the public and must remain safe and available for this purpose. As such I feel that this is not	

a satisfactory place for this usage. Details of hazardous materials to be made available and ensuring no distraction of the Bottle Lake Forest for the enjoyment of general public. Smoke/smell from air discharge to be nil/ minimal. Water discharge as above. Use of groundwater to have a negative effect on the environment and surrounding areas.' (28701) We are strongly opposed to public and recreational lands being used to benefit private enterprise works, especially given the nature of the hazardous materials being stored, together with the extra noise pollution and traffic movements the operation generates. This use of our precious ground water is not acceptable. (28719) I DO NOT want hazardous substances, storm water, contaminants to be stored or put onto this site or ground water taken from this site. It is a beautiful area used by the local and distant community for recreational purposes and by granting to proposed applications, this site will be ruined. We have had enough things ruined in Christchurch by the natural disasters and we should not be added to that through manmade choices. (28702)	
Storm water. A couple of people commented on the discharge of storm water. There is no guarantee for the future health & wellbeing of the residential areas when contaminants are to be discharged into the air, especially if a nor-east wind is blowing. What long term effect will there be from the use and storage of hazardous substances and the discharge of storm water into and onto the land. Some time ago consent was sought to use Kate Valley as a landfill and this was declined as there was local objection. Kate Valley is a long way from any residential areas and yet local residents are being asked to consent to an unknown danger. This should not be allowed. (28745)	

Issue 3: Discharge of hazardous substances to air

Windblown Contamination. Many of the comments referred to a fear that the contaminants are going to reach their properties. 'We are located right next to Bottle Lake Forest. Those proposal sites are surrounding us in our northern boundary. Whenever blowing NW & NE, the contamination can get to us within seconds. We are extremely concerned and against this application. The company, the people who make this application has no consideration on our health.' (28708) 'I do not wish to be breathing in and smelling any contaminated air. There must be enough land well away from housing areas that these things can go to.' (28705)	
Health issues. A few people raised the fear of respiratory problems. (also see risks to health) 'I am opposing the consent due diminishing numbers of bird & other wild life in the area due to the noise pollution and dust contamination. Monitoring of noise pollution, fumes, ground movement + raised levels of respiratory problems, if levels exceeded then rebate locals or cease + desist.' (28714) 'No discharge of contaminants into air that my children breathe!' (28706) 'We are immediate neighbours to the area / recovery park. We have up to 200 members playing our golf course on a daily basis during all daylight hours. We are in a very wind prone area and believe that contaminants will be carried to our course by the wind. Discharge of contaminants to air. This should not be allowed, as it will directly affect the health of our members.' (28720) 'Leeching of waste materials and contamination into sea. Illness + respiratory problems – legionnaire's – pneumonia caused by dust and airborne bacteria.' (28715) I strongly oppose to resource consent application. Bottle Lake is a very popular area use by hundreds of people for walking, running or biking. I care about environment and reopening Burwood landfill already cause problems with huge air pollution in the area and other issues like increased trucks,	

traffic and noise. Pollution kills. I would like to know who will take responsibility for people getting sick because of an exposure to contaminated water and air. (28757)	
Residential area. Several people mentioned that such discharges should not be allowed in a residential area. 'I object to any contaminants being discharged into the air close to residential areas. There historical evidence to show such ventures impact on the environment negatively despite assurances. Find somewhere else.' (28711)	
Unknown issues. A few people mentioned that they were worried about the unknown issues. 'Object to hazardous substances – unknown health issues, same with contaminants in air (need to be clear on what the hazardous substances are, and what the contaminants are).' (28814)	
Need to know what is being discharged. A few people mentioned that they wanted to have it made clear what was being discharged. 'Concern over hazardous materials, discharge to air and water and use of groundwater. The Bottle Lake Forrest is for the enjoyment of the public and must remain safe and available for this purpose. As such I feel that this is not a satisfactory place for this usage. Details of hazardous materials to be made available and ensuring no distraction of the Bottle Lake Forest for the enjoyment of general public. Smoke/smell from air discharge to be nil/ minimal. Water discharge as above. Use of groundwater to have a negative effect on the environment and surrounding areas.' (28701) 'Object to hazardous substances – unknown health issues, same with contaminants in air (need to be clear on what the hazardous substances are, and what the contaminants are.' (28814)	

Issue 4: Dust and other windblown emissions – from traffic outside the recovery park and landfill site boundaries	
Dust Clouds from trucks. A number of people commented on the dust coming off trucks and the need to cover the trucks (and enforce this).	

'The constant "rolling out" of mud & dust from LANDFILL DRIVE onto both Prestons & Burwood Roads is totally unacceptable. Trucks are cutting the corner turning left onto Burwood Rd & ruining the berm & seal edge, as well as creating huge DUST clouds behind as they accelerate from Landfill Drive.' (28716) 'Dust – coming off trucks and roads entering properties in Tumara Park. All trucks to be covered when travelling to and from the Landfill site.' (generic)	
Eyesore. A couple of the comments referred to the appearance of the park and fumes. 'I oppose the consent due to the noise, pollution and dust contamination, which will create a total eyesore for residents living nearby.' (28715)	
General dust comments. A number of people made very general comments about the dust. 'Move the access road to Lower Styx Road – residents no longer impacted by dust noise and lights. Appropriate screening of access road.' (generic)	
Compliance. A few people commented on the need for compliance and enforcement. Heavy penalties for non compliance of speed + lack of covering on trucks. (28714)	

Issue 5: Noise – from site operations	
Noise from operations. A limited number of people commented on the noise from the park itself. Most people were more concerned about the noise from the trucks. 'I am opposing the consent due diminishing numbers of bird & other wild life in the area due to the noise pollution and dust contamination. Monitoring of noise pollution, fumes, ground movement + raised levels of respiratory	

problems, if levels exceeded then rebate locals or cease + desist. (28714) 'Noise – created by the use of large diesel vehicles in close proximity to neighbouring properties.' (generic) 'Increased noise from trucks coming and going.' (28814)	
Monitoring of noise. Again compliance was raised in relation to noise. 'I oppose the consent due to the noise, pollution and dust contamination, which will create a total eyesore for residents living nearby. Especially when the trees are farmed and by the size of them will be very shortly. Monitoring of noise, pollution, fumes, ground movement.' (28715)	

Issue 6: Consent duration	
Duration of consent. A few people commented on limiting the duration of the consent. 'I am against all of these Resource Consents. The fact that Burwood has been used to dump contaminated waste and material from demolition sites over the last 18 months has been bad enough, but needs to stop ASAP. We now can smell the waste products especially on a still day at our homes and the smell is disgusting at times in the Park itself.' (28717) 'We appreciate that we are experiencing exceptional circumstances post-earthquake however we do not believe this should give the council the right to push through resource consent applications without addressing the very real concerns of residents now living next to an active landfill site. It is completely unreasonable to expect anyone to put up with the constant disruption we have endured for the past 22 months and to allow it to continue for a minimum of 5 more years by granting this resource consent without reasonable conditions is against our rights as citizens and ratepayers. Further, following this period of "rubble & demolition material acceptance" there will be many more years- 5-10+?? While the "recovered material is removed. Thus some 20 or so years for this dust, noise & loss of quality of life so caused, will continue.' (28716)	

With the Burwood landfill closing after reaching its useful life and with Kate valley taking its place. It gave confidence in being able to build your home close to the tranquillity that is offered by the Bottle lake forest. With its many walking, biking and running tracks Bottle lake is to us its neighbours as Hagley park is to many others. We don't have a problem with it being reopened due to the State of Civil emergency that existed after the earthquakes, no problem whatsoever. We put up with the clouds of liquefaction dust that covered our properties and the many heavy vehicles that travelled the roads to and fro. I do however have an issue with the proposed "ongoing operations" involving the handling, dumping, discharge into the air and on to land of hazardous materials e.g. asbestos, pollutants, dust, particulates etc. Please don't put profit before the health of residents. The Burwood landfill should now be closed and all waste diverted to Kate Valley. (28871) 'The expiry date for the land use consent for stockpiling and sorting/processing earthquake demolition material is 31 March 2017. No extension to be granted past this date.' (28822)	

Issue 7: Management plan	
Operating hours. Several comments referred to limiting the hours of operation. 'The Burwood R.R Park should be closed on Saturdays + Sundays + public holidays to give us residents some relief from noise and trucks etc.' (28715) 'Hours of operation - business hours NO WEEKENDS.' (28722) 'The hours of operation are excessive for impact to local residents.' (28810)	
Compliance and support. A few people raised issues about compliance or community support. 'Residents in this locality need to be re-assured that the assessment protocols which will be undertaken by Environment Canterbury are robust enough to protect residents against adverse effects of in particular CRC130059 and CRC130061 and the later particularly given the Nor-East	

winds being a regular weather pattern in the area. Future use of the last past this current need to locate demolition materials. Total impact on the residential properties in the Burwood / Parklands suburban area.' (28843)	

Issue 8: Odour	
Smell. A few of the comments mentioned that they could smell the park now or that they did not want to in the future. 'I do not wish to be breathing in and smelling any contaminated air. There must be enough land well away from housing areas that these things can go to.' (28705) 'We now can smell the waste products especially on a still day at our homes and the smell is disgusting at times in the Park itself.' (28717) 'Smoke/smell from air discharge to be nil/ minimal.' (28701)	

Issue 9: Property values	
Property value. A couple of comments referred to the devaluation of property. 'Never to let any of the above or any other dangerous suggestions to go before Environment Canterbury again where it entails health risks or devaluation of property.' (28705)	

Issue 10: Rehabilitation/restoration	
Restoration. A few people commented on their fear that the park would not be restored in a reasonable timeframe. "The site activities are expected to end in March 2017, and the site will be restored in accordance with the terms of the agreement with Christchurch City Council, and therefore BRRP seeks a consent expiry date of 31 March 2017." This remains to be seen.' (28716) Fully restore park to a better condition than before use. (28808)	

Issue 11: Conservation and Recreation	
Conservation. A number of comments referred to the damage to the environment in general. 'I am opposing the consent due diminishing numbers of bird & other wild life in the area due to the noise pollution and dust contamination. The increase in vermin due to the waste etc requires immediate assessment + investigation prior to any future development. Wild life assessment + conservation.' (28714) 'I oppose the consent due to diminishing numbers of bird and other wild life in the area. Conservation of birds and animals.' (28715) 'Include plans to mitigate any adverse effects on eco-systems including effects on plants + animals.' (28808)	
Recreation. A number of people also commented that this was a prime recreation facility and that this should not be damaged. 'I strongly oppose this action going ahead and my reasons are as follows. This area is the largest recreational area available within the city limits on the north east, it is heavily used by joggers, walkers, mountain bikers and horse riding. It is a wonderful natural resource of which we have very few left. Should you turn this into a dump not only will this carry great risk to the environment there is also the risk to its frequent users.' (28710) 'This is a beautiful part of Christchurch I which many people use for biking, walking, swimming, horse riding and family days at the beach. We have lost so much already it is disgusting and unacceptable for this area to be used as a dump any longer.' (28717)	
Environmental Impact. Several people commented on the overall environmental impact. 'The forest has already been damaged a lot following its large scale waste removal following the Feb Earthquake. This large scale use should now cease and should certainly not increase. The reasons are many but none less than the forest and beach being well used by locals as well as sports and	

outdoor enthusiasts from all across Christchurch. The eastern suburbs have suffered loss of a great many things, so in what world would it be good to make people too scared to use any remaining forest and or beach areas we have left here, whilst risking air and land contamination to the environment only a few hundred meters from where people live. There are plenty of better suited areas around the city where a less environmental impact would occur for all the proposed consents.' (28703)	

Appendix 4 – Consultation feedback from community

Appendix 5 – Russell Malthus report

Christchurch City Council

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Resource Consent Applications to the Christchurch City Council:

- RMA92020447:

  Burwood Resource Recovery Park

- RMA92020450:

  Disposal of Earthquake Waste at Burwood Landfill

Environmental Health Assessment for the Christchurch City Council

Russell Charles Malthus
Senior Environmental Health Consultant, Novo Group Limited

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1. INTRODUCTION

1.1. My name is Russell Charles Malthus, and I am Senior Environmental Health Consultant with Novo Group Limited, a Christchurch-based Traffic Engineering and Planning consultancy. I am a qualified Environmental Health Officer with over thirty years' previous employment by the Christchurch City Council. As a consultant in private practice since leaving the Council in 2004, I have provided expert advice to territorial authorities and private clients on the assessment of environmental health effects of land use proposals, including Plan Changes.

1.2. I have been engaged by the Council's Senior Planner, Jesse Burgess to prepare an expert assessment of environmental health effects of the activities described in the application documents for the Burwood Resource Recovery Park (BRRP) and the disposal of Earthquake Waste at Burwood Landfill.

1.3. I have read the application documents, and I have visited the application sites. I also attended the public consultation meetings held by the applicants in May and June.

1.4. I have carried out my assessments with appropriate regard to the provisions of the Christchurch City Plan, the Operational Natural Resources Regional Plan (NRRP), NZ standards and guidelines, and other relevant information.

1.5. I have limited my assessment to matters which are within my expertise and experience.

2. EXECUTIVE SUMMARY

2.1. Applications and assessments of effects on the environment (AEEs) prepared by Pattle Delamore Partners Ltd (PDP) and URS New Zealand Ltd (URS) for the establishment of the Burwood Resource Recovery Park (BRRP) and for the disposal of earthquake waste at Burwood Landfill are assessed in this report.

2.2. The applications largely treat the BRRP activities and the Landfill Disposal activities as totally separate activities. In terms of effects generated within the individual sites within the Landfill Zone (Sites A, B, D, F and P as indicated in Figure 2 of the BRRP AEE) this is appropriate, as the sites are sufficiently remote from residential areas to avoid common effects issues.

2.3. While insufficient consideration has been given to common effects issues arising from all truck movements associated with the proposed activities using a single access to the BRRP area and transporting materials near the Living 1 zone, this matter has now been addressed in further information and assessments provided by the applicants.

2.4. In my opinion, sufficient information has now been provided on the scale and nature of effects and means of mitigating those effects for the Commissioner to grant the consents that have been applied for, subject to appropriate consent conditions.

3. THE PROPOSED ACTIVITIES

3.1. The activities covered by the applications are in summary:

- the establishment of the Burwood Resource Recovery Park (BRRP) for the receipt, stockpiling, and processing of Earthquake Waste (Demolition Materials) in Sites B and D of the Burwood Landfill, and the recovery of resources from those materials in Site B.

- the disposal of earthquake waste - unrecoverable waste demolition material from the BRRP process at Burwood Landfill Site A
- the disposal of earthquake waste - infrastructure rebuild demolition material at Burwood Landfill Site F; and of waste silts and sludges from the infrastructure rebuild at Burwood Landfill Site P.

3.2. Demolition materials are currently stockpiled at sites B and D, and infrastructure wastes are currently disposed of at Sites F and P, under temporary provisions set in place by CERA. The consents will formalise these processes, and in addition they will provide for the BRRP resource recovery process to be established at Area B and for residual, non-recoverable wastes from the BRRP to be disposed of in Area A.

3.3. Figure 1 below, which is reproduced from Figure 2 of the BRRP application, shows the location of the various Sites to the Living 1 zone boundary.

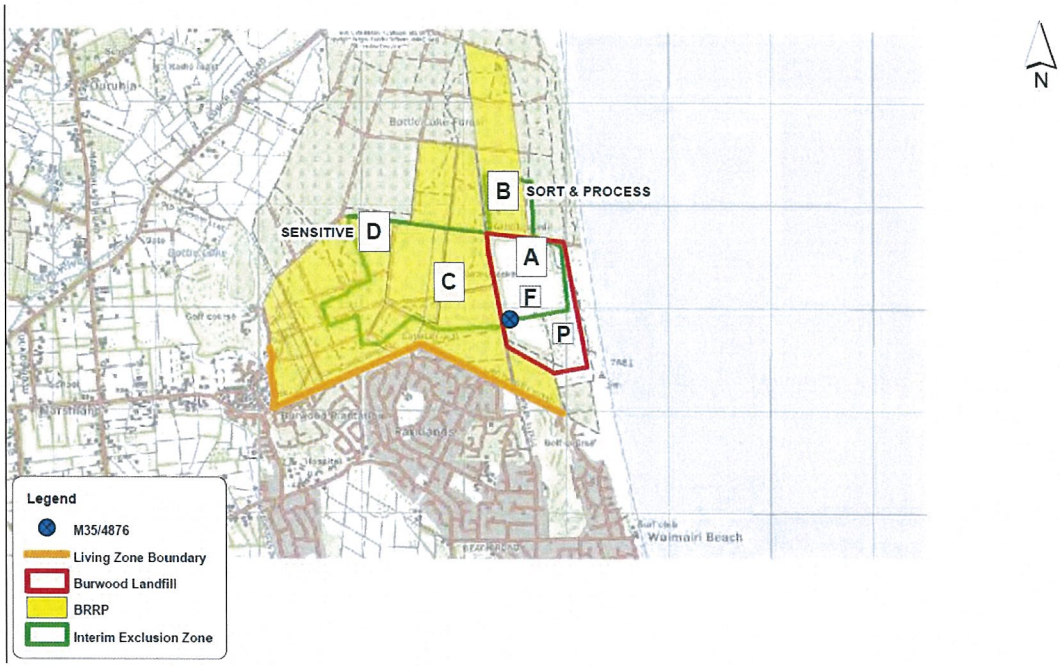

Figure 1
Site locations and L1 zone boundary

4. POTENTIAL ENVIRONMENTAL HEALTH EFFECTS

4.1. The following environmental health effects are associated and identified with the proposed activities:

- Management of unacceptable materials
- Operational noise and Construction noise
- Effects of truck movements
- Dust discharges from processing, and fugitive dust
- Odour
- Hazardous substances
- Land contamination
- Lighting
- Landfill gas

4.2. In assessing these effects, the applications largely treat the BRRP activities and the Landfill Disposal activities as totally separate activities. In terms of effects generated within the individual sites within the Landfill Zone (Sites A, B, D, F and P as indicated in Figure 2 of the BRRP AEE) this is appropriate, as the sites are sufficiently remote from residential areas to avoid common effects issues. However there is insufficient assessment of common effects issues (noise, dust, litter, vehicle lights), arising from all trucks using a single access to the BRRP area and transporting materials on Landfill Avenue near the Living 1 zone. This has been addressed in further information and undertakings provided by the applicant, which I will discuss below.

4.3. The applicants have also now provided a draft list of conditions which appropriately combines and coordinates the conditions that were submitted in the separate applications. The final list of conditions that will be submitted for the Commissioner's approval includes changes that I have recommended, arising from my assessment in this report. The draft conditions also appropriately provide for a joint Management Plan which will cover all the proposed activities. In my opinion, this combined approach provides appropriate certainty that there will be a high level of consistency in the management of effects from the separate proposed activities.

5. EFFECTS OF TRUCK MOVEMENTS

5.1. The proposed activities involve the transport of waste materials by trucks through the site access on Landfill Avenue, close to residential properties in the Living 1 zone. This has occurred since the earthquakes began, and has gradually scaled down to current levels which are stated in section 6.3 of the BRRP application (up to 200 movements per day between 6 am and 6 pm) and section 5.8 of the Sites F and P application (740 movements for Site F between 7 am and 5 pm, and 100 movements for Site P between 5 pm and 7 am).

5.2. Notwithstanding that truck movements have decreased significantly, residents have continued to object to nuisance effects from noise, dust, litter and warning lights on the trucks particularly at night-time. As a mitigation measure, Putake Drive has been used as an access in rotation with the main access, to relieve effects on residents near the main access and those adjacent to Landfill Avenue. However, this has simply transferred effects to a more sensitive area, and the applicants have now agreed to close this access and concentrate on mitigation of effects at the main access.

5.3. The close relationship of the Living 1 zone residential area to the site accesses and the waste transport route on Landfill Avenue are shown in Figure 2 below.

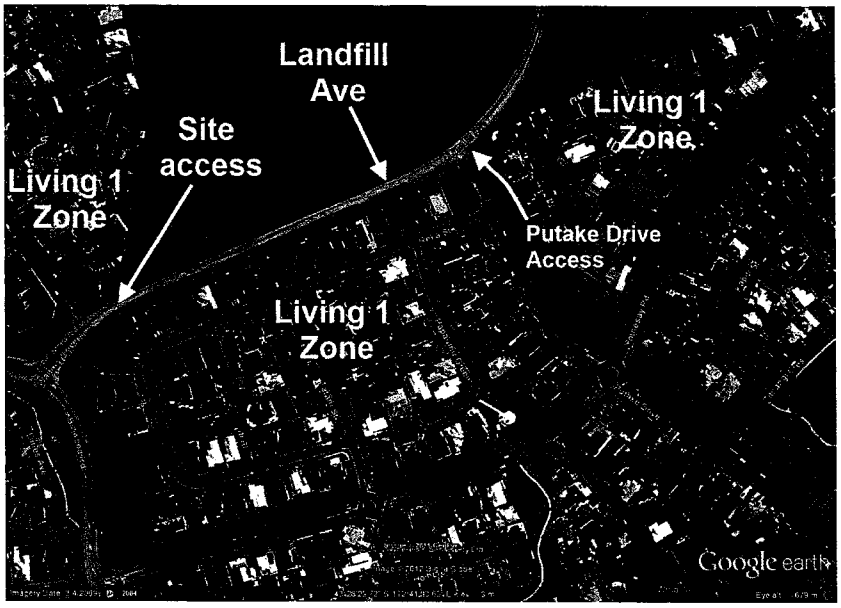

Figure 2
Site accesses and Landfill Avenue, and L1 zone residential properties

5.4. While the applications acknowledge that truck noise is a potential adverse effect, no technical or objective assessment of truck noise or its effect on Living 1 zone residents is provided. Furthermore each AEE considers only the effects of trucks associated with the BRRP or the Landfill activities and does not consider any cumulative effect of noise from all trucks using the same access and route between 6 am and 6 pm. In my opinion it is appropriate to consider total truck noise and not to assess each activity in isolation, because any affected persons would react to the total noise and would not make any distinction in noise from trucks which access the site for different purposes. This approach also provides for mitigation measures to be coordinated and not duplicated unnecessarily.

5.5. In the absence of any technical information, I have carried out my own calculations using generic data from truck movements elsewhere, which indicate that noise from the cumulative truck movements exceeds accepted guideline limits in NZS 6802:2008 Acoustics – Environmental Noise for avoidance of serious annoyance, for residential amenity and sleep protection at residential properties near the main site access and Landfill Avenue. Those limits are 55 dBA Leq during daytime and 45 dBA during night-time. It should be noted that the land use zone noise limits in Volume 3 Part 11 of the City Plan do not apply to road traffic, under an exemption in Section 1 clause 1.2.3 (a).

5.6. In terms of mitigation, the dwellings on the south side of Landfill Avenue as far as Putake Drive are set back from the site access and road by about 10 m. Within this setback is an earth bund approximately 1.5 m high and standard wooden paling boundary fences approximately 1.8 m high on the residential boundaries. These physical barriers do not provide adequate or reliable attenuation to keep noise within the guideline limits in NZS 6802:2008. Although the proposed additional mitigation measures in the applications (i.e. restricting "open gate" hours, maintenance of road surfaces, and instating of "no stopping" signs and speed limits) would help to mitigate noise, they would also not be sufficient to reduce noise to the appropriate levels.

5.7. In previous information exchanges with the applicants, I had recommended that additional attenuation should be provided by installing a continuous acoustic barrier between the access/road and the affected residential properties. However I now understand that this is impracticable due to Planning constraints.

5.8. Furthermore, although an alternative access away from a built-up area remains a possibility, the feasibility of this has not been examined fully, and a thorough evaluation would take up to three months to complete (refer Pattle Delamore Partners letter dated 7 September 2012).

5.9. After further consideration, the applicants have undertaken to resolve the truck noise issue by realigning the access road so that it is further away from the residents, and to install acoustic barriers as described in the report of Michael Smith, URS's acoustics engineer (refer Attachment 1 of this report). Having participated in Mr Smith's field measurements to quantify the truck noise on 10 September, I am satisfied that the general methodology of the assessment is robust. However referring to Section 5 and the noise contour map in Appendix A of the report, I consider that the fence height should be maintained at 4 m for the entire length of the south side, as I am concerned that the proposed 2 m high section may not provide sufficient noise attenuation for the closest residents in Putake Drive and Orewa Close. A height of 4 m would also shield the trucks from view of residents and contain dust, litter and light generated by vehicles.

5.10. My main reason of concern that a lower fence would not provide sufficient noise attenuation is that the number of trucks used by Mr Smith to model the contours is not representative of the busiest night-time hour. Referring to section 4.4 of the report, the figure of 20 tanker movements per hour during night-time is associated only with Site P; however haulage trucks from the BRRP will also use the site access and road between 6 am and 7 am, which is a noise-sensitive time of the day. I also note that the number of trucks during daytime (320) is inconsistent with the number of truck movements in the AEEs (refer paragraph 5.1 above) which indicate there would be 940 truck movements involving 470 trucks (i.e. 740 movements for Site F, and 200 for the BRRP during daytime).

5.11. I have discussed this with Mr Smith, who agrees that the figures may not be correct, and that he would endeavour to get realistic truck counts for this overlap period when confirming the final barrier locations in liaison with the civil engineers for the project.

5.12. To provide certainty, I have recommended a condition of consent requiring that:

In conjunction with the construction of the realigned access road, acoustic barriers shall be installed adjacent to the road. The finished height of the barriers shall be no less than 4 m above the finished surface of the road, and shall be constructed with a surface mass of not less than 10 kg/m2, and shall be maintained with no gaps in their structure or at ground level. Prior to installation of the barriers, the consent holder shall engage an experienced acoustics engineer to verify that the final location and design of the barriers will ensure that truck noise does not exceed a level of 45 dBA Leq (1 hr) between 7 pm and 6 am on any day. The verification modelling shall use a representative number of truck movements for the 6 am to 7 am period based on actual counts at the landfill weighbridge over the busiest 3 months in 2012.

5.13. On this basis, I consider that the proposed road realignment and barrier will provide an effective nuisance mitigation measure, and will achieve an appropriate

level of noise protection for residential amenity and the avoidance of sleep disturbance.

6. SITE SPECIFIC EFFECTS: SITE B - BRRP PROCESS

6.1. Receiving, stockpiling, sorting, processing and management of demolition materials

6.1.1. Section 3.3 of the AEE identifies the types of demolition wastes that can be accepted at the BRRP, and indicates that asbestos, silt and private resident's waste will not be accepted. However referring to subclause b) of the Order in Council (OIC), the definition of "earthquake wastes" provides that such unacceptable wastes can be received when it is not reasonably practicable to separate them out of the waste stream. In my opinion, the AEE and Management Plan for the BRRP and the proposed conditions in Section 9.1 of the AEE do not provide sufficient certainty that such wastes will be managed to avoid adverse effects. Although section 3.4 of the AEE and section 3.2 of the Draft Management Plan describe how unacceptable materials will be detected by a series of visual inspections when they are received and tipped at Area B, and will be diverted to a more appropriate location, no procedures are stated for the detection and diversion of such materials when stockpiles are being worked, or during the sorting process.

6.1.2. Nor is there any information about how such materials will be handled, or where and how they will be stored so as to avoid or mitigate hazards, while awaiting removal to Kate Valley or some other appropriate location.

6.1.3. There are also no provisions for cleaning up and managing spillage of demolition materials from trucks at the access or on the road, which could cause nuisance litter and dust effects.

6.1.4. It should be noted that although the demolition materials could contain traces of asbestos, Christchurch's Medical Officer of Health Dr Alistair Humphrey advised the residents at one of the public meetings that the risk to anyone's health would be insignificant because concentrations would be at non-occupational levels. He reiterated this in a Press article on 25 August 2012 (refer Attachment 2 of this report).

6.1.5. Nevertheless, given the close proximity to the Living 1 zone, in my opinion it is essential for the Management Plan for the BRRP to make appropriate provision for the detection, handling and disposal of unacceptable wastes, and contingency arrangements for spillage.

6.1.6. These matters are addressed in the final draft of the combined conditions.

6.2. Noise

6.2.1. Noise from BRRP activities in Site B is assessed in Section 6.1.1 against noise limits in the City Plan and NZS 6803:1999 *Acoustics – Construction noise*. The City Plan limits apply to noise from the processing plant, and the NZS 6803 limits apply to any construction work on the site. The limits apply at residential properties in the Living 1 zone which are approximately 1.3 km from Site B.

6.2.2. In Table 6 in Section 6.1.1, the parameter for decibel levels is not stated. However from the NZS 6803 and City Plan noise standards that are included in the Table it is deduced to be Leq.

6.2.3. On page 28 it is stated that as a worst case, a level of around 96 dBA Leq at 10 m could occur if all machinery operated in one part of the site at the same time. This would theoretically result in a noise level of about 54 dBA Leq at the Living 1 zone when only distance attenuation is taken into account. While this exceeds the City Plan Group 1 zone Development Standards for Daytime and Night-time, in practice I would expect the noise to comply, and possibly to be inaudible at any residential property, because the plant and equipment will be spread out over the site, and noise will also be attenuated by covers on the proposed plant, forest and ground cover, landfill mounds, rough open ground and atmospheric absorption.

6.2.4. While no technical or objective assessment of noise levels on recreational users of the Bottle Lake Forest Park is provided in the AEE I agree with the comment that recreational users could notice more significant noise but for short periods. It should be noted that there are no performance standards in the City Plan or relevant guidance in NZ standards or guidelines for recreational noise.

6.2.5. On this basis, I consider that any noise effects from activities in Sites B and D would be insignificant at the Living 1 zone and in recreational areas in the vicinity of the BRRP.

6.3. Dust and Odour

6.3.1. There are no specific requirements for the management of dust and odour in the City Plan.

6.3.2. It can be expected that Environment Canterbury will fully and appropriately evaluate potential dust and odour effects in its consideration of the application to discharge contaminants to air. This would also apply to their assessment of air discharges from Sites A, F and P.

6.3.3. However the proposed sweeping of the access road and its shoulders would exacerbate dust emissions by lifting dust from the road. In my opinion, a suction method should be used on the stretch or road from the site access to the landfill kiosk.

6.3.4. The proposed requirement that trucks carrying materials that may generate dust shall be covered when leaving the BRRP complements Critical Standard 7.2.3(a) in the City Plan rules for the Special Purpose (Landfill) Zone, which requires such materials in earthquake waste going to the Landfill site to be covered.

6.3.5. It has been suggested the applicants should consider providing a truck wash or wheel wash to avoid tracking of materials onto public roads. I do not consider that this is essential, as any dust on vehicles is unlikely to carry onto roads near the Living 1 Zone, given the distance of 2 – 3 km between Sites B and D and the kiosk. However, I do not oppose this being included as a matter for consideration in the Management Plan.

6.3.6. These matters have been addressed in the final draft of the combined conditions.

6.4. Hazardous substances

6.4.1. The need for resource consent from Environment Canterbury for the storage and use of substances is identified (one 10,000 litre aboveground diesel tank and minor quantities of hydraulic oil, lubricants and coolants). That consent will address any adverse effects on ground water and soils.

6.4.2. However the requirements of the City Plan have not been fully considered. Referring to Volume 3 Part 11 Section 3, Schedule 2, the diesel tank exceeds the permitted quantity limit of 2000 litres aboveground storage for class 3.3 flammable liquids for the Rural Landfill zone and is thus a restricted discretionary activity. Notwithstanding this I am satisfied that compliance with HSNO, which is mandatory, and ECan's consent conditions, and the proposed conditions and provisions in the Management Plan for control of spillage and management of hazardous substances will provide reasonable assurance that effects will be controlled. These provisions would also ensure that the Development standards in Volume 3 Part 11 Section 3.3.3 (b) to (e) which require secure containment of hazardous substances and wastes and appropriate signage are complied with.

6.4.3. The only possible potential effect on other sites would be the accidental spillage of diesel from a tanker on the BRRP access road close to the Living 1 zone. However such events would be extremely rare, as vehicles used for the transport of hazardous substances are designed and operated under strict conditions in order to comply with the NZ Land Transport Authority's "Dangerous Goods Rule" which is enforced by the Police. The use of public roads by such vehicles is not restricted. In any case, diesel does not have a significant fire risk and at worst would cause a short-term odour and vehicle tracking nuisance.

6.4.4. On this basis, I consider that any adverse effects of the storage and use of hazardous substances on any other land use would be insignificant.

6.5. Lighting

6.5.1. I concur with the AEE that operational lighting effects will be internalised and isolated to the operating area, due to shielding by forests. Together with the existing landfill mound and distance, these factors provide sufficient assurance that there would be no adverse effects at the Living 1 zone.

6.5.2. In consultation, residents have raised the issue of flashing warning lights on trucks being used unnecessarily accessing the site during hours of darkness. I consider that this effect would be mitigated satisfactorily by the proposed road realignment and the noise barriers. Notwithstanding this, to provide certainty, the draft conditions require any lighting effects to be addressed in the Management Plan.

6.6. Land contamination

6.6.1. The *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (the NES) which came into force on 1 January 2012. The NES controls the establishment of new activities on contaminated land. The information from Environment Canterbury's Listed Land Use Register (LLUR) in Appendix B of the BRRP application indicates that the land is identified as potentially contaminated because of the previous landfilling activities.

6.6.2. Ministry for the Environment's Users' Guide to the NES[1] explains on page 11 that:

Existing uses are not affected by the regulations. The NES only applies if you intend to do one of these five activities – removing or replacing a fuel storage system, sampling the soil, disturbing the soil, subdividing land, and changing the use of the land – as defined in regulation 5 of the NES.

...

A land use consent or subdivision consent granted before 1 January 2012 will prevail over the NES.

6.6.3. The applications do not include any evaluation of the proposed activities in terms of the NES. However from the information provided, the aspects of the activities which need to be considered under the NES are disturbing the soil (excavation for site works) and change of use (processing of demolition materials).

6.6.4. Under the NES, resource consent is required if the volume of soil disturbed exceeds 25 m3 per 5000 m2 of the land area, or if soil taken away from the site exceeds 5 m3 per 500 m2 per year; or if a preliminary site investigation (PSI) states that the change of use is highly unlikely to cause a risk to human health.

6.6.5. From the information provided, it is not clear what the total volume of disturbed soil will be, however from Section 3.9 of the BRRP application it appears that site works for the BRRP will involve levelling and compaction of ground and the excavation of a stormwater infiltration basin in Site B for the purpose of the resource recovery plant and processes.

6.6.6. From the applications for Sites A, F and P, and information provided by Mr David Harris, the Council's Landfill Aftercare Officer, it would appear that any site works have been completed, or would involve scraping and stockpiling of previous landfill cover material for reapplication as final cover. There is no indication that it is intended to remove any disturbed soils from any of the sites.

6.6.7. While no PSI has been provided for any of the sites to state that there is no likelihood of human health risk from the land, the isolation of the sites from the Living 1 zone would ensure that any risk to human health will be an occupational health matter to be addressed by the BRRP management under the Health and Safety in Employment Act, and is therefore not a matter of concern to public health. In any case I consider the potential is likely to be low as Sites A and B are in areas have not previously been used for sanitary land filling, and Sites F and P involve areas that have been previously capped with clean cover material.

6.6.8. The final draft conditions require the Management Plan to include management provisions for the avoidance and mitigation of environmental effects of hazardous substances and unacceptable wastes.

6.6.9. On the basis of the information above, I consider that any public health risk of soil contamination will be avoided.

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[1] http://www.mfe.govt.nz/publications/rma/users-guide-nes-for-assessing-managing-contaminants-in-soil/guide-nes-for-assessing-managing-contaminants-in-soil.pdf

6.7. Landfill gas

6.7.1. The AEE identifies the potential for landfill gas infiltration affecting the proposed activity, and discusses the means by which risks and hazards would be mitigated. This is also an occupational health and safety issue that would not affect persons or property beyond the boundaries of the BRRP, and need not be addressed by conditions.

7. SITE SPECIFIC EFFECTS - LANDFILL SITES A, F AND P

7.1. While no technical assessment of operational or construction noise has been provided, many of the noise mitigation factors identified for the BRRP would also apply to these sites (i.e. distance, shielding, forest and ground cover, landfill mounds, rough open ground and atmospheric absorption). Noting that fewer machinery units are involved, levels within the sites will be lower than for the BRRP. I would expect that noise from activities at these sites would not exceed the City Plan noise limits for operating noise or the NZS 6803 standards for construction work, and would most likely be inaudible at any site in the Living 1 zone for most of the time. I do not consider that there will be any cumulative effects with noise from the BRRP.

7.2. Given the isolation of the sites from the Living Zone, and the proposed management of all the sites under common general conditions and a common Management Plan, my assessment of effects of dust, odour, litter and spillage of materials, lighting and landfill gas for the BRRP applies equally to Sites A, F and P.

7.3. No storage of hazardous substances has been applied for, as I understand that equipment will be refuelled and maintained using materials held at the BRRP site.

7.4. After public consultation, the applicants have withdrawn any permission for infrastructure-related wastes containing asbestos to be received at Area F. This is confirmed in the final draft of the combined conditions.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Applications and assessments of effects on the environment for the establishment of the Burwood Resource Recovery Park (BRRP) and for the disposal of earthquake waste at Burwood Landfill have been assessed with appropriate regard to the provisions of the Christchurch City Plan, the NRRP, NZ standards and guidelines, and other relevant information.

8.2. In my opinion, sufficient information has now been provided on the scale and nature of effects and means of mitigating those effects for the Commissioner to grant the consents that have been applied for, subject to the final draft consent conditions that have been submitted for the Commissioner's consideration. .

Russell Malthus
Senior Environmental Health Consultant
NOVOGROUP LIMITED

13 September 2012

ATTACHMENT 1

URS ROAD REALIGNMENT AND ACOUSTIC BARRIER ASSESSMENT

ATTACHMENT 2

THE PRESS 25 AUGUST 2012

http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/7545933/Asbestos-fears-unlikely-to-be-realised

ASBESTOS FEARS UNLIKELY TO BE REALISED

Rumours persist in Christchurch that asbestos inhaled from earthquake dust and debris will cause death and disease. DEIDRE MUSSEN investigates the risks.

A photograph capturing Christchurch on February 22 last year shows a thick pall of dust cloaking the city. Within 24 hours, health officials were out spreading warnings of asbestos risks. Since then, the city's asbestos management has been under the spotlight as numerous buildings are demolished and rubble mountains created.

Fears have been fanned by a handful of horror stories, the latest an abandoned demolition dump in Sydenham. In May, a protest by residents over proposed asbestos dumping at Burwood Resource Recovery Centre forced the Christchurch City Council to send it instead to Kate Valley landfill in North Canterbury.

So what is the asbestos health risk to Christchurch residents post-quake?

Extremely low, according to Canterbury medical officer of health Dr Alistair Humphrey, who is eager to dispel community concerns. "The question is, 'could people have been exposed at the time to asbestos?' The evidence suggests not."

Other asbestos experts agree but admit they won't know for decades.

Typically, people need heavy exposure to asbestos fibres and usually for a long time, but there is a long time lag between exposure and becoming sick. This is borne out by New Zealand's two asbestos registers, which began 20 years ago and gather data on exposure and disease. Of the 1246 people registered with asbestos-related diseases since 1992, 99 per cent were caused by exposure many years earlier, before people understood its dangers.

"It's probably people who worked without any protection," Humphrey says.

More than two-thirds worked in the building industry, including plumbers, fitters, laggers, carpenters, builders and electricians. Most of the rest were asbestos processors or sprayers, although a few breathed in fibres from their partners' asbestos-laden clothes or hair.

Asbestos, a known carcinogen, can cause mesothelioma, a rare fatal cancer of the lining of lungs or abdominal cavity, lung cancer, asbestosis or scarring of lung tissue, and pleural plaques.

Humphrey says there has been a background level of asbestos in our lives since it began being imported into New Zealand in the 1920s in brake linings and clutch pads. It was commonly used from the 1940s to the 1980s in roofing, wall and ceiling claddings, insulating boilers and pipes, and as a fire retardant on structural steelwork.

"You and I will probably have thousands of asbestos fibres in our lungs but will never get sick from them."

He says brief possible exposure to asbestos by people inhaling dust near collapsing buildings or during early rescue attempts was extremely unlikely to be enough to cause disease. Plus, asbestos monitoring since the February 22 quake has failed to detect any unsafe levels and many buildings that fell were built in the pre- asbestos era. Controls on work safety in the red zone were quickly instituted, including strict precautions for rescue workers and those removing asbestos.

A proposed new study into asbestos in New Zealand may shed more light on the issue. Massey University's Centre for Public Health Research associate director, Associate Professor Barry Borman, says his study will link asbestos exposure records with mortality, hospitalisation databases and the New Zealand Cancer Register.

"Therefore, we will be able to see what causes of death, hospitalisation, or cancer that these people have experienced since the register started in the early 1990s," he says.

The asbestos registers are an incomplete record of asbestos-related disease cases because notification is voluntary, whereas the cancer register is compulsory. According to it, 1024 cases of mesothelioma were diagnosed in the 15 years to 2009.

ACC's Dr John Monigatti, who has reviewed all claims for compensation for asbestos-related disease for the past 15 years, says it is unlikely Cantabrians will suffer from asbestos-related diseases from the earthquake but he is keen to see the proposed study's results.

"It is feasible and no one will know for 30 to 40 years that there could be a peak."

He says lung cancer and mesothelioma may require only short periods of exposure over a few weeks but in high levels.

Those with asbestos- related diseases can get lump sum payouts from ACC, with $57 million paid out in the past six years to 701 people, the vast majority for mesothelioma. However, only about half those diagnosed with mesothelioma gain lump sum compensation, which raises concerns people are not seeking compensation they are entitled to.

The latest cancer statistics show 91 people registered as being diagnosed with mesothelioma in 2009, including 76 men and 15 women. That year, 101 people died of it, while only 51 people got compensation. One of New Zealand's leading asbestos researchers, Professor Bill Glass, says most asbestos-related diseases are dose-related, although this may be less true with mesothelioma.

"The length of time of exposure doesn't have to be long but the quantity of asbestos over that time does have to be high."

He has led the asbestos medical panel for 20 years and has intimate knowledge of the hundreds of people who have suffered the consequences of asbestos.

The time lag between exposure to asbestos and diagnosis with mesothelioma varies from 12 to 74 years for the register's 227 cases, with an average time of 45 years.

Post-February 22, there has been a surge in notifications of asbestos exposure, according to the Ministry of Business, Innovation and Employment's Labour Group, which replaced the Labour Department. Last year, 61 Cantabrians put their names on the asbestos exposure register, 46 more than the previous year and more than double the region's annual average of 25 people for the previous four years. That increase has slowed this year.

The New Zealand Demolition and Asbestos Association says that is no surprise. In the past eight months, it has had 15 new applications by contractors wanting to do asbestos removal in Christchurch, says president Diana Stil. Only those with a certificate of competency can legally remove friable, or easily crumbled, asbestos, which is more likely to release fibres into the air if disturbed. It has been a challenging environment; some earthquake-stricken buildings were unsafe to enter to remove asbestos, forcing "dirty demolitions", Stil says.

"Also, there have been buildings where it was assumed prior to the earthquake that a clean-out had been done, then asbestos has been found after the demolition."

The association's 200-plus page New Zealand Guidelines for the Management and Removal of Asbestos was published only weeks after February's earthquake, after gaining endorsement by the then Labour Department.

She says the vast majority of operators have been very careful in managing asbestos when demolishing earthquake-damaged buildings.

"But you are always going to get the odd rogue. The most important thing is getting the public aware. There is a lot of fear about asbestos."

The Labour Group's Christchurch service manager, Margaret Radford, agrees, saying the community wrongly believes asbestos risks from the earthquake are high. She too is eager to change that. "I do think it is an emotive subject."

Most contractors have adhered to asbestos regulations, with only 22 "events" since the quake until mid-June, despite thousands of hours in earthquake- related work, she says. "The departmental perspective is asbestos has been handled extremely well since the beginning, though maybe not in the first few days only."

Since February 22, the ministry has stepped up monitoring health and safety for the Christchurch recovery. Post-earthquake, the ministry has been notified of about 320 "hazardous" demolition sites because of asbestos removal.

New Zealand is not the first country to face issues with asbestos risks from earthquakes.

The 1989 San Francisco earthquake prompted the United States Environmental Protection Agency to develop its first guidelines two years later for catastrophic emergency situations involving asbestos.

According to the International Ban Asbestos Secretariat, a rubble collector in Japan became the first to gain worker's compensation in 2009 for developing mesothelioma after being exposed to asbestos while cleaning up debris after the 1995 Kobe earthquake.

On that earthquake's 15th anniversary in 2010, the former co-director of America's Mount Sinai School of Medicine's centre for occupational and environmental health, Dr Stephen Levin, addressed a conference in Japan on lessons about asbestos risks from Kobe and the World Trade Center disaster. Before he died in February, Levin helped to lead a study of more than 27,000 responders and recovery workers for 9/11, a group set to become one of the most examined groups for health impacts of an international disaster.

Researchers say the huge plume of dust and smoke that spewed into the air when the twin towers collapsed after the terrorist attack on September 11, 2001, contained dangerous levels of asbestos . Humphrey says it is unhelpful to compare to Christchurch's earthquakes to the World Trade Center because the disasters are so different.

Regardless, the message from health experts is clear: fears over earthquake-related asbestos have been blown way out of proportion. In fact, a far greater health risk is that smoking levels have risen in Canterbury since the earthquake, despite reducing nationwide.

Smoking is far more likely to cause premature deaths than misplaced anxiety over post-earthquake asbestos, Humphrey says.

12 September 2012
Project No. 42186640

Christchurch City Council
Hereford Street
Christchurch 8011

Burwood Resource Recovery Park
C/- Transpacific Waste Management South Island
PO Box 11 337 Sockburn, Christchurch

Attention Dave Harris / Gareth James

Subject: Burwood Landfill and Burwood Resource Recovery Park
Noise assessment of realigned access road

1 Introduction

Following the lodgement of resource consent applications for the above sites, URS has been requested to perform noise measurements of existing truck movements and to design a noise barrier for the proposed realignment of Landfill Avenue. The newly aligned road will increase the separation distance between it and the nearest houses, thereby decreasing noise levels. Further reduction in noise will be achieved through noise barriers.

URS previously provided[1] an options assessment for noise barriers along Landfill Avenue, as well as outlining a hierarchy of noise control treatment options, including management controls, which should still be considered.

This letter details the measurement results, noise modelling performed, and the extent and detailing of the proposed noise barrier. Consent conditions are proposed which specify an appropriate level of detail.

A site plan is provided in Figure A-1 in Appendix A.

2 Criteria

The Christchurch City Plan specifies 41 dB $L_{Aeq(1h)}$ as the development standard for Living 1 zones, which permitted activities must meet, and 49 dB $L_{Aeq(1h)}$ as the critical standard which is the upper limit for discretionary activities. Under the fast-track process for the sites set up following the Canterbury earthquakes, the proposal is a controlled activity under the City Plan, and therefore neither the development nor critical standards apply, however they do provide a point of reference.

[1] URS letter to CCC dated 20 August 2012

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In reviewing the application, the Council's environmental consultant Novo Group have proposed 45 dB $L_{Aeq(1h)}$ as an appropriate the design target. This is supported by WHO internal noise criteria[2] of 30 dB $L_{Aeq(8h)}$ and external criteria in NZS 6802[3].

We agree that achieving this noise level at night will provide reasonable residential amenity and provide appropriate protection from sleep disturbance.

3 Noise measurements

3.1 Procedure

A noise survey was conducted by URS as follows:

Personnel:	Michael Smith
Times/dates:	0900–1030h, 10 September 2012
Instrumentation:	Brüel and Kjær Type 2250L hand-held sound analyser, serial number 2638850, calibration date 21/03/12. Brüel and Kjær Type 4231 acoustic calibrator, calibration date 22/03/12.
Microphone position:	The analyser was mounted on a tripod with the microphone approximately 1.4 m high. The microphone as oriented towards Landfill Avenue.
Field checks:	Prior to the measurements a field check was performed and the analyser adjusted. After the measurements, a second field check was performed and the difference in calibration levels was less than 0.1 dB.
Procedure:	Noise measurements were performed of 30 vehicle movements at a location approximately 10 metres to the south of the road. A further 10 vehicle movements were measured at a second location approximately 20 metres to the north of the road.
Weather:	There was no precipitation during the survey period, with a clear sky. The temperature ranged from 13 to 18 degrees. A light breeze was present at times from the north to east.

3.2 Results

The results were separated by vehicle type with haul trucks and liquid tankers considered separately. The sound exposure level (L_{AE}) and maximum sound level (L_{AFmax}) were statistically analysed for each passby.

Table 1 shows the arithmetic average, and the standard deviation of the sample set.

[2] Berglun, Lidvall and Schwela (1999), Guidelines for community noise. World Health Organisation
[3] NZS 6802:2008. Acoustics – Environmental noise

Table 1 Measured noise levels

Location	Vehicle type	Number of samples	Average sound exposure level, L_{AE}	Average maximum sound level, L_{AFmax}
Position 1 (10 m)	Haul truck	19	76.0 dB (σ = 3.3 dB)	68.6 dB (σ = 2.1 dB)
	Tanker	12	73.1 dB (σ = 2.9 dB)	66.1 dB (σ = 2.9 dB)
Position 2 (20 m)	Haul truck	6	68.0 dB (σ = 1.4 dB)	60.8 dB (σ = 2.2 dB)
	Tanker	2	65.5 dB	57.2 dB

The measured L_{AFmax} were not attributed to specific events during a passby (e.g. banging trailer door, or impact noise from a wheel hitting a pot hole) and are considered representative of the L_{Aeq} at the closest distance. The sound power level for a single truck has been determined using the following relationship:

$$L_{wA} = L_{AFmax} + 20 \log_{10}(10m) + 8 \quad (1)$$

3.3 Observations

In previous site visits it was observed that a number of vehicles were speeding, and excessive acceleration and braking noise was present. On this occasion, these characteristics were less prominent, which may be attributed to efforts by management to increase compliance with site protocols. No noise events were attributable to surface defects in the road, and only one empty haul truck was observed to have significant noise from the vehicle body compared to the typical engine/exhaust/tyre noise.

4 Noise model

4.1 Details

A computer acoustics model has been used to predict noise levels from vehicle movements along the realigned Landfill Avenue and to test the performance of the proposed noise barrier. Table 2 lists the key model settings.

Table 2 Acoustics model settings

Parameter	Setting / Source
Software	Cadna/A 4.2
Algorithm	ISO 9613-2
Temperature / humidity	20 degrees / 70% humidity
Order of reflections	2
Terrain	Flat
Barrier reflection loss	2 dB
Parameter	$L_{Aeq(60\ min)}$
Ground absorption	0.5 (50% soft ground)
Receiver height	1.5 m
Sound contour grid	1.5 m height, 2 m resolution

4.2 Input data

A truck is a moving point noise source, however it is necessary to model it as a line source in the computer software. The sound power is distributed along the length of the road, and the total power is determined using Equation 2, which takes into consideration the length of the road, vehicle speed, and the number of movements in the time period.

$$L_{w,line} = L_{w,point} + 10\log_{10}(t) + 10\log_{10}(n) - 10\log_{10}(T) \quad (2)$$

Where:

t is the time to traverse the line;

n is the number of vehicle movements; and

T is the reference time interval.

4.3 Model calibration

A model scenario was prepared of the existing alignment of Landfill Avenue, with a line source entered from the main gate up until the weighbridge, a length of approximately 606 metres. The time to traverse the road has been calculated as 109 seconds, based on a speed of 20 km/h. The total sound power level for the line was 114 dB.

A single tanker movement has been modelled, with a reference time interval of 1 second, to allow comparison with the measured sound exposure level.

A receiver was placed at the measurement location, and the modelled noise level is within 0.5 dB of the mean L_{AE} at that location.

4.4 Realignment Scenario

A model scenario was prepared of the proposed realignment of the access road, with a line source entered from the main gate up until the weighbridge, a length of approximately 544 metres, which is shorter than the existing alignment. This is shown in Appendix A. The time to traverse the road has been calculated as 98 seconds, based on a speed of 20 km/h.

The sound power level for a single truck in Equation 1 has been increased by the following factors:

+ 2.9 dB, which is the standard deviation of the measured set. Approximately 84% of all vehicles will be below this level, assuming there are normally distributed about the mean; and

+ 5 dB, which is a safety factor to allow for potential changes in driver behaviour (e.g., speeding).

During the day there can be up to 320 haul trucks accessing the site and a further 50 tanker trucks during the night.

A total of 20 tanker movements (in or out) was modelled over a 1 hour period, which is considered to be a conservative estimate for a busy night-time hour. The total sound power level for the line source was 99 dB.

5 Proposed barrier

A 4 metre high noise barrier has been modelled for approximately 200 metres from the main gate towards heading east, on both the northern and southern sides. A 2 metre high noise barrier continues on the southern side for a further 150 metres until the road enters the forested area. The extent of the barriers are shown in Figure A-2

Where the noise barrier has been modelled with a total height of 4 metres, it could be constructed as a 2 metre high timber fence on a 2 metre high earth bund, or a different combination.

Noise contours are shown for the proposed arrangement in Figure A-3. The predicted noise level at the most affected property is 43 dB, although this does not include any attenuation provided by the boundary fence at this property.

6 Barrier constructions

To act as an effective barrier, the barriers investigated above should be constructed using materials with a surface mass of at least 10 kg/m² and should have no gaps in their structure. Suitable materials include concrete, fibre cement board, steel and timber.

Further details on barrier construction and the other considerations can be found in the *NZTA state highway noise barrier design guide*[4].

7 Indicative costs

The indicative costs for these barriers are presented below and include planning, design, and construction. These have been obtained from the above reference for 2008 and increased for inflation to 2012 using the change in CPI between these two dates (11%).

Table 3 Indicative barrier costs

Location	Height	Construction	Indicative rate (per linear metre)	Length	Indicative cost
Northern side	4 m	2 m timber wall 2 m bund (1:3 slope)	$268 $390 Total $658	200 m	$131,600
Southern side	4 m	2 m timber wall 2 m bund (1:3 slope)	$658	230 m	$151,340
	2 m	timber wall	$268	150 m	$40,200
Total					$323,140

[4] NZTA (2010). *State highway noise barrier design guide, v1.0.* www.acoustics.nzta.govt.nz

8 Consent conditions

The realigned road and noise barriers have been designed to achieve a noise level of 45 dB $L_{Aeq(1h)}$ at night, which is a lower level than the critical standard in the City Plan. However, given the controlled activity status of the proposal, and that the usual discretionary / critical noise standards do not apply, we do not consider a specific noise standard as a condition of consent appropriate.

We consider that the realigned road with noise barriers proposed is the best practicable option to avoid and mitigate unreasonable noise as required under section 16 of the Resource Management Act. We consider that specifying the road location, noise barrier heights and design parameters (Figure A-2) are sufficient controls for noise.

The location, extent and total height of the proposed noise barriers are shown in Appendix B, and should be specified in a condition such as:

N1. A noise barrier shall be installed along the realigned access road in accordance with the attached plan [URS Plan A-2 dated 12 September 2012]. The noise barrier to the north of the access road shall be installed prior to heavy vehicles using the access road. The southern noise barriers shall be installed within 6 weeks of completion of the access road.

In addition, the Management Plan should require the consent holder the implement procedures to control speed, minimise acceleration and braking in the vicinity of the main gate, and other behaviours which can cause excessive noise.

9 Conclusions

Truck noise has been modelled from the proposed realignment of the access road to the Burwood Landfill. Noise barriers have been designed to achieve a design target of 45 dB $L_{Aeq(1h)}$ at night, using conservative estimates of tanker movements. Ongoing efforts to manage the behaviour of truck drivers will still be required.

Yours sincerely
URS New Zealand Limited

Michael Smith
Acoustics Engineer

Daniel Murray
Principal, Planner

Limitations

URS New Zealand (URS) has prepared this letter in accordance with the usual care and thoroughness of the consulting profession for the use of Christchurch City Council and only those third parties who have been authorised in writing by URS to rely on this letter.

It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this letter.

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This letter was prepared between 10–11 September 2012 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

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Any estimates of potential costs which have been provided are presented as estimates only as at the date of the letter. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Appendix A - Plans

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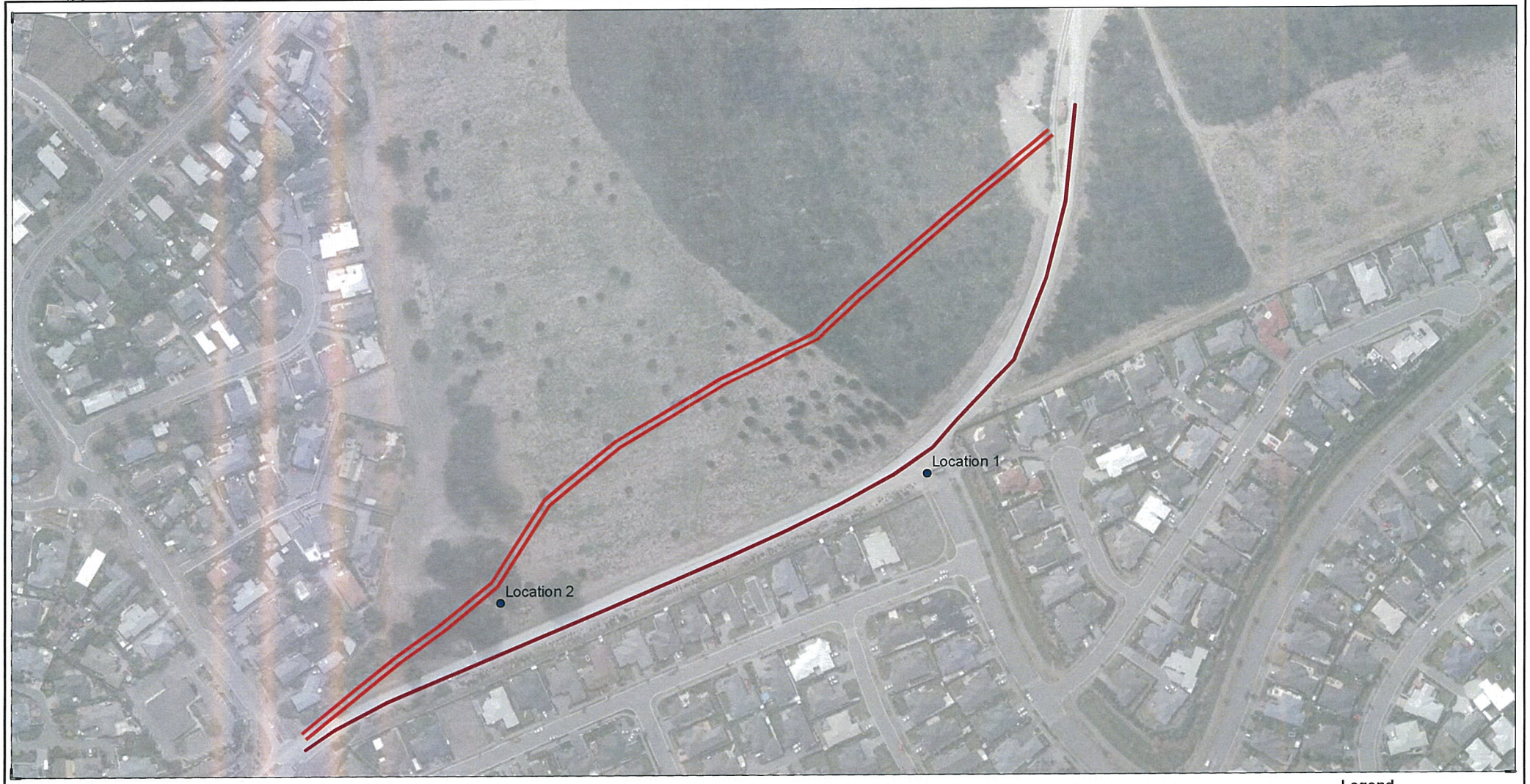

N
W E
S

0 0.015 0.03 0.06 0.09 0.12 km

Scale: 1:3,000 (A4)
NZGD 2000 New Zealand Transverse Mercator

NOTES:
Road realignment is only indicative and subject to changes during detailed design.
This drawing is for consenting and is not for construction.

Legend
- Measurement locations
- Proposed road
- Existing road

Source: F:\Jobs\Burwood\Burwood - Site plan.mxd

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SITE PLAN

URS

BURWOOD LANDFILL AND BURWOOD RESOURCE RECOVERY PARK

Figure: A-1

Drawn: MS Reviewed: DM Date: 12/09/2012

Rev.- A4

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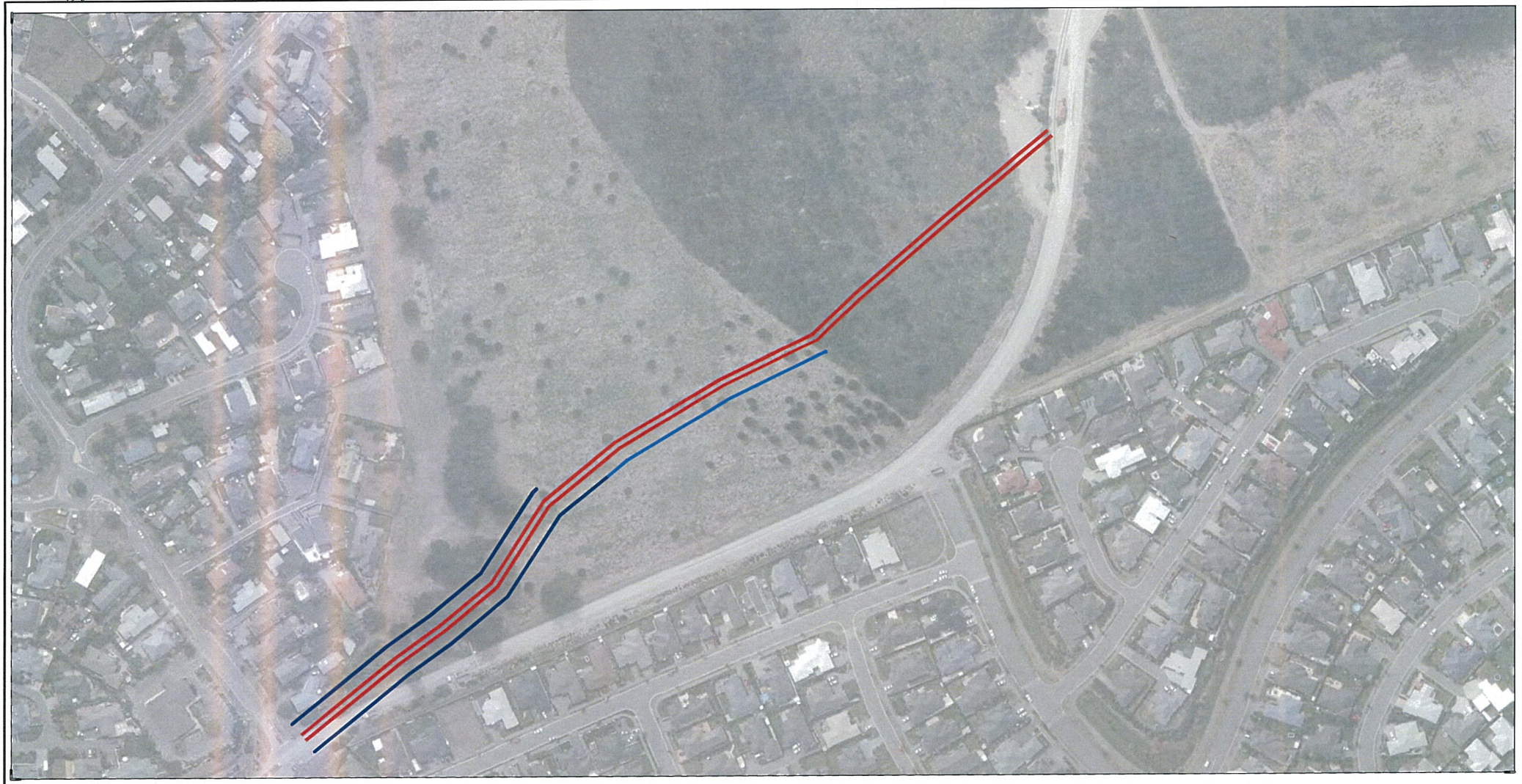

N
W E
S

0 0.015 0.03 0.06 0.09 0.12 km

Scale: 1:3,000 (A4)
NZGD 2000 New Zealand Transverse Mercator

Source: F:\Jobs\Burwood\Burwood - Barrier location plan.mxd

NOTES:
The barrier height specified is relative to the level of the road, and may be a combination of walls and bunds.
The noise wall to be constructed of timber panels with a surface mass of at least 10 kg/m² and be free of gaps.
Road realignment is only indicative and subject to changes during detailed design.
This drawing is for consenting and is not for construction.

Barrier heights
2 m
4 m

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NOISE BARRIER LOCATIONS

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BURWOOD LANDFILL AND BURWOOD RESOURCE RECOVERY PARK

Figure: A-2

Drawn: MS Reviewed: DM Date: 12/09/2012

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N
W E
S

0 0.015 0.03 0.06 0.09 0.12 km

Scale: 1:3,000 (A4)
NZGD 2000 New Zealand Transverse Mercator

Source: F:\Jobs\Burwood\Burwood - Predicted noise levels.mxd

NOTES:
Predicted noise levels assuming 20 tanker movements in a 1 hour period.
Road realignment is only indicative and subject to changes during detailed design.
This drawing is for consenting and is not for construction.

Barrier height
- 2 m
- 4 m

Predicted noise levels
- 40—45 dB
- 45—50 dB
- 50—55 dB
- 55—60 dB

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PREDICTED NOISE LEVELS

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BURWOOD LANDFILL AND BURWOOD RESOURCE RECOVERY PARK

Figure: A-3

Drawn: MS Reviewed: DM Date: 12/09/2012 Rev.- A4

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Appendix 6 – Landfill Avenue proposed road realignment

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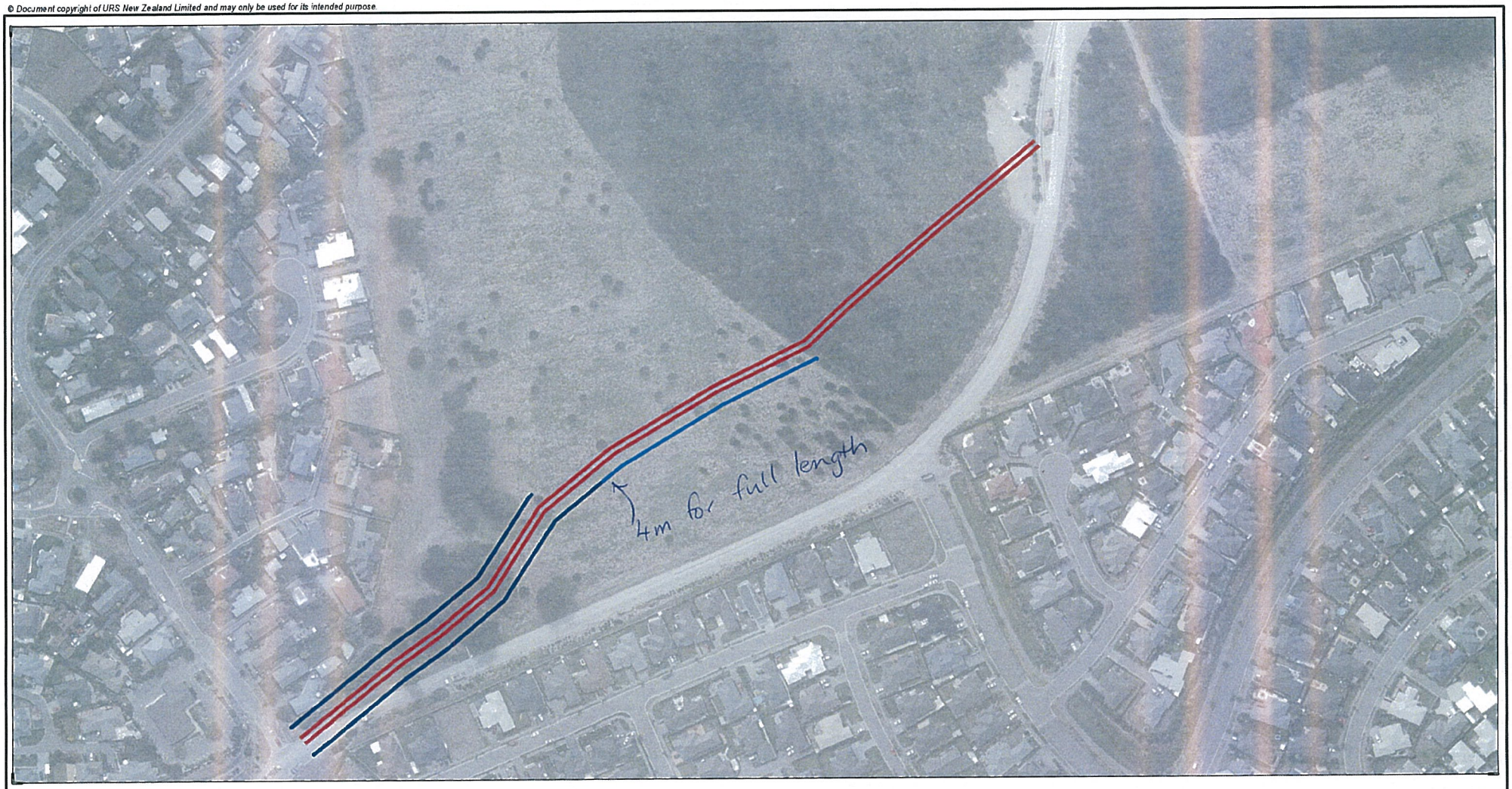

N
W E
S

0 0.015 0.03 0.06 0.09 0.12 km

Scale: 1:3,000 (A4)

NZGD 2000 New Zealand Transverse Mercator

Source: F:\Jobs\Burwood\Burwood - Barrier location plan.mxd

NOTES:

The barrier height specified is relative to the level of the road, and may be a combination of walls and bunds.
The noise wall to be constructed of timber panels with a surface mass of at least 10 kg/m² and be free of gaps.
Road realignment is only indicative and subject to changes during detailed design.
This drawing is for consenting and is not for construction.

Barrier heights

2 m
4 m

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NOISE BARRIER LOCATIONS

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BURWOOD LANDFILL AND BURWOOD RESOURCE RECOVERY PARK

Figure: A-2

Drawn: MS Reviewed: DM Date: 12/09/2012

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Appendix 7 – Landfill access proposed by concerned residents