Your Ref: **DA136/2015**
Our Ref: **15044**
Contact: **Rohan Johnston**

13 May 2016

The General Manager
Gundagai Shire Council
PO Box 34
Gundagai NSW 2722

ATTN: Mr Brent Livermore

Dear Sir,

RE: PROPOSED EXTENSION TO EXISTING WASTE MANAGEMENT FACILITY - 303 BURRA ROAD, GUNDAGAI - ADDITIONAL INFORMATION - ADDENDUM 3

I refer to Council's letter of 28 April 2016 requesting further information to assist the EPA in the assessment of the subject DA.

Please find attached document titled *Addendum 3 to Environmental Impact Statement* that addresses the Information requests made by the EPA. This will be Included with Part C to the EIS document submitted with the development application and is to be read in conjunction with Parts A and B.

If you require and further clarification, please don't hesitate to contact our office on (02) 69218588.

Yours sincerely,

R. Johnston

Rohan Johnston
Town Planner
Salvestro Planning

Salzan P/L ACN: 122 431 752 ABN: 29 122 431 752 A. 16 Fitzmaurice St (PO Box 783), Wagga Wagga NSW 2650
P. 02 6921 8588 F. 02 6921 8388 W. admin@salvestroplanning.com.au W. www.salvestroplanning.com.au

Addendum 3 to Environmental Impact Statement

Proposed Extension to Existing Waste Management Facility (Class 2 Solid Landfill)

303 Burra Road, Gundagai

Prepared for MH Earthmoving Pty Ltd
May 2016

Response to Additional Information Request – DA136/2015 – GSC 28/4/16

1 INTRODUCTION

The following addendum document is in response to additional information request issued by Council on the 28 April 2016, as a result of EPA correspondence on 27 April 2016. It is to be read in conjunction with:

- Environmental Impact Statement and Attachments (Parts A & B), as originally lodged with Gundagai Shire Council (GSC) on 21 December 2015;
- EIS Part C - Addendum 1 lodged with GSC on 1 April 2016; and
- EIS Part C - Addendum 2 lodged with GSC on 12 May 2016

The topics covered in this addendum relate to groundwater impacts, odour impact, particulate impact, noise impact and blasting.

2 GROUNDWATER IMPACTS

The EPA have requested further information in relation to groundwater impacts, in particular:

- *Accurately determine the depth to groundwater relative to the base and benches for landfill cell 3 and cell 4, and for this information to be used to update the long section and cross section drawing of cell 3 and cell 4 to include groundwater levels.*

- *Detail the intended control measures, if required, to prevent damage to the leachate barrier system where high groundwater levels occurring in either the bases or benches of the landfill cells could possibly affect the stability and performance of the leachate barrier.*

The additional information provided below is to be read in conjunction with section 6.12 of the main EIS Part A document, Section 5 of Part C - Addendum 1 and all relevant attachment material.

The groundwater depth has been accurately determined in the DM McMahon Earth Science response to the additional information request, as submitted to Council on 1 April 2016. This response has also included historical groundwater standing levels to accurately determine the highest groundwater standing level. The construction plans have been previously amended to reflect these levels, with respect to the base level of Cell 3 and 4. The base of each cell has been raised to incorporate a minimum 1m buffer between the base of each cell and the highest recorded standing ground water level.

To detail the control measures to be employed to prevent any damage to the leachate barrier system, the following information was provided by DM McMahon Earth Science (see attached relevant email from DM McMahon Earth Science):

> *The base of the landfill has been designed so there is at least a 1 metre buffer between the highest recorded piezometric groundwater level and the base of the*

clay liner. The NSW EPA Environmental Guidelines - Solid Waste Landfills, recommend that for general solid waste landfills the "base and walls of all solid waste landfill cells should be lined with a durable material of very low permeability to form a barrier between the waste and the groundwater, soil and substrata". Therefore, the design for the Burra Rd landfill exceeds the guidelines by having at least a 1 metre buffer between the highest recorded piezometric groundwater level and the base of the clay liner.

In the event of groundwater being encountered upon further investigation, or during construction of the new cells, then a relief layer can be installed in between the current surface level of the creek bed and the base of the clay liner. The relief layer would be made of crushed rock which protect the integrity of the clay liner. A layer of bidum (or other suitable geofab) would be laid between the top of the relief layer and the bottom of the clay liner to assist in the protection of the clay liner base from any groundwater that may be encountered.

The methods outlined above are consistent with the NSW EPA *Draft Environmental Guidelines: Solid Waste Landfills* and present a best practice solution to reduce the potential for damage to the leachate barrier system as proposed.

2.1 Results of April Groundwater and Sprillbry Creek Testing

The current landfill operations include regular testing of groundwater from four approved bore sites located onsite, in accordance with its licencing requirements, ensuring the highest levels of environment management. The report detailing the results of this testing is attached to this addendum.

On 21 April 2016, four groundwater monitoring bore samples and one leachate sample were collected in compliance with AS5667.11:1998 *Water Quality Sampling, Part 11: Guidance on sampling of groundwater* based on the requirements of Environmental Protection Licence (EPL) number 20297. The samples were analysed for the pollutants required by EPL no. 20297.

Duplicate samples were also collected by representatives from the Environmental Protection Authority. In addition, a sample from the Sprilbry Creek headwaters was collected upstream of the landfill to demonstrate undiluted background levels of relevant parameters. The creek was flowing at the time.

The results demonstrate that Sprilbry Creek, upstream of the landfill at the headwaters, has higher levels of sodium and chloride than in the monitoring bores at the landfill. The sodium levels in the headwaters of Sprilbry Creek are more than double that of monitoring bore P1. Monitoring bore P1 is the bore which there has been some conjecture about, with the perception that the clay liner at the landfill is leaking owing to variable salinity levels over time. It has been demonstrated by comprehensive investigation and testing that the variable groundwater salinity levels on site are an effect of groundwater mounding, and are influenced by seasonal conditions, especially rainfall.

Testing of the headwaters of Sprilbry Creek resulting in high levels of salt, clearly demonstrates that salinity is inherent to the locale. It can also be suggested that over time, wider land management practices within the catchment has had far more of an impact on the salinity of the Sprilbry Creek catchment's surface waters and groundwaters than historical quarrying or current landfill operations.

The landfill operations have not had a measured effect on groundwater within the catchment as the clay liner has been built to specification which is intact. The salinity of the headwaters of Sprilbry Creek validates these findings, that the level of salt in the catchment's surface waters and groundwaters, is a pre-existing environmental characteristic.

3 ODOUR IMPACT ASSESSMENT

The following information is to be read in conjunction with Section 6.7 of the main EIS Part A document and Addendum 1. In addition to the information contained in previous documents, the odour modelling has been updated to incorporate the expansion, increased waste deposition rate and all ancillary activities. It is noted that the increase in waste deposition rate from 40,000tpa to 60,000tpa, does not affect the odour omitted by the site as the odour is calculated on the total surface area of the landfill cells and the leachate pond. The Air Quality advice can be found as attached to this addendum.

The criteria for the odour impact was defined by the use of the population based odour criteria of 4OU and the use of the NSW OEH Odour guideline criteria of 2OU. To accurately determine the emission of odour and the impacts on the surrounding receptors, the calculations and modelling assumed a worst case scenario, with Cell 3.4 at close to full capacity. Based on this scenario, the predicted impact on all nearby receptors were below the population based odour criteria of 4OU, with all private residences meeting the NSW OEH Odour Guideline Criteria of 2OU. The results of the odour modelling are shown in the table below

Table 1: Predicted Cumulative Odour at Sensitive Receptors

Receiver	Receiver ID	Predicted Cumulative 99th Percentile One Second Odour (OU)	Impact assessment criteria (OU)
R1	Gundagai Bee Farm Pty Ltd	2.17	4
R2	Private Residence	0.16	
R3	Private Residence	0.95	
R4	Private Residence	0.62	
R5	Private Residence	1.26	
R6	Private Residence	0.96	
R7	Private Residence	0.29	

The results above indicate that the predicted odour impacts for the site will not significantly impact on the surrounding receptors, and all predicted impacts are within the acceptable criteria limits as set out by the relevant guidelines for odour generating developments.

4 PARTICULATE IMPACTS

The additional information provided below is to be read in conjunction with Section 6.7 of the EIS Part A document and Addendum 1. The additional modelling undertaken by Advitech can be found within the Air Quality advice as attached to this addendum.

The initial advice given by Advitech indicates that there may be some particulate impacts to the surrounding receivers during operation and construction phases of the operation. This advice is preliminary advice based on the limited time available to conduct a thorough investigation into the emissions inventory. Further modelling that takes into account the operational procedures of the site as well as the mitigation measures shown below, and as listed in the EIS Part A document, may reduce the predicted impacts of particulate emission from the site. The particulate emission mitigations proposed include:

- Watering of exposed surface, including stockpiles, during periods of high winds;
- Use of water trucks on unsealed haul roads during construction and operational activities to reduce the amount of wheel generated dust; and
- Limiting dust generating activities during adverse wind conditions
- Water suppression techniques during the operation of high particulate emission generating plant and equipment

These mitigation measures are consistent with best practise particulate management techniques as recommended by the relevant EPA guidelines. It is considered that any particulate impacts can be successfully mitigated using these techniques.

5 NOISE IMPACTS

The information in this section expands on information contained in Section 6.9 of the EIS Part A document and Addendum 1. Further to the previous assessment of the potential noise impacts caused by the site, revised modelling and reporting has been undertaken to determine the impacts of all phases of the proposed expansion including construction, operation and traffic impacts. The full report prepared by Advitech Environmental can be found attached to this addendum.

The report utilised all sources of noise generating activity on the site, including all machinery and plant, at the expected locations of operation. The modelling software also takes into account site topography and expected meteorological conditions. All results generated by modelling are generated at worst case scenarios and are considered to represent conservative assumptions.

The assessment of the operational phase of the development were considered to comply with the Project Specific Noise Level (PSNL), of 35dB(A), at all receivers. During the construction phase of the development, the Noise Management Level of 40db(A) is expected to be met at all receivers. Analysis of the existing and proposed additions to the traffic flows along Burra Road indicates that the road traffic noise levels may be expected to increase slightly, but remain within +2db(A), as outlined in the RMS Road Noise Policy.

The revised modelling undertaken on the site indicates that there will be no negative noise impact on nearby receptors, in accordance with criteria contained within the *Interim Construction Noise Guideline* (DECC 2009) and the *NSW Road Noise Policy* (DECCW, 2011). As no potential impact has been indicated, there is no requirement to undertake mitigation to reduce potential impacts. However, the site operator has proposed to employ standard mitigation measures to further reduce the potential for noise impacts, as outlined in Section 6.9 of the EIS Part A document. These measures include:

- Plant and equipment to be effectively and routinely maintained to ensure acoustic performance is not de-rated;
- Adherence to approved hours of operation; and
- Regular consultation with neighbouring residents.

6 BLASTING

The following information expands on information contained in Section 3.5 of the EIS Part A and information provided in Section 6 of Part C - Addendum 1. Further discussion on the issue of blasting has resulted in the completion of a blasting report to cover situations where blasting will be required in conjunction with excavation. The report covers the topics of blasting overpressure and ground vibration, number and duration of blasting activity, impacts on landfill liner and monitoring/review criteria to be adopted.

Blasting in association with the proposed expanded activity has been assessed in accordance with EPA referenced guidelines *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (A&NZEC 1990)*.

The blasting report has been completed based on the information available with the geology of the site used to provide assumptions where information or data is currently unavailable. The report also utilizes a number of relevant National and International Standards and Guidelines to determine the criterion that is appropriate for the site and the impact that blasting will have on the surrounding structures and human comfort levels.

These criteria then determine a number of factors that are site specific, including the Maximum Instantaneous Charge (MIC), blast design and blasting sequence. The

report details the blasting overpressure (dBlinear) and ground vibration impacts (mm/s) expected when a MIC of 48kg is used on the site. From this initial analysis, relevant data is generated and used to assess the impacts against the established criterion for overpressure and ground vibration at nearby sensitive receptors and the existing clay leachate barrier system.

The report recommends using blast sequence, blast design and a MIC of 7kg at the near point of blasting to minimise the risk of causing damage to nearby structures and minimising the disturbance to nearby residents. A greater MIC can be used, although this reaches the maximum human comfort criterion.

To limit the probability of damage to the clay liner, it is advised to utilise a 3.7kg MIC at the near point of blasting in the proposed Cell 4. In all blasting scenarios, the report advises that blasting should commence at the far point from the near liner, although a greater MIC can be used as the distance from the clay leachate barrier increases. The report also states that as more site specific data is gathered, especially in relation to the geology of the site, the accuracy of the calculations and recommendation will increase. It is also recommended by the report to undertake testing of the clay material to determine the geotechnical characteristics of the material in relation to blasting.

A strategy for the monitoring of blasting is also outlined, ensuring that the 'site law', as calculated in the report with respect to each criteria, is met. Monitoring is to be undertaken at all nearby receptors and at the near point of any existing clay leachate barrier. Monitoring will assess the overpressure (dBlinear) and ground vibration (mm/s), to determine that the 'site law' is met during all blasting activities. Blasting is estimated to be required 8 times over 4 months based on current knowledge of the sites geology.

The results from the report indicate that blasting can be safely undertaken on the site to aid excavation, in accordance with EPA referenced guidelines *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (A&NZEC 1990)*. The report is to be used as a guide by blasting technicians with records of all blasting details to be taken and used to further refine the conclusions drawn in the attached report.

Part C – EIS Addendum 2 Attachments

List of Attachments:

ATTACHMENT 1: EMAIL ADVICE FROM DM MCMAHON – 13/5/2016

ATTACHMENT 2: DM MCMAHON EARTH SCIENCES – MONITORING REPORT – 21/4/2016

ATTACHMENT 3: ADVITECH – AIR QUALITY IMPACT REPORT – 13/5/2016

ATTACHMENT 4: ADVITECH – NOISE IMPACT ASSESSMENT REPORT – 13/5/2016

ATTACHMENT 5: SLR – POTENTIAL BLASTING IMPACTS ASSESSMENT – 12/5/2016

ATTACHMENT 1: EMAIL ADVICE FROM DM MCMAHON – 13/5/2016

Subject: Re: Additional Information Letter - Burra Road Landfill (15044)
Date: Friday, 13 May 2016 at 8:03:56 AM Australian Eastern Standard Time
From: David McMahon
To: Rohan Johnston
CC: Admin, Garry Salvestro, James Maloney
Attachments: RJ Email Signature2[17].png

Hi Rohan

In regard to the following, my comments can be seen below:
Detail the intended control measures, if required, to prevent damage to the leachate barrier system where high groundwater levels occurring in either the bases or benches of the landfill cells could possibly affect the stability and performance of the leachate barrier.

The base of the landfill has been designed so there is at least a 1 metre buffer between the highest recorded piezometric groundwater level and the base of the clay liner. The NSW EPA Environmental Guidelines - Solid Waste Landfills, recommend that for general solid waste landfills the "base and walls of all solid waste landfill cells should be lined with a durable material of very low permeability to form a barrier between the waste and the groundwater, soil and substrata". Therefore the design for the Burra Rd landfill exceeds the guidelines by having at least a 1 metre buffer between the highest recorded piezometric groundwater level and the base of the clay liner.

In the event of groundwater being encountered upon further investigation, or during construction of the new cells, then a relief layer can be installed in between the current surface level of the creek bed and the base of the clay liner. The relief layer would be made of crushed rock which protect the integrity of the clay liner. A layer of bidum (or other suitable geofab) would be laid between the top of the relief layer and the bottom of the clay liner to assist in the protection of the clay liner base from any groundwater that may be encountered.

Regards, David
David McMahon
DIRECTOR

DM McMahon Pty Ltd
4a Norton Street (PO Box 6118) Wagga Wagga NSW 2650
t (02) 6931 0510 **f** (02)69 310 511
e david@dmmcmahon.com.au **w** www.dmmcmahon.com.au

From: David McMahon
Sent: 02 May 2016 08:49:35
To: Rohan Johnston
Cc: Admin; Garry Salvestro; James Maloney
Subject: Re: Additional Information Letter - Burra Road Landfill (15044)

Hi Rohan

As discussed if Marty follows up Michael Gray for the GW heights on the plans for cells 3 & 4.

In regard to the following, my comments can be seen below:
Detail the intended control measures, if required, to prevent damage to the leachate barrier system where high groundwater levels occurring in either the bases or benches of the landfill cells could possibly affect the stability and performance of the leachate barrier.

The base of the landfill has been designed so there is at least a 1 metre buffer between the highest recorded groundwater level and the base of the clay liner, as recommended in the NSW EPA Draft Environmental Guidelines: Solid Waste Landfills. In the event of groundwater being encountered upon further investigation, or during construction of the new cells, then a relief layer can be installed in between the current surface level of the creek bed and the base of the clay liner. The relief layer would be made of crushed rock which would allow through drainage. A layer of bidum (or other suitable geofab) would be laid between the top of the relief layer and the bottom of the clay liner to assist in the protection of the clay liner base from any water that may arise in the event of encountered high groundwater levels.

Regards, David
David McMahon
DIRECTOR

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t (02) 6931 0510 **f** (02)69 310 511
e david@dmmcmahon.com.au **w** www.dmmcmahon.com.au

From: Rohan Johnston <rohan@salvestroplanning.com.au>
Sent: 29 April 2016 11:08:19
To: David McMahon
Cc: Admin; Garry Salvestro
Subject: Additional Information Letter - Burra Road Landfill (15044)

Hi Dave,

In addition to our phone discussion with Advitech, we received a letter from the EPA yesterday concerning the additional information as lodged. Please see the excerpt below from the letter attached detailing the additional information they require to complete their assessment:

Groundwater impacts
The EPA notes that the base of the proposed landfill cell 3 has been raised to reduce the potential for groundwater ingress during construction and operation of the landfill. However, as highlighted in the EPA's letter dated 26 August 2015 to the Department of Planning and Infrastructure outlining its requirements for preparation of the ELS and letter dated 5 February 2016 to Gundagai Shire Council, the proposed development is located in an environmentally sensitive area. In order for the EPA to assess the potential environmental risk and consider the adequacy of proposed mitigation measures the ground water regime must be accurately and comprehensively assessed.
The additional information in Addendum 1 did not contain all the requested information in regard to groundwater characterisation and impact assessment.

Accurately determine the depth to groundwater relative to the base and benches for landfill cell 3 and cell 4, and for this information to be used to update the long section and cross section drawing of cell 3 and cell 4 to include groundwater levels. Detail the intended control measures, if required, to prevent damage to the leachate barrier system where high groundwater levels occurring in either the bases or benches of

the landfill cells could possibly affect the stability and performance of the leachate barrier.

Could you please provide comment on the above?
Thanks,
Rohan

Rohan Johnston
Town Planner
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rohan@salvestroplanning.com.au w www.salvestroplanning.com.au
PO Box 783, 16 Fitzmaurice Street, Wagga Wagga, NSW 2650

ATTACHMENT 2: DMM EARTH SCIENCES – MONITORING REPORT – 21/4/2016

Burra Road Landfill, MH Earthmoving Pty Ltd, Gundagai

Groundwater & Leachate Monitoring Report

April 2016

DM McMahon Pty Ltd
4a Norton St (PO Box 6118)
Wagga Wagga NSW 2650
t (02) **6931 0510** **www.dmmcmahon.com.au**

Groundwater & Leachate Monitoring

Burra Road Landfill

Gundagai

NSW 2722

MH Earthmoving Pty Ltd

April 2016

Brief

At the request of Martin Hay, MH Earthmoving Pty Ltd, on 21 April 2016, four groundwater monitoring bore samples and one leachate sample were collected in compliance with AS5667.11:1998 Water Quality Sampling, Part 11: Guidance on sampling of groundwaters based on the requirements of Environmental Protection Licence (EPL) number 20297. The samples were analysed for the pollutants required by EPL no. 20297 as follows:

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Groundwater quality monitoring		Groundwater monitoring bore P1 as shown in Groundwater monitoring plan, June 2013
2	Groundwater quality monitoring		Groundwater monitoring bore P2 as shown in Groundwater monitoring plan, June 2013
3	Groundwater quality monitoring		Groundwater monitoring bore P3 as shown in Groundwater monitoring plan, June 2013
4	Groundwater quality monitoring		Groundwater monitoring bore P4 as shown in Groundwater monitoring plan, June 2013
5	Leachate monitoring		Leachate storage dam

POINT 1,2,3,4

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Quarterly	Grab sample
Calcium	milligrams per litre	Quarterly	Grab sample
Chloride	milligrams per litre	Quarterly	Grab sample
Conductivity	millisiemens per centimetre	Quarterly	Grab sample
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	Quarterly	Grab sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Grab sample
pH	pH	Quarterly	Grab sample
Potassium	milligrams per litre	Quarterly	Grab sample
Sodium	milligrams per litre	Quarterly	Grab sample
Standing Water Level	metres (Australian Height Datum)	Quarterly	In situ
Sulfate	milligrams per litre	Quarterly	Grab sample
Total dissolved solids	milligrams per litre	Quarterly	Grab sample
Total organic carbon	milligrams per litre	Quarterly	Grab sample
Total Phenolics	milligrams per litre	Quarterly	Grab sample

POINT 5

Pollutant	Units of measure	Frequency	Sampling Method
Alkalinity (as calcium carbonate)	milligrams per litre	Every 6 months	Grab sample
Calcium	milligrams per litre	Every 6 months	Grab sample
Chloride	milligrams per litre	Every 6 months	Grab sample
Conductivity	microsiemens per centimetre	Every 6 months	Grab sample
Fluoride	milligrams per litre	Yearly	Grab sample
Lead	milligrams per litre	Yearly	Grab sample
Magnesium	milligrams per litre	Every 6 months	Grab sample
Manganese	milligrams per litre	Yearly	Grab sample
Nitrate + nitrite (oxidised nitrogen)	milligrams per litre	Every 6 months	Grab sample
Nitrogen (ammonia)	milligrams per litre	Every 6 months	Grab sample
pH	pH	Every 6 months	Grab sample
Potassium	milligrams per litre	Every 6 months	Grab sample
Sodium	milligrams per litre	Every 6 months	Grab sample
Sulfate	milligrams per litre	Every 6 months	Grab sample
Total dissolved solids	milligrams per litre	Every 6 months	Grab sample
Total organic carbon	milligrams per litre	Every 6 months	Grab sample
Total Phenolics	milligrams per litre	Every 6 months	Grab sample

Site Identification

Address: Burra Road, Gundagai NSW 2722
Real property description: Lot 2 DP 111917, Lot 472 & 502 DP 751421
Centre co-ordinate: E 598141 N 6121769 (approx.) MGA GDA z55
Property size: Not Known
Owner: Paul Mann
Operator: MH Earthmoving Pty Ltd
Local Council Area: Gundagai Shire Council
Present use: Landfill & Agriculture

Monitoring results

Laboratory analysis was carried out at ALS Environmental Laboratories. The NATA accredited Laboratory number for ALS 992.

Google Earth _Image date 18 Nov 2013.

Groundwater Monitoring MH Earthmoving PTY LTD							
Parameters	**Unit of Measure**	**Quarter**	**P1**	**P2**	**P3**	**P4**	**Leachate**
Standing Water Level	[3]metres (TOC)	**Apr-16**	-3.2	-1.57	-5.40	-4.02	n/a
Standing Water Level	metres AHD	**Apr-16**	267.65	277.22	280.74	267.70	n/a
Alkalinity(as $CaCO_3$)	mg/L	**Apr-16**	989	537	587	352	10200
Calcium	mg/L	**Apr-16**	405	119	86	96	22
Chloride	mg/L	**Apr-16**	288	105	71	149	721
Conductivity	µs/cm	**Apr-16**	2420	1360	1220	1020	18200
Fluoride	mg/L	**Apr-16**	0.6	0.6	0.6	0.3	0.5
Lead	mg/L	**Apr-16**	-	-	-	-	<0.11
Magnesium	mg/L	**Apr-16**	57	48	40	30	308
Manganese	mg/L	**Apr-16**	-	-	-	-	0.50
Nitrate & Nitrite (oxidised N)	mg/L	**Apr-16**	1.61	1.50	1.89	5.04	0.39
Nitrogen (Ammonia)	mg/L	**Apr-16**	0.06	<0.01	<0.01	0.02	<0.01
pH	pH unit	**Apr-16**	6.78	7.19	7.27	7.48	9.35
Potassium	mg/L	**Apr-16**	2	1	<1	2	1780
Sodium	mg/L	**Apr-16**	88	142	148	84	3750
Sulfate	mg/L	**Apr-16**	149	191	78	28	<1
Total Dissolved Solids	mg/L	**Apr-16**	1570	884	793	663	11800
Total Organic Carbon	mg/L	**Apr-16**	11	2	<1	2	2310
Total Phenolics	µg/L	**Apr-16**	<0.05	<0.05	<0.05	<0.05	<0.10

1National Environment Protection Measure (Assessment of site contamination) 2011 Investigation levels for Soil and Groundwater

2.ANZECC (2000) Section 4.2.10.1 Australia and New Zealand guidelines for Fresh and Marine water Quality

3. Measurement taken as metres below Top Of Casing

References

- Standards Australia AS/NZS 5667.11:1998 Water Quality Sampling. Part 11: Guidance on sampling of groundwaters.
- ANZECC (2000) *Australian & New Zealand Guidelines for Fresh & Marine Water Quality*. Artarmon, NSW. Section 4.2.10.1
- National Environment Protection Measure (Assessment of site contamination) 2011 Investigation levels for Soil and Groundwater.
- Geoscience Australia, Groundwater Sampling and Analysis – A Field Guide, Record 2009 / 27.

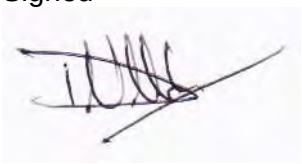
Attachments

- Field records
- Certificate of Analysis
- Quality Control Report
- Interpretative Quality Control Report

Disclaimer

The information contained in this report has been extracted from field and laboratory sources believed to be reliable and accurate. DM McMahon Pty Ltd will not assume any responsibility for the misinterpretation of information supplied in this report. The accuracy and reliability of recommendations identified in this report need to be evaluated with due care according to individual circumstances. It should be noted that the recommendations and findings in this report are based solely upon the said site location and the environmental conditions at the time of testing. The results of the said investigations undertaken are an overall representations of the conditions encountered. The properties of the soil, surface water and groundwater within the location may change due to variations in conditions outside of the tested area. The author has no control or liability over site variability that may warrant further investigation that may lead to significant impacts or design changes.

Signed



5 May 2016
David McMahon BAppSc GradDip WRM ASSSI

DM McMahon Pty Ltd

#3798

Client:	Martin Hay Earthmoving
Site:	Burra Road Landfill
Person Sampling:	JAMES MALONEY.

Bore ID Number:	Point 1 - Groundwater monitoring		Bore drilled depth:	16.5 meters
Casing / Screen diameter & type	50mm PVC inside protective casing	Cap Type - Plastic	Standing Water Level	-3.2m TOC.
Date :	21-4-2016.		$\pi * r^2 * h$ h = depth of water Bore water Volume	$(3.14 * 0.025^2 * h)$ (0.0019625 * h)
Purge Method:	pump.			
Purge Volume				
Purge Observations:	Post Sample Post Purge SWL → -8.9 m. TOC.			
Sample Containers required - Quarterly				
Sample Containers required - Annual				
Time:	9:00 AM.		Colour:	CLEAR.
SWL (m)	-3.2 m TOC.		Turbidity:	—
pH	6.8		Odour:	—
EC (µS/cm)	1908 µS/cm.		Purge volume	>20 litres.
DO (mg/L)	2.6% DO.		Temp °C	20.4
Observations				

Bore ID Number:	Point 2 - Groundwater monitoring		Bore drilled depth:	14.5 meters
Casing / Screen diameter & type	50mm PVC inside protective casing	Cap Type - Plastic	Standing Water Level	-1.57 TOC.
Date :	21-4-16.		$\pi * r^2 * h$ h = depth of water Bore water Volume	$(3.14 * 0.025^2 * h)$ (0.0019625 * h)
Purge Method:	Micropurge / pump.			
Purge Volume	>30 litres.			
Purge Observations:				
Sample Containers required - Quarterly				
Sample Containers required - Annual				
Time:	10:00 AM.		Colour:	clear.
SWL (m)	-1.57 m TOC.		Turbidity:	—
pH	7.17		Odour:	—
EC (µS/cm)	1245 µS/cm		Purge volume	>30 litres.
DO (mg/L)	—		Temp °C	19.0 °C.
Observations				

DM McMahon Pty Ltd

Client:	Martin Hay Earthmoving
Site:	Burra Road Landfill
Person Sampling:	JAMES MALONEY.

Bore ID Number:	Point 3 - Groundwater monitoring		Bore drilled depth:	16.0 meters
Casing / Screen diameter & type	50mm PVC inside protective casing	Cap Type - Plastic	Standing Water Level	-5.40 m TOC
Date :	21 - 4 - 2016.		$\pi * r^2 * h$ h = depth of water Bore water Volume	$(3.14 * 0.025^2 * h)$ (0.0019625 * h)
Purge Method:	pump / Microperge.			
Purge Volume	> 30 litres.			
Purge Observations:	—			
Sample Containers required - Quarterly				
Sample Containers required - Annual				
Time:	10:30.	Colour:	CLEAR.	
SWL (m)	-5.40 m TOC.	Turbidity:	—	
pH	7.24.	Odour:	—	
EC (µS/cm)	1207 µS/cm.	Purge volume	> 30 Litres.	
DO (mg/L)	—	Temp °C	18.4 °C.	
Observations				
	—			

Bore ID Number:	Point 4 - Groundwater monitoring		Bore drilled depth:	21.5 meters
Casing / Screen diameter & type	50mm PVC inside protective casing	Cap Type - Plastic	Standing Water Level	-4.02 m TOC
Date :	21 - 4 - 2016.		$\pi * r^2 * h$ h = depth of water Bore water Volume	$(3.14 * 0.025^2 * h)$ (0.0019625 * h)
Purge Method:	pump / Microperge.			
Purge Volume	> 30 litres.			
Purge Observations:	SAMPLE collected @ Depth of 13 M. TOC.			
Sample Containers required - Quarterly				
Sample Containers required - Annual				
Time:	9:30 Am.	Colour:	cloudy.	
SWL (m)	-4.02 m TOC.	Turbidity:	—	
pH	7.43	Odour:	—	
EC (µS/cm)	1250 µS/cm.	Purge volume	> 25 litres.	
DO (mg/L)	—	Temp °C	18.0 °C.	
Observations				
	—			

DM McMahon Pty Ltd

Client:	Martin Hay Earthmoving
Site:	Burra Road Landfill
Person Sampling:	JAMES HALONEY.

EPL Identification no:	Point 5 - Leachate storage Dam	pH	9.45.
Date :	21 - 4 - 2016.	EC (µS/cm)	12,245. µS/cm.
Time:	11:30.	DO (mg/L)	—
Valve open:	YES.	Temp °C	15.9°C.
Appearance:	BROWN / ALGAE.	Odour	—
Colour:	BROWN.	Turbidity	—
Observations:	HEAVY BROWN COLOUR → ALGAE ON SURFACE		
Sample Containers required - Quarterly			
Sample Containers required - Annual			

* Duplicate SAMPLES collected By BRIAN WILD, MARK ENRIGHT + —— NOLAN.

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* A SAMPLE OF SPRILBRY CREEK HEADWATERS WAS ALSO COLLECTED, UPSTREAM OF THE LANDFILL. TO DEMONSTRATE UNDILUTED BACKGROUND LEVELS of RELEVANT PARAMETERS.
→ CREEK WAS FLOWING AT THE TIME.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1608730**	Page	: 1 of 6
Client	: **DM MCMAHON PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR DAVID MCMAHON	Contact	: Mary Monds
Address	: 4a Norton Street Wagga Wagga NSW, AUSTRALIA 2650	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 6931 0510	Telephone	: 02 6372 6735
Project	: MARTIN HAY EARTHMOVING	Date Samples Received	: 22-Apr-2016 09:30
Order number	: MHE	Date Analysis Commenced	: 22-Apr-2016
C-O-C number	: ----	Issue Date	: 29-Apr-2016 10:12
Sampler	: DAVID MCMAHON		
Site	: ----		
Quote number	: ----		
No. of samples received	: 6		
No. of samples analysed	: 6		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EG005T: Sample ES1608730 #005 required dilution (X10) due to matrix interference and LOR's have been raised accordingly.
- EP035G:LOR raised for Phenol analysis on various samples due to sample matrix.
- EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Point 1	Point 2	Point 3	Point 4	Point 5/Leachate
			Client sampling date / time	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]
Compound	CAS Number	LOR	Unit	ES1608730-001	ES1608730-002	ES1608730-003	ES1608730-004	ES1608730-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.78	7.19	7.27	7.48	9.35
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	2420	1360	1220	1020	18200
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	1570	884	793	663	11800
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	1250	495	379	363	1320
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	3900
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	989	537	587	352	6300
Total Alkalinity as CaCO3	----	1	mg/L	989	537	587	352	10200
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	149	191	78	28	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	288	105	71	149	721
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	405	119	86	96	22
Magnesium	7439-95-4	1	mg/L	57	48	40	30	308
Sodium	7440-23-5	1	mg/L	88	142	148	84	3750
Potassium	7440-09-7	1	mg/L	2	1	<1	2	1780
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	0.01	mg/L	----	----	----	----	<0.11
Manganese	7439-96-5	0.01	mg/L	----	----	----	----	0.50
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.6	0.6	0.6	0.3	0.5
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.06	<0.01	<0.01	0.02	<0.01
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.17	<0.01	<0.01	0.02	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	1.44	1.50	1.89	5.02	0.39
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Point 1	Point 2	Point 3	Point 4	Point 5/Leachate
				Client sampling date / time	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]	[21-Apr-2016]
Compound	CAS Number	LOR	Unit		ES1608730-001	ES1608730-002	ES1608730-003	ES1608730-004	ES1608730-005
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.61**	**1.50**	**1.89**	**5.04**	**0.39**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	**0.03**	**5.14**
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**31.0**	**17.7**	**15.4**	**11.8**	**224**
Total Cations	----	0.01	meq/L		**28.8**	**16.1**	**14.0**	**11.0**	**235**
Ionic Balance	----	0.01	%		**3.66**	**4.68**	**4.56**	**3.74**	**2.35**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**11**	**2**	<1	**2**	**2310**
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	<0.10

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Sprilbry_Headwaters	----	----	----	----
			Client sampling date / time	[21-Apr-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1608730-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.35	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	1680	----	----	----	----
EA016: Calculated TDS (from Electrical Conductivity)								
Total Dissolved Solids (Calc.)	----	1	mg/L	1090	----	----	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	550	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	16	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	356	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	372	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	27	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	386	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	108	----	----	----	----
Magnesium	7439-95-4	1	mg/L	68	----	----	----	----
Sodium	7440-23-5	1	mg/L	184	----	----	----	----
Potassium	7440-09-7	1	mg/L	3	----	----	----	----
EG005T: Total Metals by ICP-AES								
Lead	7439-92-1	0.01	mg/L	<0.01	----	----	----	----
Manganese	7439-96-5	0.01	mg/L	<0.01	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.5	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	Sprilbry_Headwaters	----	----	----	----
				Client sampling date / time	[21-Apr-2016]	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1608730-006	--------	--------	--------	--------
					Result	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		**0.03**	----	----	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**18.9**	----	----	----	----
Total Cations	----	0.01	meq/L		**19.1**	----	----	----	----
Ionic Balance	----	0.01	%		**0.48**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		<1	----	----	----	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	----	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES1608730**	Page	: 1 of 5
Client	: **DM MCMAHON PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR DAVID MCMAHON	Contact	: Mary Monds
Address	: 4a Norton Street Wagga Wagga NSW, AUSTRALIA 2650	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: 02 6931 0510	Telephone	: 02 6372 6735
Project	: MARTIN HAY EARTHMOVING	Date Samples Received	: 22-Apr-2016
Order number	: MHE	Date Analysis Commenced	: 22-Apr-2016
C-O-C number	: ----	Issue Date	: 29-Apr-2016
Sampler	: DAVID MCMAHON		
Site	: ----		
Quote number	: ----		
No. of samples received	: 6		
No. of samples analysed	: 6		

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA
WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 433136)									
ES1608714-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.17	8.18	0.122	0% - 20%
ES1608730-005	Point 5/Leachate	EA005-P: pH Value	----	0.01	pH Unit	9.35	9.35	0.00	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 433137)									
ES1608714-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	3780	3760	0.296	0% - 20%
ES1608730-005	Point 5/Leachate	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	18200	18200	0.00	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 433135)									
ES1608655-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	610	606	0.495	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	610	606	0.495	0% - 20%
ES1608730-005	Point 5/Leachate	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	3900	3850	1.21	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	6300	6130	2.65	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	10200	9990	2.10	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 433085)									
ES1608652-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	118	118	0.00	0% - 20%
ES1608730-004	Point 4	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	28	29	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 433086)									
ES1608652-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	78	78	0.00	0% - 20%
ES1608730-004	Point 4	ED045G: Chloride	16887-00-6	1	mg/L	149	152	1.68	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 434384)									
ES1608600-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	20	19	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	8	8	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	13	13	0.00	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 434384) - continued									
ES1608600-001	Anonymous	ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
ES1608738-025	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	77	78	1.69	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	122	123	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1130	1100	2.95	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	14	14	0.00	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 433661)									
ES1608730-005	Point 5/Leachate	EG005T: Lead	7439-92-1	0.01	mg/L	<0.11	<0.11	0.00	No Limit
		EG005T: Manganese	7439-96-5	0.01	mg/L	0.50	0.49	0.00	No Limit
ES1608772-007	Anonymous	EG005T: Lead	7439-92-1	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG005T: Manganese	7439-96-5	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 433132)									
ES1608454-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.2	1.2	0.00	0% - 50%
ES1608730-005	Point 5/Leachate	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.00	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 433237)									
ES1608596-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.04	0.00	No Limit
ES1608730-002	Point 2	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.00	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 433088)									
ES1608730-004	Point 4	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	0.00	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 433236)									
ES1608596-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.87	2.87	0.00	0% - 20%
ES1608730-002	Point 2	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	1.50	1.50	0.00	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 433087)									
ES1608730-004	Point 4	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.03	0.03	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 433915)									
ES1608681-014	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	25	26	0.00	0% - 20%
ES1608730-005	Point 5/Leachate	EP005: Total Organic Carbon	----	1	mg/L	2310	2160	6.66	0% - 20%
EP035G: Total Phenol by Discrete Analyser (QC Lot: 434294)									
ES1608718-001	Anonymous	EP035G: Phenols (Total)	----	0.05	mg/L	<0.05	<0.05	0.00	No Limit
ES1608730-003	Point 3	EP035G: Phenols (Total)	----	0.05	mg/L	<0.05	<0.05	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA010P: Conductivity by PC Titrator (QCLot: 433137)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	96.5	95	113
ED037P: Alkalinity by PC Titrator (QCLot: 433135)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	102	81	111
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 433085)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	111	82	122
ED045G: Chloride by Discrete Analyser (QCLot: 433086)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	114	81	127
				<1	1000 mg/L	102	81	127
ED093F: Dissolved Major Cations (QCLot: 434384)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	80	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	90	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	93.8	82	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.5	85	113
EG005T: Total Metals by ICP-AES (QCLot: 433661)								
EG005T: Lead	7439-92-1	0.01	mg/L	<0.01	0.1 mg/L	91.0	80	120
EG005T: Manganese	7439-96-5	0.01	mg/L	<0.01	0.1 mg/L	90.4	81	119
EK040P: Fluoride by PC Titrator (QCLot: 433132)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	98.0	82	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 433237)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	99.9	90	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 433088)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	98.2	82	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 433236)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	98.3	91	113
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 433087)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	106	85	117
EP005: Total Organic Carbon (TOC) (QCLot: 433915)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	98.8	72	120
EP035G: Total Phenol by Discrete Analyser (QCLot: 434294)								
EP035G: Phenols (Total)	----	0.05	mg/L	<0.05	0.5 mg/L	88.6	64	98

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 433085)							
ES1608652-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70	130
ED045G: Chloride by Discrete Analyser (QCLot: 433086)							
ES1608652-001	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	110	70	130
EG005T: Total Metals by ICP-AES (QCLot: 433661)							
ES1608730-005	Point 5/Leachate	EG005T: Lead	7439-92-1	1 mg/L	105	70	130
		EG005T: Manganese	7439-96-5	1 mg/L	103	70	130
EK040P: Fluoride by PC Titrator (QCLot: 433132)							
ES1608454-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	92.6	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 433237)							
ES1608596-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	91.8	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 433088)							
ES1608713-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	96.7	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 433236)							
ES1608596-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 433087)							
ES1608713-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	102	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 433915)							
ES1608681-023	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	102	70	130
EP035G: Total Phenol by Discrete Analyser (QCLot: 434294)							
ES1608718-001	Anonymous	EP035G: Phenols (Total)	----	0.42 mg/L	78.6	70	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES1608730**	Page	: 1 of 8
Client	: **DM MCMAHON PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR DAVID MCMAHON	Telephone	: 02 6372 6735
Project	: MARTIN HAY EARTHMOVING	Date Samples Received	: 22-Apr-2016
Site	: ----	Issue Date	: 29-Apr-2016
Sampler	: DAVID MCMAHON	No. of samples received	: 6
Order number	: MHE	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES1608652--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	ES1608596--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Due for extraction	Days overdue	Analysis: Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
Point 1,	Point 2,	----	----	----	22-Apr-2016	21-Apr-2016	**1**
Point 3,	Point 4,						
Point 5/Leachate,	Sprilbry_Headwaters						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
Point 1,	Point 2,	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	21-Apr-2016	×
Point 3,	Point 4,							
Point 5/Leachate,	Sprilbry_Headwaters							
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
Point 1,	Point 2,	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
Point 3,	Point 4,							
Point 5/Leachate,	Sprilbry_Headwaters							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	05-May-2016	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**26-Apr-2016**	28-Apr-2016	✓
EG005T: Total Metals by ICP-AES							
Clear Plastic Bottle - Nitric Acid; Unspecified (EG005T)							
Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**26-Apr-2016**	18-Oct-2016	✓	**26-Apr-2016**	18-Oct-2016	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	23-Apr-2016	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	19-May-2016	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**22-Apr-2016**	23-Apr-2016	✓
EP005: Total Organic Carbon (TOC)							
Amber VOC Vial - Sulfuric Acid (EP005)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**----**	----	----	**26-Apr-2016**	19-May-2016	✓
EP035G: Total Phenol by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EP035G)							
Point 1, Point 2, Point 3, Point 4, Point 5/Leachate, Sprilbry_Headwaters	**21-Apr-2016**	**26-Apr-2016**	19-May-2016	✓	**26-Apr-2016**	19-May-2016	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phenol by Discrete Analyser	EP035G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-AES	EG005T	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phenol by Discrete Analyser	EP035G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phenol by Discrete Analyser	EP035G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phenol by Discrete Analyser	EP035G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Calculated TDS (from Electrical Conductivity)	EA016	WATER	In house: Calculation from Electrical Conductivity (APHA 2510 B) using a conversion factor specified in the analytical report. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Total Recoverable Metals by ICP-AES	EG005T	WATER	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Samples are digested by USEPA 3005 prior to analysis. The ICPAES technique ionises the sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Total Phenol by Discrete Analyser	EP035G	WATER	In house: Referenced to APHA 5530 B&D. Steam distillable Phenols are reacted with 4-aminoantipyrine. The resultant colour intensity is measured by Seal. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Phenols After Microdistillation	EP035D	WATER	In house: Referenced to APHA 5530 A, B&D pH adjusted Steam distillable Phenolic compounds. The resultant colour intensity is measured by Discrete Analyser.

ATTACHMENT 3: ADVITECH – AIR QUALITY IMPACT REPORT – 13/5/2016

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Advitech Pty Limited t/a Advitech Environmental ABN 29 003 433 458 P 02 4924 5400 F 02 4967 3772

13 May, 2016

Salvestro Planning
16 Fitzmaurice Street
Wagga Wagga NSW 2650

Attention: **Rohan Johnston**

Subject: **Gundagai Landfill Air Quality Advice**

Advitech Pty Ltd (T/A Advitech Environmental) was engaged by Salvestro Planning to provide advice relating to potential air quality impacts from the expansion of the Gundagai Landfill / Recycling Centre at Burra Road, Gundagai.

Advitech Environmental was previously involved in the preparation of an Air Quality Impact Assessment (AQIA) for the construction and operation of Cells 1 and 2, which are currently in use. Advitech Environmental understands that the operator of the landfill facility is proposing to develop Cell 3, immediately to the east of Cells 1 and 2, and Cell 4 to the south of Cells 1 and 2. Operations in Cell 3 will commence once Cells 1 and 2 have reached their usable life span, with Cell 4 to be initiated following the closure of Cell 3. In addition, the operator is proposing to divert an unnamed drain and connect this to Sprilbry Creek.

Salvestro Planning has requested that Advitech Environmental provide additional air quality technical advice to confirm that potential air quality impacts associated with the proposed expansion of the Burra road landfill (i.e. construction and operation of Cells 3 and 4 and creek diversion) are maintained below NSW air quality guidelines.

In accordance with the 'Plan of Engineering Works', and the Environmental Impact Statement – Proposed Extension to Existing Waste Management Facility (Class 2 Solid Landfill) provided by Salvestro Planning, Advitech Environmental examined the existing air quality model(s) to assess the potential air quality impacts and greenhouse gas emissions associated with the project extension. The review of the existing air quality model included qualitative assessment of potential changes in emission rates of particulates and odour as a result of the modification. All other parameters were maintained from the existing air quality impact assessment.

Odour

The results of the previous air quality model predicted that the cumulative odour at the sensitive receivers beyond the site boundary were well under the population based odour criteria of 4 OU. The nearest receiver locations R3 and R5 were predicted to have a 99th percentile one (1) second average cumulative odour of 0.883 OU and 0.856 OU respectively.

Air dispersion modelling for odour was undertaken to account for additional activities proposed by the project extension that contribute to odour emissions. The updated model considered the following additional activities:

- Daily application of leachate dam water via water cannon onto active landfill areas. It is understood that up to seven (7) kilolitres per day of leachate water will be applied onto active landfill areas each day for evaporation purposes. It should also be noted that the application of leachate will also serve as a dust emission suppression measure. Based on leachate water testing and analysis (i.e. a total organic carbon potential of approximately 500 mg/L), it is evident that leachate water may exhibit an additional odour generation potential to that already accounted for in the original air quality assessment.

  The original air quality assessment assumed an odour emission rate of 0.3 OUV/m^2/s from the entire landfill area of 12,000 m^2. It is our opinion that additional leechate water on the landfill area will not result in odour emissions above those accounted for in the original air quality assessment. The assumed odour emission rate of 0.3 OUV/m^2/s for landfill areas is the same as odour emission rates for aerobic and anoxic wastewater treatment processes, and therefore, adequately accounts for any potential impact from leachate.

- Higher total organic carbon concentrations in the leachate dam may also have the potential for higher odour emissions. The model has increased the original studies leachate dam odour emission rate from 0.1 OUV/m^2/s to 0.3 OUV/m^2/s to account for this.

The result of additional odour modelling is shown in **Table 1** below and indicates that the proposed project extension will not result in exceedences in the odour impact assessment criteria.

Table 1: Predicted Cumulative Odour at Sensitive Receptors

Receiver	Receiver ID	Predicted Cumulative 99th Percentile One Second Odour (OU)	Impact assessment criteria (OU)
R1	Gundagai Bee Farm Pty Ltd[1]	2.17	4
R2	Private Residence	0.16	
R3	Private Residence	0.95	
R4	Private Residence	0.62	
R5	Private Residence	1.26	
R6	Private Residence	0.96	
R7	Private Residence	0.29	

[1] - The odour impact at the Gundagai Bee Farm decreased from 5.05 OU to 2.17 OU due to the changes in the location of the leachate dam made after the finalisation of the 2013 Advitech Air Quality Report.

Particulate Matter

The results of the previous air quality model predicted that the cumulative PM_{10} and TSP concentrations and particulate deposition were within impact assessment guidelines.

Air dispersion modelling for particulates was undertaken to account for additional or modified activities proposed by the project extension. The updated model examined the proposed project extension sequence. The updated model examined the operational sequence that would most likely correspond to a maximum intensity of PM_{10} emissions. The project sequence that was identified to have the maximum intensity of particulate air emissions (during normal operation) corresponded to the following:

- Cell 1 and 2 capped and revegetated, Cell 3 (i.e. Cell 3.1) operating and the completed construction of the unnamed drain connection to Sprilbry Creek.

In considering the operating scenario, the updated model considered the following factors:

- Vehicle / operating plant inventories including location, frequency and time of use and anticipated material through-put tonnages;
- Vehicle trips into and out of the property;
- Dust suppression processes (i.e. water cart and leachate water cannon); and
- Bitumen sealing on main access road.

The predicted project extension operational phase particulate emissions for previously identified sensitive receptors are summarised in **Table 2**.

Table 2: Predicted Cumulative PM_{10} at Sensitive Receptors (Project Extension Operational Phase)[1,2]

Receiver	Receiver ID	Maximum Increment ($\mu g/m^3$)	Maximum Background ($\mu g/m^3$)	Total (increment + background) ($\mu g/m^3$)	Impact assessment criteria ($\mu g/m^3$)
R1	Gundagai Bee Farm Pty Ltd	52	39.2	91.2	50
R2	Private Residence	2.2		41.4	
R3	Private Residence	14		53.4	
R4	Private Residence	10		49.2	
R5	Private Residence	19		58.2	
R6	Private Residence	26		65.2	
R7	Private Residence	3.2		42.4	

[1] - The 24 hour PM_{10} predictions represent the project operational phase immediately at the completion of the 40 day creek diversion construction phase, revegetation of Cell 1 and 2 and landfill operation of Cell 3.
[2] - Shaded cells indicate dust exceedance above the 24 hour averaging time criteria.

The modelling results provided in **Table 2** above are based upon Advitech's current understanding of the project extension. There was limited time to compile an accurate mosaic of all functional modes of the project extension and further emissions inventory refinement may result in improved precision of particulate impacts. However, the current modelling does suggest that project extension construction phase activities (i.e. creek diversion, Cell 3 construction, and Cell 4 construction) may result in dust ground level concentrations higher than the increment values listed in **Table 2**.

Greenhouse Gas Emissions

The results of the previous greenhouse gas emissions landfill model indicate a similar range to those anticipated. The previous range of production was 20,000 to 50,000 tonnes per annum and this is now confirmed to be operating at 40,000 tonnes per annum. When Dregs & Grits is included from both Front Storage, and Woodyard Storage, equivalent to an annual total of 75,000 tonnes wet weight, (i.e. 43,422 tonnes dry weight) is used for estimation. While previously default waste type compositions from NGER were used in the previous model, operating compositions could now also be confirmed (paper of Paper Machine Rejects at 30.5% dry weight, and total organic carbon at 3.77% dry weight of the Dregs, Grit, and Lime mud).

Previous landfill model greenhouse gas emissions were estimated to be 45,618.3 over a 10 year period associated with 20,000 tonnes p.a.. Current landfill model greenhouse gas emissions are estimated to be 43,384 tonnes CO_2e for Paper Machine Rejects, and 5,353 tonnes CO_2e for Dregs and Grits (totalling 48,737 tonnes CO_2e - a 6.8% increase from minimum previous range) over a 10 year period associated with 75,000 tonnes p.a. total wet weight, or 43,422 tonnes p.a. dry weight.

Methane emissions produced are estimated to be 1,950 tonnes p.a. over a 10 year period, experiencing a maximum generation of 502.8 tonnes per year. This estimate is based on methane representing a global warming potential 25 times greater than CO_2 (NGER Regulations 2014-15). This multiplier is used in the theoretical landfill model and while it is not designed to estimate gas concentrations for safety or landfill gas risk assessments, this figure could be used as a guide to check relevant associated procedural, or engineered barriers, that may increase the safety of the site.

Apart from the changes to the landfill production and composition, in terms of greenhouse gas impacts, it is not anticipated that there is any other notable change from the previous estimate. The greenhouse gas landfill model results indicate a similar range to those previously found.

Yours faithfully,

Dr Carl Fung

(Odour and Particulate Matter)
Lead Consultant – Environmental Engineering and Sustainability
Advitech Pty Limited

Dr Micah Bell
(Greenhouse Gas Emissions)
Senior Consultant - Sustainable Strategies
Advitech Pty Limited

Job No.: J0160051
Folder No.: F14391
Our Ref: 14391 Gundagai Landfill Air Quality Advice Rev3.docx

ATTACHMENT 4: ADVITECH – NOISE IMPACT ASSESSMENT REPORT – 13/5/2016

advitech

Report

Burra Road Landfill

Noise Impact Assessment

Salvestro Planning

13 May, 2016
Rev 0 (Final)

www.advitech.com.au

advitech environmental

Report Details

Burra Road Landfill - Noise Impact Assessment

Job #: J0160051-00, Folder #: F14391, Revision: 0 (Final), Date: 13 May, 2016

Filename: 14391 BurraRd Landfill NIA Rev0

Prepared For

Salvestro Planning

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History

Date	Revision	Comments
13/05/2016	A	Draft Issue for Review
13/05/2016	0	Final Issue

Endorsements

Function	Signature	Name and Title	Date
Prepared by		Clayton Sparke Senior Environmental Scientist (M.A.A.S)	13 May, 2016
Checked by	for 	Dr Rod Bennison Lead Environmental Scientist	13 May, 2016
Authorised for Release by	for 	Dr Rod Bennison Lead Environmental Scientist	13 May, 2016

EXECUTIVE SUMMARY

M H Earthmoving Pty Ltd (M H Earthmoving) proposes extend the life of an existing solid waste (non-putrescible) landfill facility, located at 303 Burra Road (Lots 472 and 502 DP751421 and Lot 2 DP111917), approximately 3 km northwest of the Gundagai township.

Advitech was engaged to undertake a review of the proposed development, and update the NIA prepared to support the operation of the initial stages of the facility. This update is provided to clarify assessment of potential noise impacts, and assist with the proponent's response to regulator enquiry.

Existing noise criteria were adopted as they are considered to remain relevant to the contemporary assessment. Revised modelling scenarios were constructed, accounting for proposed changes to cell preparation, operational and traffic noise scenarios. Operational phase noise levels were modelled to evaluate impacts associated with internal truck movements for waste transport and dust control, plus operation of mobile plant within the waste emplacement areas. In addition to modelling of activities in new areas (Cell 3 and Cell 4), the model was updated to:

- reflect changes to proposed equipment that will be used within the waste emplacement areas; and
- correct assumptions relating to site boundaries, and the evaluation of vehicle movements on public roads vs. private haul roads.

The assessment indicates that received noise levels will comply with the PSNL at all receiver locations during all operational scenarios.

Updated modelling of cell preparation scenarios indicates that contributions from landfill activities under typical conditions are likely to be below the construction NML of 40dB(A) at all receivers. The differences between working in exposed vs. protected locations are typically greater for works in Cell 4.

Analysis of existing and proposed traffic flows indicates that receivers adjacent to the Burra Road transport corridor are expected to experience noise levels below the relevant guideline for the day period. While road traffic noise levels may be expected to increase slightly under the proposed operational scenario, the increase is less than the +2dB change outlined in the RNP.

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APPENDICES

1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by Salvestro Planning to undertake an assessment of potential noise impacts associated with the proposed redevelopment of an existing landfill near Gundagai, NSW.

It should be noted that this report was prepared by Advitech Pty Limited for Salvestro Planning ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. BACKGROUND AND OBJECTIVES

M H Earthmoving Pty Ltd (M H Earthmoving) proposes to extend the life of an existing solid waste (non-putrescible) landfill facility, located at 303 Burra Road (Lots 472 and 502 DP751421 and Lot 2 DP111917), approximately 3 km northwest of the Gundagai Township (as shown in **Figure 1**).

A Noise Impact Assessment (NIA) was prepared to support the initial Development Application (DA) for the Burra Road landfill facility in 2013 (Advitech, 2013). At that time, a landfill with 2 operational cells was evaluated and granted approval to operate.

In 2015, Advitech was engaged by Salvestro Planning (acting on behalf of MH Earthmoving) to review the 2013 assessment, and provide guidance on potential impacts associated with construction and operation of an additional 2 landfill cells (Cell 3 and Cell4). Advitech understands that this assessment was issued as part of an addendum to an EIS submitted for the project in 2015 (Salvestro Planning, 2015).

Following regulatory review, the NSW Environment Protection Authority (EPA) issued a request for additional information relating to assessment of potential noise impacts. This updated NIA forms part of the proponent's response to these requests.

Noise Impacts

Addendum 1 only considered operational noise impacts. No additional information has been provided in accordance with EPA assessment criteria for construction noise impacts and road traffic noise impacts.

The following information is required by the EPA to enable completion of its assessment of … the DA – the proposed extension to existing waste management facility at 303 Burra Road:

- *Noise impact assessments for the propose development must be undertaken in accordance with the following EPA guidelines:*
  - *Construction noise – Interim Construction Noise Guideline (DECC 2009). The assessment must also include details of all plant, equipment and construction activity for the expected duration of each construction phase for the life of the landfill; and*
  - *Road traffic noise – NSW Road Noise Policy (DECCW, 2011). The assessment must consider all phases of the landfill development and operation along all potentially impacted transport routes*

If the predicted noise levels exceed the relevant noise criteria, then the assessment must proposed all feasible and reasonable mitigation measures to achieve the relevant criteria.

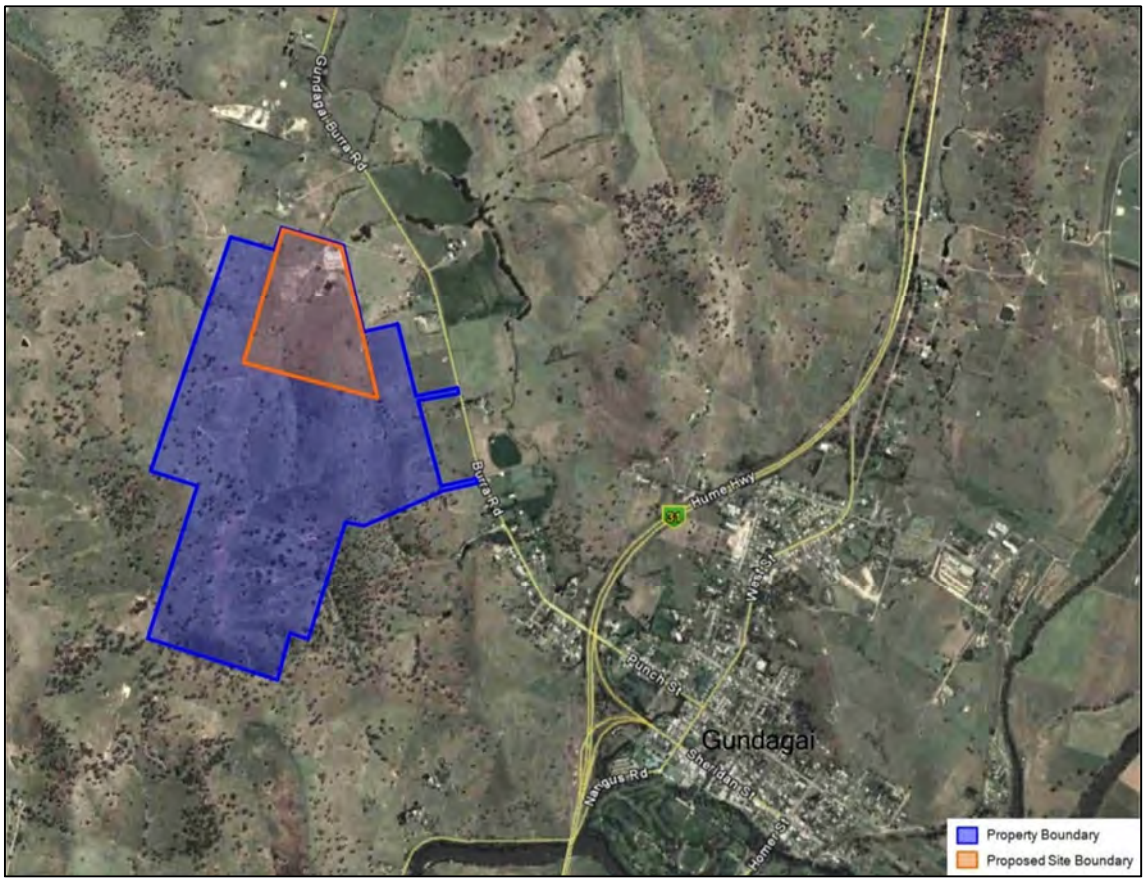

Figure 1: Site location (source: Google Earth)

2.1 Process Description

Advitech Environmental understands that the operator of the landfill facility is proposing to develop Cell 3, which will be located immediately east of existing Cells 1 and 2. Cell 4 will also be progressively developed to the south of Cells 1 and 2. Operations in Cell 3 are planned to commence once the existing cells (Cells 1 and 2) have reached their usable life span, with Cell 4 to be initiated following the closure of Cell 3. The layout of the existing and proposed Cells is provided in **Figure 2**.

2.1.1 Operational Noise

It is proposed that existing and future landfilling activities will continue to operate during the approved hours of 7:00 am to 5:00 pm Monday to Friday and 8:00 am to 1:00 pm Saturday. Waste will be received at the landfill from heavy vehicles entering the site through the existing Burra Road entrance off the Hume Highway. Material is deposited directly into the Cell before being spread and compacted. Material that is won from the preparation of Cell 3 and Cell 4 will be processed and stockpiled for use in periodic capping of the emplaced waste material. Operational activities are expected to comprise noise emissions from the following sources:

- heavy vehicles (truck and dog) bringing waste material to site;
- water cart on internal roadways for dust management;
- front end loader and excavator to manage emplacement of waste.

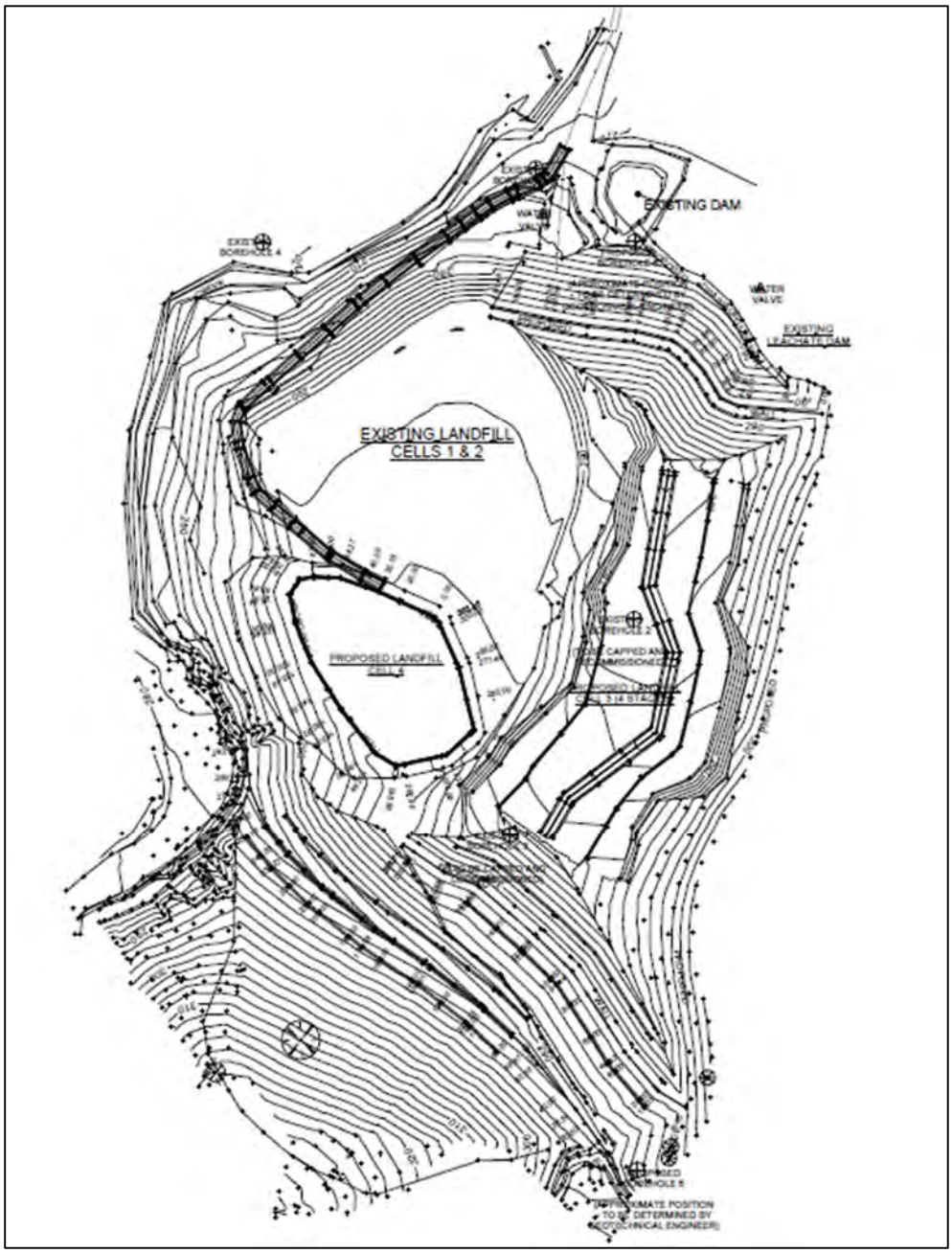

Figure 2: Indicative design plan for Cells 3 and 4

2.1.2 Construction Noise (Cell Preparation)

Construction activities at the site include works to prepare future Cells (Cell 3 and Cell 4) for receipt of waste material:

- Cell 3 will be constructed and operated progressively in 4 stages (Cell 3.1, 3.2, 3.3 and 3.4);
  - preparation for each stage will occur as the current stage approaches capacity;
  - capping and closure of complete stages will occur as operations shift into the next stage;
- Cell 4 will be constructed and operated in a single stage.

- preparation will commence as operational Stage 3.4 approaches capacity; and
- capping and closure will occur when the Cell reaches capacity.

In addition to these preparation works, earthworks are required ahead of Stage 3 in order to construct a creek diversion. Construction and preparation activities are expected to utilise the following noise generating equipment:

- heavy vehicles transporting impervious material (clay lining and capping) to site;
- water cart on internal roadways for dust management;
- front end loader and excavator to manage emplacement of waste and capping material;
- shaping works to be undertaken using dozer and roller;
- crushing of excavated material to yield product suitable for capping;
- drilling as required for preparation of blasts.

A full list of noise generating plant and activities relevant to the construction phase of the project is provided in **Section 4**.

2.1.3 Road Traffic Noise

It is understood that vehicle movements generated by the development would typically access the site from Gundagai via Burra Road. Heavy vehicle movements generated by the development would be comprised of transport of both waste, and clay material required for lining and capping of cells.

2.2 Assessment Methodology

The New South Wales (NSW) *Industrial Noise Policy* (INP, 2000) provides a procedure for the assessment of potential noise impacts associated with industrial (premises based) activities in NSW. In addition to the INP, this assessment will evaluate potential construction phase noise impacts in accordance with the Interim Construction Noise Guideline (ICNG, 2009), and traffic noise impacts in accordance with provisions of the NSW Road Noise Policy (RNP, 2011).

Given that the proposal relates to proposed expansion of an existing development, this assessment will reference information from the original NIA where it remains relevant to the current proposal. For the purposes of this assessment:

- all noise criteria established in the previous NIA (Advitech, 2013) will be adopted to assist in evaluation of impacts associated with the contemporary proposal. The noise criteria relevant to this assessment are summarised in **Section 3**;
- the current assessment will build on the existing noise model (and modelling assumptions), but will be updated to ensure that the inventory of noise generating plant and processes is representative of the proposed operations. Modelling will be used to evaluate impacts associated with both operational and construction phase activities, as well as road traffic noise. Discussion of noise modelling construction and assumptions is provided in **Section 4**;

While this approach seeks to reference existing assessment, this NIA is constructed in such a way as to enable it to be read as a stand-alone assessment of the contemporary proposal. No assessment of the existing development is presented, as those activities are considered to be subject to an existing approval.

3. ASSESSMENT CRITERIA

Noise monitoring was conducted as part of the previous NIA (Advitech, 2013) to assist in characterising the existing noise environment, and to evaluate Rating Background Levels (RBL) for receiving environments adjacent to the proposed development. The RBL is referenced in the determination of both Project Specific Noise Level (PSNL) goals for operational noise, and Noise Management Levels (NML) for construction noise activities.

The existing NIA identified that the RBL for receiving environments adjacent to the Burra Road landfill were less than 30dB(A) during the day period. In accordance with guidance established in Section 3.1.2 of the INP, the RBL was set at a level equal to 30dB(A). As the contemporary development does not propose any change to operating hours, these findings remain relevant, and the RBL and related noise goals are adopted for this assessment.

3.1 Operational Stage Criteria

The NSW INP (2000) provides a framework for the assessment of intrusive noise, as well as potential industrial noise impacts on the amenity of a receiving noise environment. On the basis of long term background noise monitoring, the previous NIA derived both intrusiveness and amenity noise goals for the receiving environment adjacent to the Burra Road landfill. The applicability of these goals was evaluated in accordance with provisions of the INP; the intrusiveness goal was found to be the most stringent criterion, and was adopted at the PSNL for the development.

The intrusiveness, amenity and PSNL goals from the existing NIA are reproduced in **Table 1**. For the purposes of this assessment, the PSNL remain relevant and are adopted as relevant criteria for assessment of potential impact.

Table 1: Operational noise goals, dB(A)

Location	Criteria	Day Period (7:00 to 18:00)
Adjacent Rural Receivers	Intrusiveness Criteria ($L_{Aeq,15minute}$)	35
	Amenity Criteria ($L_{Aeq,11hour}$)	50
	Project Specific Noise Level ($L_{Aeq,15minute}$)	35

3.2 Construction Stage Criteria

The existing assessment evaluated potential noise impacts associated with short term construction works against NMLs derived in accordance with the provisions of the ICNG (2009). Construction activities evaluated as part of the existing NIA included construction of roads, cell lining, water management and leachate dams.

Similarly, the contemporary NIA will evaluate potential impacts associated with intermittent works for construction of new cells, closure of old cells, creek diversion earthworks and blast preparation the same way. On this basis, NMLs determined as part of the existing NIA are adopted for the contemporary assessment. These NMLs are reproduced in **Table 2**.

Table 2: Construction Noise Management Levels (NML), $L_{Aeq,15minute}$

Location	Period / Management Level	NML, dB(A)
Adjacent Receivers	Standard Work Hours	40
	Non-standard Work Hours	35
	Highly Noise Affected	75

3.3 Traffic Noise Criteria

The NSW RNP (2011) provides a framework for the management of noise issues associated with road traffic from existing roads, new road projects, road redevelopment projects and new traffic-generating developments. The primary aim of the RNP is to provide assessment criteria for road traffic noise based on protecting amenity and wellbeing.

The assessment criteria for affected residences are applied to particular types of road project, road categories and land uses. The criterion reproduced in **Table 3** is adopted from the existing NIA, and is considered suitable for assessment of traffic noise impacts associated with the contemporary operation. Calculated contributions from landfill related road traffic noise may be compared against road traffic noise management levels to assist with evaluation of potential project related impacts.

Table 3: Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project / Land Use	Assessment Criteria - dB(A)	
		Day 7am - 10pm	Night 10pm - 7am
Sub-Arterial Roads	1. Existing residences affected by noise from new road corridors.	$L_{Aeq, (15hour)}$ 60 (external)	$L_{Aeq, (9hour)}$ 55 (external)
	2. Existing residences affected by noise from redevelopment of existing roads.	Limit increases to < existing level +2dB	
	3. Existing residences affected by additional traffic on existing roads generated by land use developments.		

4. PREDICTED NOISE LEVELS

A model of the proposed construction, operational noise and traffic noise scenarios, and adjacent sensitive receivers was constructed using the Predictor (Type7810) environmental noise modelling software. Predictor is an environmental noise mapping package that facilitates calculation of noise impacts, accounting for source receiver relationships, terrain and meteorological affects. To assess the noise impacts, impact predictions provided by the noise modelling are presented against the relevant noise criteria.

If modelling results indicate that relevant noise criteria may be exceeded, feasible and reasonable noise mitigation strategies may be designed and assessed for the proposed development.

4.1 Sensitive Receivers

Review of the existing NIA indicates that there are four potentially sensitive receivers adjacent to the proposed landfill facility that may be adversely affected by site based operational and construction noise. The location of these receivers is provided in **Figure 3.**

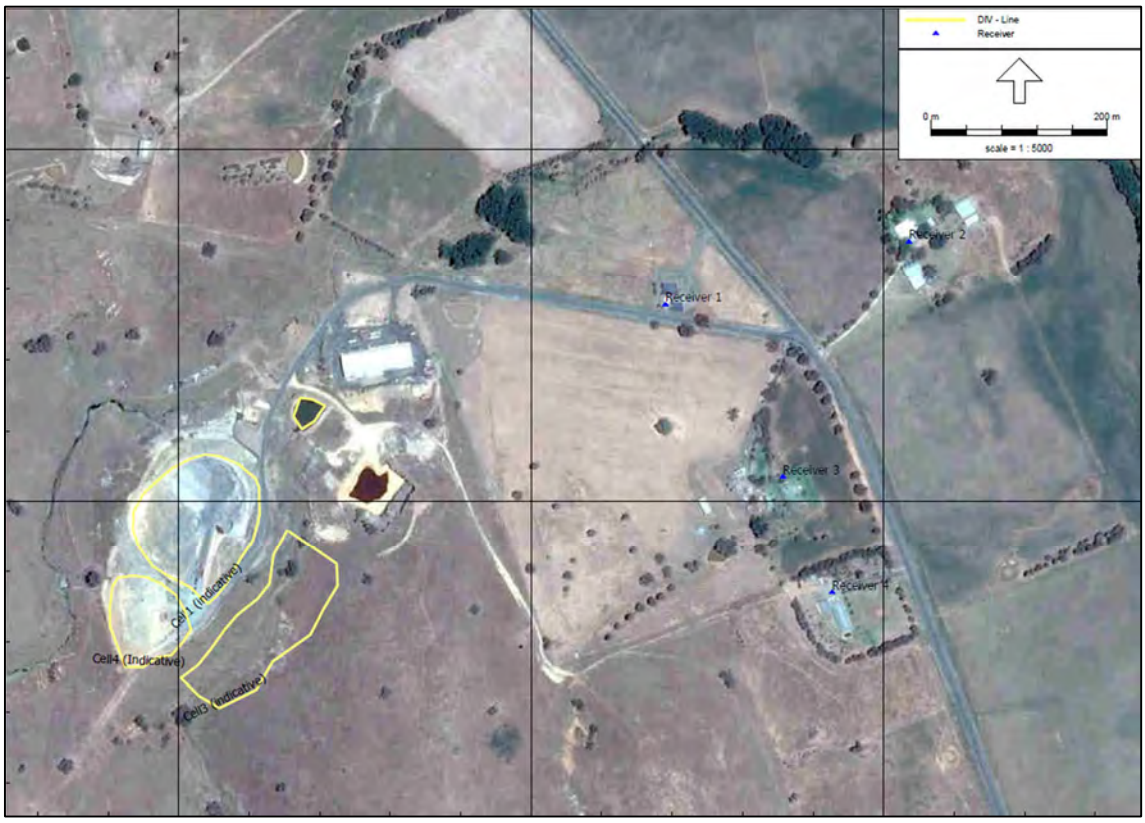

Figure 3: Sensitive receiver locations adjacent to project site

Further review was undertaken to identify potentially sensitive receivers that may be exposed to project related road traffic noise. The location of these receivers along the proposed Burra Road access route is provided in **Figure 4**.

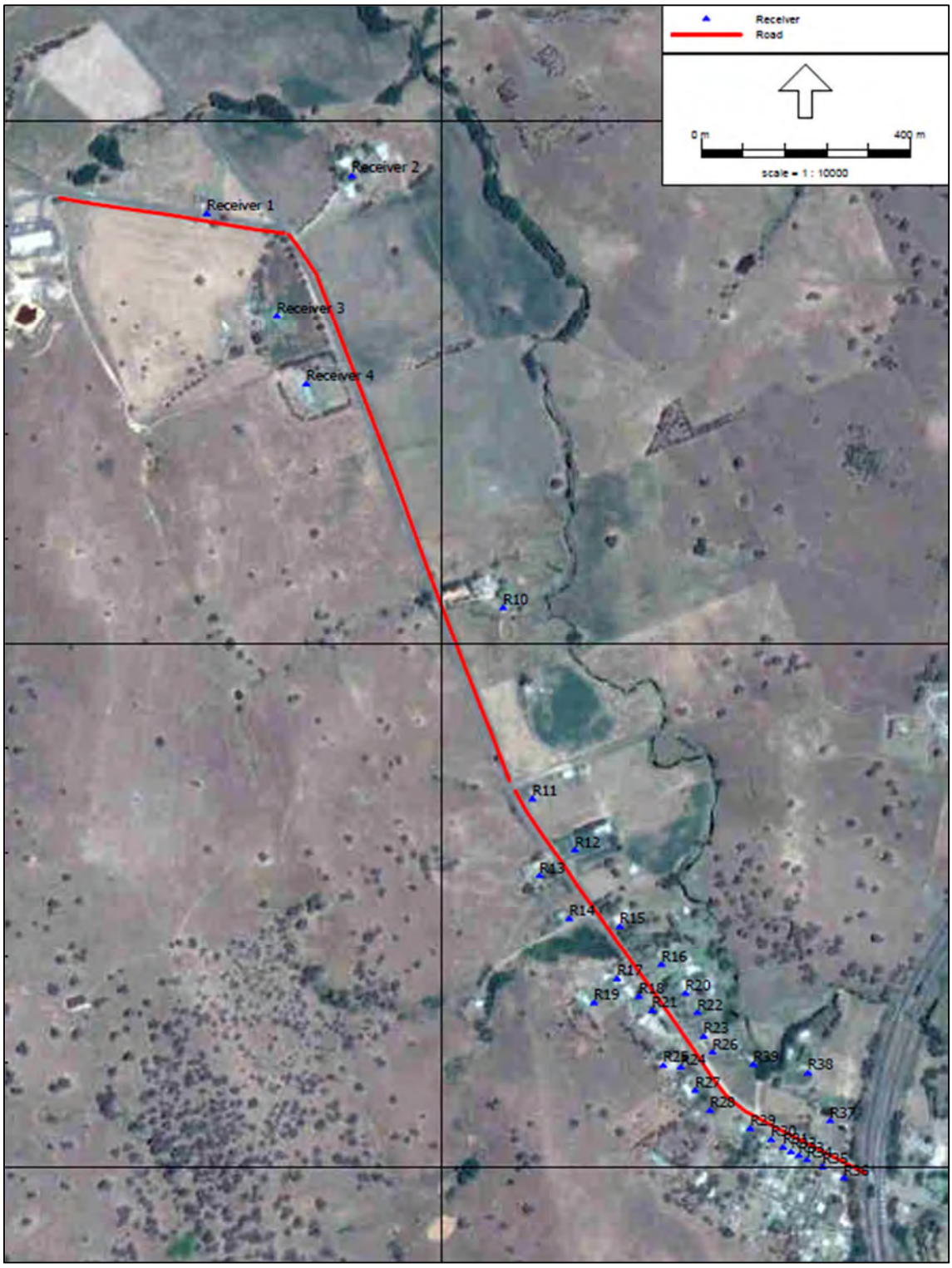

Figure 4: Sensitive receiver locations adjacent to access route

4.2 Operational Stage Noise Sources

A model of operational noise impacts was constructed using the ISO9613 calculation method within Predictor. A summary of SWL for plant utilised during operational phase activities are shown in **Table 4**. A detailed inventory of operational stage plant is provided in **Appendix I**.

Table 4: Operational stage noise sources

Plant Description	Description of Utilisation	SWL, dB(A)
Heavy Vehicle (Truck & Dog)	Waste transport to site	107
Water Cart	Manage dust on internal roads	107
Front End Loader	Waste emplacement	104
Excavator	Waste emplacement	106

Four separate operational scenarios were modelled in order to evaluate potential noise impacts over the life of the proposed project. These include:

- waste emplacement in Cell 3 at protected locations (excavator and loader operations at bottom of cell, at least 5m below natural surface levels);
- waste emplacement in Cell 3 at exposed locations (excavator and loader operations at exposed locations close to natural surface levels);
- waste emplacement in Cell 4 at protected locations (excavator and loader operations at bottom of cell, at least 5m below natural surface levels); and
- waste emplacement in Cell 4 at exposed locations (excavator and loader operations at exposed locations close to natural surface levels).

While it is acknowledged that waste emplacement activities will move about each Cell depending on the stage of its life, sources were modelled in a single location representative of expected worst case impacts. The waste emplacement activities (excavator and loader) were located:

- towards the north and east extent of Cell3; and
- centrally in Cell 4.

The location of each noise source is provided in the results presentation in **Appendix II**. Heavy vehicle access and water cart usage on internal roadways were included in all modelling scenarios. In lieu of detailed survey data outlining the proposed shape and depth of each Cell, a 5m barrier was placed around equipment whilst working at natural surface height to emulate the effects of working at protected locations close to the bottom of an active cell.

4.3 Construction Stage Noise Sources and Activities

Construction stage works are likely to comprise several discrete sets of activities, each of which is outlined in further detail below. A summary of SWL for plant utilised as part of site preparation is shown in **Table 5**. A detailed inventory of operational stage plant is provided in **Appendix I**.

Table 5: Construction stage noise sources

Plant Description	Description of Utilisation	SWL, dB(A)
Heavy Vehicle (Truck & Dog)	Transport clay Cell lining to site	107
Water Cart	Manage dust on internal roads	107
Vibratory Roller	Prepare final surfaces	108
D8R Dozer	Earthworks and shaping	112
Crushing Plant	Crush material won during Cell excavation for use in capping closed Cells	109
Drill Rig	Prepare working areas for blasting (as required)	111
Front End Loader	Moving won material about operation during cell preparation	104
Excavator	Moving won material about operation during cell preparation	106

Several activity scenarios were modelled in order to evaluate potential noise impacts associated with preparation and closure works required by the project. These include:

- preparation works for Cell 3. As with the operational stage assessment, and in order to evaluate potential impacts associated with both opening and closure of cells, sources were modelled at both protected (bottom of excavated cell) and exposed (natural surface) locations. Variants of these scenarios were modelled with and without rock crushing;
- preparation works for Cell 4. As with the operational stage assessment, and in order to evaluate potential impacts associated with both opening and closure of cells, sources were modelled at both protected (bottom of excavated cell) and exposed (natural surface) locations. Variants of these scenarios were modelled with and without rock crushing;
- earthworks associated with creek diversion prior to preparation of Cell 3; and
- drilling as may be required to prepare cell areas for blasting. It is noted that this assessment seeks only to evaluate the potential impact associated with airborne noise from blast preparation activities. Detailed assessment of air blast overpressure and ground vibration is addressed as part of a separate study.

While it is acknowledged that waste emplacement activities will move about each Cell depending on the stage of its life, sources were modelled in a single location representative of expected worst case impacts. As with the operational stage assessment, noise sources were generally located:

- towards the north and east extent of Cell3; and
- centrally in Cell 4.

The location of each noise source is provided in the results presentation in **Appendix II**. Heavy vehicle access and water cart usage on internal roadways were included in all modelling scenarios. In lieu of detailed survey data outlining the proposed shape and depth of each Cell, a 5m barrier was placed around equipment whilst working at natural surface height to emulate the effects of working at protected locations close to the bottom of an active cell.

Due to the nature of the preparation works, it is anticipated that works will be staged such that the construction equipment listed above will not all be operating simultaneously. It should also be noted that during any given period, the equipment items to be used in the project area will operate at maximum sound power levels for only brief stages. Notwithstanding this, noise modelling of each scenario assumes that all equipment is operating simultaneously in any 15 minute assessment period.

4.4 Road Traffic Noise Modelling

Advitech understands that during 'typical' operating conditions, the proposed Burra Road landfill facility will receive heavy vehicles transporting both waste for emplacement, and impervious clay material required for preparation and capping of the waste cells. These vehicles will reach the site via Burra Road, and it is anticipated that 24 movements would be generated each day.

A road traffic noise model was constructed using the Predictor (Type7810) calculation software and the Calculation of Road Traffic Noise (CoRTN) methodology. In lieu of traffic noise monitoring data, two modelling scenarios were constructed to evaluate Road traffic noise impacts at receivers along Burra Road associated with:

- existing traffic flows; and
- existing traffic flows plus HV movements created by the proposed development.

Information provided by Salvestro Planning indicates that the Average Annual Daily Traffic (AADT) for Burra Road is approximately 700 vehicles. In order to evaluate the distribution of vehicle flows across the day and night periods, classified vehicle count data from nearby Gocup Road (Station #94176, 1.19km East of Readfords Rd, South Gundagai, 2011) was sourced from the NSW Roads and Maritime Services (RMS) Traffic Volume Viewer database (RMS, 2016).

This site was assumed to be representative of diurnal variation in traffic flows on roads in the area, and trends from this site were used to evaluate vehicle flows and compositions for the $L_{Aeq,15hour}$ day period (7:00 to 22:00, as defined in the RNP). Assessment is restricted to the potential impact that landfill traffic may have on day period noise levels, as the development does not operate during the night.

The results of this analysis were used to construct the 'existing case' traffic noise model. The additional movements proposed as part of the landfill development were assumed to be distributed evenly throughout the day, and added to the existing flow rates to provide input for the 'existing + landfill' traffic noise model. A summary of the traffic modelling assumptions is included in **Table 6**.

Table 6: Traffic noise model input data

Hour of Day	Flow Rate	Proportion Heavy Vehicle
7:00 to 8:00	39	21%
8:00 to 9:00	51	21%
9:00 to 10:00	52	21%
10:00 to 11:00	51	22%
11:00 to 12:00	53	24%
12:00 to 13:00	51	23%
13:00 to 14:00	51	22%
14:00 to 15:00	52	21%
15:00 to 16:00	63	20%
16:00 to 17:00	61	18%

Burra Road was modelled as three separate sections of road to account for three distinct speed zones along the access route. Traffic was assumed to travel at the sign posted speed limits of:

- 50km/hr for approximately the first 1.0km of the route, heading northwest along Burra Road from the Hume Hwy;
- 100km/hr for approximately the next 1.5km, until the route bears towards the west and leaves Burra Road; and
- 60km/hr for the remaining route between Burra Road and the landfill access gate.

The road surface was assumed to be constructed of bitumen, and traffic was conservatively modelled with multiple source heights representative of light (RL+0.5m) and heavy vehicles (RL+1.5 engine noise, RL+3.6 exhaust noise) given the relatively high proportion of heavy vehicle movements. All impact predictions were modelled at a height of RL+1.5m, and assumed a +2.5dB correction for façade incident noise levels was applied.

5. MODELLING RESULTS

5.1 Operational Noise Levels

The predicted worst case $L_{Aeq,15minute}$ noise levels at the nearest sensitive receivers associated with typical operational activities are provided in **Table 7**. Noise level contours for each of the operational stage scenarios are provided in **Appendix II**.

Table 7: Noise impact predictions, operational stage ($L_{Aeq,15minute}$ dB(A))

Scenario	Area	Receiver Location			
		R1	R2	R3	R4
Waste Emplacement (Exposed Location)	Cell 3	33	<30	<30	<30
Waste Emplacement (Protected Location)	Cell 3	33	<30	<30	<30
Waste Emplacement (Exposed Location)	Cell 4	35	<30	<30	<30
Waste Emplacement (Protected Location)	Cell 4	33	<30	<30	<30
Project Specific Noise Level		**35**	**35**	**35**	**35**

The results of noise modelling indicate that contributions from landfill activities under typical operational conditions are likely to be below the PSNL of 35dB(A) at all receivers. While review of the existing NIA suggests that predicted contributions had previously been evaluated at significantly higher levels, it must be noted that several key assumptions have changed, including:

- slightly different equipment is proposed for use; and
- the point at which the access road changes from public road to a private haul road has changed, which significantly reduces the exposure of receiver R1 to site-based emissions from heavy vehicle access to the site.

The results also indicate that relatively small change in Sound Pressure Levels (SPL) may be expected where waste emplacement activities are working at protected locations towards the bottom of the Cell. Review of detailed monitoring results (of individual source contributions) suggests that:

- despite significant reductions from the previous NIA, internal truck and water cart movements remain the dominant contributor to SPLs at Receiver 1; and
- the natural terrain appears to provide reasonable protection against noise propagation to receivers R2 to R4 when equipment is working in the approximate location of Cell 3.

5.2 Construction Noise Levels

The predicted worst case $L_{Aeq,15minute}$ noise levels at the nearest sensitive receivers associated with typical cell preparation activities are provided in **Table 8**. Noise level contours for each of the operational stage scenarios are provided in **Appendix II**.

Table 8: Noise impact predictions, cell preparation activities ($L_{Aeq,15minute}$ dB(A))

Scenario	Area	Receiver Location			
		R1	R2	R3	R4
Creek Diversion Earthworks	Near Cell 3	37	31	30	<30
Creek Diversion Earthworks, with Rock Crushing	Near Cell 3	38	32	30	<30
Cell Preparation (Exposed Location)	Cell 3	37	31	30	<30
Cell Preparation (Protected Location)	Cell 3	37	31	<30	<30
Cell Preparation (Exposed Location)	Cell 4	39	33	33	<30
Cell Preparation (Protected Location)	Cell 4	37	<30	<30	<30
Cell Preparation (Exposed Location), with Rock Crushing	Cell 3	38	32	30	<30
Cell Preparation (Protected Location), with Rock Crushing	Cell 3	38	32	30	<30
Cell Preparation (Exposed Location), with Rock Crushing	Cell 4	40	34	34	<30
Cell Preparation (Protected Location), with Rock Crushing	Cell 4	37	<30	<30	<30
Blast Preparation (Drilling) (with Operations in Cell 1&2)	Cell 3	36	<30	<30	<30
Blast Preparation (Drilling) (with Operations in Cell 3)	Cell 4	37	<30	<30	<30
Noise Management Level		**40**	**40**	**40**	**40**

The results of noise modelling indicate that contributions from landfill activities under typical cell preparation conditions are likely to be below the construction NML of 40dB(A) at all receivers. The results also indicate that only relatively small changes in SPL may be expected where activities are located in more protected locations. The differences between working in exposed vs protected locations are typically greater for works in Cell 4.

It should be noted that model predictions are based on the worst case conditions over each 15 minute period. It was assumed that construction equipment operated at maximum capacity for the entirety of that 15 minute period. During any given period, the equipment items to be used in the project area will operate at maximum sound power levels for only brief stages. At other stages, the equipment may produce lower sound levels while carrying out activities not requiring full power.

5.3 Traffic Noise Levels

Modelling was conducted for day period scenarios, as the project will not generate additional traffic during the night period. In lieu of measurement data to evaluate existing levels of road traffic noise, modelling of both the existing and proposed increase in vehicle volumes is presented to assist evaluating potential road noise impacts.

To understand the range of impact predictions and potential sensitivity of the assessment, analysis of impact predictions at 34 receiver locations adjacent to Burra Road is presented. Summary analysis of the distribution of impact predictions are provided in **Figure 5**.

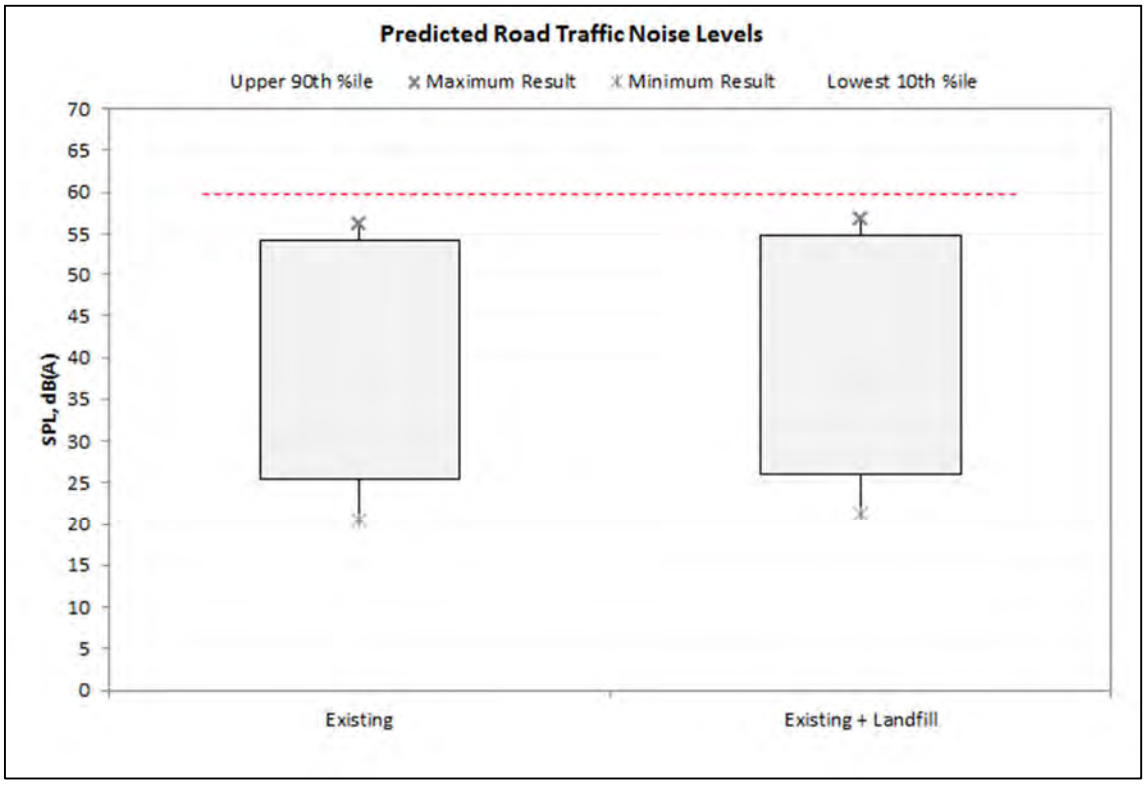

Figure 5: Range of impact predictions at road noise affected receivers ($L_{Aeq,15hour}$)

This analysis indicates that:

- the maximum $L_{Aeq,15hour(Day)}$ road traffic noise impact prediction was in the order of 57dB(A);
- 90% of receivers are predicted to experience road traffic noise levels less than 55dB(A);
- the median impact prediction was in the order of 40dB(A).

Assessment of worst case impact predictions against the road noise criteria is provided in **Table 9**.

Table 9: Calculated road traffic noise levels, $L_{Aeq,15hour}$ dB(A)

Scenario	Result	Existing Traffic, dB(A)	Existing Traffic + Construction Traffic, dB(A)	Increase on Existing Case
Day Period $L_{Aeq,15hour}$	Maximum	56	57	+0.6
	90th%ile	54	55	+0.6
	50th %ile	39	41	+1.9
Road Noise Criteria		**60**	**60**	**<+2**

The results of this analysis indicate that existing levels of road noise (based on modelling assessment and historical traffic count data) were evaluated to be below guidance exposure levels for receivers adjacent to this type of road. Modelling also suggests that while noise levels may be expected to increase when landfill generated traffic is added to the existing traffic flows, this increase is less than 1dB(A) at receivers most affected by traffic noise, and less than 2dB(A) at receivers with significantly lower exposures.

6. DISCUSSION AND CONCLUSION

M H Earthmoving Pty Ltd (M H Earthmoving) proposes to extend the life of an existing solid waste (non-putrescible) landfill facility, located at 303 Burra Road (Lots 472 and 502 DP751421 and Lot 2 DP111917), approximately 3 km northwest of the Gundagai township.

Advitech was engaged to undertake a review of the proposed development, and update the NIA prepared to support the operation of the initial stages of the facility. This update is provided to clarify assessment of potential noise impacts, and assist with the proponent's response to regulator enquiry. Existing noise criteria were adopted as they are considered to remain relevant to the contemporary assessment. Revised modelling scenarios were constructed, accounting for proposed cell preparation, operational and traffic noise scenarios.

6.1 Operational Noise Levels

Operational phase noise levels were modelled to evaluate impacts associated with internal truck movements for waste transport and dust control, plus operation of mobile plant within the waste emplacement areas. In addition to modelling of activities in new areas (ie Cell 3 and Cell 4), the model was updated to:

- reflect changes to proposed equipment that will be used within the waste emplacement areas; and
- correct assumptions relating to site boundaries, and the evaluation of vehicle movements on public roads vs. private haul roads.

The assessment indicates that received noise levels will comply with the PSNL at all receiver locations during all operational scenarios. These results suggest that noise levels at Receiver R1 may approach the PSNL when plant is operated at exposed locations in Cell 4.

6.2 Construction Noise Levels

The results of noise modelling indicate that contributions from landfill activities under typical cell preparation conditions are likely to be below the construction NML of 40dB(A) at all receivers. The results also indicate that only relatively small changes in SPL may be expected where activities are located in more protected locations. The differences between working in exposed vs. protected locations are typically greater for works in Cell 4.

6.3 Traffic Noise Levels

Analysis of existing and proposed traffic flows indicates that receivers adjacent to the Burra Road transport corridor are not expected to experience noise levels above the guideline $L_{Aeq,15hour}$ value for the day period. While road traffic noise levels may be expected to increase slightly under the proposed operational scenario, the increase is less than the +2dB change outlined in the RNP.

7. REFERENCES

The following information was used in the preparation of this report:

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2. AS 2436-2010: *Guide to noise and vibration control on construction, demolition and maintenance sites*.
3. AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values;*
4. NSW Department of Environment and Climate Change (2009). *Interim Construction Noise Guideline*, Department of Environment and Climate Change, Sydney*;*
5. NSW Department of Environment, Climate Change and Water (2011), *NSW Road Noise Policy,* Department of Environment, Climate Change and Water, Sydney.
6. NSW Environment Protection Agency (2000). *NSW Industrial Noise Policy*, NSW Environment Protection Agency, Sydney;
7. Roads and Maritime Services NSW (2015). *Noise and vibration management sub-plan, Nambucca Heads to Urunga*;
8. Roads and Maritime Services NSW (2016). *Traffic Volume Viewer*, accessed 16/5/2016 at http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/index.html;
9. Salvestro Planning (2015). *Environmental Impact Statement: Proposed Extension to Existing Waste Management Facility (Class 2 Solid Landfill), 303 Burra Road Gundagai*, Revision D dated 18/12/2015; and
10. UK Department of Environment, Food and Rural Affairs (2005), *Update of noise database for prediction of noise on construction and open sites,* UK Department of Environment, Food and Rural Affairs, Norwich.

Appendix I

Modelling Assumptions

Assumptions of the Model

Key assumptions of the model include:

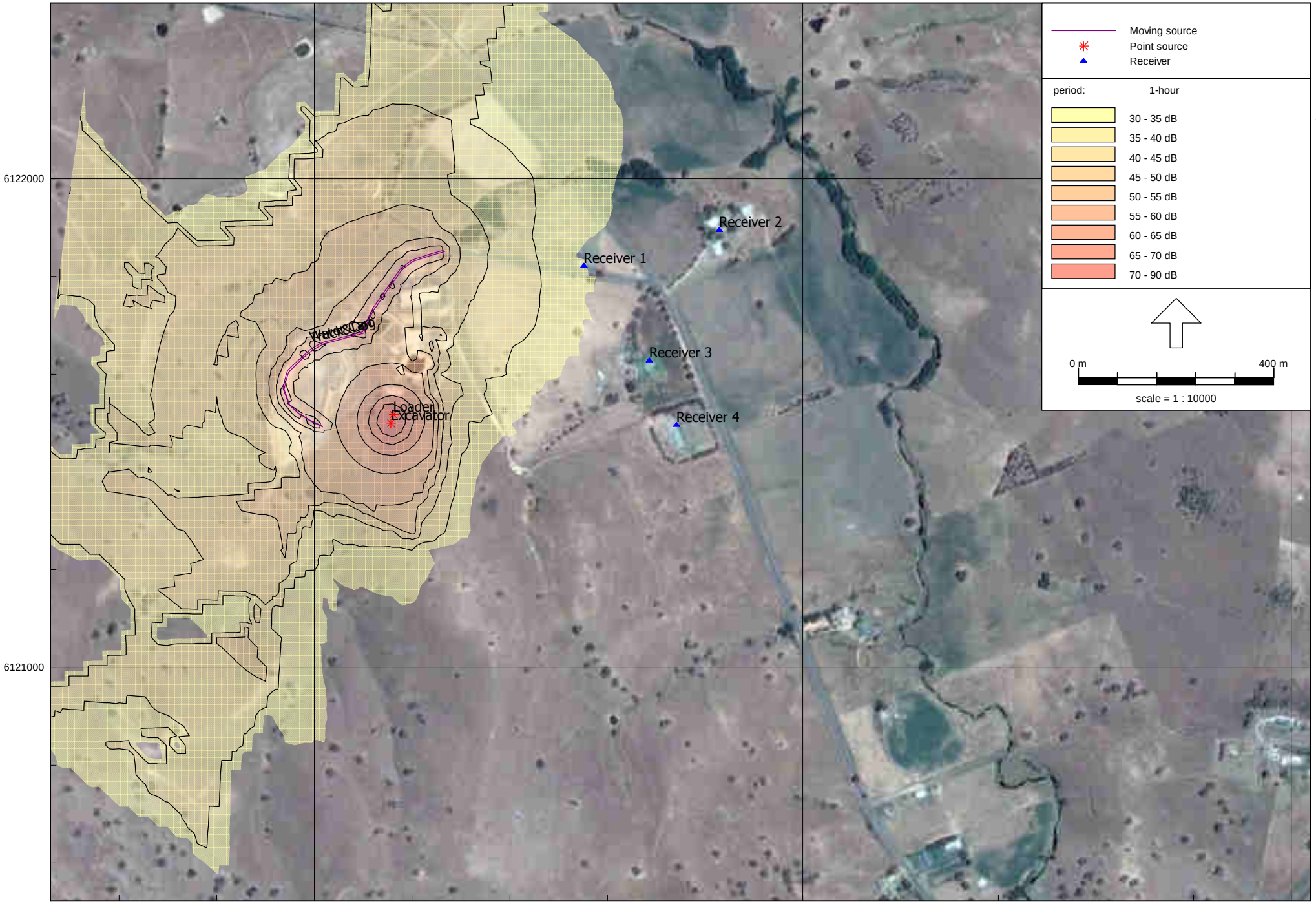
- heavy vehicles accessing the facility were modelled as moving sources, mobile plant and earthmoving equipment were modelled as point sources;
- sound power levels (SWLs) for all sources were time weighted based on usage estimates. Usage estimates were assumed to be 100% for all items of plant:
- SWLs for mobile plant derived from the DEFRA database are calculated from unweighted octave band sound pressure level (SPL);
- all sources were deemed to operate at their maximum assumed noise levels for the duration of the assessment period;
- all sources for each modelling scenario were deemed to operate concurrently;
- simultaneous operational and site preparation scenarios were not assessed, as some items of plant are required for both of these activities. On this basis, it was not considered that operation of the waste emplacement would occur concurrently with Cell preparation or other major earthworks;
- the operational and blast preparation (drilling) scenarios were assumed to operate concurrently, as it is considered that blast drilling would require engagement of a specialist contractor;
- given the close location and similarity of the proposed activities, modelling results for exposed works at Cell 3 were assumed representative of the earthworks associated with the Creek Diversion;
- due to the proximity and location of the nearby sensitive receivers to the works areas, neutral meteorological conditions were assumed for each of the modelling scenarios. A single C-value (C=5.0) was applied to all models. All models assumed an ambient air temperature of 10degrees Celsius and 60% relative humidity;
- default ground absorption factors were used;
- these are considered to represent conservative assumptions, and the modelling results represent the upper limit of expected noise levels.

Table IV-1: Noise generating activities and associated Sound Power Levels (SWL), L_{Aeq} (dB(A))

Stage	Major Equipment	Source RL (m)	SWL, dB(A)	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Operation	Truck & Dog	+1	107	70	78	93	92	102	103	97	84
	Water Cart	+1	107	81	88	98	100	102	102	95	87
	Excavator (40t/200kw)	+2	106	75	93	94	101	101	99	94	87
	Loader (20t/180kw)	+2	104	84	94	90	98	97	96	95	85
Cell Preparation	Truck & Dog	+1	107	70	78	93	92	102	103	97	84
	Water Cart	+1	107	81	88	98	100	102	102	95	87
	Excavator (40t/200kw)	+2	106	75	93	94	101	101	99	94	87
	Loader (20t/180kw)	+2	104	84	94	90	98	97	96	95	85
	Rock Crusher (80-250tph)	+2	109	95	98	98	106	103	100	95	86
	Drill Rig	+1	111	85	103	95	102	106	106	103	99
	D8R Dozer	+2	112	78	92	102	106	109	105	99	90

Appendix II

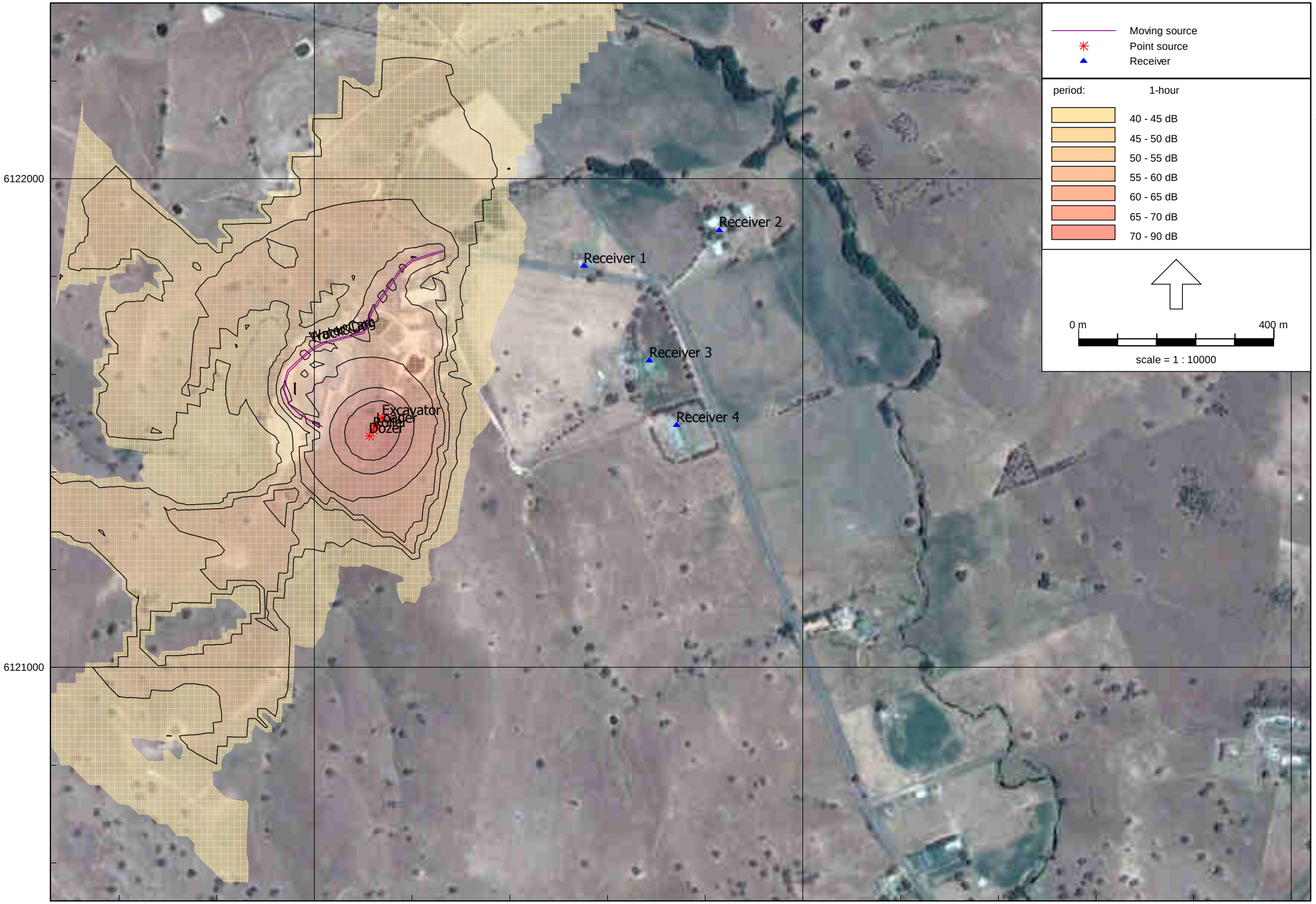
Predicted Noise Contours



Industrial noise - ISO 9613.1/2, [Operations - Operations (exposed)(Cell 3)] , Predictor V8.11

Impact Predictions
Published 13 May, 2016

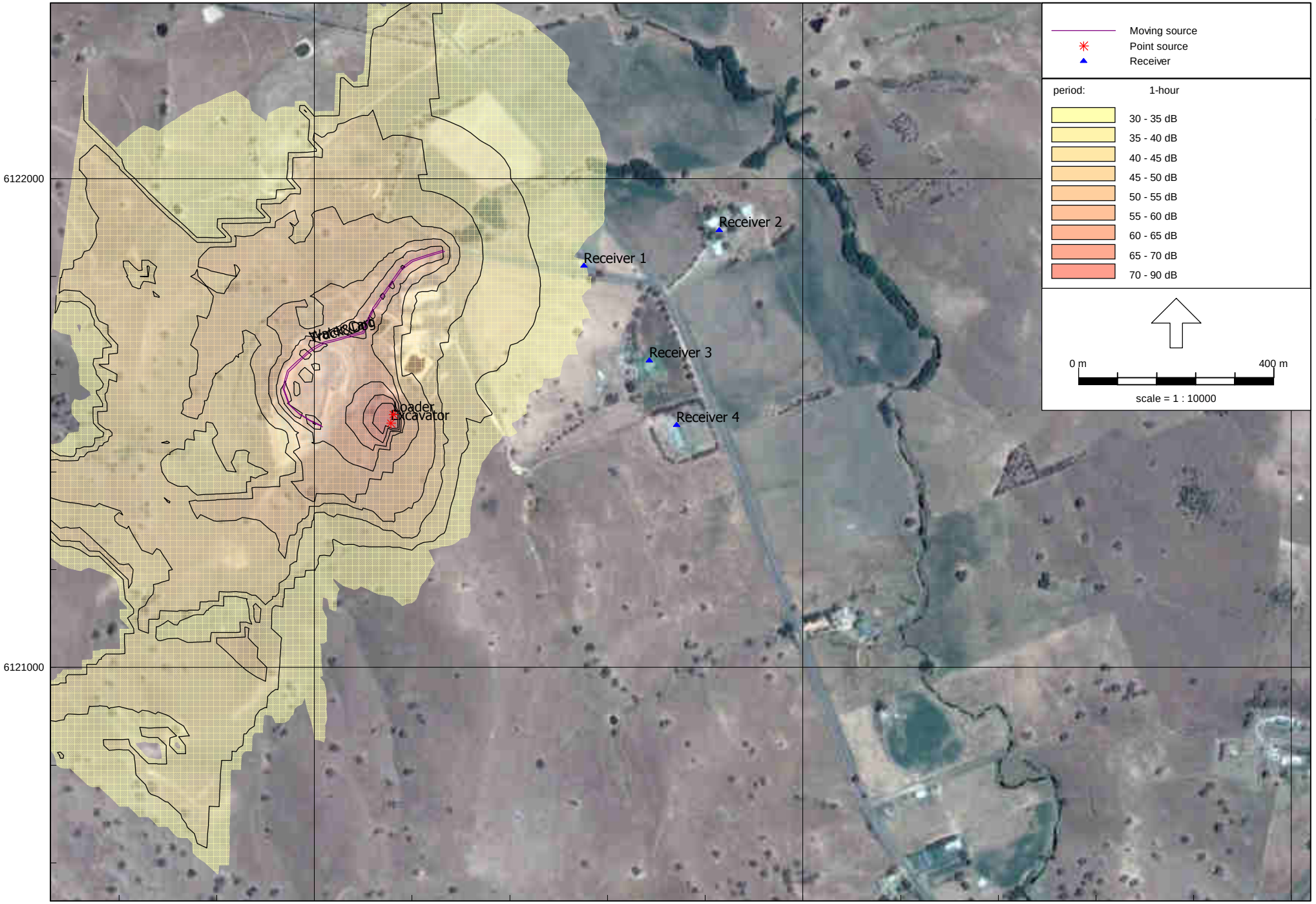
Advitech Environmental Pty Ltd



Impact Predictions
Published 13 May, 2016

Industrial noise - ISO 9613.1/2, [Construction - Construction (Exposed) (Cell 3)] , Predictor V8.11

Advitech Environmental Pty Ltd



Industrial noise - ISO 9613.1/2, [Operations - Operations (protected)(Cell 3)] , Predictor V8.11

Impact Predictions
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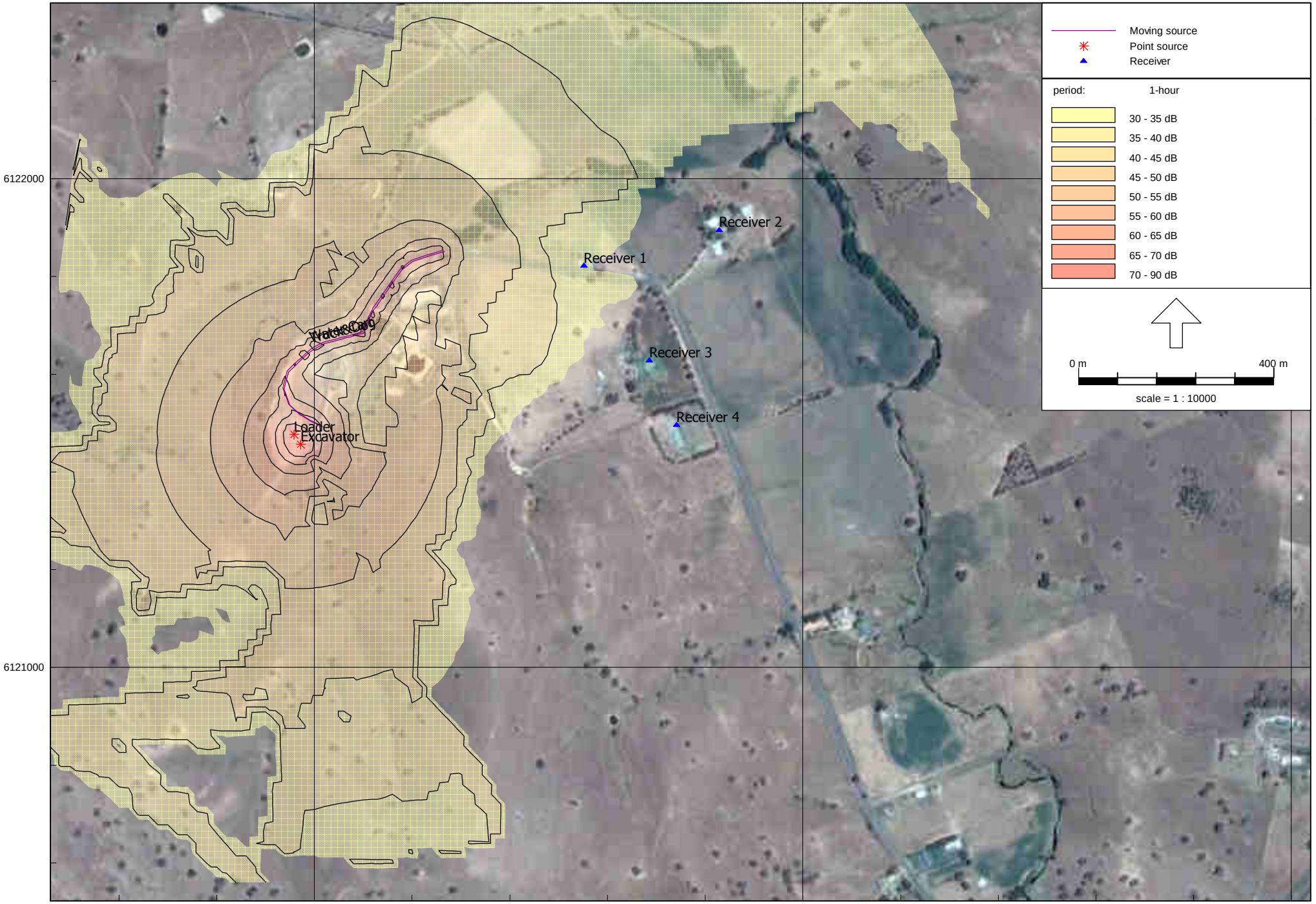
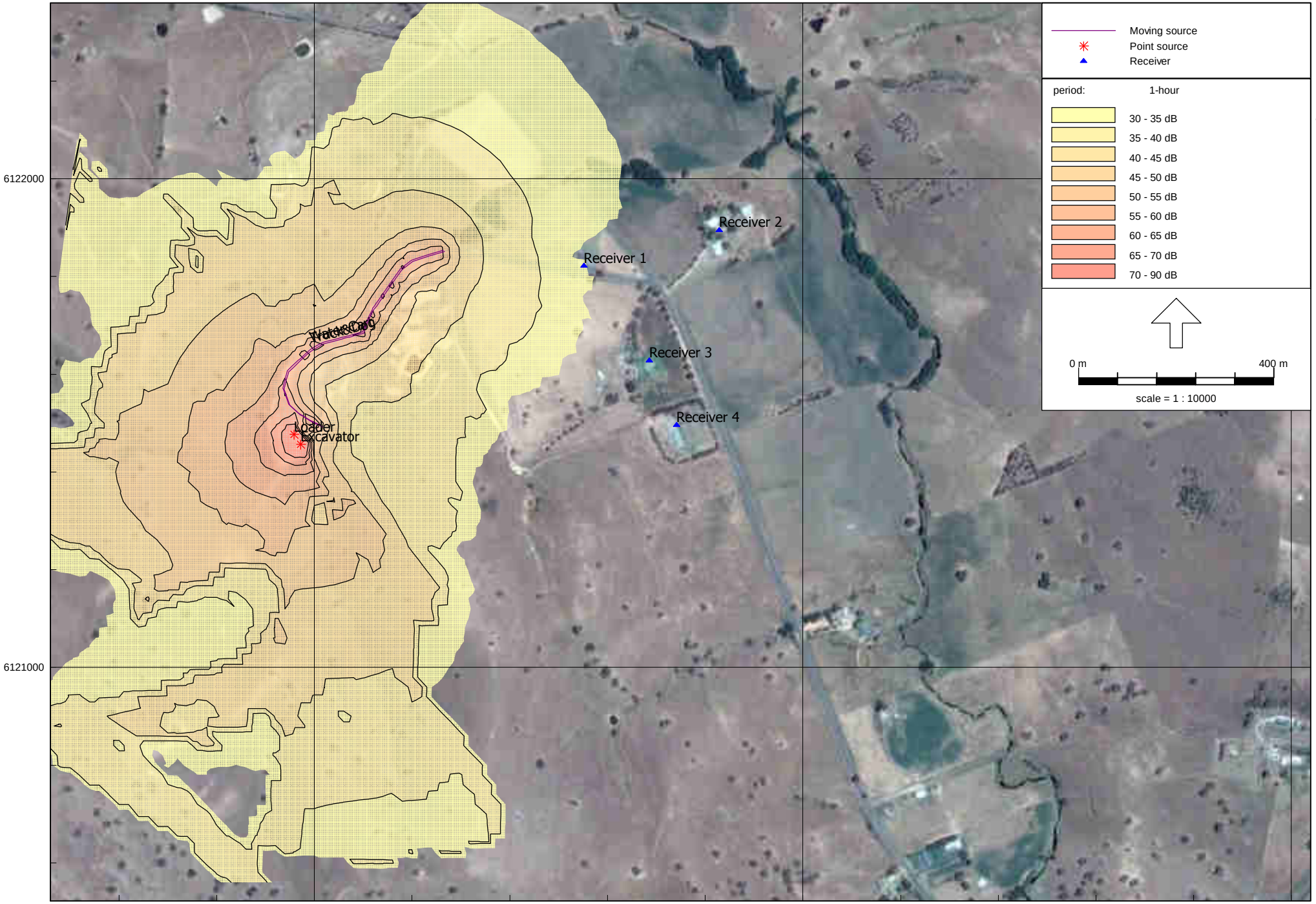
Advitech Environmental Pty Ltd



Impact Predictions
Published 13 May, 2016

Industrial noise - ISO 9613.1/2, [Operations - Operations (exposed)(Cell 4)] , Predictor V8.11

Advitech Environmental Pty Ltd



Industrial noise - ISO 9613.1/2, [Operations - Operations (protected)(Cell 4)] , Predictor V8.11

Impact Predictions
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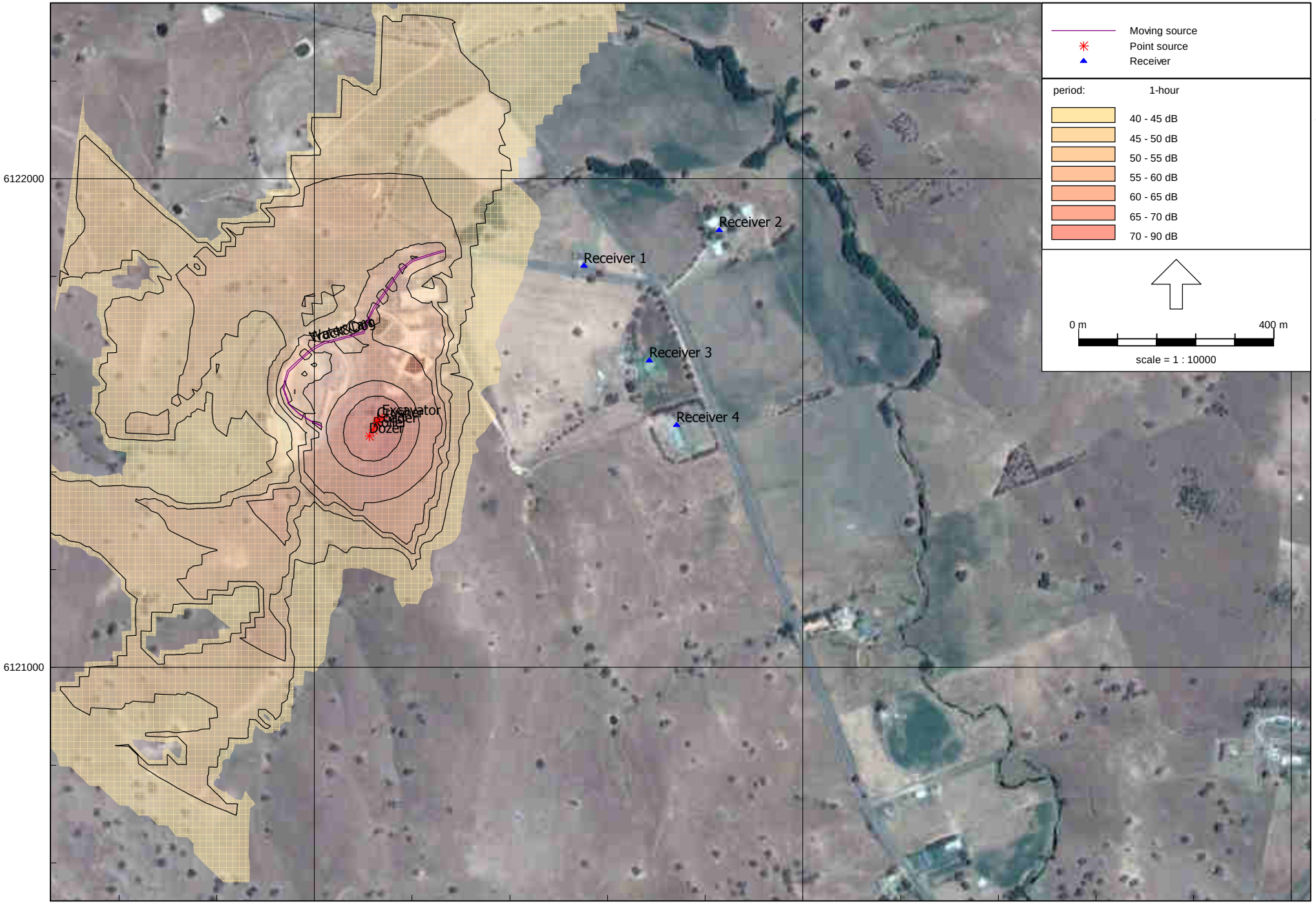
Advitech Environmental Pty Ltd



Industrial noise - ISO 9613.1/2, [Construction - Construction (Exposed, with Crushing) (Cell 3)] , Predictor V8.11

Impact Predictions
Published 13 May, 2016

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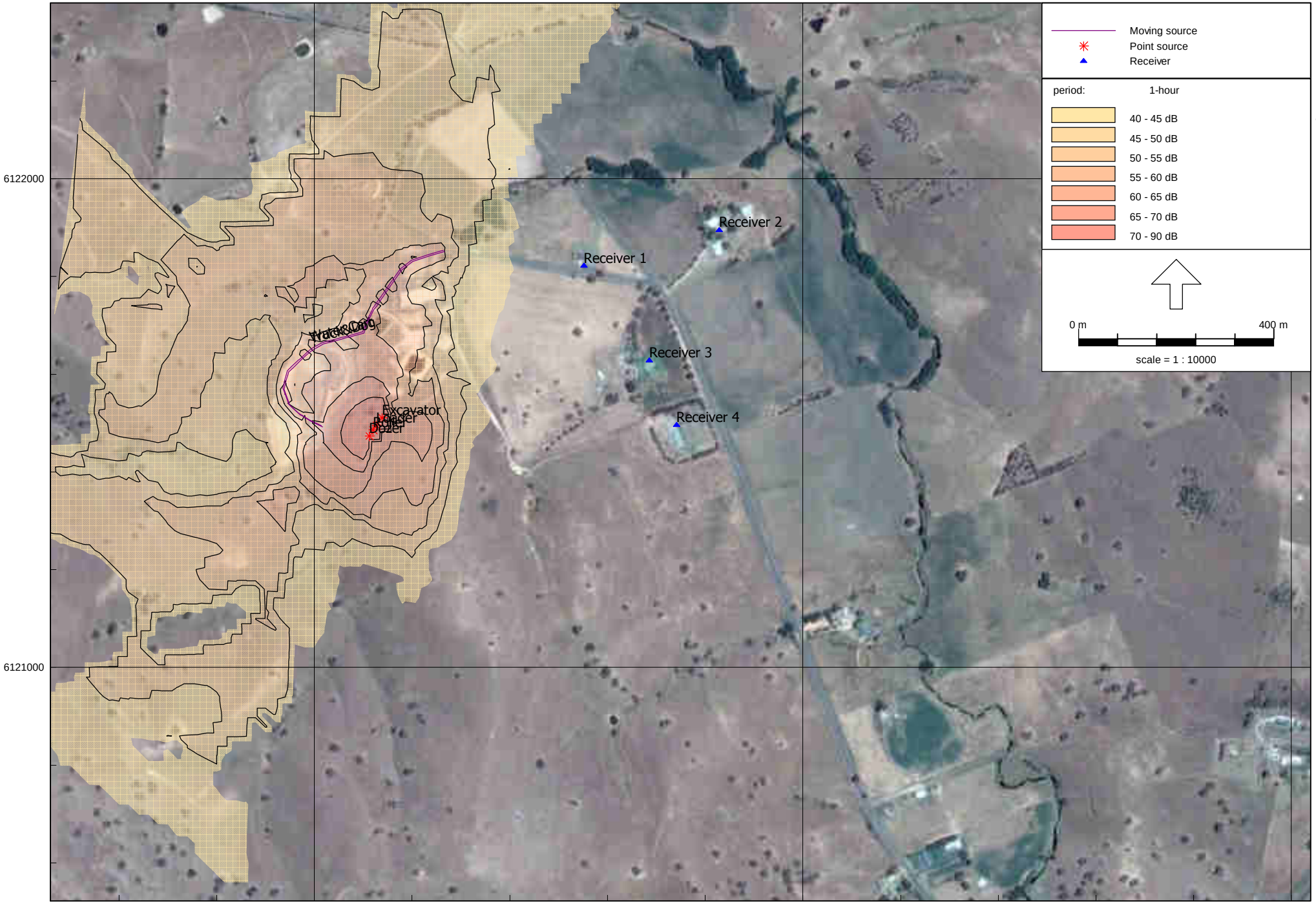

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Industrial noise - ISO 9613.1/2, [Construction - Construction (Protected) (Cell 3)] , Predictor V8.11

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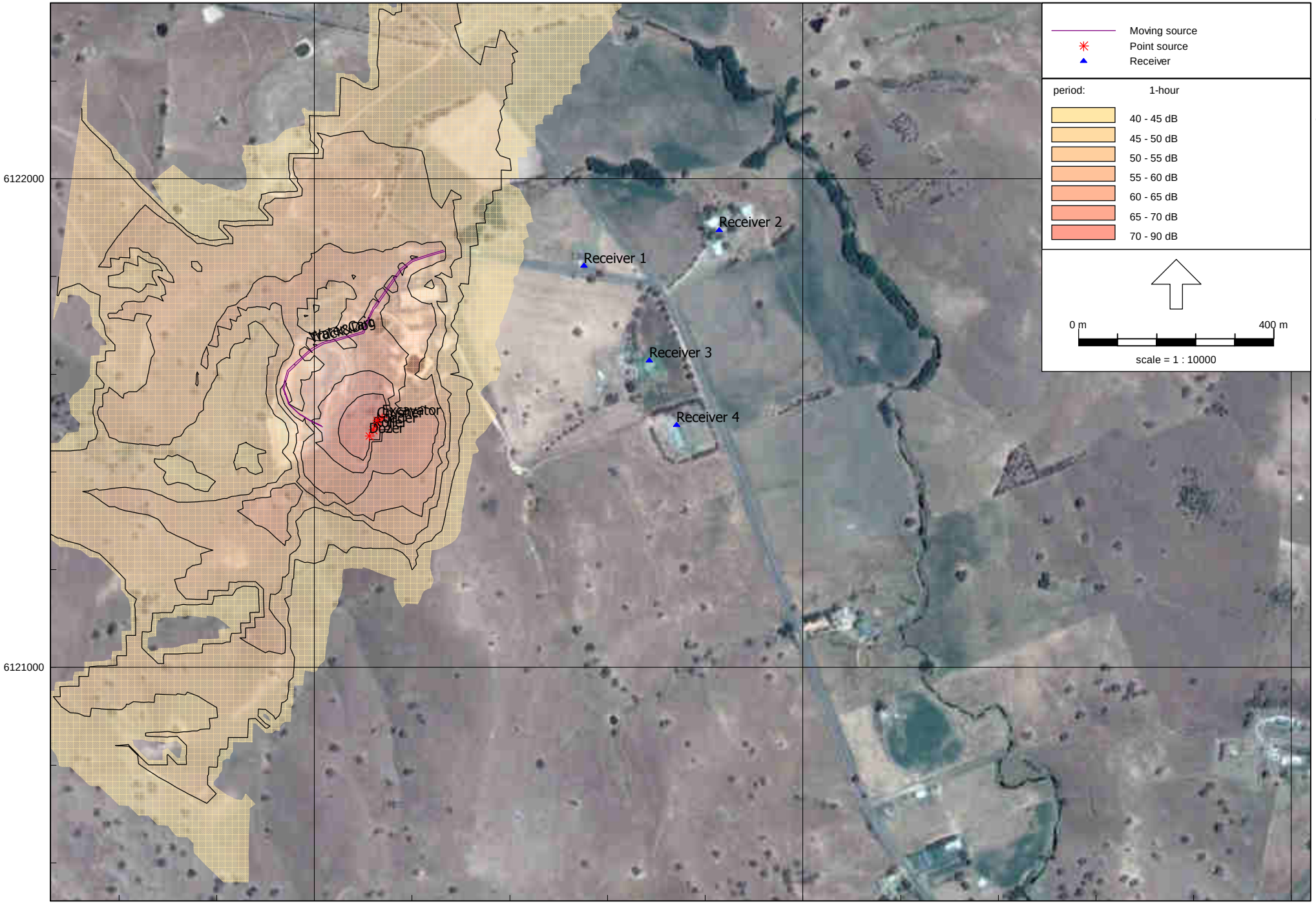

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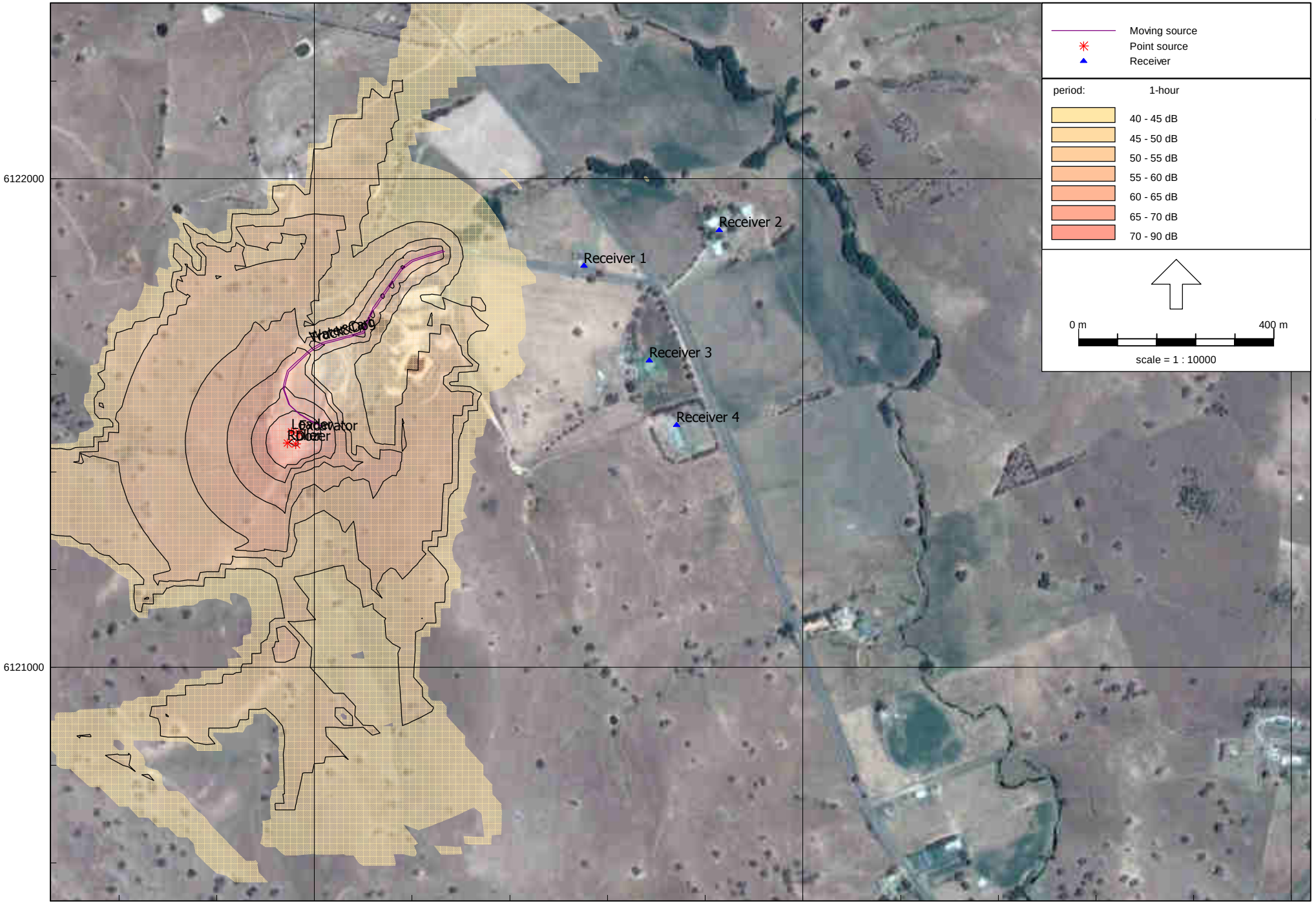

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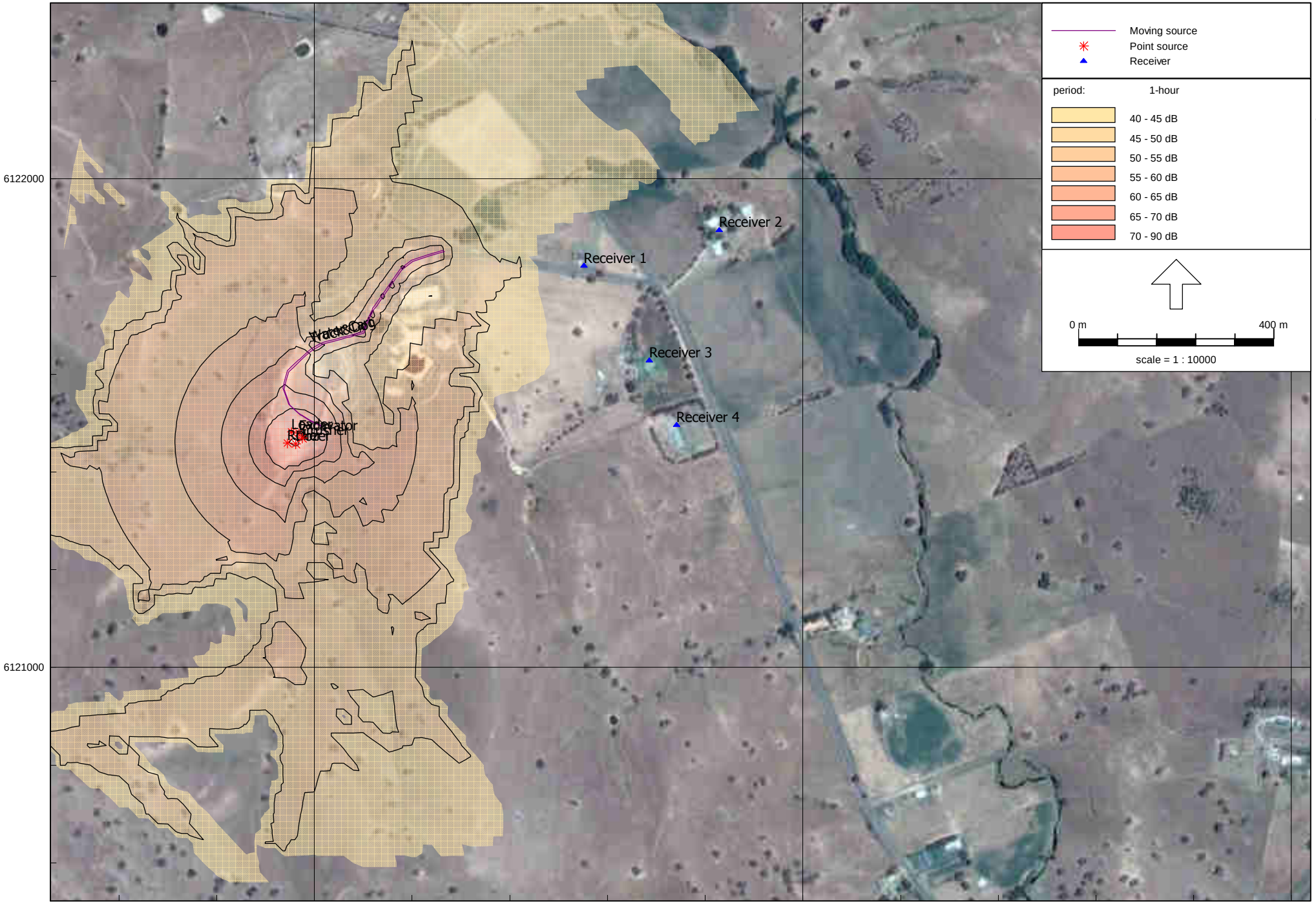

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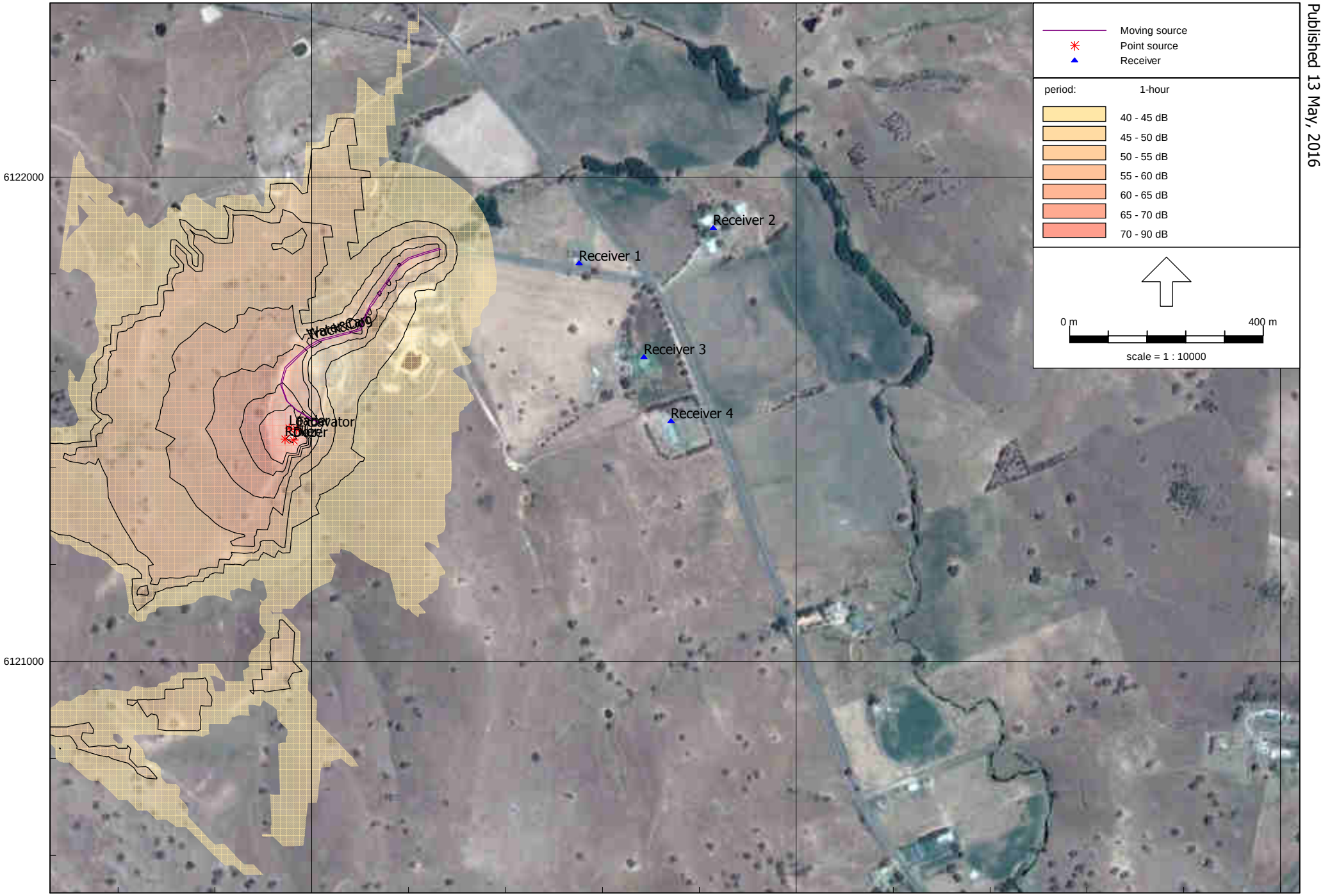

Impact Predictions
Published 13 May, 2016

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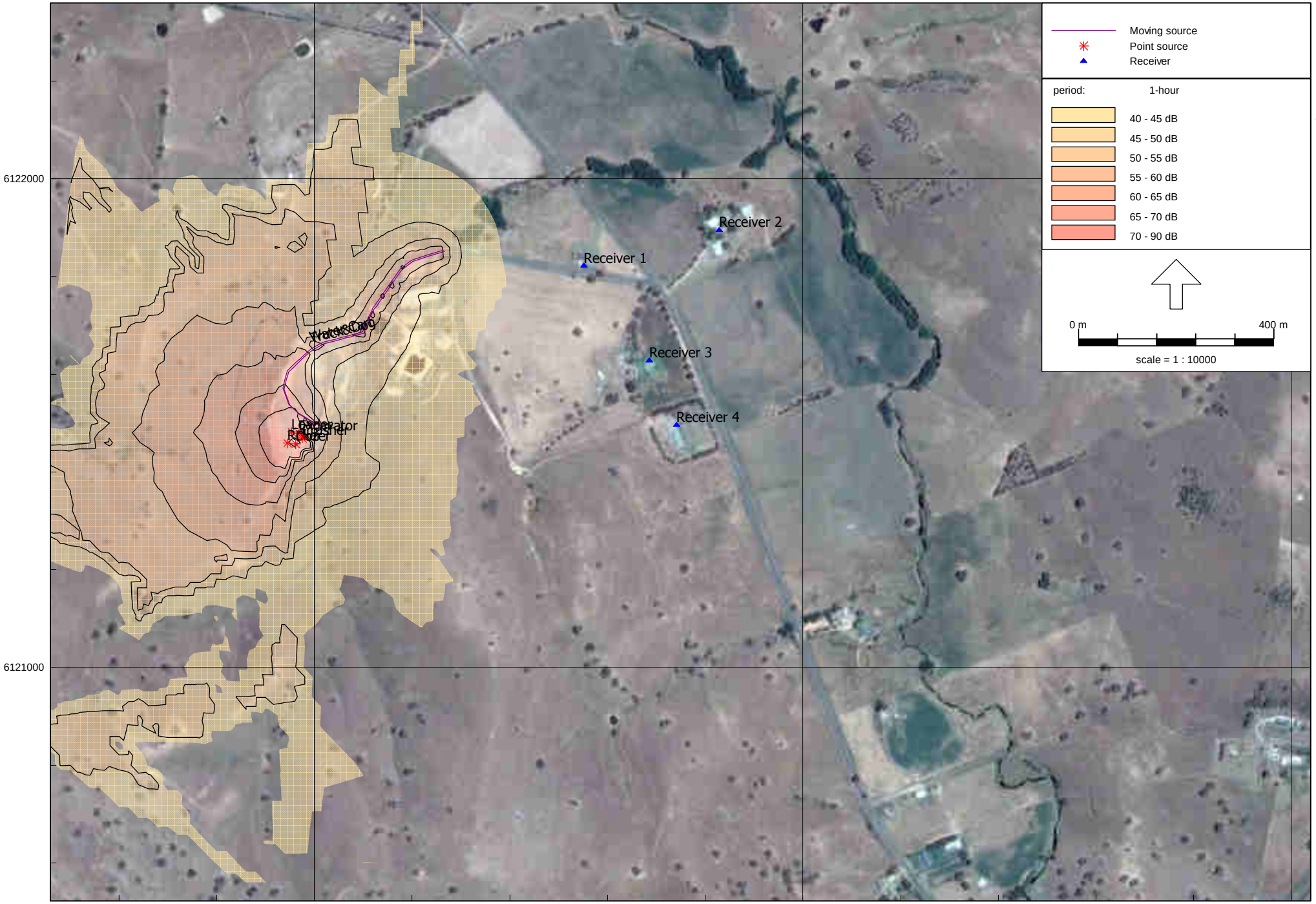
Advitech Environmental Pty Ltd



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Published 13 May, 2016

Industrial noise - ISO 9613.1/2, [Construction - Construction (Protected, with Crushing) (Cell 4)] , Predictor V8.11

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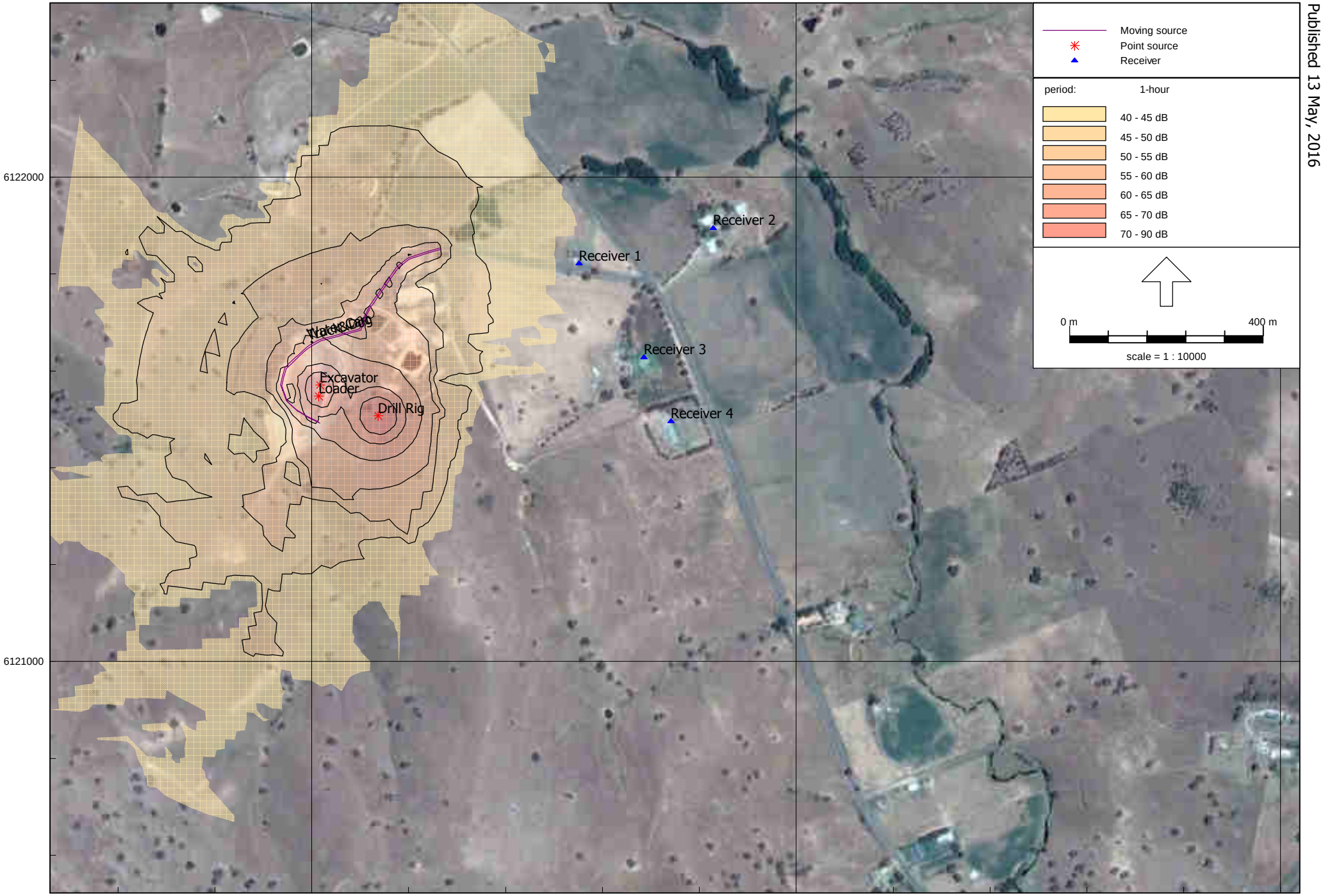

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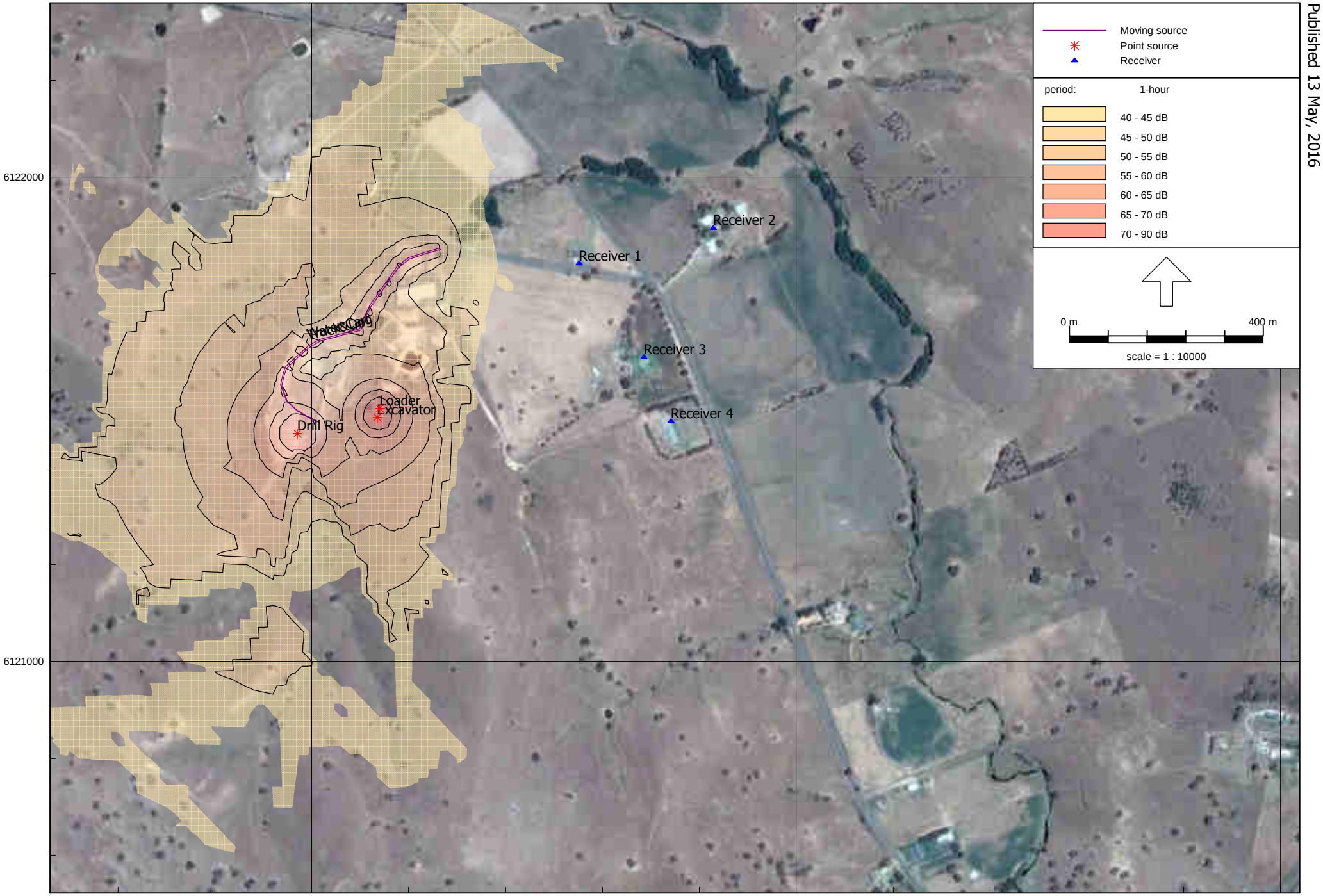
Advitech Environmental Pty Ltd



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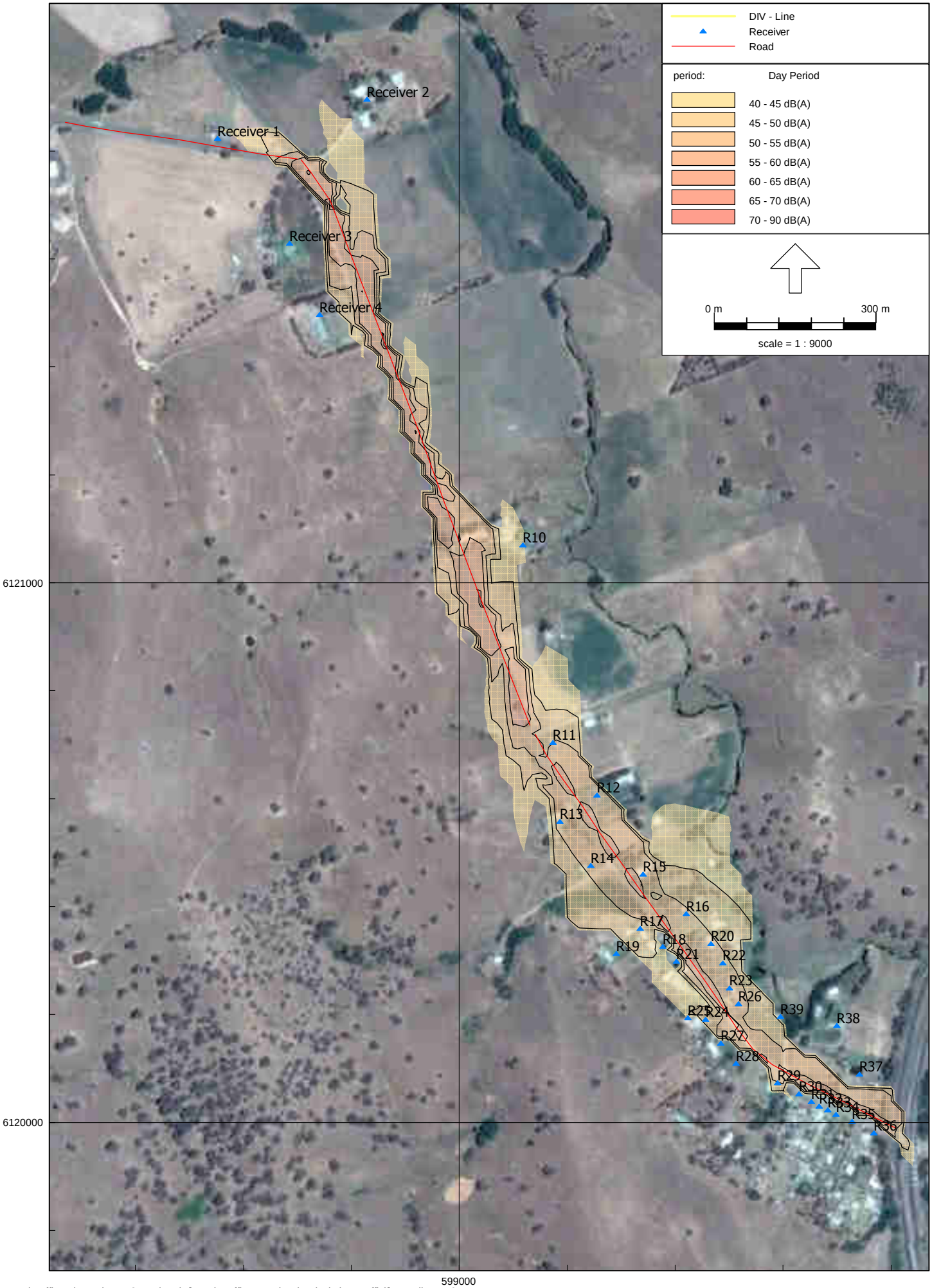
Impact Predictions
Published 13 May, 2016

Advitech Environmental Pty Ltd


DIV - Line
Receiver
Road
period:
Day Period
40 - 45 dB(A)
45 - 50 dB(A)
50 - 55 dB(A)
55 - 60 dB(A)
60 - 65 dB(A)
65 - 70 dB(A)
70 - 90 dB(A)
0 m
300 m
scale = 1 : 9000
Receiver 1
Receiver 2
Receiver 3
Receiver 4
R10
R11
R12
R13
R14
R15
R16
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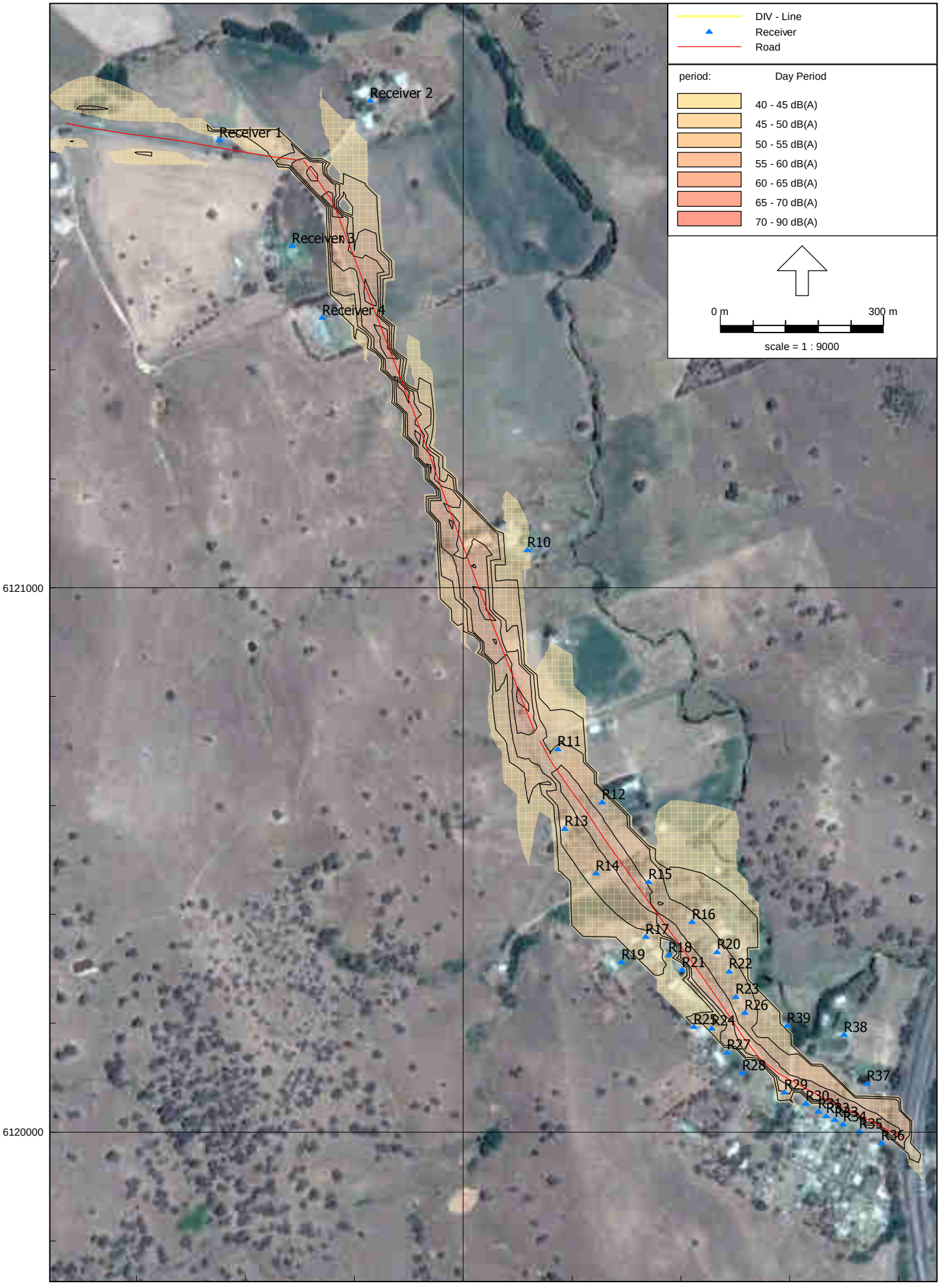
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
6121000
6120000
599000



Road traffic noise - LimA - CRTN(TRL), [Road Traffic - Road Noise (Existing Traffic + Landfill Traffic)] , Predictor V8.11

ATTACHMENT 5: SLR – POTENTIAL BLASTING IMPACTS ASSESSMENT – 12/5/2016