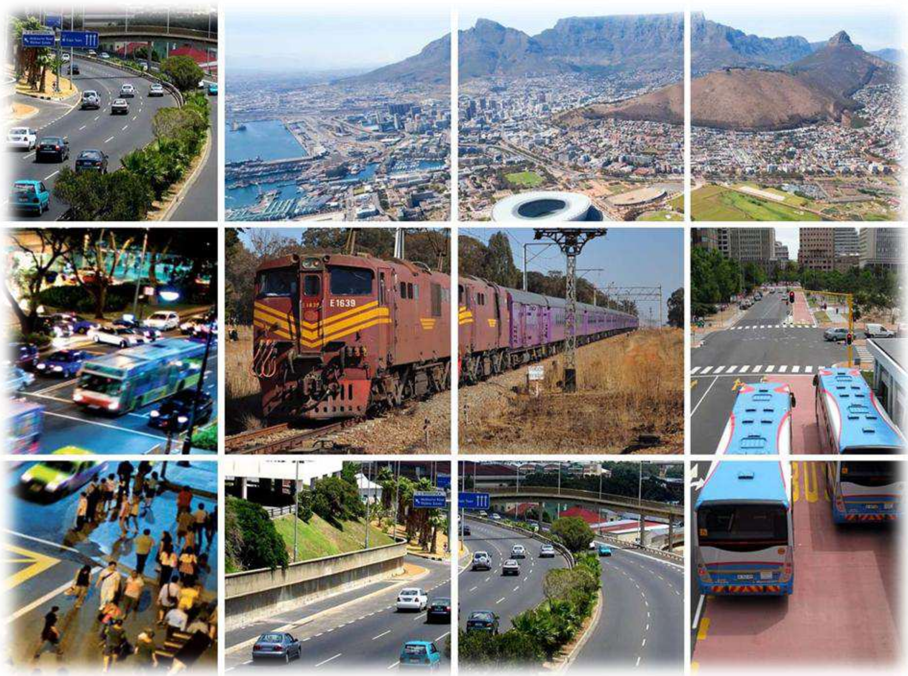
APPENDIX F4: Noise Impact Assessment

NOISE STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

for the Proposed

Motorsport Development in Mossdustria, Mossel Bay, Western Cape Province



Study done for:

NEMAI CONSULTING

Prepared by:

EARES
Enviro Acoustic Research

P.O. Box 2047, Garsfontein East, 0060
Tel: 012 – 004 0362, Fax: 086 – 621 0292, E-mail: info@eares.co.za

EXECUTIVE SUMMARY

INTRODUCTION

Enviro-Acoustic Research cc was commissioned by Nemai Consulting (Pty) Ltd (the EAP) to undertake a specialist study to determine the potential noise impact on the surrounding environment due to the proposed Motorsport development in Mossdustria, Mossel Bay.

PROJECT DESCRIPTION

The Municipality of Mossel Bay is proposing a Motorsport development in an extension of Mossdustria, Mossel Bay, Western Cape Province. The project entails establishment of a motorsport arena on the remainder of Portion 8 of Farm Rietvalley 225 and may include a new motorsport arena with a total footprint of approximately 34.5ha. It may incorporate:

- Tracks;
- Parking;
- Ablution facilities;
- Training facilities;
- Fuel storage (5 000 ℓ or 5 m^3);
- Pavilions;
- Associated infrastructure; and
- Motorsport workshop area.

This facility would allow a number of different activities, including:

- Circuit Racing, with head-to-head competitions on paved tracks featuring various racing vehicles such as touring or saloon cars, with the track designed to allow up to 20 cars at any one time;
- Endurance Racing, with ents lasting a number of hours that test the durability of cars and the stamina of driver teams;
- Drag Racing event, with short, high-speed acceleration contests, typically over 400m, held on dedicated straight-line "drag strips";
- Motorcycle Racing, allowing various engine volume and motorcycle types;
- Karting - a common entry point for aspiring professionals and a popular amateur activity, often held on scaled-down dedicated tracks within the larger facility;
- Track Days, where the public can bring their own street-legal cars or motorcycles to drive at high speeds under controlled conditions;
- Driving Schools, that will allow programs such as defensive driving courses, advanced handling techniques, drift training and anti-skid training;

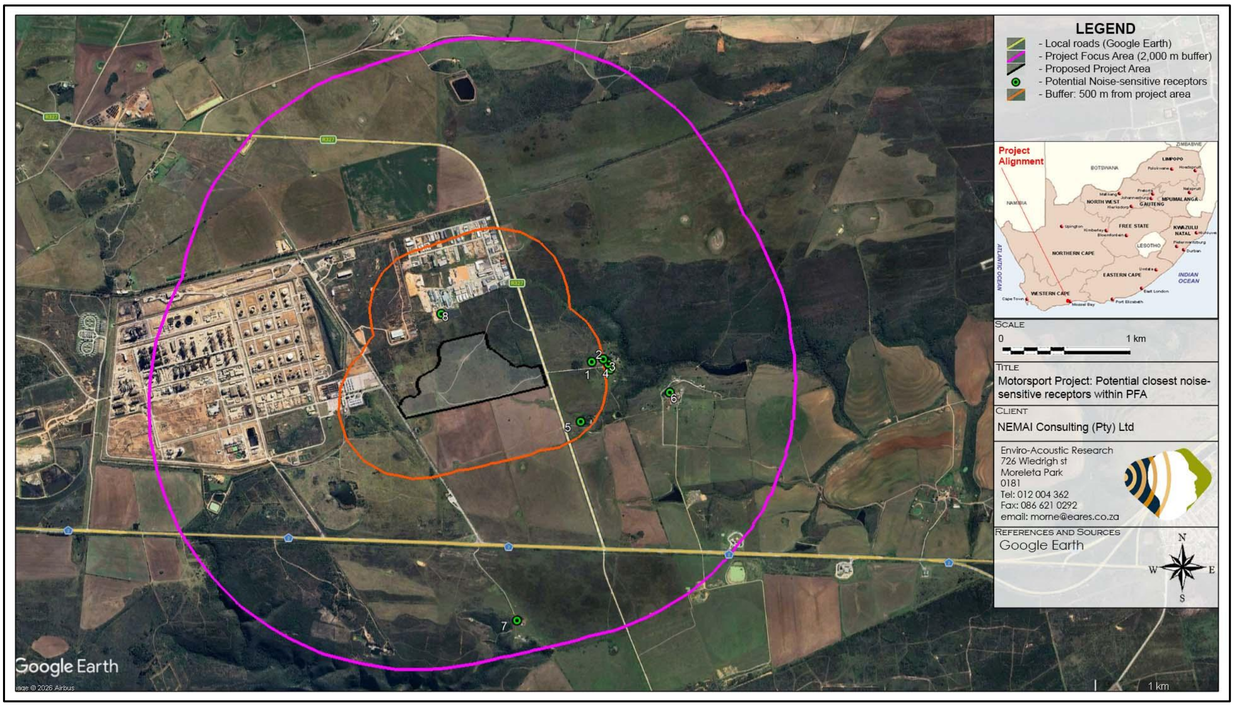
- Supercar Experiences, that allow opportunities for people to drive or ride as passengers in luxury supercars with expert guidance;
- Team Building event, or corporate packages that include karting, vehicle testing, and high-adrenaline group challenges; and
- Motor Shows and related large-scale festivals, which feature exhibitions, live music, and food stalls.

SURROUNDING LAND USES

The surrounding land use in the vicinity of the proposed development are heavy and light industry, agricultural, tourism and residential. The existing industrial activities increase road traffic in the area, with road traffic influencing the ambient sound levels in the area.

POTENTIAL NOISE-SENSITIVE RECEPTORS

An assessment of the site was done using available aerial images (Google Earth®) to identify potential dwellings that could be considered to be noise-sensitive developments (NSR). The site was visited in March 2026 to confirm the status of a number of dwellings and potential noise-sensitive locations. These receivers were marked in the figure below.



BASELINE

Ambient (background) noise levels were measured over a 2-night period from 7 to 9 March 2026 in accordance with the South African National Standard SANS 10103:2008, also considering the protocols defined GG 43110 of 20 March 2020 (GNR 320 of 2020). Semi-continuous measurements were collected at one location further than 500m from the R327, and further than 1,000m from the N2 roads. The measurements resulted in more than 138 daytime and 96 night-time readings, with the data indicating relatively low ambient sound levels typical of a rural to sub-urban noise district at NSR06. This data was augmented by a number of measurements near the N2 and R327 roads, that confirmed very high noise levels associated with road traffic. Access restrictions limited the measurements of residual noise levels at NSR01, NSR05 and NSR08.

DESIRED RATING LEVELS

It should be noted that ambient sound levels at NSR locations closer to the R327 road would be higher due to road traffic noises. Similar, NSR locations located within the industrial areas would typically be subject higher noise levels, due to traffic and industrial noises. Based on Table 2 of SANS 10103 (see **Table 3-2**) desired rating levels, three sets of rating levels would be relevant to the project, namely:

- Industrial area - Project area and surrounds:
    - Daytime rating level of 70 dBA,
    - Night-time rating level of 60 dBA,
- Urban area (residential use – in vicinity of workshops; business premises; and main roads) - Locations within and up to ±1,000m from the industrial area; locations within around ±500m from the R327:
    - Daytime rating level of 60 dBA,
    - Night-time rating level of 50 dBA,
- Urban area (residential use) – Locations further than ±1,000m from the industrial area and the N2 road, further than ±500m from the R619:
    - Daytime rating level of 55 dBA,
    - Night-time rating level of 45 dBA.

Based on the developmental character and the locations of the NSR, likely rating levels are discussed in the table below.

Location Reference	Designated rating level		Comment on recommendation (rating levels as per Table 2, SANS 10103 [also see Table 3-2])
	Day	Night	
NSR01	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR02	60	50	Location within 500m from busy road, near commercial

			premises. NSR located within 1,000m from industrial area.
NSR03	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR04	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR05	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR06	55	45	NSR located within 1,000m from industrial area, but further than 1,000m from very busy road (and further than 500m from the R327)
NSR07	60	50	Location within 1,000m from very busy road. NSR located within 1,000m from industrial area.
NSR08	70	60	NSR located within 1,000m from heavy industrial area, with factory located within light-industrial area.

FINDINGS

Potential scenarios were conceptualized for the future proposed motor racing events. with the output of noise modelling exercises indicating a potential noise impact of high significance for high-noise motor racing events. Without mitigating these noises, surrounding receptors may consider the noise levels disturbing. In line with Regulation 4(3) of the Western Cape NCR, this assessment also includes management and mitigation measures that would assist in reducing noise levels as well as the probability of noise complaints being registered. While regular communication will not reduce noise levels, it significantly lowers the "perceived annoyance" and increases the psychological tolerance for events.

Effective noise management in motorsport requires a tiered approach, targeting the noise at its source, along its travel path, and at the receiver. Measures that will assist in significantly reducing noise levels include:

- **Source Limits (Vehicle Technical Regulations):** Imposing strict decibel limits (e.g., 95–105 dB) and requiring high-efficiency **exhaust silencers** or mufflers. This addresses propulsion noise directly.
- **Earth Berms:** Large mounds of earth (soil bunds) act as heavy, dense barriers that block the direct line-of-sight between the track and the closest NSR. When constructed with an acoustically soft (grass-covered) surface, they absorb sound better than hard walls and are less affected by wind-driven noise refraction.

- **Sunken Carriageways (Topography Changes):** Excavating the track so it sits in a trench below ground level (subject to safe operation considering wet conditions and stormwater control). The surrounding earth acts as a natural, permanent barrier that contains sound waves before they can propagate horizontally.
- **Acoustic Barriers:** Purpose-built sound walls made of concrete, metal, or mineral foam. These can achieve reductions of 5–15 dB once they break the line-of-sight.
- **Buildings and Grandstands:** Strategic placement of pit buildings or large spectator stands can act as secondary shields for receptors located behind them. However, they may also reflect noise toward other areas if not placed carefully.

The following measures could also reduce noise levels in associated with other measures;

- **Topography Manipulation:** The topography slope upwards towards NSR08, and, but "cutting" the track into this higher area, the surrounding walls could assist in reducing noise levels on the ostrich abattoir.
- **Low-Noise Asphalt:** Utilizing porous or open-graded road construction methods can reduce rolling noise and tire friction. While highly effective for highway traffic, this is less impactful in racing where propulsion (engine) noise dominates.
- **SAFER Barriers:** While primarily a safety feature (Steel and Foam Energy Reduction), the foam backing can provide minor localized sound absorption compared to bare concrete walls, though it is not a primary noise mitigation tool.
- **Operational Management:** Limiting race hours, restricting high-decibel categories to specific times, providing "respite periods". While not lowering the peak noise level, it reduces the Race Equivalent Level perceived by closest receptors.
- **Specific times-slots for high-noise classes:** By planning high-noise classes during the early afternoons, a racing event can benefit from refraction due to temperature gradients in the atmosphere.

RECOMMENDED NOISE MANAGEMENT

The project developer must know that community involvement (feedback on project: especially race schedules as well as the details of the vehicle classes that will participate) needs to continue throughout the project. Annoyance is a complicated psychological phenomenon, as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself.

RECOMMENDATIONS

While the motorsport arena would raise noise levels at the nearest receptors, this project is not fatally flawed as noise impacts can be managed. It is therefore recommended that the proposed Mossdustria motorsport project be authorized from an acoustic perspective.

No additional noise impact assessments will be required, to future noise monitoring is recommended should this project proceed.

Report should be sited as:

De Jager, M (2026). "*Noise Study for Environmental Impact Assessment for the Proposed Motorsport Development in Mossdustria, Mossel Bay, Western Cape Province", E*nviro-Acoustic Research cc, Pretoria

Client:

NEMAI Consulting (Pty) Ltd for
Municipality of Mossel Bay

147 Bram Fischer Dr
Ferndale, Randburg, 2194
Tel: +27 11 794 7534

Report no:

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Author:

M. de Jager *(B. Ing (Chem))*

Review:

Johan Maré *(MSc. Microbiology, PriSci Nat (400092/91))*

Date:

June 2026

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GLOSSARY OF ABBREVIATIONS

dB	Decibel
EARES	Enviro-Acoustic Research cc
ENIA	Environmental Noise Impact Assessment
EP	Equator Principle
GG	Government Gazette
GN	Government Notice
Hz	Hertz
IDZ	Industrial Development Zone
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
km/h	kilometres per hour
LMV	Light Motor Vehicles
m	Meters
mamsl	Meters above mean sea level
NCR	Noise Control Regulations (under Section 25 of the ECA)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NSR	Noise-Sensitive Receptors
RPM	Revolutions per Minute
SABS	South African Bureau of Standards
SANS	South African National Standard
PWL	Sound Power Levels
UTM	Universal Transverse Mercator
WBG	World Bank Group
WHO	World Health Organisation

1 THE AUTHOR

The Author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining-related courses (Mining [stoping and development], Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc.] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years, the last two during which he studied Mining Engineering. He used to be a holder of a temporary blasting certificate during the period he mined at JCI: Cook 2 shaft. He changed course from Mining Engineering to Chemical Engineering after the second year of his studies at the University of Pretoria.

After graduation he worked as a Water Pollution Control Officer at the Department of Water Affairs and Forestry for two years (first year seconded from Wates, Meiring and Barnard), where duties included the perusal (evaluation, commenting and recommendation) of various regulatory required documents (such as EMPR's, Water Licence Applications and EIA's), auditing of licence conditions as well as the compilation of Technical Documents.

Since leaving the Department of Water Affairs, Morné has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period, he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing a number of these projects. During that period, he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control as well as blasting impacts. Since 2007 he has completed more than 300 Environmental Noise Impact Assessments and Noise Monitoring Reports as well as various acoustic consulting services, including amongst others:

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Isivunguvungu (Aurecon), De Aar (Aurecon), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Kokerboom 3 (Aurecon), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee (ARCUS), Kolkies (ARCUS), San Kraal (ARCUS), Phezukomoya (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Scarlet Ibis (CESNET), Albany (CESNET), Sutherland (CSIR), Kap Vley (CSIR), Kuruman (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Perdekraal (ERM), Teekloof (Mainstream), Eskom Aberdene (SE), Dorper (SE), Spreeukloof (SE), Loperberg (SE), Penhoek Pass (SE), Amakhala Emoyeni (SE), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE),*

	Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Namas (SE), Zonnequa (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Klipheuwel (SE), INCA Swellendam (SE), Cookhouse (SE), Iziduli (SE), Msenge (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Boulders (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Graskoppies (SiVEST), Philco (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Spitskop West (Terramanzi), Haga Haga (Terramanzi), Vredenburg (Terramanzi), Msenge Emoyeni (Windlab), Wobben (IWP), Trakas (SiVest), Beaufort West (SiVest), Pienaarspoort 1 and 2 (SE), Kokerboom 3 (Zutari), Mphepo Zambia (SLR)
Mining and Industry	*Full Environmental Noise Impact Assessments for – Delft Sand (AGES), BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream Environmental), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hacra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream Environmental), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream Environmental), Otjikoto Gold (AurexGold), Klipfontein Colliery (MENCO), Imbabala Coal (MENCO), ATCOM East Expansion (Jones and Wagner), IPP Waterberg Power Station (SE), Kangra Coal (ERM), Schoongesicht (CleanStream Environmental), EastPlats (CleanStream Environmental), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Glencore Boshoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladum Smelter, Iron and PGM Complex (Prescali Environmental), Fumani Gold (AGES), Leiden Coal (EIMS), Colenso Coal and Power Station (SiVEST/EcoPartners), Klippoortjie Coal (Gudani), Rietspruit Crushers (MENCO), Assen Iron (Tshikovha), Transalloys (SE), ESKOM Ankerlig (SE), Nooitgedacht Titano Project (EcoPartners), Algoa Oil Well (EIMS), Spitskop Chrome (EMAssistance), Vlakfontein South (Gudani), Leandra Coal (Jacana), Grazvalley and Zoetveld (Prescali), Tjate Chrome (Prescali), Langpan Chromite (Prescali), Vereeniging Recycling (Pro Roof), Meyerton Recycling (Pro Roof), Hammanskraal Billeting Plant 1 and 2 (Unica), Development of Altona Furnace, Limpopo Province (Prescali Environmental), Haakdoorndrift Opencast at Amandelbult Platinum (Aurecon), Landau Dragline relocation (Aurecon), Stuart Coal Opencast (CleanStream Environmental), Tetra4 Gas Field Development (EIMS), Kao Diamonds – Tiping Village Relocation (EIMS), Kao Diamonds – West Valley Tailings Deposit (EIMS), Upington Special Economic Zone (EOH), Arcellor Mittal CCGT Project near Saldanha (ERM), Malawi Sugar Mill Project (ERM), Proposed Mooifontein Colliery (Geovicon Environmental), Goedehoop North Residue Deposit Expansion (Geovicon Environmental), Mutsho 600MW Coal-Fired Power Plant (Jacana Environmentals), Tshivhaso Coal-Fired Power Plant (Savannah Environmental), Doornhoek Fluorspar Project (Exigo), Royal Sheba Project (Cabanga Environmental), Rietkol Silica (Jacana), Gruisfontein Colliery (Jacana), Lehlabile Colliery (Jaco-K Consulting), Bloemendal Colliery (Enviro-Insight), Rondevly Colliery (REC), Welgedacht Colliery (REC), Kalabasfontein Extension (EIMS), Waltloo Power Generation Project (EScience), Buffalo Colliery (Marang), Balgarthen Colliery (Rayten), Kusipongo Block C (Rayten), Zandheuvel (Exigo), NamPower Walvis Bay (GPT), Eloff Phase 3 (EIMS), Dunbar (Enviro-Insight), Smokey Hills (Prescali), Bierspruit (Aurecon), ECM Lannex (Prescali). ECM Tweefontein (Prescali), Smokey Hills (Prescali), Dalyshope (Digby Wells), Eland Platinum Mine (JEMS), Tweefontein (Prescali), Lannex (Prescali), Salene Manganese (Prescali), Baberton Gas to Power (Rayten)*
Road and Railway	*K220 Road Extension (Urbansmart), Boskop Road (MTO), Sekoko Mining (AGES), Davel-Swaziland-Richards Bay Rail Link (Aurecon), Moloto Transport Corridor Status Quo Report and Pre-Feasibility (SiVEST), Postmasburg Housing Development (SE), Tshwane Rapid Transport Project, Phase 1 and 2 (NRM Consulting/City of Tshwane), Transnet Apies-river Bridge Upgrade (Transnet), Gautrain Due-diligence (SiVest), N2 Piet Retief (SANRAL), Atterbury Extension, CoT (Bokomoso Environmental), Riverfarm Development (Terramanzi), Conakry to Kindia Toll Road (Rayten)*

Airport	*Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping (Aurecon)*
Noise monitoring and Audit Reports	*Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional (Xstrata), Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF Ambient Sound Level study (Cennergi and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Hopefield WEF Noise Analysis (Umoya), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon), Jeffries Bay Wind Farm (Globeleq), Sephaku Aganang (Exigo), Sephaku Delmas (Exigo), Beira Audit (BP/GPT), Nacala Audit (BP/GPT), NATREF (Nemai), Rappa Resources (Rayten), Measurement Report for Sephaku Delmas (Ages), Measurement Report for Sephaku Aganang (Ages), Bank of Botswana measurements (Linnspace), Skukuza Noise Measurements (Concor), Development noise measurement protocol for Mamba Cement (Exigo), Measurement Report for Mamba Cement (Exigo), Measurement Report for Nokeng Fluorspar (Exigo), Tsitsikamma Community Wind Farm Pre-operation sound measurements (Cennergi), Waainek WEF Operational Noise Measurements (Innowind), Sedibeng Brewery Noise Measurements (MENCO), Tsitsikamma Community Wind Farm Operational noise measurements (Cennergi), Noupoort Wind Farm Operational noise measurements (Mainstream), Twisdraai Colliery (Lefatshe Minerals), SASOL Prospecting (Lefatshe Minerals), South32 Klipspruit (Rayten), Sibanye Stillwater Kroondal (Rayten), Rooiberg Asphalt (Rooiberg Asphalt), SASOL Shondoni (Lefatshe), SASOL Twisdraai (Lefatshe), Anglo Mototolo (Exigo), Heineken Inyaniga (AECOM), Glencore Izimbiwa (Cleanstream) Glencore Impunzi (Cleanstream), Black Chrome Mine (Prescali) Sibanye Stillwater Ezulwini (Aurecon), Sibanye Stillwater Beatrix (Aurecon), Bank of Botshwana (Linspace), Lakeside (Linspace), Skukuza (SiVest), Rietvlei Colliery (Jaco-K Consulting)*
Small Noise Impact Assessments	*TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlardia K220 (UrbanSmart), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Slag Milling Plant (AGES), Arcelor Mittal WEF (Aurecon), RVM Hydroplant (Aurecon), Grootvlei PS Oil Storage (SiVEST), Rhenosterberg WEF, (SiVEST), Concerto Estate (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion 2 (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), RareCo (SE), Struisbaai WEF (SE), Perdekraal WEF (ERM), Kotula Tsatsi Energy (SE), Olievenhoutbosch Township (Nali), , HDMS Project (AECOM), Quarry extensions near Ermelo (Rietspruit Crushers), Proposed uMzimkhulu Landfill in KZN (nZingwe Consultancy), Linksfield Residential Development (Bokomoso Environmental), Rooihuiskraal Ext. Residential Development, CoT (Plandev Town Planners), Floating Power Plant and LNG Import Facility, Richards Bay (ERM), Floating Power Plant project, Saldanha (ERM), Vopak Growth 4 project (ERM), Elandspoort Ext 3 Residential Development (Gibb Engineering), Tiegerpoort Wedding Venue (Henwood Environmental), Monavoni Development (Marindzini), Rezoning of Portion 1 (Primo Properties), Tswaing Mega City (Makole), Mabopane Church (EP Architects), ERGO Soweto Cluster (Kongiwe), Fabio Chains (Marang), GIDZ JMP (Marang), Temple Complex (KWP Create), Germiston Metals (Dorean), Sebenza Metals (Dorean)*
Noise Compliance Statements	*Dwarsrug BESS (SiVEST), Hyperion BESS (SE), Loeriesfontein BESS (SiVEST), Platsjambok East and West BESS (SiVEST), Waaihoek BESS (CESNET)*
Project reviews and amendment reports	*Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma Community Wind Farm Noise Simulation project (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (SE), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy), De Aar WEF (Holland), Quarterly Measurement Reports – Dangote Delmas (Exigo), Quarterly Measurement Reports – Dangote Lichtenburg (Exigo), Quarterly Measurement Reports – Mamba Cement (Exigo), Quarterly*

	Measurement Reports – Dangote Delmas (Exigo) Quarterly Measurement Reports – Nokeng Fluorspar (Exigo), Proton Energy Limited Nigeria (ERM), Hartebeest WEF Update (Moorreesburg) (Savannah Environmental), Modderfontein WEF Opinion (Terramanzi), IPD Vredenburg WEF (IPD Power Vredenburg), Paul Puts WEF (ARCUS), Juno WEF (ARCUS), Rheboksfontein WEF (ERM), Umzinde WEF (Zutari), Kokerboom 4 (Zutari), etc.

Contact details for the Author:

Author:	Morné de Jager
Company:	Enviro-Acoustic Research cc
Website:	http://www.eares.co.za
Email:	morne@eares.co.za
Office number:	012 004 0362
Mobile number:	082 565 4059

2 INTRODUCTION

2.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research cc was commissioned by Nemai Consulting (Pty) Ltd (the EAP) to undertake a specialist study to determine the potential noise impact on the surrounding environment due to the proposed Motorsport development in Mossdustria, Mossel Bay.

This report describes the potential noise impact that the operation might have on potential noise-sensitive areas, highlighting the methods used, potential issues identified, findings and recommendations. The Terms of Reference (ToR) for this study is in the guidelines provided by SANS 10103:2008, SANS 10328:2008, the procedures defined in Government Gazette 43110 of 20 March 2020 (GNR 320) and the National Noise Control Regulations GN R154 of 1992. The study also considers the noise limits as proposed by the International Finance Corporation (IFC) for a residential area which is based on studies completed by the World Health Organization (WHO).

2.2 BRIEF PROJECT DESCRIPTION

The motorsport project is proposed within the Mossel Bay Local Municipality, located within the Garden Route District Municipality in the Western Cape Province. The Western cape Province has promulgated provincial noise control regulations (PN 200 of 2013) (also see **section 3.3.2**).

The Municipality of Mossel Bay is proposing a Motorsport development in an extension of Mossdustria, Mossel Bay, Western Cape Province. The regional location of the proposed motorsport area is depicted in **Figure 2-1**.

The project entails establishment of a motorsport arena on the remainder of Portion 8 of Farm Rietvalley 225 that may include a new motorsport arena with a total footprint of approximately 34.5ha, incorporating:

- Tracks;
- Parking;
- Ablution facilities;
- Training facilities;
- Fuel storage (5 000 ℓ or 5 m^3);
- Pavilions;

- Associated infrastructure; and
- Motorsport workshop area.

This facility would allow a number of different activities, including:

- Circuit Racing, with head-to-head competitions on paved tracks featuring various racing vehicles such as touring or saloon cars, with the track designed to allow up to 20 cars at any one time;
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- Supercar Experiences, that allow opportunities for people to drive or ride as passengers in luxury supercars with expert guidance;
- Team Building event, or corporate packages that include karting, vehicle testing, and high-adrenaline group challenges; and
- Motor Shows and related large-scale festivals, which feature exhibitions, live music, and food stalls.

2.3 STUDY AREA

The Motorsport project is proposed within the Mossel Bay Local Municipality, located within the Garden Route District Municipality in the Western Cape Province. The Western cape Province has promulgated provincial noise control regulations (PN 200 of 2013) (see **section 3.3.2**).

The potential project area is also enclosed within a Project Focus Area (PFA), enclosing the zone up to 2,000m from the main project infrastructure. The site is further described in terms of environmental components that may contribute or change the sound character in the area.

2.3.1 Existing Ambient Sound and Noise Levels

Ambient sound levels (residual noise levels) were measured during March 2026 with the results summarized in **section 4.3**. Road traffic noises were significant and dominant at all the measurement locations, though faunal noises were audible during the quieter periods. Road traffic noises is relatively dominant in the area and the season when the measurements were collected have no influence on the measurement results.

2.3.2 Topography

ENPAT[1] (1998) describes the topography of the focus area as "*moderately undulating plains*". There are no local topographical features that will limit the propagation of noises from the motorsport activities, though proposed buildings may influence the propagation of noise.

2.3.3 Surrounding Land Use

The surrounding land use in the vicinity of the proposed development are heavy and light industry, agricultural, tourism and residential. The existing industrial activities increase road traffic in the area, with road traffic influencing the ambient sound levels in the area. It was also reported that there are residential apartments located at the entrance to the Mossdustria industrial area. With the apartments located within a zone industrial area (with higher acceptable rating levels), the apartments are excluded from this assessment.

2.3.4 Roads

Main roads in the area are the N2 national, and R327 provincial roads. Both these roads carry sufficient traffic to impact an area up to 500m from these roads.

2.3.5 Ground conditions and vegetation

Area falls within the Fynbos biome with the vegetation type being mainly Coastal Macchia (Van Riet, 1998). The natural veldt has been significantly disturbed due to agriculture and other anthropogenic activities. The ground surface is well covered with various grasses, a sedges and shrubs.

Taking into consideration available information it is the opinion of the author that the ground conditions (when considering acoustic propagation on a ground surface) can be classified as medium soft, which implies that the ground surface could absorb some of the acoustic

[1] Van Riet, W. Claassen, P. van Rensburg, J. van Viegen & L. du Plessis, "*Environmental Potential Atlas for South Africa*", Pretoria, 1998.

energy hitting the ground surface. It should be noted that this factor is only relevant for air-borne waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

2.4 DESIRED RATING LEVELS

The development of the motorsport project will result in changes in the ambient sound levels during the construction and operational phases, though this assessment will mainly consider operational noises. Considering the recommendations from the SANS 10103:2008 guideline, three potential noise rating levels would be relevant, namely:

- Industrial area - Project area and surrounds:
  - Daytime rating level of 70 dBA,
  - Night-time rating level of 60 dBA,
- Urban area (residential use – in vicinity of workshops; business premises; and main roads) - Locations within and up to ±1,000m from the industrial area; locations within around ±500m from the R327:
  - Daytime rating level of 60 dBA,
  - Night-time rating level of 50 dBA,
- Urban area (residential use) – Locations further than ±1,000m from the industrial area and the N2 road, further than ±500m from the R619:
  - Daytime rating level of 55 dBA,
  - Night-time rating level of 45 dBA.

2.5 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

An assessment of the site was done using available aerial images (GoogleEarth®) to identify potential locations that could be considered to be noise-sensitive. The site was visited in March 2026 to confirm the status of potential noise-sensitive receptors (NSR), with the identified NSR indicated on **Figure 2-2**.

Also indicated on this figure are generalized 500m and 2 000m buffer zones. Generally, noises from such motorsport activities:

- are significant, will be clearly audible and at a potential disturbing level at a distance of 500m from the raceway track, with receptors located within 500m from activities being able to detect the change in ambient sound levels with potential complaints about the noise levels. There is an ostrich abattoir (represented by NSR08) located just to the north of the proposed motorsport venue;

- will be clearly audible, but the noise impact is normally limited to a distance of approximately 1,000m from the active motorsport activities (depending on the type of activity). Ambient sound levels will be increased due to noises from the motorsport activities, with the potential noise impact measurable and audible. The Reedvalley Winery[2] as well as at least three residential activities are located in this area (represented by NSR 1, 2, 3, 4 and 5); and
- could be audible up to a distance of 2,000m, with noises generally of a low concern at distanced greater than 2,000m from motorsport activities. There are at a number of farm dwellings (represented by NSR 07 and 08) in this buffer area.

2.6 TERMS OF REFERENCE

A noise impact assessment must be completed for the following reasons:

- It was identified as an environmental theme needing further investigation i.t.o. the National Screening Tool as per the procedures of Government Gazette 43110 of 20 March 2020 (GNR320 of 2020);
- A change in land use as highlighted in SANS 10328:2008, section 5.3;
- If a new road or railway line is to be established within 500 m (or, in the case of a busy throughway, 1 000 m) of a road or railway line (SANS 10328:2008 [5.4 (c)]) *or visa versa (SANS 10328:2008 [5.4 (c)])*;
- If an industry (500 m for light industry as per SANS 10328:2008 [6.3.3 (g)]) is to be established within 1,000 m from a potential noise sensitive development (SANS 10328:2008 [5.4 (h)]);
- It is a controlled activity in terms of the NEMA regulations and an ENIA is required, because it may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010;
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) or GN R154 of 1992.

[2] Restaurant, wine tasting room, outdoor boma, performance and events venue (weddings, conferences and private parties)

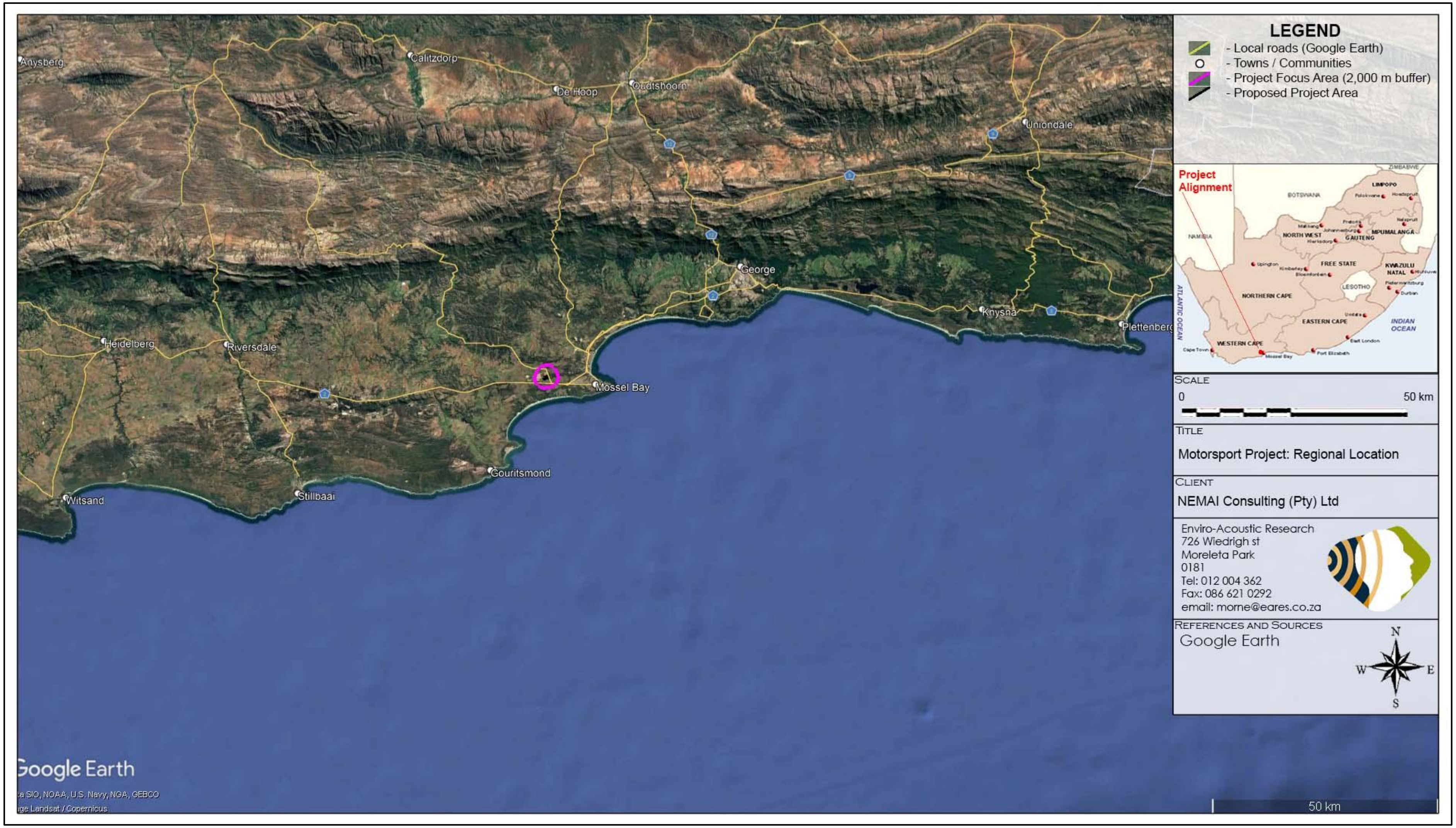

Figure 2-1: Locality map indicating the proposed project focus area

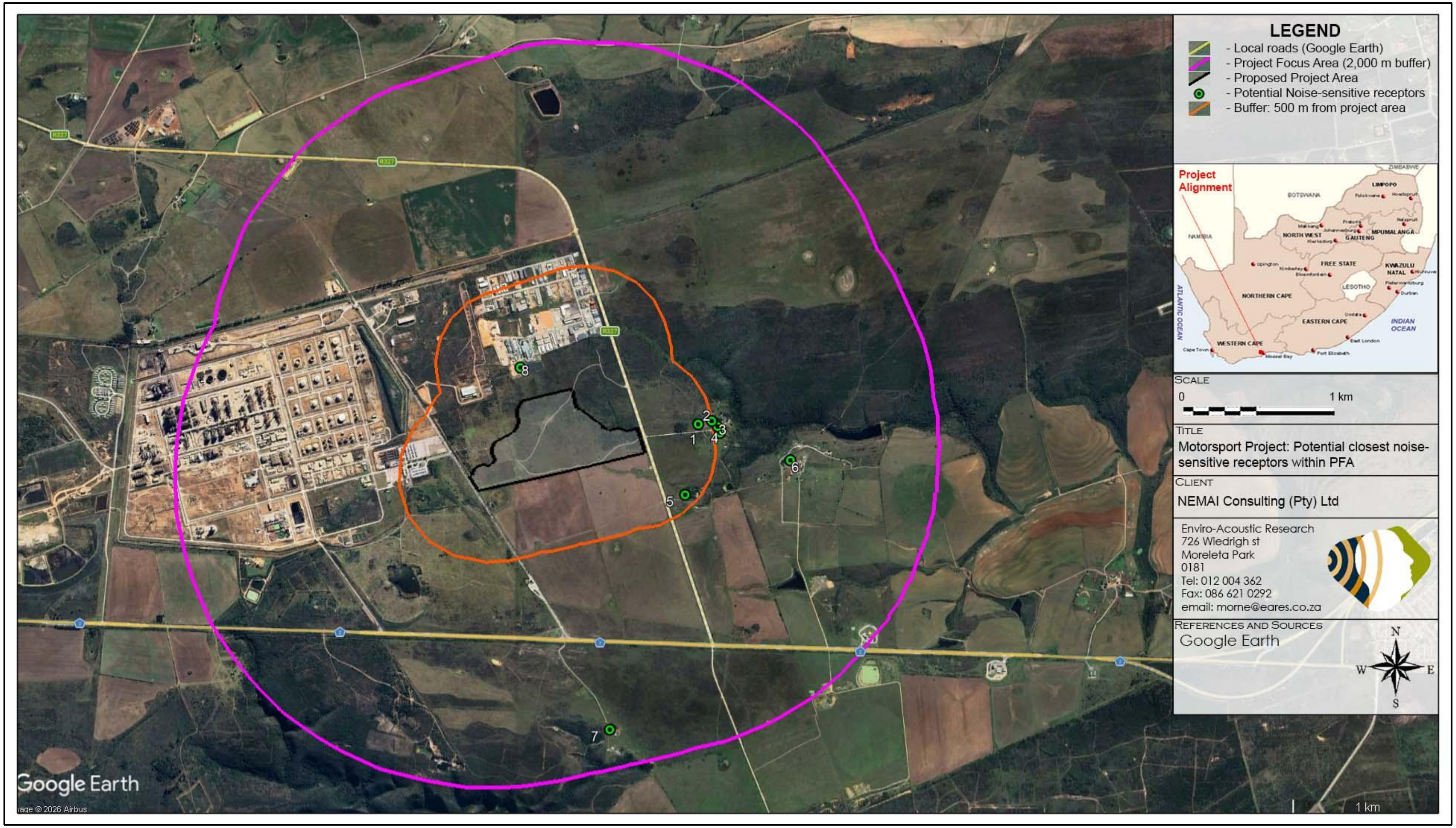

Figure 2-2: Aerial image indicating potentially noise-sensitive receptors close to the proposed PFA

2.6.1 Requirements as per South African National Standards

In South Africa the document that addresses the issues specifically concerning environmental noise is SANS 10103:2008. It has been thoroughly revised in 2008 and brought in line with the guidelines of the World Health Organisation (WHO). It provides the maximum average ambient noise levels during the day and night to which different types of developments indoors may be exposed.

In addition, SANS 10328:2008 (Edition 3) specifies the methodology to assess the potential noise impacts on the environment due to a proposed activity that might impact on the environment. This standard also stipulates the minimum requirements to be investigated for EIA purposes. These minimum requirements are:

a) the purpose of the investigation (see **section 2.1**);
b) a brief description of the planned development or the changes that are being considered (see **section 2.2**);
c) a brief description of the existing environment including, where relevant, the topography, surface conditions and meteorological conditions during measurements (see **section 4**);
d) the identified noise sources together with their respective sound pressure levels or sound power levels (or both) and, where applicable, the operating cycles, the nature of sound emission, the spectral composition and the directional characteristics (see **section 5**);
e) the identified noise sources that were not taken into account and the reasons as to why they were not investigated (see **section 5**, **7** and **8**);
f) the identified noise-sensitive developments and the noise impact on them (see **section 2.5, 9 and 10**);
g) where applicable, any assumptions, with references, made with regard to any calculations or determination of source and propagation characteristics (see **section 8**);
h) an explanation, either by a brief description or by reference, of all measuring and calculation procedures that were followed, as well as any possible adjustments to existing measuring methods that had to be made, together with the results of calculations (see **section 7 and 8**);
i) an explanation, either by description or by reference, of all measuring or calculation methods (or both) that were used to determine existing and predicted rating levels, as well as other relevant information, including a statement of how the data were obtained and applied to determine the rating level for the area in question (see **section 4, 7** and **9**);

j) the location of measuring or calculating points in a sketch or on a map (see **Figure 4-5** and **section 9**);
k) quantification of the noise impact with, where relevant, reference to the literature consulted and the assumptions made (see **section 9**);
l) alternatives that were considered and the results of those that were investigated (see **section 10.4**);
m) a list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation (no comments received);
n) a detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them (no comments received);
o) conclusions that were reached (see **section 13**);
p) proposed recommendations (see **section 13**);
q) if remedial measures will provide an acceptable solution which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority (see **section 11** and **13**); and
r) any follow-up investigation which should be conducted at completion of the project as well as at regular intervals after the commissioning of the project so as to ensure that the recommendations of this report will be maintained in the future (see **section 13**).

3 LEGAL CONTEXT, POLICIES AND GUIDELINES

3.1 THE REPUBLIC OF SOUTH AFRICA CONSTITUTION ACT ("THE CONSTITUTION")

The environmental rights contained in section 24 of the Constitution provide that everyone is entitled to an environment that is not harmful to his or her well-being. In the context of noise, this requires a determination of what level of noise is harmful to well-being. The general approach of the common law is to define an acceptable level of noise as that which the reasonable person can be expected to tolerate in the particular circumstances. The subjectivity of this approach can be problematic, which has led to the development of noise standards (see **Section 3.4**).

"Noise pollution" is specifically included in Part B of Schedule 5 of the Constitution, which means that noise pollution control is a local authority competence, provided that the local authority concerned has the capacity to carry out this function.

3.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act ("NEMA") defines "pollution" to include any change in the environment, including noise. A duty therefore arises under section 28 of NEMA to take reasonable measures while establishing and operating any facility to prevent noise pollution occurring. NEMA sets out measures, which may be regarded as reasonable. They include the following measures:

1. to investigate, assess and evaluate the impact on the environment
2. to inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed to avoid causing significant pollution or degradation of the environment
3. to cease, modify or control any act, activity or process causing the pollution or degradation
4. to contain or prevent the movement of the pollution or degradation
5. to eliminate any source of the pollution or degradation
6. to remedy the effects of the pollution or degradation

In addition, a number of regulations have been promulgated as Regulation 982 of December 2014 (Government Notice 38282) in terms of this Act. It defines minimum information requirements for specialist reports, with Government Gazette (GG) 43110 (20 March 2020) updating the minimum requirements for reporting.

GG 43110 prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorisation. These protocols were promulgated in terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998.

When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements.

3.3 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act ("ECA") allows the Minister of Environmental Affairs and Tourism ("now the Ministry of Water and Environmental Affairs") to make regulations regarding noise, among other concerns. See also **section 3.3.1**.

3.3.1 National Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. The Provincial regulations will be relevant for the Western Cape Province.

3.3.2 Western Cape Provincial Noise Control Regulations: PN 200 of 2013

The control of noise in the Western Cape is legislated in the form of the Noise Control Regulations (NCR) in terms of Section 25 of the Environment Conservation Act No. 73 of 1989, applicable to the Province of the Western Cape as Provincial Notice 200 of 20 June 2013.

The regulations define:
"**ambient noise**" means the all-encompassing sound in a given situation at a given time, measured as the reading on an integrated impulse sound level meter for a total period of at least 10 minutes".

"**disturbing noise**" means a noise, excluding the unamplified human voice, which—
(a) exceeds the rating level by 7 dBA;
(b) exceeds the residual noise level where the residual noise level is higher than the rating level;
(c) exceeds the residual noise level by 3 dBA where the residual noise level is lower than the rating level; or
(d) in the case of a low-frequency noise, exceeds the level specified in Annex B of SANS 10103;

''noise sensitive activity'' means any activity that could be negatively impacted by noise, including residential, healthcare, educational or religious activities;

''low-frequency noise'' means sound which contains sound energy at frequencies predominantly below 100 Hz;

''rating level'' means the applicable outdoor equivalent continuous rating level indicated in Table 2 of SANS 10103;

''residual noise'' means the all-encompassing sound in a given situation at a given time, measured as the reading on an integrated impulse sound level meter for a total period of at least 10 minutes, excluding noise alleged to be causing a noise nuisance or disturbing noise;

"sound level'' means the equivalent continuous rating level as defined in SANS 10103, taking into account impulse, tone and night-time corrections;

These Regulations prohibits anyone from causing a disturbing noise (Clause 2) and uses the $L_{Aeq,impulse}$ descriptor to define ambient sound and noise levels.

Also, in terms of regulation 4:
(1) The local authority, or any other authority responsible for considering an application for a building plan approval, business license approval, planning approval or environmental authorisation, may instruct the applicant to conduct and submit, as part of the application—

(a) a noise impact assessment in accordance with SANS 10328 to establish whether the noise impact rating of the proposed land use or activity exceeds the appropriate rating level for a particular district as indicated in SANS 10103; or

(b) where the noise level measurements cannot be determined, an assessment, to the satisfaction of the local authority, of the noise level of the proposed land use or activity.

(2) *(a)* A person may not construct, erect, upgrade, change the use of or expand any building that will house a noise-sensitive activity in a predominantly commercial or industrial area, unless he or she insulates the building sufficiently against external noise so that the sound levels inside the building will not exceed the appropriate maximum rating levels for indoor ambient noise specified in SANS 10103.

(b) The owner of a building referred to in paragraph *(a)* must inform prospective tenants or buyers in writing of the extent to which the insulation measures contemplated in that paragraph will mitigate noise impact during the normal use of the building.

(c) Paragraph *(a)* does not apply when the use of the building is not changed.

(3) Where the results of an assessment undertaken in terms of subregulation (1) indicate that the applicable noise rating levels referred to in that subregulation will likely be exceeded, or will not be exceeded but will likely exceed the existing residual noise levels by 5 dBA or more—

(a) the applicant must provide a noise management plan, clearly specifying appropriate mitigation measures to the satisfaction of the local authority, before the application is decided; and

(b) implementation of those mitigation measures may be imposed as a condition of approval of the application.

(4) Where an applicant has not implemented the noise management plan as contemplated in subregulation (3), the local authority may instruct the applicant in writing to—

(a) cease any activity that does not comply with that plan; or

(b) reduce the noise levels to an acceptable level to the satisfaction of the local authority.

3.4 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from developments, industry and roads. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication'.
- SANS 10210:2004. 'Calculating and predicting road traffic noise'.
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.
- SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'.

The relevant standards use the equivalent continuous rating level (calculated from the sound pressure levels over the reference time, see **Appendix A**) as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se*. In terms of environmental noise, the two most important standards are SANS 10103 and 10328 discussed below:

3.4.1 SANS 10103:2008

SANS 10103 provide standard procedures to measure and define rating levels with respect to annoyance and speech communication, mainly focusing on subsections:

- clause 4.1 - Ambient indoor noise;
- clause 4.2 – Typical noise in various districts; and
- clause 4.5 – Assessment of annoyance.

3.4.1.1 Clause 4.1 – Ambient indoor noise

This is a critical section, frequently ignored by authorities and even acoustic specialists. This clause provide recommended rating levels ($L_{Req,T}$) for ambient noise for different areas of occupancy during the time periods when the areas are used for their intended purposes and with the building services (e.g. ventilation systems, air-conditioning systems, lifts, plumbing and lighting) under normal operating conditions. The rating levels given in column 2 of the table are design values, while those given in column 3 are the maximum levels beyond which the ambient noise can be considered to be annoying or otherwise intrusive. Note 2 highlights that, where these levels are used as guidance for the design of buildings in non-residential areas where the ambient noise exceeds the typical level for the type of development, the building design should provide sufficient acoustic isolation to result in the occupancy level specified in Table 1 of SANS 10103 (see example for residential use in **Table 3-1**).

Table 3-1: Recommended ambient noise for different areas of occupancy indoors (Table 2 - SANS 10103:2008)

1	2	3
Types of occupancy or activity	**Design equivalent continuous rating level ($L_{Req,T}$)a for ambient noise dBA**	**Maximum equivalent continuous rating level ($L_{Req,T}$)a for ambient noise dBA**
9. Residential buildings		
Living rooms	35	45
Kitchens and service areas	45	55

Bathrooms and toilets	40	55
Bedrooms	30	40

3.4.1.2 Clause 4.2 – Typical noise in various districts

This section covers typical rating levels ($L_{Req,T}$) for ambient noise in different districts in Table 2 (duplicated in **Table 3-2**). This standard recommends that these values not be exceeded, and outdoor ambient noise exceeding these levels will be considered to be annoying to the community.

Table 3-2: Acceptable Zone Sound Levels for noise in districts (Table 2 - SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req,T}$) for noise dBA**					
	Outdoors			**Indoors, with open windows**		
	Day/night $L_{R,dn}$	**Daytime $L_{Req,d}$**	**Night-time $L_{Req,n}$**	**Day/night $L_{R,dn}$**	**Daytime $L_{Req,d}$**	**Night-time $L_{Req,n}$**
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

The levels may be used as a guide for zoning purposes and assumes that a building with natural ventilation and open windows will provide sound insulation of about 10 dBA, with the rating levels considering Table 1 rating levels (duplicated in **Table 3-1**). This standard highlight in note 1 that, where occupancies have to be allowed within areas where the acceptable outdoor values are exceeded for the particular type of occupancy, the sound insulation of the building housing the occupancy should be proven to comply to the indoor levels defined in Table 1 (see example for residential use in **Table 3-1**) of this standard.

3.4.1.3 Clause 4.5 – Assessment of annoyance

This section recommends investigation only when the rating level ($L_{Req,T}$) of the ambient noise exceeds the rating level ($L_{Req,T}$) of the residual noise (ambient sound levels) at the same location during the relevant time period. The ambient indoor or outdoor sound level should be compared with the appropriate level given in Table 1 (see **section 3.4.1.1**) or Table 2 (see **section 3.4.1.2**). This standard state that it is probable that the noise is annoying or otherwise intrusive to the community or to a group of persons if the rating level of the ambient noise under investigation exceeds the applicable of the following:

a) the rating level of the residual noise (determined in the absence of the specific noise under investigation);
b) the maximum rating level for the ambient indoor noise given in table 1 (see example for residential use in **Table 3-1**); or
c) the typical rating level for the ambient noise for the applicable environment given in table 2 (duplicated in **Table 3-2**). The probable community or group response to the excess ($\Delta L_{Req,T}$) is given in **Figure 3-1**.

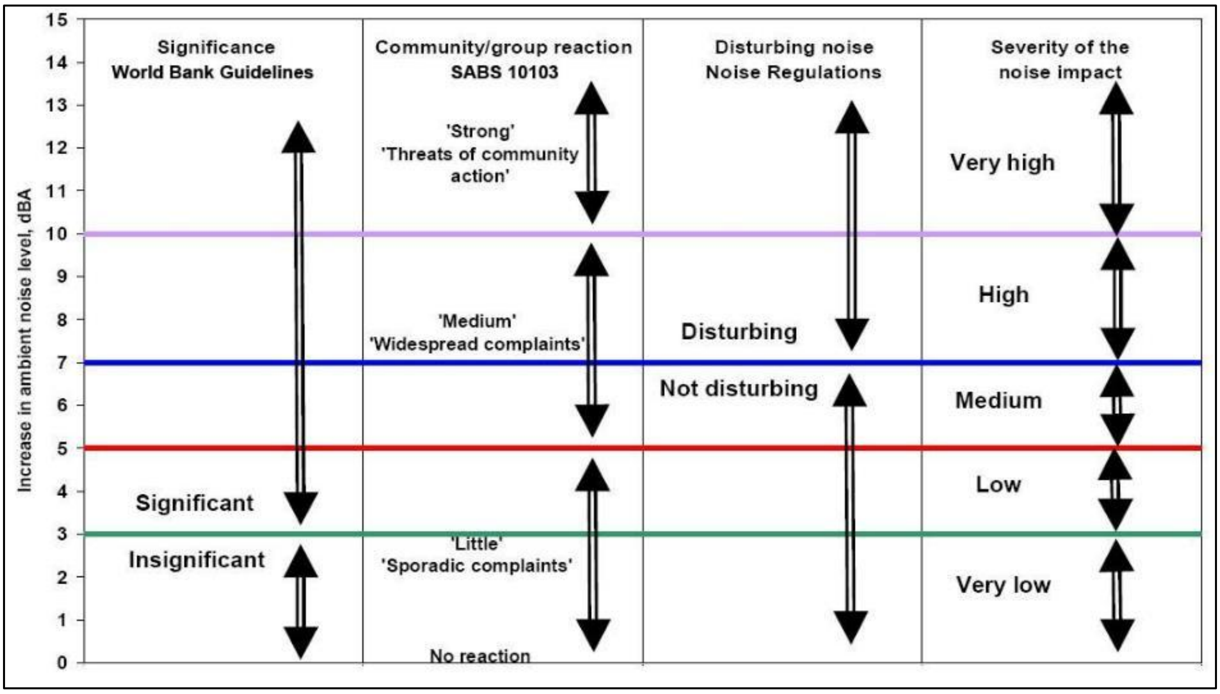

Figure 3-1: Criteria to assess the significance of impacts stemming from noise

3.4.2 SANS 10328:2008

SANS 10328 provide methods for environmental noise impact assessment, with relevant regulations (see **section 3.3.1**) stipulating that this standard be followed when doing a noise specialist study.

SANS 10328 recommends that the procedures given in clause 6 to clause 8 (inclusive) be followed if:

a) an application, in respect of any activities identified in terms of the current relevant legislation are proposed, if noise sources listed in clauses 3.17 and 3.18 (of SANS 10328) are to be developed, or the issues listed in clause 5 (of SANS 10328) may take place, is made to the relevant authority;
b) an application for a noise-sensitive development (see 3.16 of SANS 10328) is made to the relevant authority;
c) an application for a change in land use is made to the relevant authority; or
d) an environmental noise impact investigation is requested by an applicant or any interested or affected party.

The minimum contents of the noise specialist study are also included in **section 2.6** of this report.

3.5 INTERNATIONAL GUIDELINES

While a number of international guidelines and standards exists, those selected below are used by numerous countries for environmental noise management.

3.5.1 Guidelines for Community Noise (WHO, 1999)

The World Health Organization's (WHO) document on the *Guidelines for Community Noise* is the outcome of the WHO expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the World Health Organization and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. It discusses the specific effects of noise on communities including:

- Interference with communication, noise-induced hearing impairment, sleep disturbance effects, cardiovascular and psychophysiological effects, mental health effects, effects on performance, annoyance responses and effects on social behavior.

It further discusses how noise can affect (and propose guideline noise levels) specific environments such as residential dwellings, schools, preschools, hospitals, ceremonies, festivals and entertainment events, sounds through headphones, impulsive sounds from toys, fireworks and firearms, and parklands and conservation areas.

To protect the majority of people from being affected by noise during the daytime, it proposes that sound levels at outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the day, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}. At night, equivalent sound levels at the outside façades of the living spaces should not exceed 45 dBA and 60 dBA L_{Amax} so that people may sleep with bedroom windows open. It is critical to note that this guideline requires the sound level measuring instrument to be set on the "fast" detection setting.

3.5.2 Night Noise Guidelines for Europe (WHO, 2009)

Refining previous Community Noise Guidelines issued in 1999, and incorporating more recent research, the World Health Organization has released a comprehensive report on the health effects of night time noise, along with new (non-mandatory) guidelines for use in Europe. Rather than a maximum of 30 dB inside at night (which equals 45-50 dB max outside), the WHO now recommends a maximum year-round outside night-time noise average of 40 db to avoid sleep disturbance and its related health effects. The report notes that only below 30 dB (outside annual average) are "*no significant biological effects observed*," and that between 30 and 40 dB, several effects are observed, with the chronically ill and children being more susceptible; however, "*even in the worst cases the effects seem modest*." Elsewhere, the report states more definitively, "*There is no sufficient evidence that the biological effects observed at the level below 40 dB (night, outside) are harmful to health*." At levels over 40 dB "*Adverse health effects are observed*" and "*many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected*."

The 184-page report offers a comprehensive overview of research into the various effects of noise on sleep quality and health (including the health effects of non-waking sleep arousal), and is recommended reading for anyone working with noise issues. The use of an outdoor noise standard is in part designed to acknowledge that people do prefer to leave windows open when sleeping, though the year-long average may be difficult to obtain (it would require longer-term sound monitoring than is usually budgeted for by either industry or neighbourhood groups).

While recommending the use of the average level, the report notes that some instantaneous effects occur in relation to specific maximum noise levels, but that the health effects of these "cannot be easily established."

3.5.3 Equator Principles

The **Equator Principles** (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs.

The Equator Principles were developed by private sector banks and were launched in June 2003. Revision III of the EPs has been in place since June 2013. The participating banks chose to model the Equator Principles on the environmental standards of the World Bank Group (1999) (WBG) and the social policies of the International Finance Corporation (IFC). Eighty-three financial institutions (2016) have adopted the Equator Principles, which have become the de facto standard for banks and investors on how to assess major development projects around the world.

3.5.4 IFC: General EHS Guidelines – Environmental Noise Management

These guidelines are applicable to noise created beyond the property boundaries of a development that conforms to the Equator Principles. The environmental standards of the WBG have been integrated into the social policies of the IFC since April 2007 as the IFC Environmental, Health and Safety (EHS) Guidelines.

It states that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from project facilities/operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. It goes as far as to proposed methods for the prevention and control of noise emissions, including:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casing radiating noise;
- Improving the acoustic performance of constructed buildings, apply sound insulation;
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas ;

- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Placement of permanent facilities away from community areas if possible;
- Taking advantage of the natural topography as a noise buffer during facility design;
- Reducing project traffic routing through community areas wherever possible;
- Planning flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas; and
- Developing a mechanism to record and respond to complaints.

It sets noise level guidelines (see **Table 3-3**) and highlights the certain monitoring requirements pre- and post-development. It adds another criterion in that the existing background ambient noise level should not rise by more than 3 dBA. This criterion will effectively sterilize large areas of any development. Therefore, it is EARES's considered opinion that this criterion was introduced to address cases where the existing ambient noise level is already at, or in excess of the recommended limits.

Table 3-3: IFC Table .7.1-Noise Level Guidelines

Receptor type	One hour L_{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Night-time 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The document uses the $L_{Aeq,1hr}$ noise descriptors to define noise levels. It does not determine the detection period, but refers to the IEC standards, which requires the fast detector setting on the Sound Level Meter during measurements in Europe.

3.5.5 European Parliament Directive 200/14/EC

Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors was adopted by the European Parliament and the Council and first published in May 2000 and applied from 3 January 2002. The directive placed sound power limits on equipment to be used outdoors in a suburban or urban setting. Failure to comply with these regulations may result in products being prohibited from being placed on the EU market. Equipment list is vast and includes machinery such as compaction machineries, dozers, dumpers, excavators, etc. Manufacturers as a result started to consider noise emission levels from their products to ensure that their equipment will continue to have a market in most countries.

4 CURRENT ENVIRONMENTAL SOUND CHARACTER

4.1 EFFECT OF SEASON ON SOUND LEVELS

Natural sounds are a part of the environmental noise surrounding humans. In rural areas the sounds from insects and birds would dominate the ambient sound character, with noises such as wind flowing through vegetation increasing as wind speed increase. Work by Fégeant (2002) stressed the importance of wind speed and turbulence causing variations in the level of vegetation generated noise. In addition, factors such as the season (e.g. dry or no leaves versus green leaves), the type of vegetation (e.g. grass, conifers, deciduous), the vegetation density and the total vegetation surface all determine both the sound level as well as spectral characteristics.

Ambient sound levels are significantly affected by the area where the sound measurement location is situated. When the sound measurement location is situated within an urban area, close to industrial plants or areas with a constant sound source (ocean, rivers, etc.), seasons and even increased wind speeds could have a significant impact on ambient sound levels.

Sound levels in undeveloped rural areas (away from occupied dwellings) however are impacted by changes in season for a number of complex reasons. The two main reasons are:

- Faunal communication during the warmer spring and summer months as various species communicate in an effort to find mates; and
- Seasonal changes in weather patterns, mainly wind (also see the following section).

For environmental noise, weather plays an important role, the greater the separation distance, the greater the influence of the weather conditions, so, from day to day, a road 1,000 m away can sound very loud or can be completely inaudible. Other, environmental factors that impact on sound propagation includes wind, temperature and humidity, as discussed in the sub-sections below.

Ambient sound levels are generally less during the colder months (due to less faunal communication) and higher during the warmer months.

4.1.1 Effect of Temperature inversions

On a typical sunny afternoon, the air is the hottest near the ground surface and temperature decreases at higher altitudes. This temperature gradient causes sound waves to refract upward, away from the ground and results in lower noise levels being heard at a measurement location (lapse conditions). The potential effect of refraction is illustrated in **Figure 4-1**.

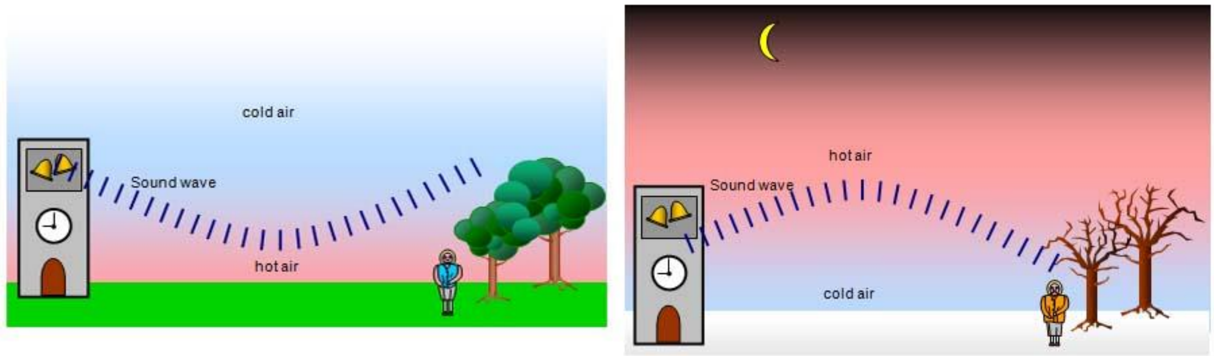

Figure 4-1: Influence of temperature inversions on the propagation of sound

In the evening, this temperature gradient will reverse, but, during certain meteorological conditions, the normal vertical temperature gradient could be inverted so that the air is colder near the surface, with a warmer layer blanketing the lower layer. This inversion layer may result in the reflection of some of the sound waves as illustrated in **Figure 4-2** below.

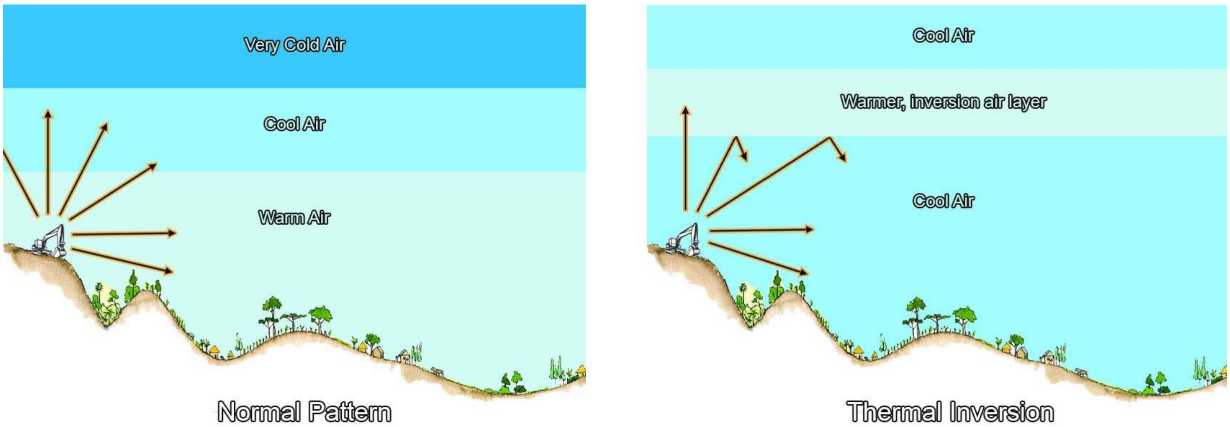

Figure 4-2: Influence of temperature inversions on the propagation of sound

When such an inversion layer is present, some of the sound waves will be refracted[3] by the temperature gradient, with the refracted sound waves returned to the ground. This effect has been noticed near airports and roads, where noises can be heard over greater distances at night than other times of day.

[3] Redirecting the wave propagation direction due to a change in the density of the air which influence the speed of sound.

Like wind gradients, temperature gradients can influence sound propagation over long distances, complicate sound level measurements as well as propagation modelling.

4.1.2 Effect of Wind

Wind alters sound propagation by the mechanism of refraction, that is, wind bends sound waves. Wind nearer to the ground moves more slowly than wind at higher altitudes, due to surface characteristics such as hills, trees, and man-made structures that interfere with the wind. This wind gradient, with faster wind at higher elevation and slower wind at lower elevation, causes sound waves to bend downward when they are traveling to a location downwind of the source and to bend upward when traveling toward a location upwind of the source as illustrated in **Figure 4-3**. Waves bending downward means that a listener standing downwind of the source will hear louder noise levels than the listener standing upwind of the source. This phenomenon can significantly impact sound propagation over long distances and when wind speeds are high. Over short distances wind direction has a small impact on sound propagation as long as wind velocities are reasonably slow, i.e., less than 5 m/s.

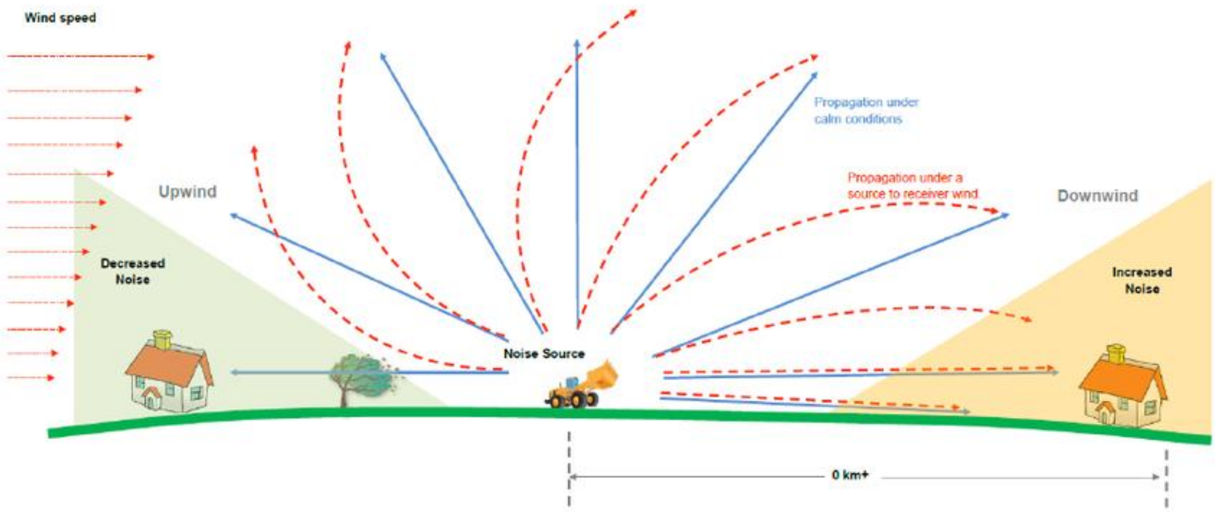

Figure 4-3: Influence of wind on sound propagation

Wind speed frequently plays a role in increasing sound levels in natural locations. With no wind, there is little vegetation movement that could generate noises and faunal noises (normally birds and insects) dominate, however, as wind speeds increase, the rustling of leaves increases which subsequently can increase sound levels. This directly depends on the type of vegetation in a certain area. The impact of increased wind speed on sound levels depends on the vegetation type (deciduous versus conifers), the density of vegetation in an area, seasonal changes (in winter deciduous trees are bare) as well as the height of this vegetation. This excludes unanticipated consequences, as suitable vegetation may create suitable habitats and food sources attracting birds and insects (and the subsequent increase in faunal communication).

4.1.3 Effect of Humidity and Temperature

On a typical sunny afternoon, the air is the hottest near the ground surface and temperature decreases at higher altitudes. This temperature gradient causes sound waves to refract upward, away from the ground and results in lower noise levels being heard at a measurement location. In the evening, this temperature gradient will reverse, resulting in cooler temperatures near the ground. This condition, often referred to is a temperature inversion will cause sound to bend downward towards the ground and results in louder noise levels at the listener position. Like wind gradients, temperature gradients can influence sound propagation over long distances, complicate sound level measurements as well as propagation modelling.

Generally, sound propagate better at lower temperatures (down to 10°C), and with everything being equal, a decrease in temperature from 32°C to 10°C could increase the sound level at a listener 600 m away by ±2.5 dB (at 1,000 Hz). The effect of humidity on sound propagation is quite complex, but effectively relates to how increased humidity changes the density of air. Lower density translates into faster sound wave travel, so sound waves travel faster at a higher high humidity. With everything being equal, an increase in humidity from 20% to 80% would increase the sound level at a listener 600 m away by ±4 dB (at 1,000 Hz at 20°C).

Together, the impact of temperature and humidity (together with air pressure - to a minor extent) are complex and highly dependent on the frequency composition of the noise. This is illustrated in **Figure 4-4**.

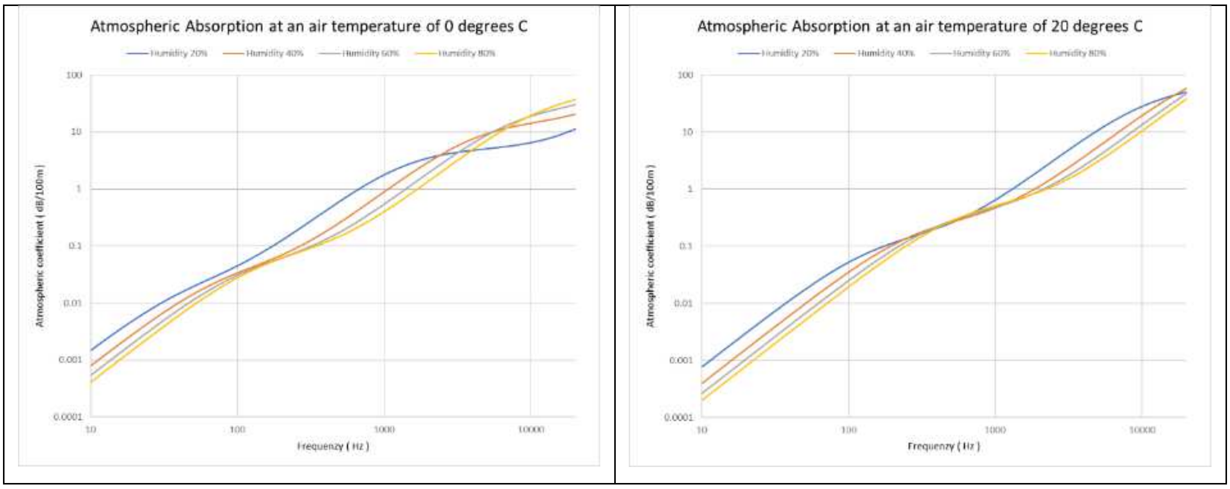

Figure 4-4: Effect of Temperature and Humidity on propagation of Sound

Humidity and temperatures as measured from 7 – 9 March 2026 are defined in **Table 4-1**.

Table 4-1: Average Humidity and Temperature measured onsite

	Humidity	Temperature
Day average	69.7	21.0
Night average	87.1	15.5
Day minimum	28.8	12.0
Day maximum	89.1	29.4
Night minimum	80.1	12.3
Night maximum	89.1	17.7

4.2 SHORT-TERM MEASUREMENTS DONE NEXT TO N2 AND R327 ROADS

The long-term measurements were augmented by a number of 1-hour (short-term) measurements during March 2026, mainly to confirm noise levels from these roads. The measurements were done using the Rion instrument defined in **Table 4-2**. The measurement locations are illustrated in **Figure 4-5**, with a summary of the sound levels defined in **Table 4-3**.

Table 4-2: Equipment used to measure short-term sound levels

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	Rion NL-62	00511791	January 2026
Pre-amplifier	NH-26	11989	January 2026
Microphone	UC-59L	02257	January 2026
Calibrator	Quest CA-22	J 2080094	July 2024

4.3 LONG-TERM MEASUREMENTS COLLECTED

Ambient sound (residual noise) levels were measured over a 2-night period from 7 to 9 March 2026 in accordance with the South African National Standard SANS 10103:2008, also considering the protocols defined GG 43110 of 20 March 2020 (GNR 320 of 2020).

Semi-continuous measurements were collected at one location at an unused farm dwelling, with the data augmented with 1-hour noise level measurements next to the N2 and R327 roads, coupled with traffic counts. Due to short notice, the semi-continues measurement of ambient sound levels were not permitted at NSR01 (Reedvalley) and NSR05. The measurement locations are presented in **Figure 4-5**, with the measurement results summarized on this figure.

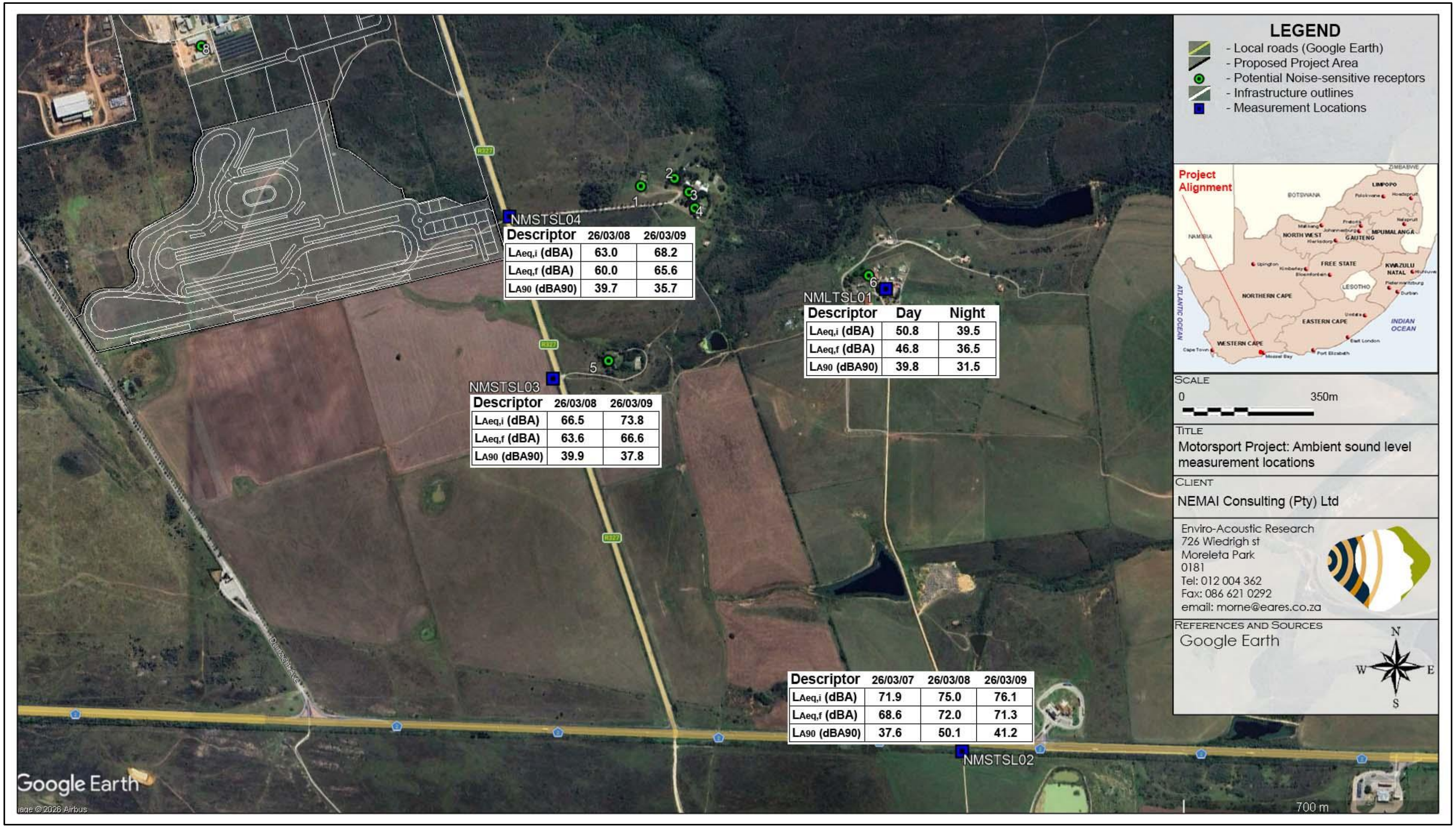

Figure 4-5: Localities where ambient sound (residual noise) levels were measured during March 2026

Table 4-3: Summary of short-term sound levels measured in area

		L_{Amax}	$L_{Aeq,i}$	L_{Amin}	$L_{Aeq,f}$	$L_{A90,f}$	Comments
NMSTSL02	2026/03/07 17:01	87.4	71.9	32.7	68.6	37.6	Some wind-induced noises at times, with road traffic dominant. Traffic (cars, bakkies) – 410 vehicles Traffic (trucks and tour busses) – 26 vehicles
	2026/03/08 10:30	86.0	75.0	40.7	72.0	50.1	Road traffic dominant and generally constant. Birds audible during quiet periods, with cows audible at times. Traffic (cars, bakkies) – 669 vehicles Traffic (trucks and tour busses) – 31 vehicles
	2026/03/09 08:21	97.6	76.1	30.5	71.3	41.2	Road traffic noises relative constant and dominant noise. Birds audible at times. Traffic (cars, bakkies) – 428 vehicles Traffic (trucks and tour busses) – 22 vehicles
NMSTSL03	2026/03/08 12:02	83.9	66.5	37.3	63.6	39.9	Road traffic dominant during passing, with road traffic noises on N2 relative constant and audible. Birds audible and relative constant. Dogs barking from premises of NSR05. Traffic (cars, bakkies) – 121 vehicles Traffic (trucks) – 6 vehicles
	2026/03/09 09:41	100.4	73.8	24.6	66.6	37.8	Road traffic dominant during passing, with road traffic noises on N2 relative constant and audible. Birds audible and relative constant. Traffic (cars, bakkies) – 205 vehicles Traffic (trucks) – 14 vehicles
NMSTSL04	2026/03/08 13:17	80.3	63.0	37.9	60.0	39.7	Road traffic dominant during passing, with road traffic noises on N2 relative constant and audible. Birds audible and relative constant. Slight hum from Mossdustria area. 2 vehicles entering Reedvalley, one vehicle leaving during measurement. Traffic (cars, bakkies) – 138 vehicles Traffic (trucks) – 5 vehicles
	2026/03/09 11:03	83.1	68.2	33.5	65.6	35.7	Road traffic dominant during passing, with road traffic noises on N2 relative constant and audible. Birds audible and relative constant. Some wind-induced noises from flag/flagpole with wind gusts. Tonal noise from Reedvalley (leaf blower or pump). Slight hum from Mossdustria area. Traffic (cars, bakkies) – 169 vehicles Traffic (trucks) – 4 vehicles

4.3.1 Ambient Sound Measurements at NMLTSL01

The microphone was deployed between a number of farm buildings, with the buildings unoccupied during the site visit, with the microphone relatively sheltered from direct wind as well as noises from the N2 road. Measurements were done using the Rion NL53 instrument defined in **Table 4-4**, with photos of the measurement location presented in **Appendix B**. The farm was unoccupied during the site visit, and as a result there were no noises typically associated with an active farm household. Birds and faunal noises were the dominant source of noise, with road traffic noises audible during deployment, inspections and collection of instrument.

Table 4-4: Equipment used to gather data at location NMLTSL01

Equipment	Model	Serial no	Calibration Date
Sound Level Meter	Rion NL-53	00251788	January 2026
Pre-amplifier	NH-25	44843	January 2026
Microphone	UC-59	27095	January 2026
Calibrator	Quest QC-20	JQOC20005	August 2025

Figure 4-6 illustrates how the impulse- and fast-weighted 10-minute equivalent values change over time, with **Table 4-5** defining the average values for the time period. The various sound measurements are also classified into different noise districts as illustrated in **Figure 4-8** and **Figure 4-9** respectively.

Table 4-5: Sound levels considering various sound level descriptors at NMLTSL01

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)
Day arithmetic average	-	50.8	46.8	39.8	-
Night arithmetic average	-	39.5	36.5	31.4	-
Day equivalent average	-	52.0	48.9	-	-
Night equivalent average	-	44.4	41.2	-	-
Day minimum	-	37.6	35.8	-	24.6
Day maximum	84.7	62.7	56.6	-	-
Night minimum	-	27.0	24.5	-	18.8
Night maximum	71.8	51.8	49.6	-	-

The L_{A90} level is presented in this report to define the "background ambient sound level", or the sound level that can be expected if there were little single events (loud transient noises) that impacts on average sound level. $\mathbf{L_{A90,f}}$ values are elevated both day and night, indicating a location with constant background noises. This is typical of an urban area near industrial areas or main roads with relative constant traffic.

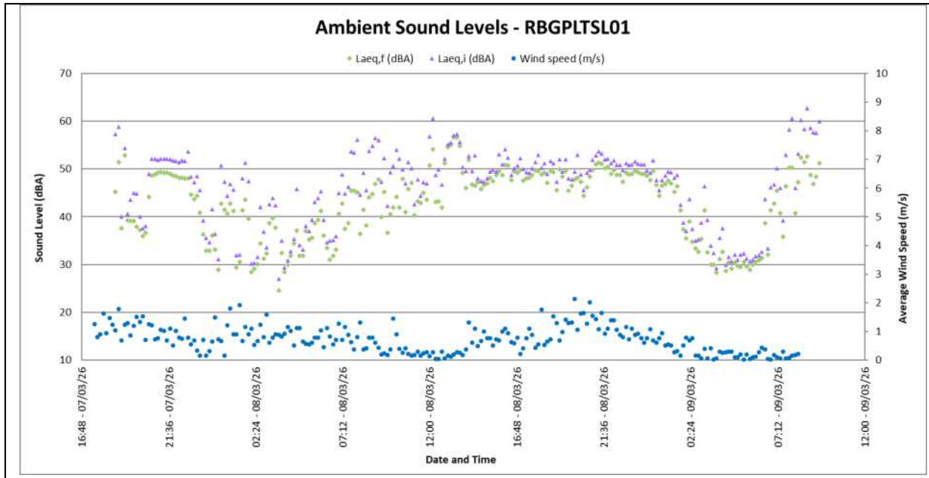

Figure 4-6: Ambient Sound Levels at NMLTSL01

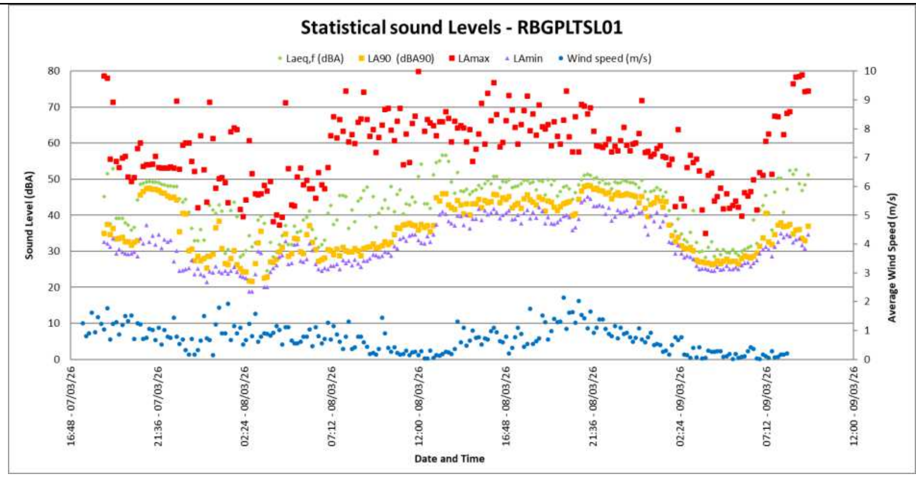

Figure 4-7: Maximum, minimum and statistical values at NMLTSL01

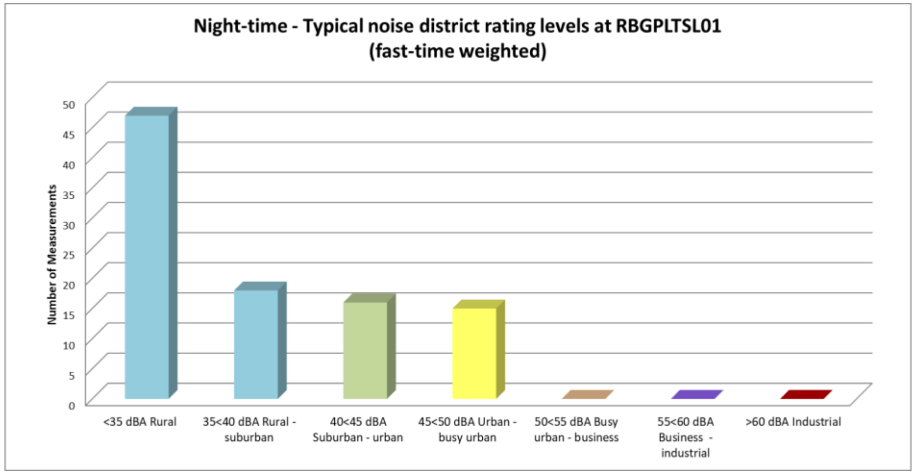

Figure 4-8: Classification of night-time noise levels – NMLTSL01

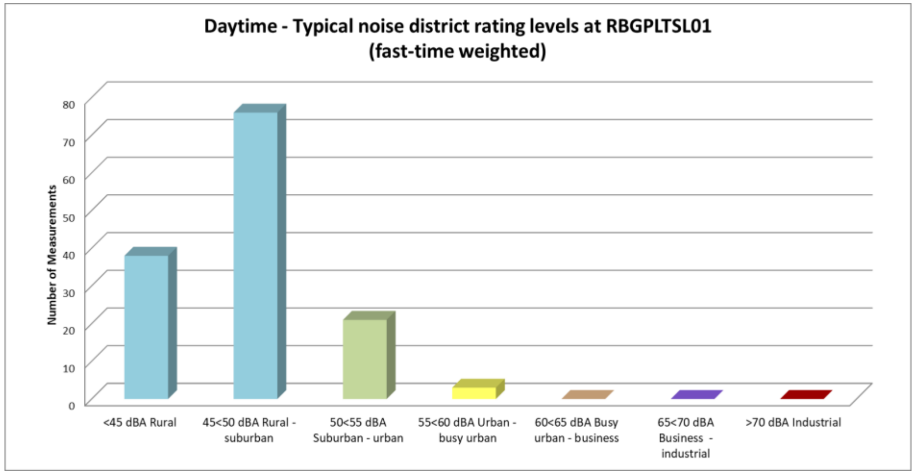

Figure 4-9: Classification of daytime noise levels - NMLTSL01

4.4 SUMMARY OF AMBIENT SOUND LEVELS AND DESIRED RATING LEVELS

Considering the measurements collected during March 2026, more than 138 daytime and 96 night-time readings were recorded, with the data indicating relatively low ambient sound levels typical of a rural to sub-urban noise district at NSR06.

Based on the readings collected during site visit, likely rating levels are defined per NSR in **Table 4-6**.

Table 4-6: Potential rating levels at various NSR

Location Reference	Designated rating level		Comment on recommendation (rating levels as per Table 2, SANS 10103 [also see Table 3-2])
	Day	Night	
NSR01	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR02	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR03	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR04	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR05	60	50	Location within 500m from busy road, near commercial premises. NSR located within 1,000m from industrial area.
NSR06	55	45	NSR located within 1,000m from industrial area, but further than 1,000m from very busy road (and further than 500m from the R327)
NSR07	60	50	Location within 1,000m from very busy road. NSR located within 1,000m from industrial area.
NSR08	70	60	NSR located within 1,000m from heavy industrial area, with factory located within light-industrial area.

5 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction of the motorsport facility and related infrastructure as well as future operational activities. The potential noise impacts from the activities associated with these phases are discussed in the following sections.

It should be noted that there are numerous equipment and activities taking place at such a project, with this study mainly focusing on the noises from motorsport racing as the main generators of noise, with the other activities or equipment having a minor impact on the noise levels (voices from a large gathering of people, public address systems, compressors, extraction fans, etc.). Based on noise measurements conducted at existing projects where modelling was conducted, the assumptions would be sufficient to ensure an accuracy within 5 dBA, leaning towards a more pre-cautious result (noise levels will be over-estimated).

5.1 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

5.1.1 Construction equipment

It is estimated that construction of the motorsport arena will take approximately 15–18 months, with heavy machinery and high-impact activities generating peak noise levels roughly 20 - 50% of the time[4]. The development process will involve the following principal phases:

- Logistics and Equipment Mobilisation: Transport of track materials, grandstand components, and specialized safety barriers to the site via flatbed trucks. Heavy civil engineering equipment (e.g., excavators, graders, pavers, and compaction rollers) will be deployed for circuit earthworks. Increased heavy traffic is expected from the continuous delivery of high-specification asphalt or ready-mix concrete required for the track surface and pit infrastructure.
- Access and Perimeter Security: Establishment of high-volume entrance gates, paddock access roads, contractor compounds, and spectator fencing.
- Track and Infield Clearing: Vegetation clearance across the circuit footprint and spectator embankments. This involves large-scale stripping of topsoil, which will be stockpiled for later use in landscaping and safety run-off areas.
- Structural Foundations: Excavation and casting of reinforced foundations for the grandstands, pit buildings, race control tower and other buildings.

[4] See also typical acoustic usage factors from: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

- Specialised Infrastructure: Construction of technical facilities, including the pit lane, fuel storage areas, scrutineering bays, workshops, and extensive stormwater management systems designed for rapid track drainage.
- Sub-grade and Base Preparation: The use of heavy-duty excavators, graders, and vibratory rollers to level and compact the earth. The high-frequency vibration from soil compaction equipment often generates low-frequency noise and ground-borne vibrations that can be perceptible over longer distances than surface noise.
- Material Supply: If an on-site asphalt batching plant is established to ensure the required temperature and consistency of the "race-grade" bitumen, it will introduce a localized, continuous noise source from its burners, mixers, and aggregate loaders.
- Asphalt Paving: The deployment of asphalt pavers and heavy transport trucks (tippers) to lay the track surface. This involves the constant mechanical noise of conveyors and screeds, as well as the idling and movement of delivery vehicles.
- Compaction and Finishing: Multiple smooth-drum and pneumatic-tyred rollers will operate in tandem to achieve the strict density and smoothness requirements of a racing surface. These machines generate consistent, mid-frequency engine drone and backup alarms (beepers).

Construction activities will be distributed across the expansive raceway circuit site at varying intervals, with machinery operating under fluctuating loads. It is important to note that while construction noise is significant, the noise levels generated during this phase are generally substantially lower than those produced during the operational phase (e.g., high-revving engines and race events).

Several factors determine the audibility and potential impact of construction noise on nearby receptors. Peak noises from activities like pile driving or heavy earthmoving may be audible over long distances but are typically transient. However, if maximum noise levels exceed 65 dBA at a receptor, or if the noise consistently exceeds the prevailing ambient sound level by more than 15 dB, it may increase annoyance and lead to formal complaints. Potential maximum noise levels generated by various construction equipment as well as the potential extent of these sounds are presented in **Table 5-1**.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound power levels associated with various activities that may be found at a construction site is presented in **Table 5-2**.

Table 5-1: Potential maximum noise levels generated by various equipment

Equipment Description[5]	Impact Device?	Maximum Sound Power Levels (dBA)	**Operational Noise Level at given distance considering potential maximum noise levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)**											
			5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Auger Drill Rig	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Backhoe	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compactor (ground)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compressor (air)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Concrete Batch Plant	No	117.7	92.7	86.7	80.6	72.7	66.7	63.1	60.6	57.1	52.7	49.2	46.7	40.6
Concrete Mixer Truck	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Concrete Pump Truck	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Concrete Saw	No	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Crane	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Dozer	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Drill Rig Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Drum Mixer	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Dump Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Flat Bed Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Front End Loader	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Generator (<25KVA)	No	104.7	79.7	73.7	67.6	59.7	53.7	50.1	47.6	44.1	39.7	36.2	33.7	27.6
Grader	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Impact Pile Driver	Yes	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Mounted Impact Hammer	Yes	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Rivit Buster/Chipping Gun	Yes	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Slurry Trenching Machine	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Vibratory Pile Driver	No	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6

[5] Equipment list and Sound Power Level sources: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm and British Standard BS5228:20124 - "Noise and Vibration Control on Construction and Open Sites"

Table 5-2: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Air compressor	92.6	67.6	61.6	55.5	47.6	41.6	38.0	35.5	32.0	27.6	24.1	21.6	15.5
Bulldozer CAT D10	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Cement truck (with cement)	111.7	86.7	80.7	74.7	66.7	60.7	57.2	54.7	51.2	46.7	43.2	40.7	34.7
Crane	107.5	82.5	76.5	70.5	62.5	56.5	53.0	50.5	46.9	42.5	39.0	36.5	30.5
Diesel Generator (Large - mobile)	106.1	81.2	75.1	69.1	61.2	55.1	51.6	49.1	45.6	41.2	37.6	35.1	29.1
Dumper/Haul truck - Terex 30 ton	112.2	87.2	81.2	75.2	67.2	61.2	57.7	55.2	51.7	47.2	43.7	41.2	35.2
Excavator - Hitachi EX1200	113.1	88.1	82.1	76.1	68.1	62.1	58.6	56.1	52.6	48.1	44.6	42.1	36.1
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
Grader - Operational Hitachi	108.9	83.9	77.9	71.9	63.9	57.9	54.4	51.9	48.4	43.9	40.4	37.9	31.9
Paver - Asphalt	104.8	79.8	73.8	67.8	59.8	53.8	50.3	47.8	44.3	39.8	36.3	33.8	27.8
Road Truck - Flatbed	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Road Truck – Side-tipper	105.7	80.7	74.7	68.7	60.7	54.7	51.2	48.7	45.2	40.7	37.2	34.7	28.7
Rock Breaker, CAT	120.7	95.7	89.7	83.7	75.7	69.7	66.2	63.7	60.2	55.7	52.2	49.7	43.7
Roller – Smooth drum	108.6	83.6	77.6	71.6	63.6	57.6	54.1	51.6	48.1	43.6	40.1	37.6	31.6
Roller - Vibratory	100.9	75.9	69.9	63.9	55.9	49.9	46.3	43.9	40.3	35.9	32.4	29.9	23.9
Water Dozer, CAT	113.8	88.8	82.8	76.8	68.8	62.8	59.3	56.8	53.3	48.8	45.3	42.8	36.8

5.2 POTENTIAL NOISE SOURCES: OPERATIONAL PHASE

5.2.1 Overview of Motorsport Noises

The operational profile of a motorsport facility extend beyond the roar of engines. While the primary acoustic signature is generated by vehicles on the track, a motorsport facility functions as an industrial ecosystem. The ambient noise floor is established by support infrastructure such as high-output public address systems, air compressors in the paddock, impact wrenches during tire changes and the heavy machinery used for track maintenance and recovery. These secondary sounds, while lower in decibel intensity than a racing engine does contribute to the soundscape during a race.

5.2.2 Principal Disciplines and Noise Profiles

The intensity and character of noise emissions are dictated primarily by the discipline of racing being hosted. Each category utilizes distinct engine architectures and exhaust configurations that produce unique acoustic signatures.

5.2.2.1 Open-Wheel and Formula Racing

High-performance open-wheel racing represents the peak of high-frequency noise emissions. These engines are designed for extreme RPM (revolutions per minute) ranges. For instance, naturally aspirated historic Formula units can reach 18,000 RPM, producing a piercing, high-pitched "scream" that registers at approximately 125–130 dBA at the source. Fortunately, modern turbocharged hybrid units have a lower, more guttural pitch due to energy recovery systems (ERS) and turbochargers acting as natural mufflers, typically sitting between 100–110 dBA. The noise is directional and moves at high velocity, creating a sharp "doppler effect" as the vehicle passes a stationary observer.

5.2.2.2 GT and Touring Cars

Production-based racing, such as GT3 or Touring Car championships, offers a broader spectrum of noises. These vehicles use larger displacement engines (V8s, V10s, or Flat-6s) that produce a lower-frequency resonance. A V8 GT3 car, for example, generates a deep, percussive "throb" that can be felt as much as heard. These cars typically emit between 105 and 115 dBA. Because these vehicles often run in dense packs, the cumulative noise level is sustained for longer durations compared to the fleeting passes of single-seaters. Furthermore, the use of "anti-lag" systems and aggressive downshift blips creates sharp, explosive "pops" and "bangs" that contribute to the peak impulse noise of the facility.

5.2.2.3 Drifting and Drag Racing

Drifting introduces a unique acoustic variable: tire squeal. While the engines are high-revving and often turbocharged (95–110 dB), the friction between the rubber and the asphalt produces a high-frequency sustained pitch that differs from mechanical engine noise. Drag racing, conversely, represents the absolute peak of impulsive noise. Top Fuel dragsters can exceed 150 dB—a level capable of causing physical pain and structural vibration—though these events are typically brief, lasting only seconds.

5.2.3 Sources, Levels, and Vehicle Impact

The generation of noise in a racing vehicle is the result of three primary mechanical processes: induction, combustion, and exhaust.

5.2.3.1 Exhaust and Combustion

The exhaust system is the primary contributor to external noise emissions. In a racing environment, the goal is to maximize gas flow; traditional silencers (mufflers) create backpressure, which reduces horsepower. Consequently, racing exhausts are often "straight-through" or fitted with minimal "race-spec" silencers designed to meet specific track limits (commonly 95 dB, 98 dB, or 105 dB depending on the venue's permit). The combustion process itself, occurring thousands of times per minute, creates a series of pressure waves that travel through the exhaust manifold; exit as the primary noise associated with racing.

5.2.3.2 Induction and Mechanical Noise

Often overlooked, the "intake" or induction noise can be significant, especially in naturally aspirated engines. The sound of air being sucked into the throttle bodies at high velocity creates a harsh, mechanical rasp. Additionally, the gearbox—specifically those using straight-cut gears—produces a high-pitched whine that increases in frequency with vehicle speed. In electric racing series (like Formula E), these mechanical and aerodynamic noises (wind rushing over the bodywork) become the dominant sounds, as there is no internal combustion to mask them.

5.2.3.3 Tire noise

The primary source of tire noise is the vibration of the tire’s carcass and sidewalls caused by road surface roughness, with secondary noise source being “air pumping”, generated as the air is compressed into and released from the tire tread grooves. Slippage and tire squeal may also generate noise during rapid acceleration, hard braking and high-speed cornering, although this is highly undesired due to power loss and a reduction in tire life. Due to high noise emission levels from exhaust and drive systems, tire noise typically only start to dominate engine noises at speeds exceeding 100km/hr.

5.2.3.4 Impact of Vehicle Class

The "class" of the vehicle determines the strictness of noise regulation. Professional-grade series often have exemptions or higher allowances for noise due to their economic and entertainment value. Conversely, "track days" for road-legal cars are strictly regulated. A standard road car may emit 70–80 dBA, but a modified "track-spec" version of the same car can easily exceed 100 dBA. The shift toward hybrid and electric powertrains is the most significant factor currently impacting noise emissions, as these vehicles significantly reduce the low-frequency rumble and high-frequency exhaust notes, leaving only the "whirr" of electric motors, tire and aerodynamic noises.

5.2.4 How race circuit affect noise emissions

The noise profile of a race circuit is fundamentally shaped by its geometry, as the physical layout dictates the engine load and mechanical stress of the competing vehicles. Straightaways are the primary source of sustained, high-intensity noise, as vehicles reach peak RPM and wide-open throttle, creating a constant roar that carries the furthest. Conversely, braking zones introduce a dramatic shift in the acoustic signature; while the engine volume drops as the driver lifts off the throttle, it is replaced by the percussive "pops" of anti-lag systems and the high-pitched whine of aggressive downshifts. The radius of a turn directly influences the duration and character of noise emission: tight, low-radius corners require heavy acceleration on exit, which generates high-torque "groans" and potential tire squeal, while large-radius, high-speed sweepers allow for sustained mid-range engine notes. Furthermore, because sound is directional, the orientation of these straights and the angle of the corners can "aim" noise toward or away from surrounding receptors, making the track's technical design a critical factor in its overall environmental footprint.

5.2.5 How the environment impact on the propagation of noise

Noise propagation from a motorsport circuit can be influenced by the physical environment. Modern facilities often utilize "noise attenuation" features such as earthen berms, acoustic fencing, and strategic landscaping. However, the transient nature of racing noise—characterized by rapid fluctuations in intensity as vehicles accelerate, brake, and downshift—presents a unique challenge compared to steady-state industrial noise. The "soundscape" is further modified by atmospheric conditions; humidity, wind direction, and temperature inversions which can cause racing sounds to travel significantly further than on a clear, still day.

5.2.6 Calculating Noise Levels from Vehicles

The total sound power level (PWL) for a single vehicle is the energetic sum of its rolling noise (L_{WR}) and propulsion noise (L_{WR}), calculated as per the following formula:

$$L_W(v) = 10.Log_{10}\left(10^{\frac{L_{WR}+C_R}{10}} + 10^{\frac{L_{WP}+C_P}{10}}\right)$$

On a racetrack, vehicles exiting a corner under full throttle generate significantly higher propulsion noise than they would at a constant speed.

The constant C_P is the most critical for motorsport events as it adjusts propulsion noise (engine, exhaust, and transmission). Vehicles exiting a corner under full throttle generate significantly higher propulsion noise than they would at a constant speed, with C_P adding a decibel penalty to the model's base emission to account for this high engine load. As vehicles approach a corner, C_P can be used to model the drop in engine noise or the specific "popping" and mechanical noise associated with downshifting and anti-lag systems.

The constant C_R adjusts rolling noise (tire-road interaction), considering cornering and speed depended noises.

Table 5-3: Rolling and Propulsion constants used for modelling

	Light Motor Vehicles (LMV)[6]		GT3-class race car	
	C_R	C_P	C_R	C_P
Traffic Signal (acceleration / deceleration)	-4.5	5.5	3.0	8.0
Roundabout (corners and turns)	-4.4	3.1	5.0	4.0

Rolling noise (L_{WR}) is calculate as follows:

$$L_{WR} = A_R + B_R.Log_{10}\left(\frac{v}{v_{ref}}\right) + \Delta L_{WR,road}$$

Where $\Delta L_{WR,road}$ is a correction for the specific road surface.

Propulsion noise (L_{WP}) is calculated as follows:

[6] Typical road legal vehicles without any modifications

$$L_{WR} = A_P + B_P\left(\frac{v - v_{ref}}{v_{ref}}\right) + \Delta L_{WR,road}$$

These values are then adjusted for factors such as number of vehicles, road gradient, acceleration, topographical features, barriers (or buildings), etc. before being propagated to find the final noise level at a receiver. For the purposed of modelling, the variables as defined in **Table 5-4** below will be used.

Table 5-4: CNOSSUS-EU Noise Constants as used for this assessment

	Light Motor Vehicle (default data as defined in SoundPlan Library)				**GT3-class race car (estimated using actual measurements) (derived from Mascolo[7], 2023 & Pascale[8], 2022)**				**Road constants (default data)**	
Hz	**A_R**	**B_R**	**A_P**	**B_P**	**A_R**	**B_R**	**A_P**	**B_P**	**A_i**	**B_i**
63	80	30	94	-1.3	75	40	92	13	0	0
125	86	41	89	7.2	78	40	95	15	0	0
250	85	39	88	7.7	82	40	98	17	0	0
500	90	26	86	8	85	42	102	20	2.6	-3.1
1000	97	33	84	8	88	42	105	20	2.9	-6.4
2000	94	37	87	8	86	42	103	18	1.5	-14.0
4000	84	39	83	8	82	40	98	15	2.3	-22.4
8000	74	40	76	8	76	40	90	10	9.2	-11.4

These setting typically would equate to a GT3-class race car with a sound power level (PWL) of approximately 110 dBA (re 1 pW) at 70 km/hr (constant speed), and a PWL of ±140 dBA (re 1 pW) at 180 km/hr (constant speed). Based on actual noise level measurements done by the author at Zwartkops Raceway, noise modelling may over-model noise levels with around 1 – 5 dBA.

5.2.7 Modelling assumptions

Straights were divided into 100m sections, with corners at around 30m sections. Speeds in corners were estimated as per **Table 5-5**. For a race with 20 vehicles, traffic volumes over an hour may be around 600 – 700 vehicles (30 – 35 laps per hour).

[7] Mascolo, Aurora & Rossi, Domenico & Pascale, Antonio & Mancini, Simona & Coelho, Margarida & Guarnaccia, Claudio. (2023). Noise Assessment during Motor Race Events: New Approach and Innovative Indicators. WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT. 19. 80-88.
[8] Pascale, Antonio & Mancini, Simona & Coelho, Margarida & Guarnaccia, Claudio. (2022). Acoustic Indicators for Motor Race Noise: Definition, Validation, and Tests in Simulated and Real Races. Applied Acoustics. 200.

Table 5-5: Assumed cornering speeds

Corner Type	Radius	Entry Speed	Apex / Mid-Corner	Exit Speed
Tight Hairpin	10–15m	80–100 km/h	50–65 km/h	110–130 km/h
Medium Speed	30–50m	140–160 km/h	90–115 km/h	160–180 km/h
Fast Sweeper	80–120m	210–230 km/h	170–195 km/h	220–240 km/h

The following were not considered:

- Potential changes due to the topography of the area surrounding the motorsport racing track;
- Potential effect of the berms on reducing noise levels;
- Potential buildings and stands to be constructed;
- Potential effect from existing buildings;
- Any noise limits that the project may implement on motor vehicles; and
- The potential benefit from SAFER barriers.

6 METHODS: NOISE IMPACT ASSESSMENT

6.1 NOISE IMPACT ON ANIMALS

Autumn (2007) summarized available literature on the significant research undertaken during the 1960's and 70's on the effects of aircraft noise on animals. While aircraft noise has a specific characteristic that might not be comparable with industrial noise, the findings should be relevant to most noise sources. A general animal behavioural reaction to aircraft noise is the startle response with the strength and length of the startle response to be dependent on the following:

- which species is exposed;
- whether there is one animal or a group of animals, and
- whether there have been some previous exposures.

Overall, the research suggests that species differ in their response to noise depending on the duration, magnitude, characteristic and source of the noise, as well as how accustomed the animals are to the noise (previous exposure).

6.1.1 Domesticated Animals

Excluding loud impulsive noises, it has been observed that most domesticated animals are generally not bothered by noise and generally can acclimatize relatively quickly to loud noises [Šottník, 2011].

6.1.2 Wildlife

Studies indicated that most animals adapt to noises and would even return to a site after an initial disturbance, even if the noise is continuous. Noise-sensitive animals would likely relocate to a quieter area [Helldin,2012]. All studies confirm that the response of animals on noise impact is highly species-dependent (Blickley and Patricelli, 2010). Noise however should not be considered in isolation, as the response of animals depend on numerous other factors, including increased visibility and increased movement of people and vehicles. The presence (or not) of such species are outside the scope of this assessment

6.1.3 Ostriches (focusing on NSR08 – Ostrich Abattoir)

In nature, anthropogenic noise can significantly disrupt ostriches by interfering with their ability to communicate, forage, and detect predators. During travel to an abattoir, noise acts as a persistent "irritant" stressor that, combined with vibration and confinement as well as the stress from being caught and loaded, elevates physiological stress levels more than short-term "intermittent" sounds (Crowther, 2003; Vazquez-Galindo, 2013).

Unfortunately, no data was found to define potential noise levels in the lairage of a typical ostrich abattoir, though noise levels of 70 – 90 dBA have been reported for cattle, pig and sheep lairages (Weeks, 2007; Weeks 2008). As such, the soundscape in a lairage cannot be described as "quiet", even though actual noise levels within an ostrich lairage would be elevated.

6.2 WHY NOISE CONCERNS COMMUNITIES[9]

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

However, it is important to remember that whether a given sound is "noise" depends on the listener or hearer. The driver playing loud rock music on their car radio hears only music, but the person in the traffic behind them hears nothing but noise.

Response to noise is unfortunately not an empirical absolute, as it is seen as a multi-faceted psychological concept, including behavioural and evaluative aspects. For instance, in some cases, annoyance is seen as an outcome of disturbances, and in other cases it is seen as an indication of the degree of helplessness with respect to the noise source.

Noise does not need to be loud to be considered "disturbing". One can refer to a dripping tap in the quiet of the night, or the irritating "thump-thump" of the music from a neighbouring house at night when one would prefer to sleep.

Severity of the annoyance depends on factors such as:

- Background sound levels and the background sound levels the receptor is used to;
- The manner in which the receptor can control the noise (helplessness);
- The time, unpredictability, frequency distribution, duration, and intensity of the noise;

[9] World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

6.2.1 Annoyance associated with Industrial Processes

Annoyance is the most widely acknowledged effect of environmental noise exposure, and is considered to be the most widespread. It is estimated that less than a third of the individual noise annoyance is accounted for by acoustic parameters, and that the non-acoustic factors play a major role. Non-acoustic factors that have been identified include age, economic dependence on the noise source, attitude towards the noise source and self-reported noise sensitivity.

On the basis of a number of studies into noise annoyance, exposure-response relationships were derived for high annoyance from different noise sources. These relationships, illustrated in **Figure 6-1**, are recommended in a European Union position paper published in 2002,[10] stipulating policy regarding the quantification of annoyance. This can be used in environmental health impact assessment and cost-benefit analysis to translate noise maps into overviews of the numbers of persons that may be annoyed, thereby giving insight into the situation expected in the long-term. It is not applicable to local complaint-type situations or to an assessment of the short-term effects of a change in noise levels.

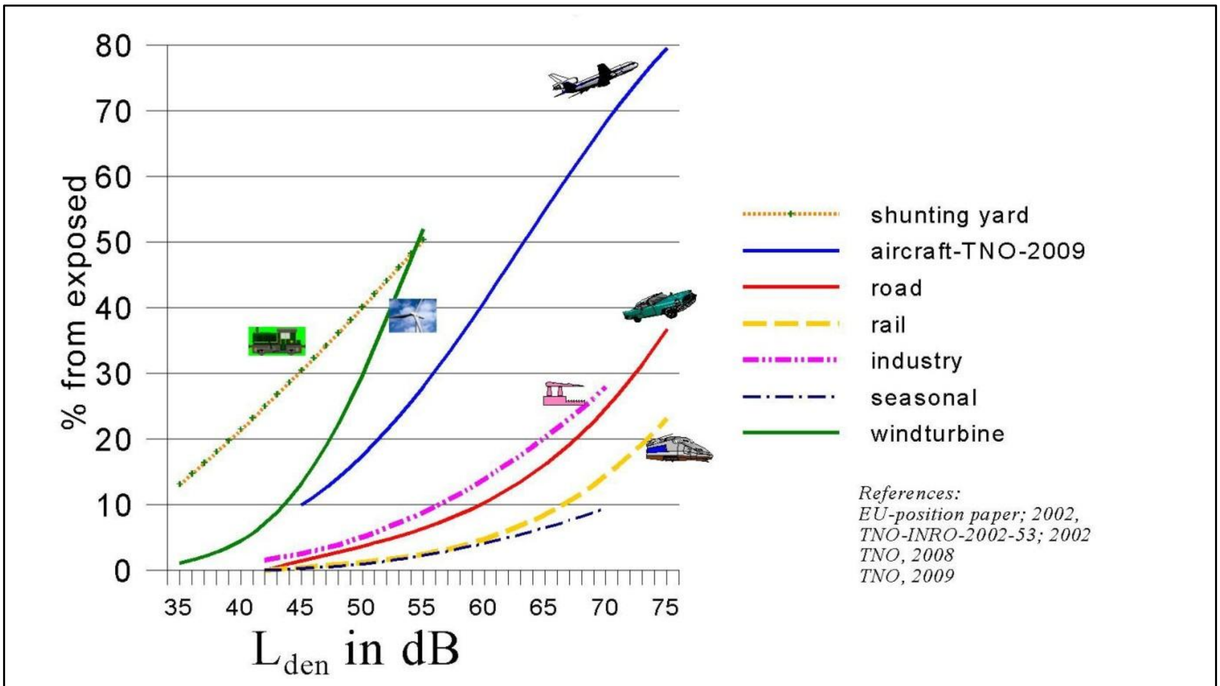

Figure 6-1: Percentage of annoyed persons as a function of the day-evening-night noise exposure at the façade of a dwelling

(10) Image from presentation, Almgren (2011). Sources Miliue, 2010, European Comm., 2010, Jansen, 2009.

As shown in **Figure 6-1**, there is significant potential of annoyance associated with noise from shunting operations, mainly due to the highly impulsive character of the noises created, while noises from most industrial operations[11], together with road traffic noises, being more acceptable to communities.

6.2.1.1 Situational and Personal Factors

There are a few other aspects, collectively referred to as non-acoustical factors that may increase annoyance with a project. These could include:

- Situational factors (visual issues, attractiveness of area);
- Socio-economic factors (age, gender, income, level of education);
- Social factors (attitude towards the applicant/producer/government, media coverage);
- Personal factors (fear or worry in relation to noise source, sensitivity to noise, economic benefit from project, existing health condition); and
- Attitude towards the project and exposure to negative sentiment.

6.3 IMPACT ASSESSMENT CRITERIA

6.3.1 Overview: The Common Characteristics

The word "noise" is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as "noise". These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and
- Offensiveness.

Of the four common characteristics of sound, intensity is the only one that is not subjective and can be quantified. Loudness is a subjective measure of the effect sound has on the human ear. As a quantity it is therefore complicated, but has been defined by experimentation on subjects known to have normal hearing.

[11] Subject that the noise do not contain tones, or having an impulsive or low-frequency characteristic that could increase annoyance with the particular noise

The annoyance and offensive characteristics of noise are also subjective. Whether or not a noise causes annoyance mostly depends upon its reception by an individual, the environment in which it is heard, the type of activity and mood of the person and how acclimatised or familiar that person is to the sound.

6.3.2 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts from the EIA Regulations of 2014 in terms of the NEMA, SANS 10103:2008, and guidelines from the WHO.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, caused by a new source of noise. With regards to the Noise Control Regulations, an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 3-1**.
- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 3-2**.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 3-2**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed.

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient sound (residual noise) level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA

is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

Note that an increase of more than 7 dBA is defined as a disturbing noise[12] and prohibited by national and provincial noise control regulations (see also **section 3.3.2**).

6.4 SETTING APPROPRIATE NOISE RATING LEVELS

Onsite ambient sound measurements (**Section 4.3**) near a farm dwelling indicated a site with an ambient sound level more typical of a rural to suburban noise district. Measurements collected near the R327 (and N2) road also confirm very high road traffic noises. Considering the results of the measurements, ambient sound levels in the vicinity of the project site are elevated, with existing road traffic being a significant source of noise.

Based on Table 2 of SANS 10103 (see **Table 3-2**) desired rating levels, three sets of rating levels would be relevant to the project, namely:

- Industrial area - Project area, including NSR08:
  - Daytime rating level of 70 dBA,
  - Night-time rating level of 60 dBA (not relevant, as facility will not operate after 22:00 at night),
- Urban area (residential use – in vicinity of workshops; business premises; and main roads) - Locations within 500m from the industrial area, the R327 and N2:
  - Daytime rating level of 60 dBA,
  - Night-time rating level of 50 dBA,
- Urban area (residential use) – Locations further than 500m from the industrial area, the R327 and N2 roads, but closer than 2,000m from these noise sources:
  - Daytime rating level of 55 dBA,
  - Night-time rating level of 45 dBA.

[12] "**disturbing noise**" means a noise, excluding the unamplified human voice, which—

(a) exceeds the rating level by 7 dBA;

(b) exceeds the residual noise level where the residual noise level is higher than the rating level;

(c) exceeds the residual noise level by 3 dBA where the residual noise level is lower than the rating level

6.5 DETERMINING THE SIGNIFICANCE OF THE NOISE IMPACT

The level of detail as depicted in the 2014 EIA regulations, as amended on 07 April 2017, was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value as defined in the third column in the tables below.

The impact consequence is determined by summing the scores of Magnitude (**Table 6-1**), Duration (**Table 6-2**) and Spatial Extent (**Table 6-3**). The impact significance (see **Table 6-6**) is determined by multiplying the Consequence result with the Probability score (**Table 6-4**). An explanation of the impact assessment criteria is defined in the following tables.

Table 6-1: Impact Assessment Criteria – Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	**Description**	**Score**
Minor	Increase in average sound pressure levels between 0 and 3 dB from the expected ambient sound levels. Ambient sound levels are defined by the lower of the measured $L_{AIeq,8hr}$ or $L_{AIeq,16hr}$ during measurement dates. Total projected noise level is less than the Zone Sound Level and/or Equator Principle in wind-still conditions.	2
Low	Increase in average sound pressure levels between 3 and 5 dB from the expected ambient sound levels. Total projected noise levels between 3 and 5 above the Zone Sound Level and/or Equator Principle (wind-less conditions).	4
Moderate	Increase in average sound pressure levels between 5 and 7 dB from the ambient sound levels. Increase in sound pressure levels between 5 and 7 above the Zone Sound Level and/or Equator Principle (wind less conditions). Sporadic complaints expected.	6
High	Increase in average sound pressure levels between 7 and 10 from the ambient sound level. Total projected noise levels between 7 and 10 dBA above the Zone Sound Level and/or Equator Principle (wind-less condition). Medium to widespread complaints expected.	8
Very High	Increase in average ambient sound pressure levels higher than 10 dBA. Total projected noise levels higher than 10 dB above the Zone Sound Level and/or Equator Principle (wind less-conditions). Change of 10 dBA is perceived as 'twice as loud', leading to widespread complaints and even threats of community or group action. Any point where instantaneous noise levels exceed 65 dBA at any receptor.	10

Table 6-2: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operation and closure phases). Will the receptors be subjected to increased noise levels for the lifetime duration of the project, or only infrequently.		
Rating	**Description**	**Score**
Temporary	Impacts are predicted to be of very short duration (portion of construction period) and intermittent/occasional (0 – 1 year).	1
Short term	Impacts that are short, predicted to last only for the duration of the construction period (2 - 5 years).	2

Medium term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (5 - 15 years).	3
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (>15 years).	4
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	5

Table 6-3: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as the footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns (further than 1,000 m from site).	3
National	The impact could have an effect that expands throughout the country (South Africa).	4
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	5

Table 6-4: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	Introduced noise level changes the average ambient sound levels with less than 3 dBA.	1
Possible	Introduced noise level changes the average ambient sound levels with between 3 and 5 dBA.	2
Likely	Introduced noise level changes the average ambient sound levels with between 5 and 7 dBA.	3
Highly Likely	Introduced noise level changes the average ambient sound levels with between 7 and 10 dBA.	4
Definite	Introduced noise level changes the average ambient sound levels with more than 10 dBA.	5

In order to assess each of these factors for each impact, the following ranking scales as contained in **Table 6-5** will be used.

Table 6-5: Assessment Criteria: Ranking Scales

PROBABILITY		MAGNITUDE	
Description / Meaning	**Score**	**Description / Meaning**	**Score**
Definite/don't know	5	Very high/don't know	10
Highly likely	4	High	8
Likely	3	Moderate	6
Possible	2	Low	4

Improbable	1	Minor	2
DURATION		**SPATIAL SCALE**	
Description / Meaning	**Score**	**Description / Meaning**	**Score**
Permanent	5	International	5
Long Term	4	National	4
Medium Term	3	Regional	3
Short term	2	Local	2
Temporary	1	Footprint	1

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a Significance Rating (SR) value for each impact (prior to the implementation of mitigation measures) as defined in **Table 6-6**.

Table 6-6: Calculating the Significance Rating for the Noise Impact

SR<31	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
31<**SR** <60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR>60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

6.6 REPRESENTATION OF NOISE LEVELS

Noise rating levels will be calculated in detail in this report using the appropriate sound propagation models as defined. It is therefore important to understand the difference between sound or noise level as well as the noise rating level (also see Glossary of Terms, **Appendix A**).

Sound or noise levels generally refers to a level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments was added. These noise rating levels are further processed into a 3D map illustrating noise contours of constant rating levels or noise isopleths. In this noise scoping report, it will be used to illustrate the potential extent of the calculated noises of the project and not a noise level at a specific moment in time.

7 METHODS: CALCULATION OF NOISE LEVELS

7.1 NOISE FROM MOTORSPORT ACTIVITIES

As discussed in section 5.2.1, there are various other sources potential noise from a motorsport event, yet, compared to the noises associated with various vehicles around the track, these noises are insignificant and will not be considered in this assessment.

Modelling motorsport noise presents unique challenges because standard traffic noise algorithms often fail to capture the extreme sound pressure levels and highly transient nature of racing. As such, using relatively simple noise models used as RLS-90 (Richtlinien für den Lärmschutz an Straßen 90) or CRTN (Calculation of Road Traffic Noise) tend to undermodel noise levels from motorsport facilities significantly, and it was selected to use the CNOSSUS-UE noise model.

CNOSSOS-EU is the mandatory harmonized methodology across all EU Member States for Strategic Noise Mapping under the Environmental Noise Directive (2002/49/EC). This noise model considers:

- Potential rolling (tire) spectral noises at different speeds;
- Potential propagation (engine, gearbox, exhausts) spectral noises at different speeds;
- Vehicle speeds and traffic flows;
- Various corrections, including road surface type, road gradient, the effects of acceleration and braking;
- Meteorological effects such as air temperature, humidity and wind directions;
- Ground effects, geometry, barriers, reflections and diffraction of sound waves; and
- Topographical layout of the area.

8 ASSUMPTIONS AND LIMITATIONS

8.1 LIMITATIONS - ACOUSTICAL MEASUREMENTS

Ambient sound (residual noise) levels are the cumulative effects of innumerable sounds generated at various instances both far and near. A high measurement may not necessarily mean that the area is always noisy. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of day, dependant on faunal characteristics (mating season, dawn chorus(13) early hours of the morning, temperature etc.), vegetation in the area and meteorological conditions (especially wind).

Selecting an ideal measurement location could be difficult, with various criteria assessed to identify the viability of a certain location as a point to define ambient sound levels. When selecting a measurement location, the most important criteria would be:

1. Security of the instrument (minimise risk to the technician; prevent theft; sabotage of the equipment);
2. Safety of the equipment (ensure that it does not prevent, interfere or limit typical agricultural or household activities; ensure that the instrument are not in a location where an animal could damage the instrument); and lastly,
3. The suitability of the measurement location to define ambient sound levels (the presence of certain trees or equipment, wetland or other water resources will influence ambient sound level significantly).

As such, after ensuring that the instrument is safe and secure, there are various environmental factors that could influence ambient sound levels measured. These constraints and limitations are discussed below and could include:

- Seasonal changes in the surrounding environment can influence typical ambient sound levels, as many faunal species are more active during warmer periods than the colder periods. As an example, cicada is usually only active during warmer periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals(14);
- Defining ambient sound levels using the result of one 10-minute measurement may be very inaccurate (very low confidence level in the results) relating to the reasons mentioned above, and measurements over a longer-term period is critical;

(13) Environ. We Int. Sci. Tech. *Ambient noise levels due to dawn chorus at different habitats in Delhi*. 2001. Pg. 134.
(14) Clyne, D. *"Cicadas: Sound of the Australian Summer, Australian Geographic"* Oct/Dec Vol 56. 1999.

- Some equipment that could influence measurements may be missed when deploying instruments, or, the equipment may not the audible. This could include equipment such as hidden water pumps and associated pipelines and outflows, ESKOM stepdown transformers, hidden compressors, inverters, condensers or other electrical equipment, etc. While not audible during deployment, such equipment may significantly influence ambient sound levels during quiet periods;
- Type, the number and sizes of trees in the vicinity of the instrument, as well as the distances between the microphone and these trees. Certain trees, especially fruiting trees could attract birds and other animals that will significantly impact on ambient sound levels;
- Type and number of animals in the vicinity of the microphone. Dogs, chickens, geese, etc. generate different noises randomly both night and day, and other livestock (sheep, goats, cattle, horses, etc.) kept in enclosures will also raise noise levels, especially if these animals are penned in large numbers;
- Measurements over wind speeds of 3 m/s could provide data influenced by wind-induced noises. However, when determining the ambient sound levels associated with increased wind speeds, it is desired to measure ambient sound levels at higher wind speeds;
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high due to faunal activity which can dominate the sound levels around the measurement point (specifically during summertime, rainfall event or during dawn chorus of bird songs). This generally is still considered naturally quiet and accepted as features of the natural environment, and in various cases sought after and pleasing. Ambient sound level data measured in such area however should not be used to develop an opinion in the potential prevailing ambient sound levels in the larger area;
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation, wetlands and external noise sources will influence measurements. It may determine whether you are measuring anthropogenic sounds from a receptors dwelling, or environmental ambient baseline contributors of significance (faunal, roads traffic, railway traffic movement etc.); and
- As a residential area develops the presence of people will result in increased dwelling related sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area matures.

8.2 CALCULATING NOISE EMISSIONS – ADEQUACY OF PREDICTIVE METHODS

Limitations due to the calculations of the noise emissions into the environment include the following:

- Most sound propagation models do not consider sound characteristics as calculations are based on an equivalent level (with the appropriate correction implemented e.g. tone or impulse). These other characteristics include intrusive sounds or amplitude modulation;
- Sound propagation models do not consider refraction through the various temperature layers (specifically relevant during the night-times);
- Most sound propagation models do not consider the low frequency range (third octave 16 Hz – 31.5 Hz). This would be relevant to facilities with a potentially low frequency issues;
- Many environmental models consider sound to propagate in hemi-spherical way. Certain noise sources (e.g. a speakers, exhausts, fans) emit sound power levels in a directional manner;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified, with ground conditions accepted as uniform. Ground conditions will not be considered in this assessment.

Due to these assumptions, modelling generally could over-model[15] noise levels with as much as +10 dBA, although realistic values ranging from 3 dBA to less than 5 dBA are more common in practice.

8.3 ADEQUACY OF UNDERLYING ASSUMPTIONS

Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.

As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor but to calculate a noise rating level that is used to identify potential issues of concern.

[15] Precautious approach – Noise propagation modelling normally over-model potential noise levels.

8.4 UNCERTAINTIES ASSOCIATED WITH MITIGATION MEASURES

Any noise impact can be mitigated to have a low significance; however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of an NSR). These mitigation measures may be engineered, technological or due to management commitment.

For the purpose of the determination of the significance of the noise impact mitigation measures were selected that is feasible, mainly focussing on management of noise impacts using rules, policy and require a management commitment. This, however, does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management).

8.5 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. The assumptions include the following:

- That octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of these processes and equipment. The determination of octave sound power levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment changes depending on the load the process and equipment are subject to. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load (work required from the engine or motor to perform action). Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;
- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely be over-estimated;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;

- The XYZ topographical information is derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global DEM data, a product of Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautical and Space Administration (NASA). There are known inaccuracies and artefacts in the data set, yet this is still one of the most accurate data sets to obtain 3D-topographical information;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Fifty per cent (50%) soft ground conditions will be modelled as the area where the construction activities are proposed is well vegetated and sufficiently uneven to allow the consideration of soft ground conditions.

8.6 CONDITIONS TO WHICH THIS STUDY IS SUBJECT

This study is not subject to any conditions.

9 PROJECTED NOISE RATING LEVELS

9.1 CONCEPTUAL SCENARIO – POTENTIAL CONSTRUCTION NOISE LEVELS

Potential construction noises were discussed in **section 5.1**, but will only be considered in passing for the following reasons:

- Construction activities are normally limited to the daytime period, a time when receptors are typically less sensitive to increased noises;
- The project will be developed within an industrial area, where it is expected that ambient sound levels will be elevated;
- The closest NSR are further than 500m from the closest point of the project infrastructure, and at this distance average noise from construction activities will be less than 45 dBA, well less than the typical rating level for the area; and
- Road traffic noises on the R327 would mostly dominate typical construction noises.

As can be seen in **Table 5-1** and **Table 5-2**, while some construction noises may be audible at the closest NSR, construction noises such as pile driving are generally of a temporary nature, with most construction activities likely resulting in noise levels less than 45 dBA at 500m.

9.2 CONCEPTUAL SCENARIO – POTENTIAL OPERATIONAL NOISE LEVELS

Noises associated with motorsport activities were discussed in **section 5.2**, highlighting that the dominant noise would mainly originate from race vehicles. This assessment will consider three potential scenarios, which include two potential worst-case scenarios, namely:

- A race event along route alignment 1 (route alignment depicted in **Figure 9-1**), using up to 20 LMV (typical road-class emissions), each with a potential PWL of ±100 dBA (re 1 pW at 70 km/hr). The potential noise rating level contours are illustrated on **Figure 9-3**. The noise levels (as well as the potential significance of the noise impact) at the identified NSR are defined in **Appendix C, Table 1**;
- A race event along route alignment 1 (route alignment depicted in **Figure 9-2**), using up to 20 GT3-class vehicles (high noise emissions), each with a potential PWL of ±110 dBA (re 1 pW at 70 km/hr). The potential noise rating level contours are illustrated on **Figure 9-4**. The noise levels (as well as the potential significance of the noise impact) at the identified NSR are defined in **Appendix C, Table 2**; and
- A race event along route alignment 2 (route alignment depicted in **Figure 9-2**), using up to 20 GT3-class vehicles (high noise emissions), each with a potential PWL of ±110 dBA (re 1 pW at 70 km/hr). The potential noise rating level contours are

illustrated on **Figure 9-5**. The noise levels (as well as the potential significance of the noise impact) at the identified NSR are defined in **Appendix C, Table 3**.

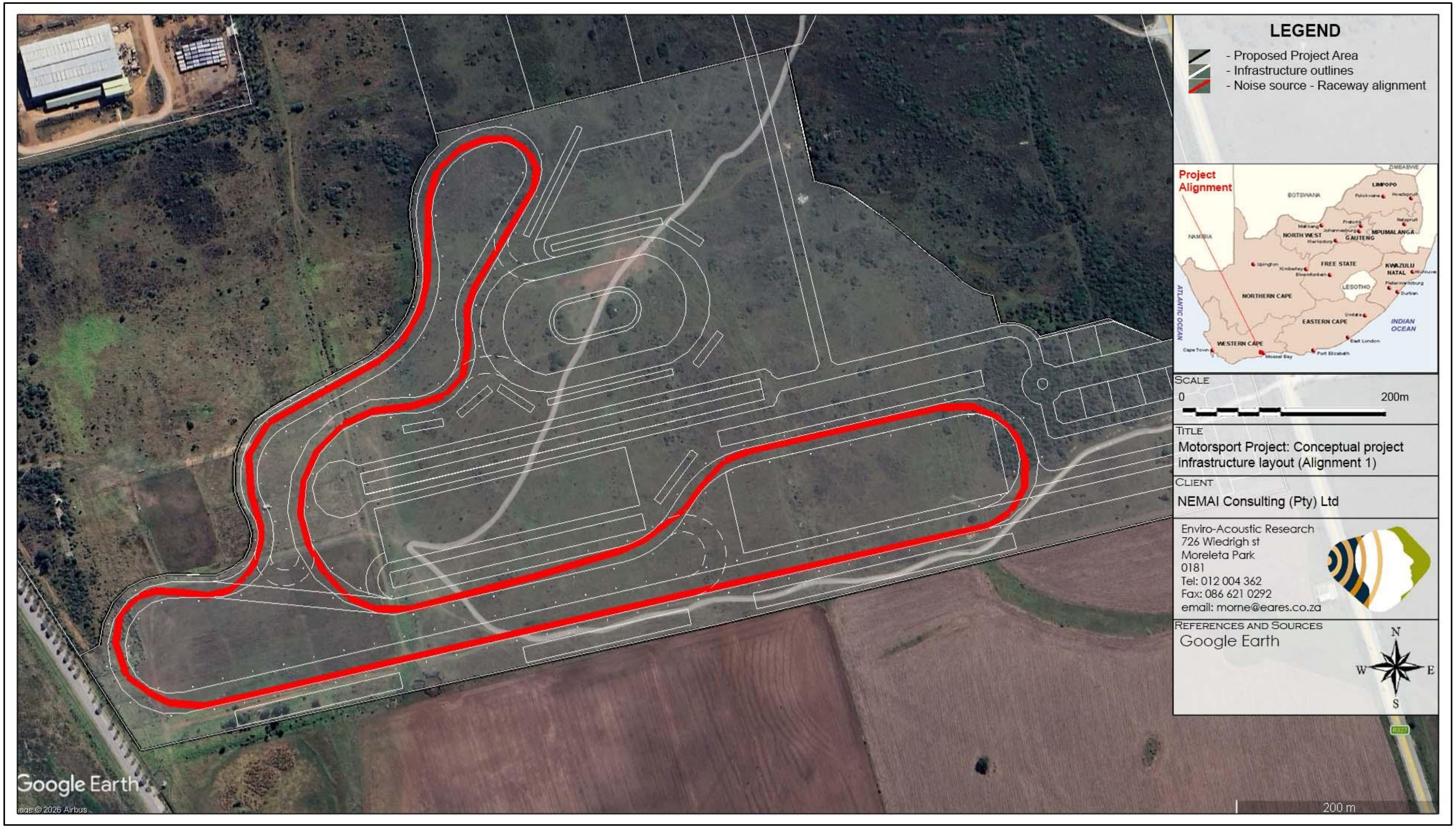

Figure 9-1: Conceptual event – raceway alignment option 1

Figure 9-2: Conceptual event – raceway alignment option 2

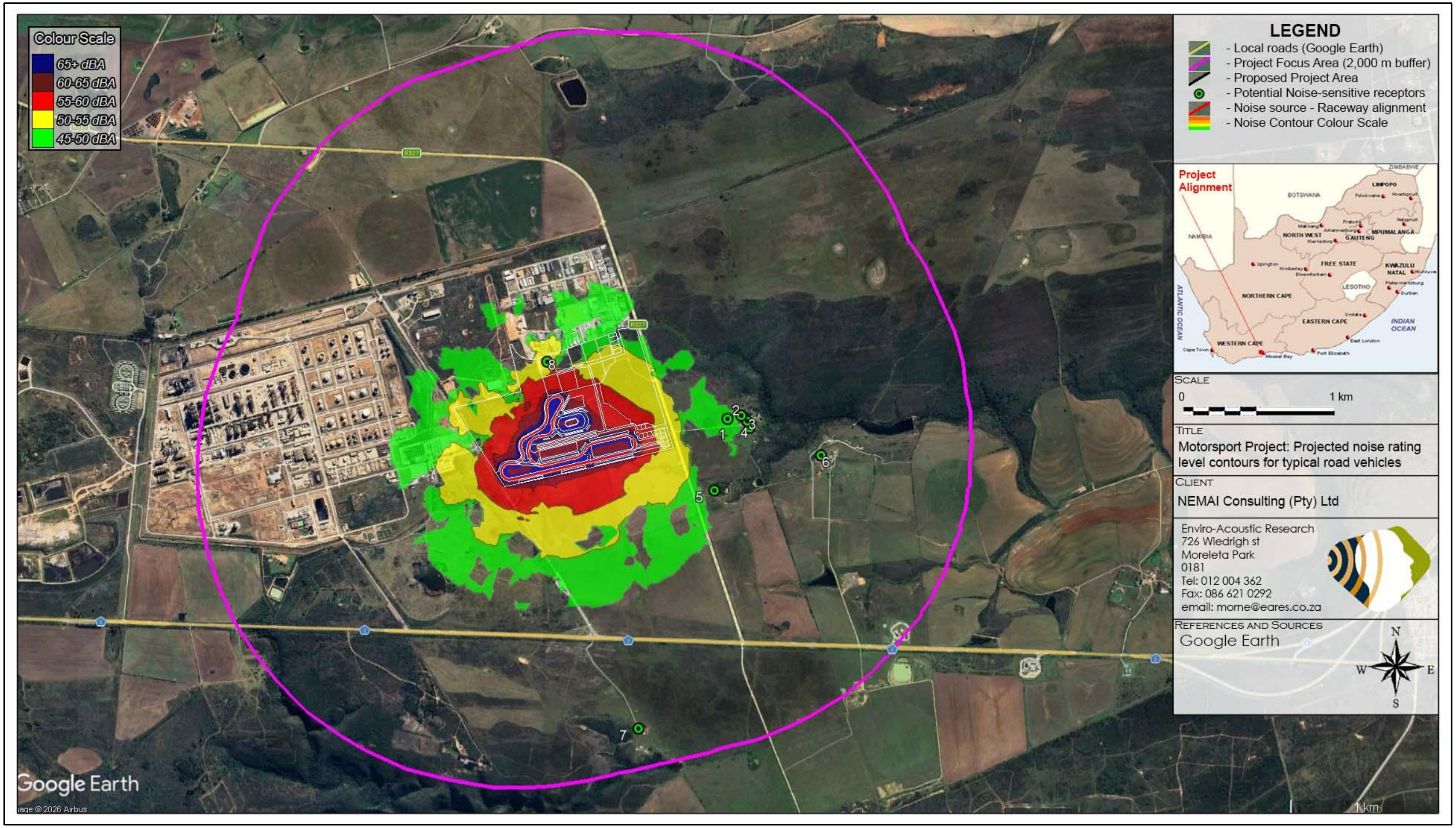

Figure 9-3: Projected noise rating level contours for a race with LMV along raceway alignment 1

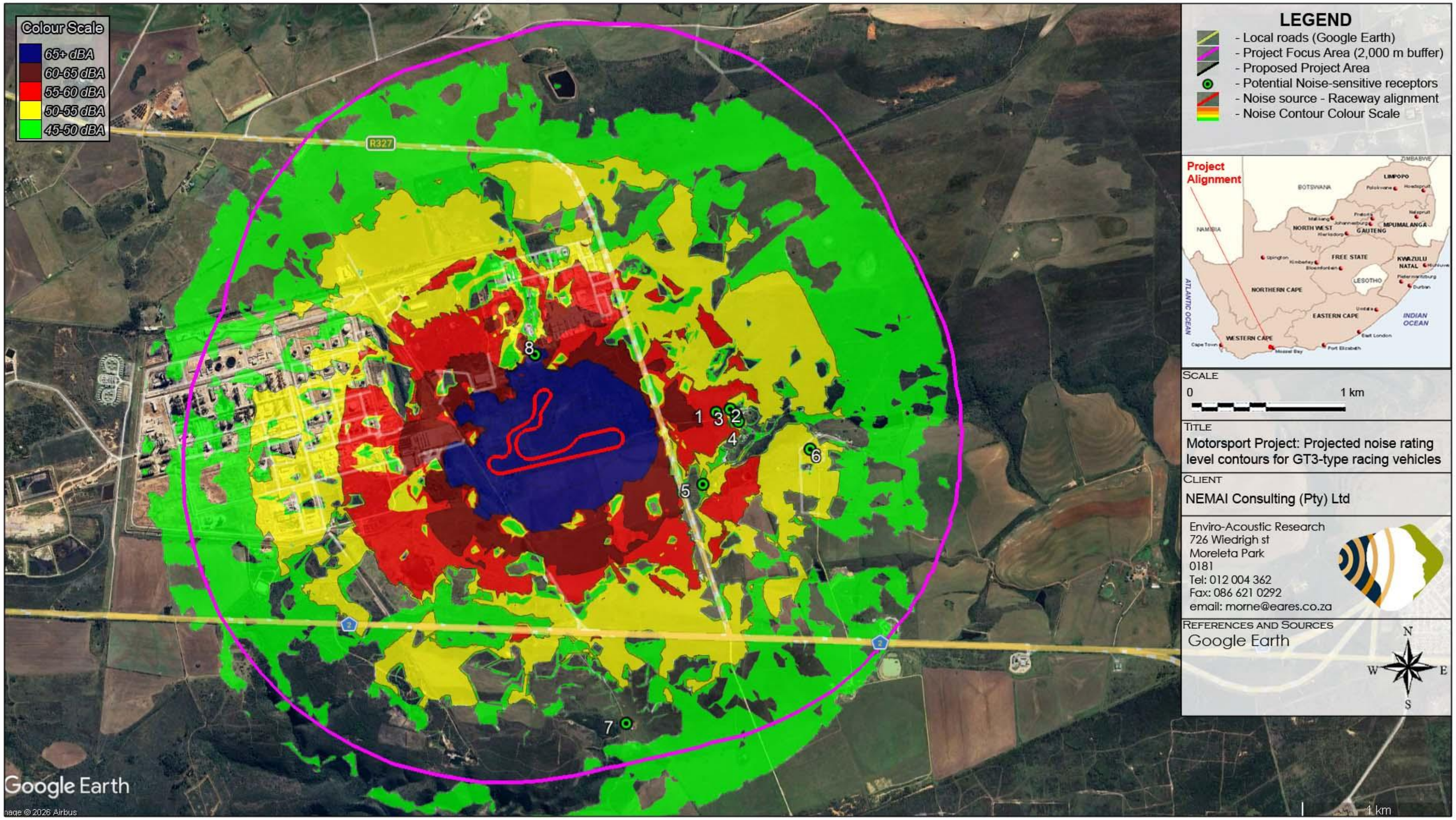

Figure 9-4: Projected noise rating level contours for a race with GT3-class vehicles along raceway alignment 1

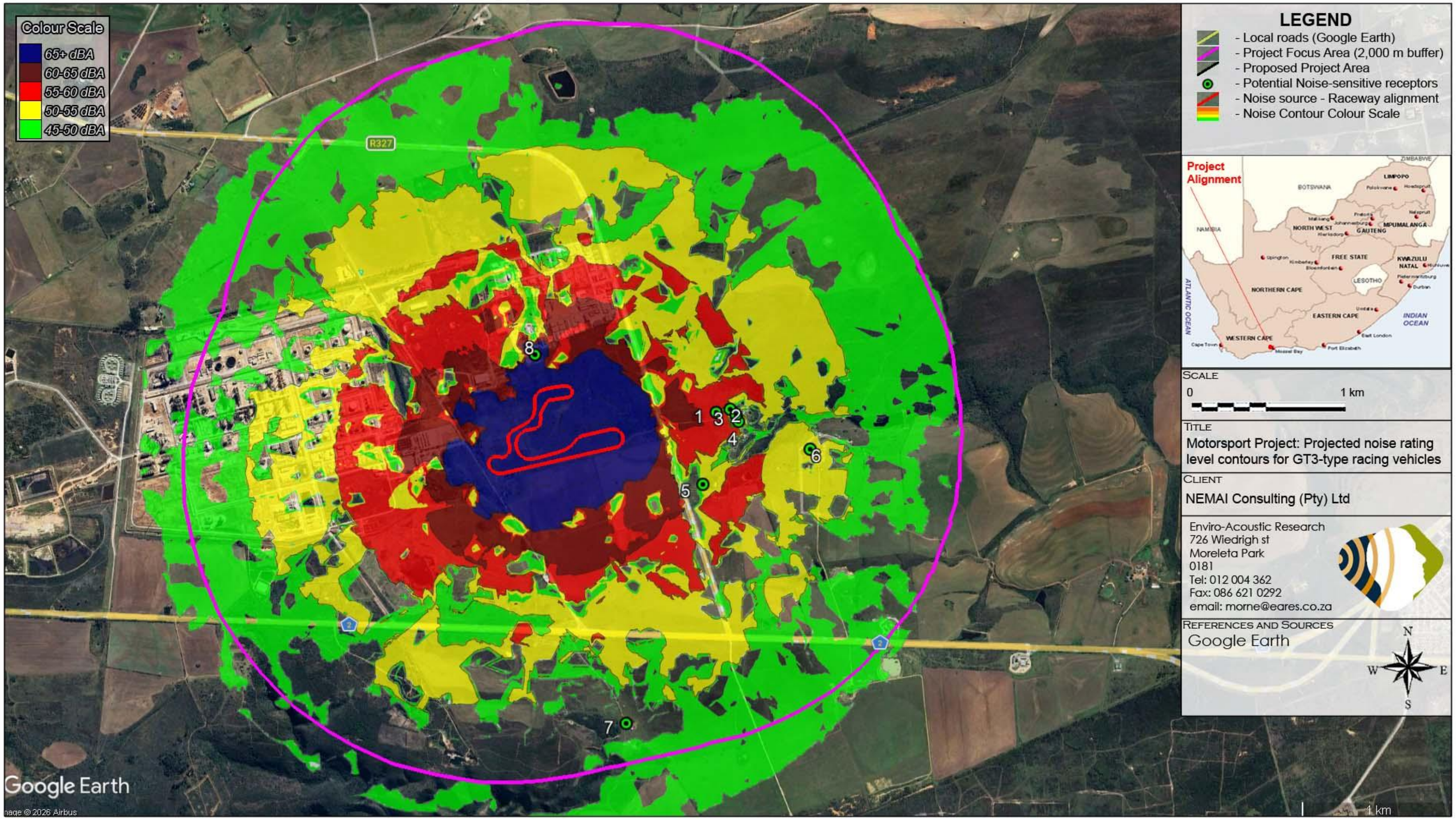

Figure 9-5: Projected noise rating level contours for a race with GT3-class vehicles along raceway alignment 2

10 SIGNIFICANCE OF THE NOISE IMPACT

10.1 POTENTIAL CONSTRUCTION NOISE LEVELS - NOISE IMPACT

The noise levels for the various conceptualized construction activities were estimated in **section 9**. The potential significance of the noise impact associated with temporary construction activities generating very high noise levels is summarized in **Table 10-1**, with the potential significance of the noise impact relating typical short-term construction activities summarized in **Table 10-2**.

Table 10-1: Noise Impact Assessment: Temporary high-noise activities

Nature of Impact: Precautious approach, with daytime ambient sound level measurements (see **section 4.3**) indicating ambient sound levels typical of a rural to suburban noise district at residential dwellings in area, though it should be noted that measurements were collected at a quiet farm dwelling, as it is expected that ambient sound levels at NSR located closer to the R327 would be higher. The projected noise levels from pile driving activities may be ±60 dBA at NSR08, ±51 dBA at NSR05 and ±50 dBA at NSR01 during piling events.			
Impact description: Increase in ambient sound levels at closest NSR in area.			
Prior to Mitigation			
	Rating	Motivation	Significance
Magnitude ***(****Table 6-1****)***	High (8)	Construction noises might change the ambient sound levels during the day assuming low ambient sound levels.	**Low (11)**
Duration ***(****Table 6-2****)***	Temporary (1)	The noise impact will be temporary.	
Extent ***($\Delta L_{Aeq,D}$>7dBA)*** ***(****Table 6-3****)***	Local (2)	The noise impact would extent from the site, potentially audible as far as 1,000m.	
Probability ***(****Table 6-4****)***	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSR.	
Mitigation: Significance for high intensity temporary noise-generating construction activities will be **low** for the scenario as conceptualized and additional mitigation measures are not required for daytime construction activities.			
Cumulative impacts: Potential of cumulative noise impact is low.			
Residual Risks: Noise levels will increase during the operational phase, for the duration of the operational phase. The significance of the noise impact for daytime operational activities are projected to be low (see **Table 10-3**).			

Table 10-2: Noise Impact Assessment: Potential night-time construction activities

Nature of Impact: Precautious approach, with daytime ambient sound level measurements (see **section 4.3**) indicating ambient sound levels typical of a rural to suburban noise district at residential dwellings in area, though it should be noted that measurements were collected at a quiet farm dwelling, as it is expected that ambient sound levels at NSR located closer to the R327 would be higher. The projected noise levels from typical construction activities may be ±56 dBA at NSR08, ±48 dBA at NSR05 and ±47 dBA at NSR01 during typical construction activities.			
Impact description: Increase in ambient sound levels at closest NSR in area.			
Prior to Mitigation			
	Rating	Motivation	Significance

Magnitude ***(****Table 6-1****)***	High (8)	Construction noises might change the ambient sound levels during the day assuming low ambient sound levels.	**Low (12)**
Duration ***(****Table 6-2****)***	Short (2)	The noise impact may last 6 - 12 months.	
Extent ***($\Delta L_{Aeq,D}$>7dBA)*** ***(****Table 6-3****)***	Local (2)	The noise impact would extent from the site, potentially audible as far as 1,000m.	
Probability ***(****Table 6-4****)***	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSR.	
Mitigation: Significance for typical construction activities will be **low** for the scenario as conceptualized and additional mitigation measures are not required for daytime construction activities.			
Cumulative impacts: Potential of cumulative noise impact is low.			
Residual Risks: Noise levels will increase during the operational phase, for the duration of the operational phase. The significance of the noise impact for daytime operational activities are projected to be low (see **Table 10-3**).			

10.2 POTENTIAL OPERATIONAL NOISE LEVELS - NOISE IMPACT

The potential noise rating levels were estimated using the CNOSSUS-EU model considering the activities as discussed in **section 5.2**, with the potential significance of the noise impacts is summarized in:

- **Table 10-3** for noise impacts relating to daytime operational activities; and,
- **Table 10-4** for noise impacts relating to night-time operational activities.
- Other industrial projects are too far from this project to pose any potential risk for cumulative effects and their contribution can be excluded.

Table 10-3: Noise Impact Assessment: Typical LMV race

Nature of Impact: Precautious approach, with daytime ambient sound level measurements (see **section 4.3**) indicating ambient sound levels typical of a rural to suburban noise district at residential dwellings in area, though it should be noted that measurements were collected at a quiet farm dwelling, as it is expected that ambient sound levels at NSR located closer to the R327 and the industrial area would be higher. The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in **Appendix C, Table 1** for a potential LMV race for the NSR as identified.			
Impact description: Increase in ambient sound levels at closest NSR in area.			
Prior to Mitigation			
	Rating	Motivation	Significance
Magnitude ***(****Table 6-1****)***	Low (4)	Racing noises may be audible, but unlikely to change ambient sound levels.	**Low (14)**
Duration ***(****Table 6-2****)***	Long-term (4)	The noise impact relating to the project could last up to 25 years.	
Extent ***($\Delta L_{Aeq,D}$>7dBA)*** ***(****Table 6-3****)***	Local (2)	The noise impact would extent from the site, potentially as far as 1,000m.	
Probability ***(****Table 6-4****)***	Improbable (1)	It is improbable that the higher noise level and change in ambient sound levels will impact on the closest NSR.	
Mitigation: Significance of the noise from LMV races is considered to be low for the scenario as conceptualized and additional mitigation measures are not required.			
Cumulative impacts: Potential of cumulative noise impact is low.			
Residual Risks:			

Noise levels will reduce after the operational phase, though noise levels may still be elevated (due to the other industrial activities associated with the industrial development zone and road traffic).

Table 10-4: Noise Impact Assessment: High noise race (GT3 class)

Nature of Impact: Precautious approach, with daytime ambient sound level measurements (see **section 4.3**) indicating ambient sound levels typical of a rural to suburban noise district at residential dwellings in area, though it should be noted that measurements were collected at a quiet farm dwelling, as it is expected that ambient sound levels at NSR located closer to the R327 would be higher (or located in the industrial area). The projected noise levels, the potential change in ambient sound level as well as the potential significance are defined in **Appendix C, Table 2** and **Appendix C, Table 3** for a high noise race (e.g. GT3 class vehicles).			
Impact description: Increase in ambient sound levels at closest NSR in area.			
Prior to Mitigation			
	Rating	Motivation	Significance
Magnitude **(***Table 6-1***)**	Very High (10)	Operational noises (motor racing during event) will result in a very high change in residual noise levels at NSR located within 1,000m from the project.	**High (68)**
Duration **(***Table 6-2***)**	Long-term (4)	The noise impact relating to the operational phase can last up to 25 years or longer.	
Extent ***($\Delta L_{Aeq,D}$>7dBA)*** **(***Table 6-3***)**	Regional (3)	The noise impact would extent from the site, potentially further than 1,000m.	
Probability **(***Table 6-4***)**	Highly Likely (4)	It is highly likely that the higher noise level and change in ambient sound levels will impact on the closest NSR.	
Mitigation / Management Measures			
Mitigation: Significance of the noises from GT3 class races (very high noise emissions) noise impact could be **high** for the scenario as conceptualized and additional mitigation measures are required and recommended (see 11.1.			
Post Mitigation			
	Rating	Motivation	Significance
Magnitude **(***Table 6-1***)**	High (8) or less	Operational noises (motor racing during event) could result in a high change in residual noise levels at NSR located within 1,000m from the project.	**Low (30)**
Duration **(***Table 6-2***)**	Long-term (4)	The noise impact relating to the operational phase can last up to 25 years or longer.	
Extent ***($\Delta L_{Aeq,D}$>7dBA)*** **(***Table 6-3***)**	Regional (3)	The noise impact would extent from the site, potentially further than 1,000m.	
Probability **(***Table 6-4***)**	Possible (2)	It is still possible that the higher noise level and change in ambient sound levels will annoy the closest NSR.	
Cumulative impacts: There is a potential for cumulative noise impacts due to noises from the racing event and the road traffic noises (NSR1, 2, 3, 4 and 5), or noises from the industrial area (NSR08).			
Residual Risks: Noise levels will reduce after the operational phase, though noise levels may still be elevated (due to the noise associated with the industrial development zone and the R327).			

10.3 POTENTIAL RESPONSE FROM SURROUNDING NSR

Defining the potential significance of noise from any activity is difficult and at best, still an objective review of various criteria to estimate how the local community may respond to the introduction of new noises. This is especially difficult when new noise-generating project is developed within an existing industrial area located near other NSR. This is because high noise levels are typical and expected within an industrial zone, yet, nearby residential (or other users) may still expect acceptable noise levels to allow the continuation of the use of their properties or dwellings. While the potential significance of the noise impact was evaluated in terms of the EIA criteria (see also **section 6.3**), this subsection evaluates the noise level in terms of the applicable NCR (see also **section 3.3.2**).

In this regard, the Western Cape NCR defines four criteria as a potential disturbing noise, of which the first three may relate to a motorsport arena. These criteria and the potential disturbing nature of the noise are discussed in **Table 10-5** below.

Table 10-5: Assessing whether the noise could be considered disturbing

Disturbing noise criteria	Comment
(a) exceeds the rating level by 7 dBA	The development and operation of the motorsport arena will not change the rating levels with more than 7 dBA (see also **Table 4-6** and **Appendix C, Table 2 / Appendix C, Table 3**) at any NSR, nor will a high-noise event change rating levels on the boundary of the facility: - Less than 65 dBA on boundary between track and NSRs 01, 02, 03, 04, 05 and 06. - Less than 70 dBA on boundary between track and NSR08.
(b) exceeds the residual noise level where the residual noise level is higher than the rating level.	Not relevant, as residual noise levels are less than the rating levels at all locations.
(c) exceeds the residual noise level by 3 dBA where the residual noise level is lower than the rating level.	Projected noise levels could exceed the residual noise levels with more than 3 dBA, and the introduction of the motorsport activities may result in noises (in an unmanaged situation) that could be considered disturbing. Because the noise levels could exceed rating levels with more than 5 dBA, a noise management plan is required in terms of Regulation 4(3) of PN200 of 2013 (of the Western Cape NCR)

10.4 EVALUATION OF ALTERNATIVES

10.4.1 Alternative 1: No-go option

The ambient sound levels will remain as is. The noise levels experienced by the surrounding receptors will remain as it is currently. Ambient sound levels are already elevated due to noises from road traffic in the area and would definitely increase as the industrial area develop and expand (and the associated road traffic noises increase).

10.4.2 Alternative 2: Proposed development of Motorsport Arena

The proposed development of the motorsport facility (worst-case evaluated) will raise the noise levels at the closest NSR as identified. Receptors staying close to the project may be annoyed and even consider the noises to be disturbing. Considering only noise[16], people may have a neutral to positive perception of the project and could see the need and desirability of the project. This is because a motorsport arena functions as a high-intensity economic catalyst, often serving as a multi-purpose venue that generates value beyond race weekends for the following reasons:

- Motorsport arenas often mandate improvements to local roads, power grids, and water systems. These upgrades benefit residents and can increase local property values in well-managed developments.
- Beyond direct track staff, the arena supports "indirect" jobs in local hospitality (hotels, restaurants, fuel stations) and "induced" jobs from increased household spending by track employees.
- Modern arenas often include business parks, research and development (R&D) hubs, or driver training centers that operate 365 days a year, providing consistent local employment and tax revenue.
- A major arena puts a region "on the map," attracting visitors who may stay Mossel Bay, visit local attractions, and boost the regional "visitor economy."
- Motorsports often attract high-tech engineering firms, specialized mechanics, and parts manufacturers to the region. This creates an **industrial cluster**, fostering innovation and high-skilled labor pools.
- Regional universities and technical colleges often partner with tracks for STEM (Science, Technology, Engineering, and Math) programs, offering students hands-on experience in aerodynamics, mechanical engineering, and data science.

[16] Considering only noise as other environmental factors may affect other people.

11 MITIGATION OPTIONS

This assessment considers the potential noise impact on the surrounding environment due to future motorsport events. It considers potential worst-case noise levels from vehicles with very high noise emissions to illustrate potential worst-case scenarios.

It was determined that the potential noise impact would be of a high significance for motorsport activities with very high noise emission levels and measures, as summarized in **Table 11-1**, discussed in more details in **section 11.1**.

Table 11-1: Summary of measures that could reduce noise levels from motorsport events

Measure	Expected Reduction	Primary Mechanism
Earth Berms (Soft)	5–10 dB	Blockage & Absorption
Buildings	5–10 dB	Blockage, Absorption, Diffraction
Vehicle Silencers	5–20 dB	Source Control
Acoustic Walls	3–12 dB	Diffraction/Reflection
Porous Asphalt	3–5 dB	Rolling Noise Reduction

The project developer must know that community involvement (feedback on project: especially race schedules as well as the details of the vehicle classes that will participate) needs to continue throughout the project. Annoyance is a complicated psychological phenomenon, as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself.

Motorsport management should maintain a commitment to the local community (people staying within 2,000 m from the project) and respond to noise concerns in an expedient fashion. Sporadic and legitimate noise complaints could be raised and it is the responsibility of the developer to investigate. For example, sudden and sharp increases in noise levels could result from vehicles not complying with noise limits and problems of this nature can be corrected quickly and it is in the developer’s interest to do so.

While regular communication will not reduce noise levels, it significantly lowers the "perceived annoyance" and increases the psychological tolerance for events.

11.1 MITIGATION OPTIONS THAT WOULD REDUCE NOISE LEVELS

Effective noise management in motorsport requires a tiered approach, targeting the noise at its source, along its travel path, and at the receiver. Measures that will assist in significantly reducing noise levels include:

- **Source Limits (Vehicle Technical Regulations – e.g. Standards as per Racing SA):** Imposing strict decibel limits (e.g., 95–105 dB) and requiring high-efficiency **exhaust silencers** or mufflers. This addresses propulsion noise directly.
- **Earth Berms:** Large mounds of earth (soil bunds) act as heavy, dense barriers that block the direct line-of-sight between the track and the closest NSR. When constructed with an acoustically soft (grass-covered) surface, they absorb sound better than hard walls and are less affected by wind-driven noise refraction.
- **Sunken Carriageways (Topography Changes):** Excavating the track so it sits in a trench below ground level (subject to safe operation considering wet conditions and stormwater control). The surrounding earth acts as a natural, permanent barrier that contains sound waves before they can propagate horizontally.
- **Acoustic Barriers:** Purpose-built sound walls made of concrete, metal, or mineral foam. These can achieve reductions of 5–15 dB once they break the line-of-sight.
- **Buildings and Grandstands:** Strategic placement of pit buildings or large spectator stands can act as secondary shields for receptors located behind them. However, they may also reflect noise toward other areas if not placed carefully.

The following measures could also reduce noise levels in associated with other measures;

- **Topography Manipulation:** The topography slope upwards towards NSR08, and, but “cutting” the track into this higher area, the surrounding walls could assist in reducing noise levels on the ostrich abattoir.
- **Low-Noise Asphalt:** Utilizing porous or open-graded road construction methods can reduce rolling noise and tire friction. While highly effective for highway traffic, this is less impactful in racing where propulsion (engine) noise dominates.
- **SAFER Barriers:** While primarily a safety feature (Steel and Foam Energy Reduction), the foam backing can provide minor localized sound absorption compared to bare concrete walls, though it is not a primary noise mitigation tool.
- **Operational Management:** Limiting race hours, restricting high-decibel categories to specific times, providing "respite periods". While not lowering the peak noise level, it reduces the Race Equivalent Level perceived by closest receptors.
- **Specific times-slots for high-noise classes:** By planning high-noise classes during the early afternoons, a racing event can benefit from lapse conditions (see also **section 4.1.1** and **Figure 4-1**).

12 ENVIRONMENTAL MONITORING PLAN

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

Active noise monitoring could include:

- Static track-side vehicle testing
- Community and/or perimeter noise monitoring.

12.1 STATIC VEHICLE TESTING

Before entering the track, every vehicle should undergo a static test to identify those that significantly exceed class limits. Measurements should follow the technical guidelines provided by ISO 5130, that require the measurement of noise levels, taken at a 45-degree angle from the exhaust, with the microphone located at a distance of 0.5m from the exhaust. The engine should be running at a power level of approximately 75%. These measurements can be done by the motorsport facility, using their own equipment.

12.2 COMMUNITY AND PERIMETER MONITORING

This should be independent auditing measurements to confirm actual noise levels on the boundary of the motorsport venue as well as identified receiver locations. Noise level measurements should follow the SANS 10103 or similar standard (such as ISO 1996). This typically require the measurements of typical residual noise levels prior to the development of the motorsport arena, followed with sporadic auditing monitoring, to confirm actual noise levels during events and providing feedback to the closest NSR.

It is thus recommended that daytime residual noise levels be determined at NSR01, NSR02, NSR05 and NSR08 prior to the development of the motorsport arena (prior to the start of operational activities).

13 CONCLUSIONS AND RECOMMENDATIONS

This ENIA covers the proposed motorsport racing activities within the existing Mossdustria industrial area near Mossel Bay, Western Cape Province.

Potential scenarios were conceptualized for the future proposed motor racing events. with the output of noise modelling exercises indicating a potential noise impact of high significance for high-noise motor racing events. Without mitigating these noises, surrounding receptors may consider the noise levels disturbing. In line with Regulation 4(3) of the Western Cape NCR, this assessment also includes management and mitigation measures that would assist in reducing noise levels as well as the probability of noise complaints being registered.

While the motorsport arena would raise noise levels at the nearest receptors, this project is not fatally flawed as noise impacts can be managed. It is therefore recommended that the proposed Mossdustria motorsport project be authorized from an acoustic perspective.

No additional noise impact assessments will be required, to future noise monitoring is recommended should this project proceed.

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APPENDIX A

Glossary of Acoustic Terms, Definitions and General Information

1/3-Octave Band	A filter with a bandwidth of one-third of an octave representing four semitones, or notes on the musical scale. This relationship is applied to both the width of the band, and the centre frequency of the band. See also definition of octave band.
A – Weighting	An internationally standardised frequency weighting that approximates the frequency response of the human ear and gives an objective reading that therefore agrees with the subjective human response to that sound.
Air Absorption	The phenomena of attenuation of sound waves with distance propagated in air, due to dissipative interaction within the gas molecules.
Alternatives	A possible course of action, in place of another, that would meet the same purpose and need (of proposal). Alternatives can refer to any of the following, but are not limited hereto: alternative sites for development, alternative site layouts, alternative designs, alternative processes and materials. In Integrated Environmental Management the so-called "no go" alternative refers to the option of not allowing the development and may also require investigation in certain circumstances.
Ambient	The conditions surrounding an organism or area.
Ambient Noise	The all-encompassing sound at a point being composed of sounds from many sources both near and far. It includes the noise from the noise source under investigation.
Ambient Sound	The all-encompassing sound at a point being composite of sounds from near and far.
Ambient Sound Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such a meter was put into operation. In this report the term Background Ambient Sound Level will be used.
Amplitude Modulated Sound	A sound that noticeably fluctuates in loudness over time.
Anthropogenic	Human impact on the environment or anthropogenic impact on the environment includes impacts on biophysical environments, biodiversity and other resources
Applicant	Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation.
Assessment	The process of collecting, organising, analysing, interpreting and communicating data that is relevant to some decision.
Attenuation	Term used to indicate reduction of noise or vibration, by whatever method necessary, usually expressed in decibels.
Audible frequency Range	Generally assumed to be the range from about 20 Hz to 20,000 Hz, the range of frequencies that our ears perceive as sound.
Ambient Sound Level	The level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source or sound generated for test purposes). Ambient sound level as per Noise Control Regulations.
Axle	Shaft connecting two wheels on either side of the vehicle. The wheels are forced to rotate at the same speed. Vehicles with independent wheels have 'stub axles' that do not connect the two wheels on either side of the vehicle.
Ballast	A layer of coarse stones supporting the sleepers.
Baseplate	A track component designed to hold the rail in place, usually with resilience to provide improved vibration isolation.
Broadband Noise	Spectrum consisting of a large number of frequency components, none of which is individually dominant.
C-Weighting	This is an international standard filter, which can be applied to a pressure signal or to a *SPL* or *PWL* spectrum, and which is essentially a pass-band filter in the frequency range of approximately 63 to 4000 Hz. This filter provides a more constant, flatter, frequency response, providing significantly less adjustment than the A-scale filter for frequencies less than 1000 Hz.
dB(A)	Sound Pressure Level in decibel that has been A-weighted, or filtered, to match the response of the human ear.
Decibel (db)	A logarithmic scale for sound corresponding to a multiple of 10 of the threshold of hearing. Decibels for sound levels in air are referenced to an atmospheric pressure of 20 μ Pa.
Diffraction	The process whereby an acoustic wave is disturbed and its energy redistributed in space as a result of an obstacle in its path, Reflection and refraction are special cases of diffraction.
Direction of Propagation	The direction of flow of energy associated with a wave.
Disturbing noise	Means a noise level that exceeds the zone sound level or, if no zone sound level has been designated, a noise level that exceeds the ambient sound level at the same measuring point by 7 dBA or more.
Echolocation	Echo locating animals emit calls out to the environment and listen to the echoes of those calls that return from various objects near them. They use these echoes to locate and

	identify the objects. Echolocation is used for navigation and for foraging (or hunting) in various environments.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects.
Environmental Control Officer	Independent Officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manages any further environmental issues that may arise.
Environmental impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental Impact Assessment	An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy that requires authorisation of permission by law and that may significantly affect the environment. The EIA includes an evaluation of alternatives, as well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures for enhancing the positive aspects of the proposal, and environmental management and monitoring measures.
Environmental issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$)	The value of the average A-weighted sound pressure level measured continuously within a reference time interval *T*, which have the same mean-square sound pressure as a sound under consideration for which the level varies with time.
Equivalent continuous A-weighted rating level ($L_{Req,T}$)	The Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$) to which various adjustments has been added. More commonly used as ($L_{Req,d}$) over a time interval 06:00 – 22:00 (T=16 hours) and ($L_{Req,n}$) over a time interval of 22:00 – 06:00 (T=8 hours). It is a calculated value.
F (fast) time weighting	(1) Averaging detection time used in sound level meters. (2) Fast setting has a time constant of 125 milliseconds and provides a fast reacting display response allowing the user to follow and measure not too rapidly fluctuating sound.
Footprint area	Area to be used for the construction of the proposed development, which does not include the total study area.
Free Field Condition	An environment where there is no reflective surfaces.
Frequency	The rate of oscillation of a sound, measured in units of Hertz (Hz) or kiloHertz (kHz). One hundred Hz is a rate of one hundred times per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate.
Green field	A parcel of land not previously developed beyond that of agriculture or forestry use; virgin land. The opposite of Greenfield is Brownfield, which is a site previously developed and used by an enterprise, especially for a manufacturing or processing operation. The term Brownfield suggests that an investigation should be made to determine if environmental damage exist.
Grinding	A process for removing a thin layer of metal from the top of the rail head in order to remove roughness and/or to restore the correct profile. Special grinding trains are used for this.
G-Weighting	An International Standard filter used to represent the infrasonic components of a sound spectrum.
Harmonics	Any of a series of musical tones for which the frequencies are integral multiples of the frequency of a fundamental tone.
I (impulse) time weighting	(1) Averaging detection time used in sound level meters as per South African standards and Regulations. (2) Impulse setting has a time constant of 35 milliseconds when the signal is increasing (sound pressure level rising) and a time constant of 1,500 milliseconds while the signal is decreasing.
Impulsive sound	A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.
Infrasound	Sound with a frequency content below the threshold of hearing, generally held to be about 20 Hz. Infrasonic sound with sufficiently large amplitude can be perceived, and is both heard and felt as vibration. Natural sources of infrasound are waves, thunder and wind.

Integrated Development Plan	A participatory planning process aimed at developing a strategic development plan to guide and inform all planning, budgeting, management and decision-making in a Local Authority, in terms of the requirements of Chapter 5 of the Municipal Systems Act, 2000 (Act 32 of 2000).
Integrated Environmental Management	IEM provides an integrated approach for environmental assessment, management, and decision-making and to promote sustainable development and the equitable use of resources. Principles underlying IEM provide for a democratic, participatory, holistic, sustainable, equitable and accountable approach.
Interested and affected parties	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Interburden	Material of any nature that lies between two or more bedded ore zones or mineral resource seams. Term is primarily used in surface mining
Joint rail	A connection between two lengths of rail, often held together by an arrangement of bolts and fishplates.
Key issue	An issue raised during the Scoping process that has not received an adequate response and that requires further investigation before it can be resolved.
Listed activities	Development actions that is likely to result in significant environmental impacts as identified by the delegated authority (formerly the Minister of Environmental Affairs and Tourism) in terms of Section 21 of the Environment Conservation Act.
Locomotive	A powered vehicle used to draw or propel a train of carriages or wagons (as opposed to a multiple unit).
L_{AMin} and L_{AMax}	Is the RMS (root mean squared) minimum or maximum level of a noise source.
Loudness	The attribute of an auditory sensation that describes the listener's ranking of sound in terms of its audibility.
Magnitude of impact	Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.
Masking	The raising of a listener's threshold of hearing for a given sound due to the presence of another sound.
Mitigation	To cause to become less harsh or hostile.
Natural Sounds	Are sounds produced by natural sources in their normal soundscape.
Negative impact	A change that reduces the quality of the environment (for example, by reducing species diversity and the reproductive capacity of the ecosystem, by damaging health, or by causing nuisance).
Noise	a. Sound that a listener does not wish to hear (unwanted sounds). b. Sound from sources other than the one emitting the sound it is desired to receive, measure or record. c. A class of sound of an erratic, intermittent or statistically random nature.
Noise Level	The term used in lieu of sound level when the sound concerned is being measured or ranked for its undesirability in the contextual circumstances.
Noise-sensitive development	developments that could be influenced by noise such as: a) districts (see table 2 of SANS 10103:2008) 1. rural districts, 2. suburban districts with little road traffic, 3. urban districts, 4. urban districts with some workshops, with business premises, and with main roads, 5. central business districts, and 6. industrial districts; b) educational, residential, office and health care buildings and their surroundings; c) churches and their surroundings; d) auditoriums and concert halls and their surroundings; e) recreational areas; and f) nature reserves. In this report Noise-sensitive developments is also referred to as a Potential Sensitive Receptor
Octave Band	A filter with a bandwidth of one octave, or twelve semi-tones on the musical scale representing a doubling of frequency.
Overburden	In mining and in archaeology, overburden (also called waste or spoil) is the material that lies above an area of economic or scientific interest. In mining, it is most commonly the rock, soil, and ecosystem that lies above a mineral resource seam or ore body
Pavement	Road surface or pavement is the durable surface material laid down on an area intended to sustain vehicular or foot traffic, such as a road or walkway.
Positive impact	A change that improves the quality of life of affected people or the quality of the environment.

Property	Any piece of land indicated on a diagram or general plan approved by the Surveyor-General intended for registration as a separate unit in terms of the Deeds Registries Act and includes an erf, a site and a farm portion as well as the buildings erected thereon
Public Participation Process	A process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme or development
Reflection	Redirection of sound waves.
Refraction	Change in direction of sound waves caused by changes in the sound wave velocity, typically when sound wave propagates in a medium of different density.
Reverberant Sound	The sound in an enclosure which results from repeated reflections from the boundaries.
Reverberation	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
Rail head	The bulbous part at the top of the rail.
Rolling Stock	Rolling stock comprises all the vehicles that move on a railway. It usually includes both powered and unpowered vehicles, for example locomotives, railroad cars, coaches, and wagons.
ROM	The mineral resource delivered from the mine that reports to the processing or preparation plant is called run-of-mine, or ROM. This is the raw material for the plant and consists of mineral resource of interest, rocks, middlings, minerals and contamination
Shunting	Shunting, in railway operations, is the process of sorting items of rolling stock into complete train sets.
Railway Sidings	A siding, in rail terminology, is a low-speed track section distinct from a running line or through route such as a main line or branch line or spur. It may connect to through track or to other sidings at either end.
Significant Impact	An impact can be deemed significant if consultation with the relevant authorities and other interested and affected parties, on the context and intensity of its effects, provides reasonable grounds for mitigating measures to be included in the environmental management report. The onus will be on the applicant to include the relevant authorities and other interested and affected parties in the consultation process. Present and potential future, cumulative and synergistic effects should all be taken into account.
S (slow) time weighting	(1) Averaging times used in sound level meters. (2) Time constant of one [1] second that gives a slower response which helps average out the display fluctuations.
Sound Level	The level of the frequency and time weighted sound pressure as determined by a sound level meter, i.e. A-weighted sound level.
Sound Power	Of a source, the total sound energy radiated per unit time.
Sound Pressure Level (SPL)	Of a sound, 20 times the logarithm to the base 10 of the ratio of the RMS sound pressure level to the reference sound pressure level. International values for the reference sound pressure level are 20 micropascals in air and 100 millipascals in water. SPL is reported as L_p in dB (not weighted) or in various other weightings.
Soundscape	Sound or a combination of sounds that forms or arises from an immersive environment. The study of soundscape is the subject of acoustic ecology. The idea of soundscape refers to both the natural acoustic environment, consisting of natural sounds, including animal vocalizations and, for instance, the sounds of weather and other natural elements; and environmental sounds created by humans, through musical composition, sound design, and other ordinary human activities including conversation, work, and sounds of mechanical origin resulting from use of industrial technology. The disruption of these acoustic environments results in noise pollution.
Study area	Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).
Timbre	Timbre (also known as tone colour or tone quality) is the quality of the sound made by a particular voice or musical instrument.
Tread braked	The traditional form of wheel brake consisting of a block of friction material (which could be cast iron, wood or nowadays a composition material) hung from a lever and being pressed against the wheel tread by air pressure (in the air brake) or atmospheric pressure in the case of the vacuum brake.
Tone	Noise can be described as tonal if it contains a noticeable or discrete, continuous note. This includes noises such as hums, hisses, screeches, drones, etc. and any such subjective description is open to discussion and contradiction when reported.
Wagon	A freight-carrying vehicle.

Zone of Potential Influence	The area defined as the radius about an object, or objects beyond which the noise impact will be insignificant.
Zone Sound Level	Means a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is similar to the Rating Level as defined in SANS 10103:2008.

APPENDIX B

Site Investigation – Photos of measurement locations

Photo B.1: Measurement location NMLTSL01

Photo B.2: Measurement location NMSTSL02

Photo B.3: Measurement location NMSTSL03

Photo B.4: Measurement location NMSTSL04

APPENDIX C

Calculated conceptual noise levels

Appendix C, Table 1: Projected noise rating levels and significance due to racing with LMV using track alignment 1

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels (noise limit - daytime rating level, Various noise districts)	Potential Existing Ambient Sound Levels (long-term, night-time fast-weighted average)	Projected Noise Level, Light Motor Vehicle racing event	Change in residual noise levels	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
1	60	46.8	48.3	3.8	Low	Long-term	Local	Improbable	Low
2	60	46.8	47.1	3.1	Low	Long-term	Local	Improbable	Low
3	60	46.8	46.2	2.7	Minor	Long-term	Local	Improbable	Low
4	60	46.8	46.0	2.6	Minor	Long-term	Local	Improbable	Low
5	60	46.8	39.2	0.7	Minor	Long-term	Local	Improbable	Low
6	55	46.8	41.2	1.0	Minor	Long-term	Local	Improbable	Low
7	60	46.8	34.4	0.2	Minor	Long-term	Local	Improbable	Low
8	70	46.8	55.1	8.9	High	Long-term	Local	Improbable	Low

Appendix C, Table 2: Projected noise rating levels and significance due to racing with GT3 class vehicles using track alignment 1

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels (noise limit - daytime rating level, Various noise districts)	Potential Existing Ambient Sound Levels (long-term, night-time fast-weighted average)	Projected Noise Level, GT3 Class Vehicle racing event (track alignment 1)	Change in residual noise levels	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
1	60	46.8	62.4	15.7	Very High	Long-term	Regional	Highly Likely	High
2	60	46.8	61.2	14.5	Very High	Long-term	Regional	Highly Likely	High
3	60	46.8	60.4	13.8	Very High	Long-term	Regional	Highly Likely	High
4	60	46.8	60.1	13.5	Very High	Long-term	Regional	Highly Likely	High
5	60	46.8	53.5	7.5	High	Long-term	Regional	Possible	Medium
6	55	46.8	55.7	9.4	High	Long-term	Regional	Likely	Medium
7	60	46.8	48.9	4.2	Low	Long-term	Regional	Improbable	Low
8	70	46.8	69.0	22.2	Very High	Long-term	Regional	Possible	Medium

Appendix C, Table 3: Projected noise rating levels and significance due to racing with GT3 class vehicles using track alignment 2

Potential Noise-sensitive development / Receptor(s)	Recommended Rating Levels (noise limit - daytime rating level, Various noise districts)	Potential Existing Ambient Sound Levels (long-term, night-time fast-weighted average)	Projected Noise Level, GT3 Class Vehicle racing event (track alignment 2)	Change in residual noise levels	Magnitude / Intensity	Duration	Extent	Probability of Impact Occurring	Significance
1	60	46.8	62.5	15.8	Very High	Long-term	Regional	Highly Likely	High
2	60	46.8	61.4	14.7	Very High	Long-term	Regional	Highly Likely	High
3	60	46.8	60.4	13.8	Very High	Long-term	Regional	Highly Likely	High
4	60	46.8	60.1	13.5	Very High	Long-term	Regional	Highly Likely	High
5	60	46.8	55.1	8.9	High	Long-term	Regional	Likely	Medium
6	55	46.8	56.0	9.7	High	Long-term	Regional	Likely	Medium
7	60	46.8	49.5	4.5	Low	Long-term	Regional	Improbable	Low
8	70	46.8	70.1	23.3	Very High	Long-term	Regional	Possible	Medium

End of Report