PREDICTION OF THE ACOUSTIC IMPACT GENERATED BY A NEW DATA CENTER CONTROL PLANT

(rif. n° 31_2/25 - 09.07.2025)

TERAKRAFT AS
Hellandsbygd Handelandsvegen 140, 4200 Sauda
Server control plant: Handelandsvegen 140 - 4200 Sauda (NO)

INDEX

SEC. 1 – SUBJECT

This assessment, conducted on 09.07.2025, aims to predict the level of noise pollution generated by a new data center to be installed in Handelandsvegen 140 - 4200 Sauda, Norway.

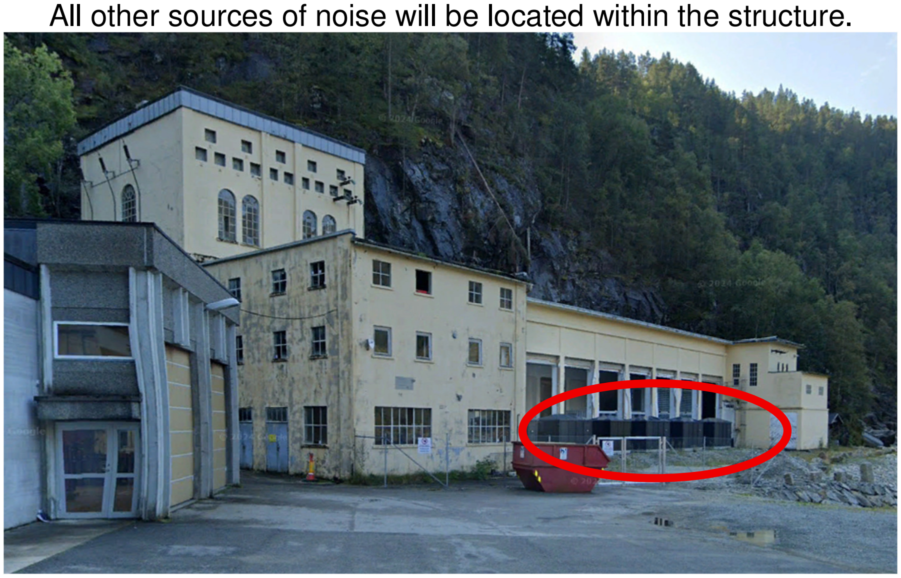
SEC. 2 – INSTRUMENTS USED

FORWARD AND APPLICATION SOFTWARE FOR DATA ANALYSIS

√ "SoundPlan version 9.1" software produced by Braunstein and Berndt GmbH.

SEC. 3 – GENERAL CONSIDERATION

The new data center plant will be installed inside the former hydroelectric plant of Sauda, Norway.
In the planned configuration, the only sources of noise will be no 5 diesel generators placed outside the wall structure, in the area as shown in the figure.
All other sources of noise will be located within the structure.



Data center structure with indication of generator positioning (in red)

SEC. 4 – SIMULATION SOFTWARE DESCRIPTION

The software SoundPLAN 9.1 is one of the main tools used for the modeling and prediction of acoustic impact in outdoor environments. Its operation is based on the construction of a three-dimensional digital model of the area of interest, into which geometric elements (buildings, roads, railways, terrain elevations, noise barriers, reflective surfaces, etc.) and sound sources (road and rail traffic, industrial plants, machinery, etc.) are inserted and characterized by their emission parameters.

The core principle of the calculation is the propagation of sound in outdoor environments, described through international normative models (ISO 9613, CNOSSOS-EU, NMPB, RLS-90, etc., depending on the application context and legal requirements). In general terms, the sound pressure level L_p at a receiving point located at distance r from the source is obtained from the following relation:

$$L_p(r) = L_w + D_c - A_{div} - A_{atm} - A_{gr} - A_{bar} - A_{misc}$$

where:
- L_w is the sound power level of the source;
- D_c is the source directivity term;
- A_div represents attenuation due to geometric divergence of propagation (spherical or cylindrical);
- A_atm is the atmospheric attenuation, depending on frequency, distance, temperature, and relative humidity;
- A_gr accounts for interactions with the ground, which may reflect or absorb part of the sound energy;
- A_bar represents attenuation due to barriers, calculated on the basis of acoustic diffraction principles;
- A_misc includes other effects, such as vegetation or multiple reflections.

When multiple sources are present, the software performs the energetic summation of the individual contributions:

$$L_{tot} = 10 * \log10(\Sigma (10^{(L_{p,i} / 10)}))$$

The final result of the calculation is expressed both in punctual form, through the sound levels predicted at specific receptors (e.g., facades of sensitive buildings), and in areal form, through noise maps that represent isophonic curves over the entire simulated area.

SoundPLAN also allows the calculation of the main normative acoustic indicators, such as L_day, L_evening, L_night, and L_den, as required by the European Directive 2002/49/EC. These values can be compared with the applicable legal limits, thus enabling the assessment of compliance and the analysis of the effectiveness of potential mitigation measures (sound-absorbing barriers, shielding, emission reduction).

In summary, SoundPLAN 9.1 operates as a three-dimensional acoustic simulator, capable of integrating the characteristics of sound sources with environmental and territorial conditions, applying the most recognized international sound propagation models. Thanks to this, the software provides reliable predictions and analysis tools that are essential for territorial planning, environmental impact assessments, and noise mitigation projects.

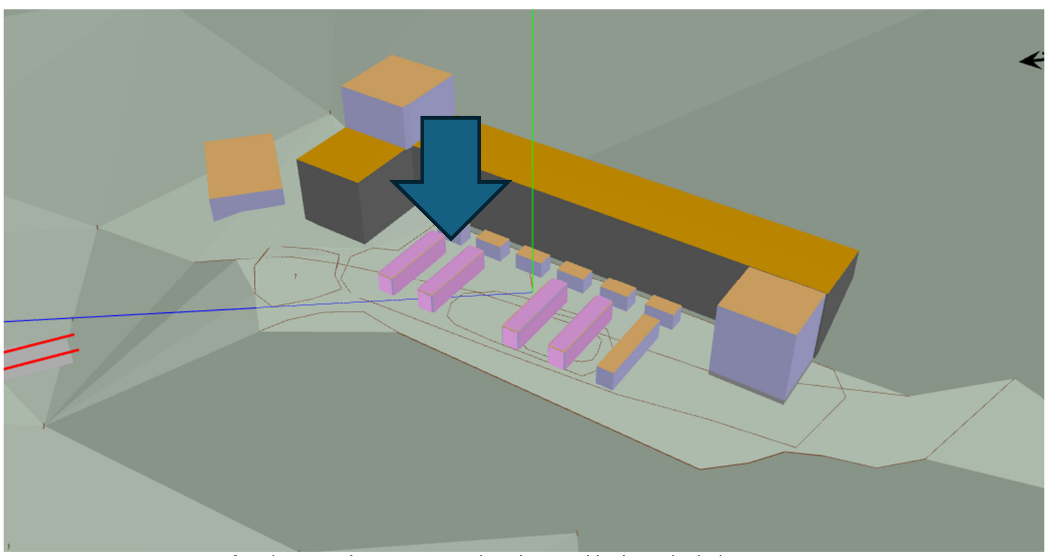
SEC. 5 – SOUND SOURCES: DEFINITION, QUANTIFICATION AND MODELING

Regards the sound power levels of the new system to be included in the “SoundPlan 9.1” calculation program, the data communicated by the customer were used.

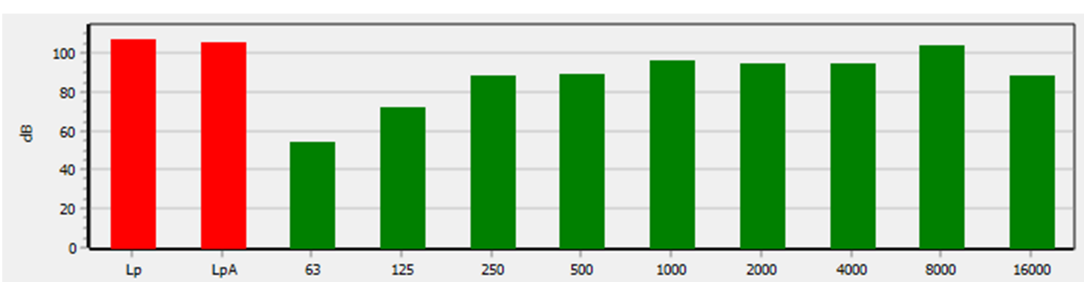
Data are the following:

- diesel generators: 5 – every generator inside a noise-insulated container
- sound pressure level: 75 dBA @ 5 m for each container
- container dimensions: 12.20 (L), 2.44 (W), 2.89 (H).

Starting with these data, for each container, a subdivided sound power level was assigned to each of the five sides of the same container through the use of area sources. The power spectrum was communicated from the customer.



Areal source for every container inserted in the calculation program



Sound power spectrum (in octave) inserted in the calculation program

SEC. 6 – CALCULATION OF THE GENERATED ACOUSTIC IMPACT

The calculations of the acoustic impact generated were performed with the "SoundPlan 9.1" software.

The modeling of the territory took place based on metric and orographic data collected regarding the area affected by the noise due to the installation of the new system.
After creating the digital model of the soil**,** in order to also take into account, the elevation, the geometric characteristics of the buildings (size, shape, height, number of floors and position of the receptors) were superimposed.

The last step for the construction of the acoustic model of the area was the insertion of the sound emission data for the new system to be installed.

In this report, the sound emissions have been simulated for different annual periods: summer (T: 20°C - RH: 70%) and winter (T: -10°C - RH: 80%).

Furthermore, regarding ground absorption, a precautionary average value of G = 0.5 has been assumed, except for the lake, which has been considered completely reflective.

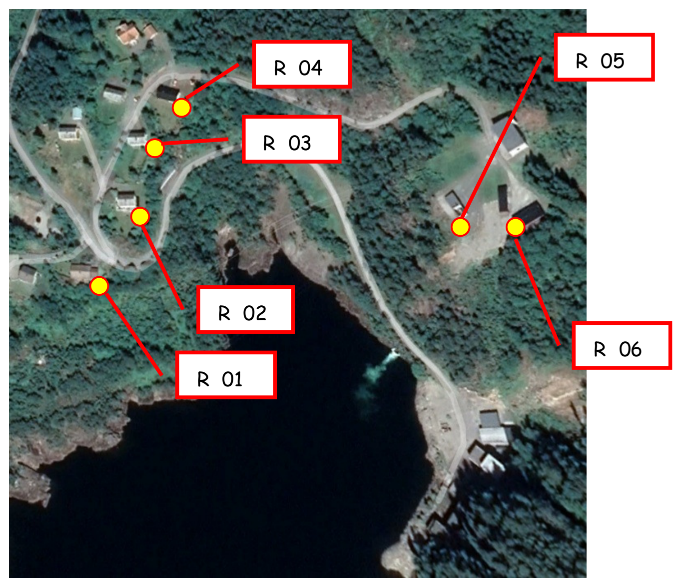
SEC. 7 – ACOUSTIC IMPACT ASSESSMENTS

For the purpose of evaluating the acoustic impact generated, the following scenarios were created (according to the customer):

- Map $1g_{20}$: 1 gen running – 20 mins daytime.
- Map $1g_{120}$: 1 gen running – 120 mins daytime
- Map $4g_{24}$: 4 gens running – 24 hours

LOCATION OF RECEIVER POINTS

Before carrying out the evaluation of the acoustic impact it is necessary to describe the location of the points used in the calculation estimates as shown in the following images:



Position of the receiver points used in the calculation program

SUMMER PERIOD

MAP 1G$_{20}$: 1 GEN RUNNING – 20 MINS DAYTIME

In the Map1g$_{20}$ scenario, the noise deriving solely from the new system is simulated. The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Receiver	Lden dBA
R_01	16.7
R_02	16.8
R_03	16.5
R_04	17.5
R_05	21.3
R_06	22.8

MAP 1G$_{120}$: 1 GEN RUNNING – 120 MINS DAYTIME

In the Map2g$_{20}$ scenario, the noise deriving solely from the new system is simulated. The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Receiver	Lden dBA
R_01	24.5
R_02	24.6
R_03	24.2
R_04	25.3
R_05	29.1
R_06	30.6

MAP 4G$_{24}$: 4 GENS RUNNING – 24 HOURS

In the Map4g$_{24}$ scenario, the noise deriving solely from the new system is simulated.
The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Receiver	Lden dBA
R_01	47.7
R_02	48.7
R_03	47.3
R_04	48.3
R_05	51.2
R_06	52.6

WINTER PERIOD

MAP 1G$_{20_WIN}$: 1 GEN RUNNING – 20 MINS DAYTIME

In the Map1g$_{20_WIN}$ scenario, the noise deriving solely from the new system is simulated.
The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Receiver	Lden dBA
R_01	14.7
R_02	14.7
R_03	14.2
R_04	15.0
R_05	19.9
R_06	21.2

MAP 1G$_{120_WIN}$: 1 GEN RUNNING – 120 MINS DAYTIME

In the Map2g$_{20_WIN}$ scenario, the noise deriving solely from the new system is simulated. The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Receiver	Lden dBA
R_01	22.5
R_02	22.5
R_03	22.0
R_04	22.8
R_05	27.7
R_06	29.0

MAP 4G$_{24_WIN}$: 4 GENS RUNNING – 24 HOURS

In the Map4g$_{24_WIN}$ scenario, the noise deriving solely from the new system is simulated. The results obtained by the "SoundPlan 9.1" calculation program are as follows:

Ricevitore	Ld dB(A)
R_01	45.6
R_02	46.6
R_03	45.2
R_04	45.9
R_05	49.8
R_06	50.9

SEC. 8 – CONCLUSIVE REPORT

This assessment, conducted on 09.07.2025, aims to predict the level of noise pollution generated by a new data center to be installed in Handelandsvegen 140 - 4200 Sauda, Norway.

Based on the characteristics of the activity to be performed, the calculations carried out and the information reported by the Client, the following is stated:

- **IN ALL SIMULATED SCENARIOS THE LEVEL LDEN AT THE RECEPTORS IS ACCEPTABLE.**

The writer declines any responsibility deriving from:

- specifications and provisions of the systems to be installed different from those communicated by the Client and simulated in this report;
- hours and type of operation of the plants different from that communicated by the client and reported in this report;
- noise from any other untreated source present in the area.

Schio (VI) I, 09.07.2025

the technician:

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D.G.R. Lombardia n° 234 del 13.01.2005
Certificazione CICPND – SINCERT n° 249/ASV/C – 240/ASV/C
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ENTECA
Elenco Nazionale dei Tecnici Competenti in Acustica
N° 1975 del 10/12/18

ANN. 1 - SIMULATIONS

ANNEX 1

SIMULATIONS

Summer Period

Receiver	Lden dBA
R_01	16,7
R_02	16,8
R_03	16,5
R_04	17,5
R_05	21,3
R_06	22,8

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 31/2025

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Map
1g20

Emissione_Gen1_OK_New Spectrum_Mappa
Result number 37
Calculation in 4 m above ground

Project Scenario with 1 gen running - 20 mins daytime

Project engineer: Ing. Luigi Motta
Created: 5/29/2025
Processed with SoundPLAN 9.1, Update 5/28/2025

Lden
dB(A)

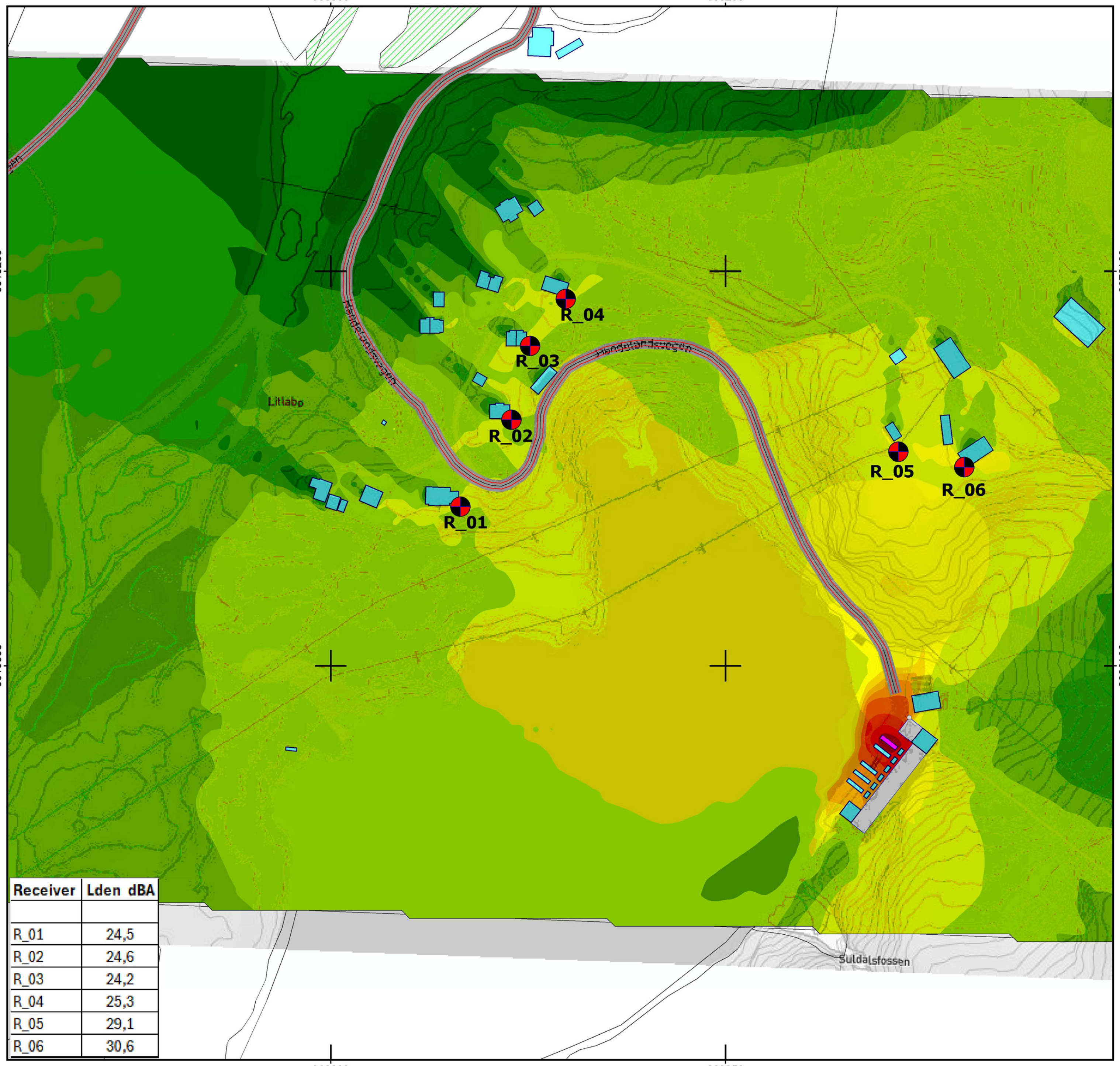
Lden dB(A)
< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90

Signs and symbols
Road axis
Emission line
Sorgente area
Strada
Edificio principale
Foresta
Ricevitore
Area calcolo rumore

Length scale 1:2500
0 20 40 80 120 160 m

N

MARVINACUSTICA
PRODOTTI E SISTEMI PER L'ISOLAMENTO ACUSTICO



Receiver	Lden dBA
R_01	24,5
R_02	24,6
R_03	24,2
R_04	25,3
R_05	29,1
R_06	30,6

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 1027/2025

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Map
1g120

Emissione_Gen1_OK_New Spectrum_Mappa_120m
Result number 41
Calculation in 4 m above ground

Project Scenario with 1 gen running - 120 mins daytime

Project engineer: Ing. Luigi Motta
Created: 17/06/2025
Processed with SoundPLAN 9.1, Update 10/06/2025

Lden
dB(A)

Lden dB(A)
< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90

Signs and symbols
- Road axis
- Emission line
- Sorgente area
- Strada
- Edificio principale
- Foresta
- Ricevitore
- Area calcolo rumore

Length scale 1:2500
0 20 40 80 120 160 m

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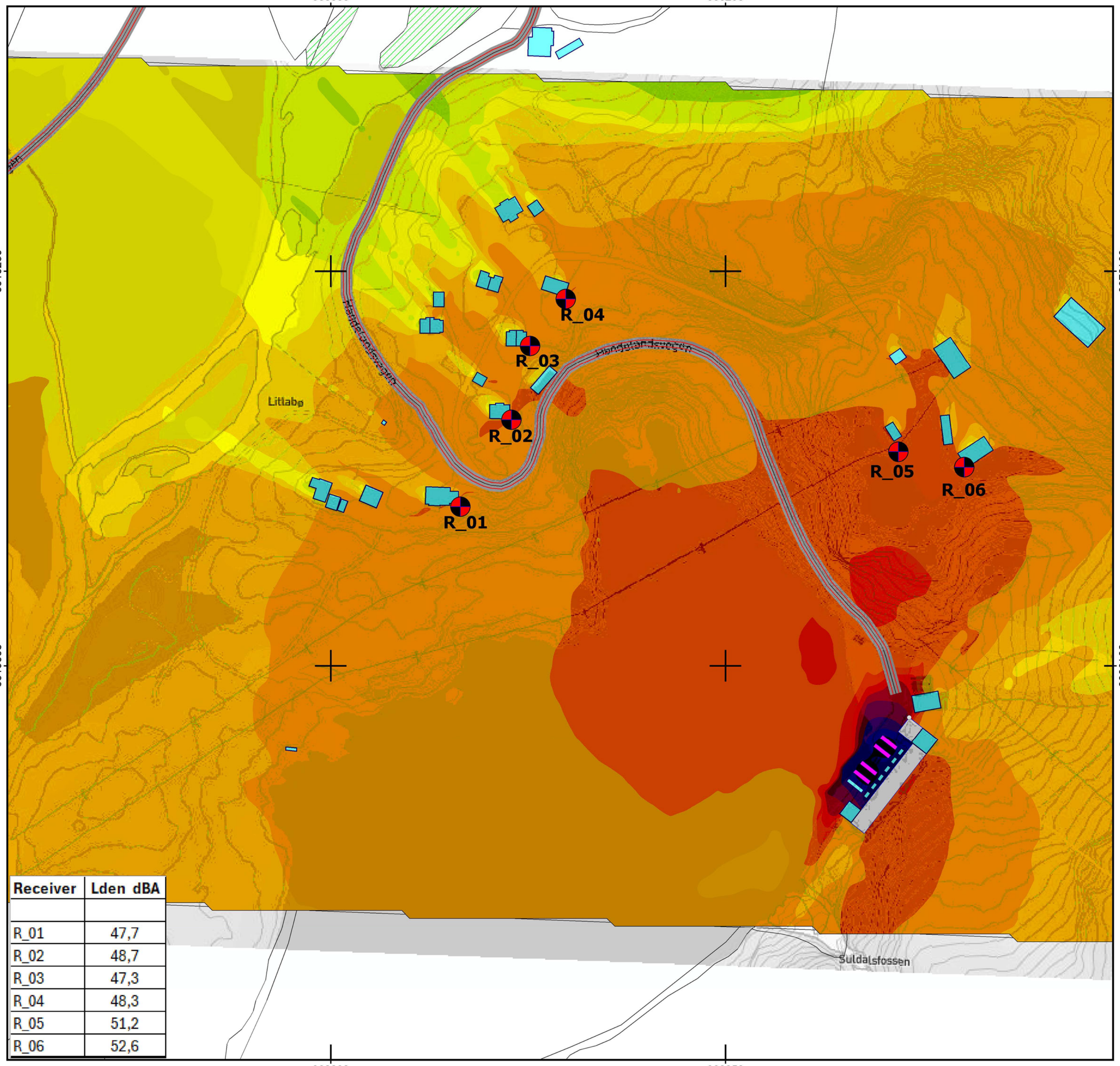

Receiver	Lden dBA
R_01	47,7
R_02	48,7
R_03	47,3
R_04	48,3
R_05	51,2
R_06	52,6

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 31/2025

Map
4g24

Emissione_Gen4_OK_New Spectrum_Mappa
Result number 39
Calculation in 4 m above ground

Project Scenario with 4 gen running - 24h/d

Project engineer: Ing. Luigi Motta
Created: 5/29/2025
Processed with SoundPLAN 9.1, Update 5/28/2025

Lden
dB(A)

< 10	
10 - 15	
15 - 20	
20 - 25	
25 - 30	
30 - 35	
35 - 40	
40 - 45	
45 - 50	
50 - 55	
55 - 60	
60 - 65	
65 - 70	
70 - 75	
75 - 80	
80 - 85	
85 - 90	

Signs and symbols
- Road axis
- Emission line
- Sorgente area
- Strada
- Edificio principale
- Foresta
- Ricevitore
- Area calcolo rumore

Length scale 1:2500
0 20 40 80 120 160 m

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PRODOTTI E SISTEMI PER L'ISOLAMENTO ACUSTICO

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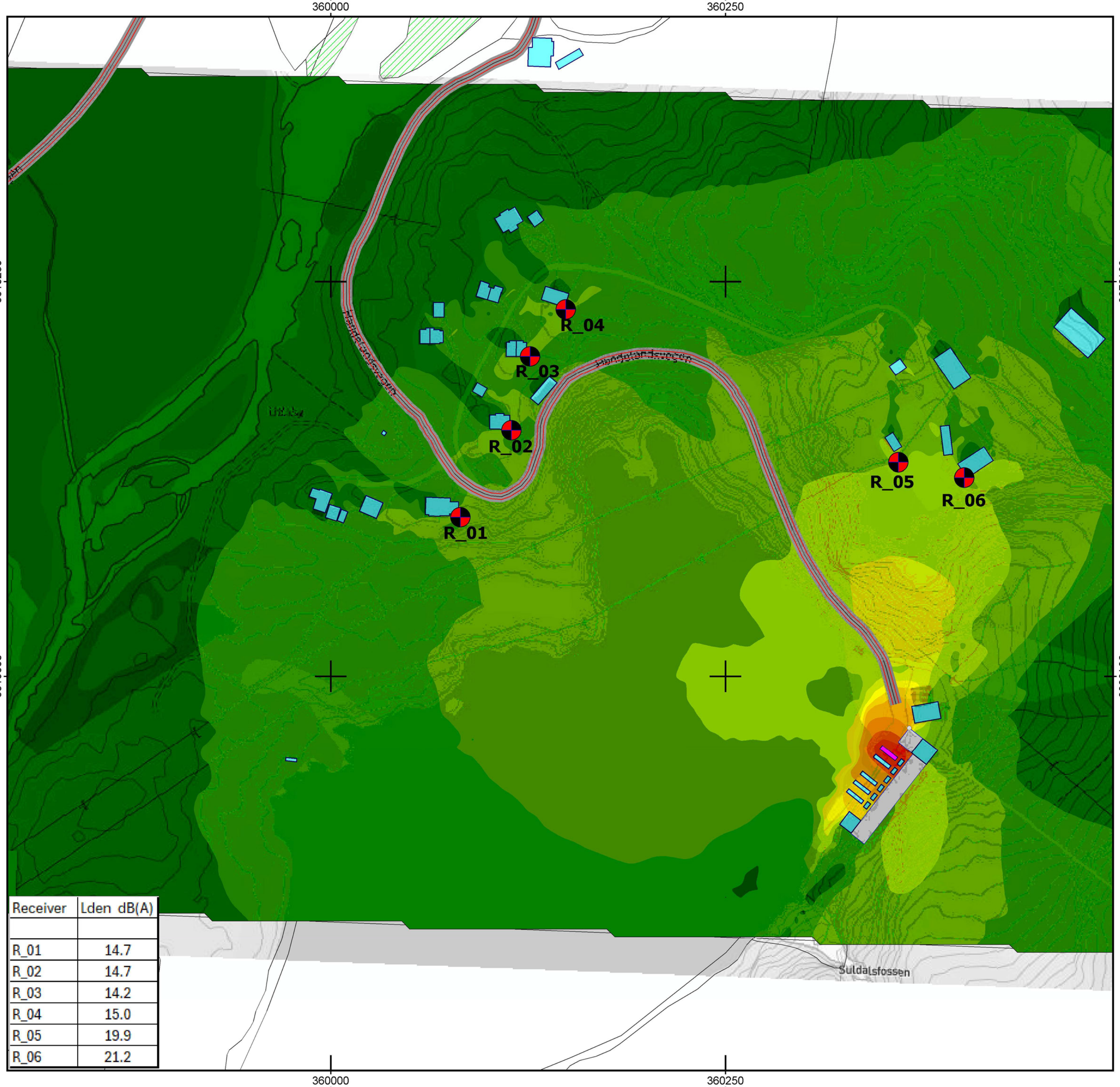
Winter Period



Receiver	Lden dB(A)
R_01	14.7
R_02	14.7
R_03	14.2
R_04	15.0
R_05	19.9
R_06	21.2

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 1027/2025

KRAFT

Map
1g20 win

Emissione_Gen1_OK_New Spectrum_Mappa_Winter
Result number 45
Calculation in 4 m above ground

Project Scenario with 1 gen running - 20 mins daytime

Project engineer: Ing. Luigi Motta
Created: 9/3/2025
Processed with SoundPLAN 9.1, Update 8/27/2025

Lden
dB(A)

Lden dB(A)
< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90

Signs and symbols
- Road axis
- Emission line
- Sorgente area
- Strada
- Edificio principale
- Foresta
- Ricevitore
- Area calcolo rumore

N

Length scale 1:2500
0 20 40 80 120 160 m

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PRODOTTI E SISTEMI PER L'ISOLAMENTO ACUSTICO

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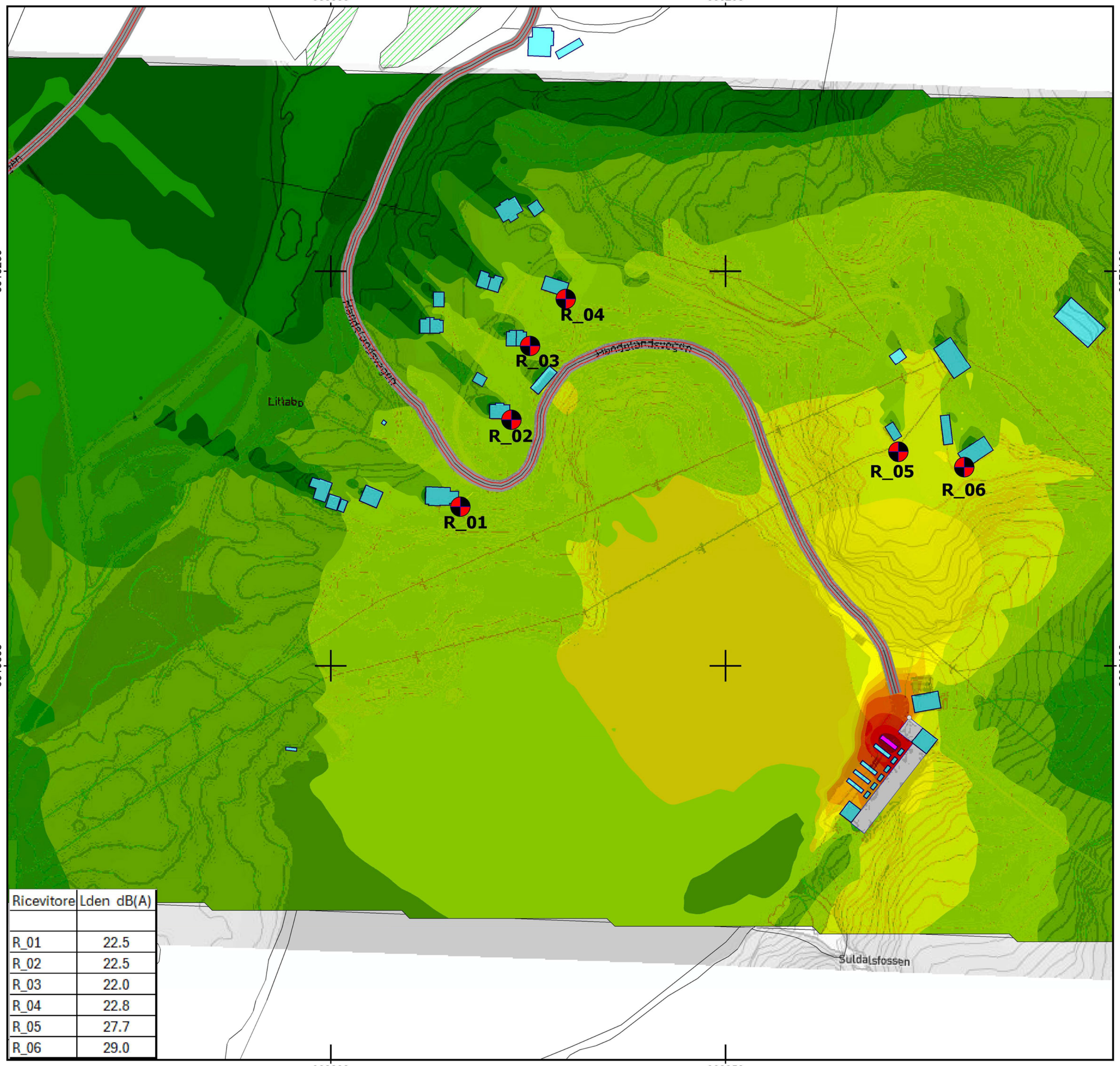

Ricevitore	Lden dB(A)
R_01	22.5
R_02	22.5
R_03	22.0
R_04	22.8
R_05	27.7
R_06	29.0

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 1027/2025

KRAFT

Map
1g120
win

Emissione_Gen1_OK_New Spectrum_Mappa_120r
Result number 46
Calculation in 4 m above ground

Project Scenario with 1 gen running - 120 mins daytime

Project engineer: Ing. Luigi Motta
Created: 9/3/2025
Processed with SoundPLAN 9.1, Update 8/27/2025

Lden
dB(A)

Lden dB(A)
< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90

Signs and symbols
- Road axis
- Emission line
- Sorgente area
- Strada
- Edificio principale
- Foresta
- Ricevitore
- Area calcolo rumore

N

Length scale 1:2500
0 20 40 80 120 160 m

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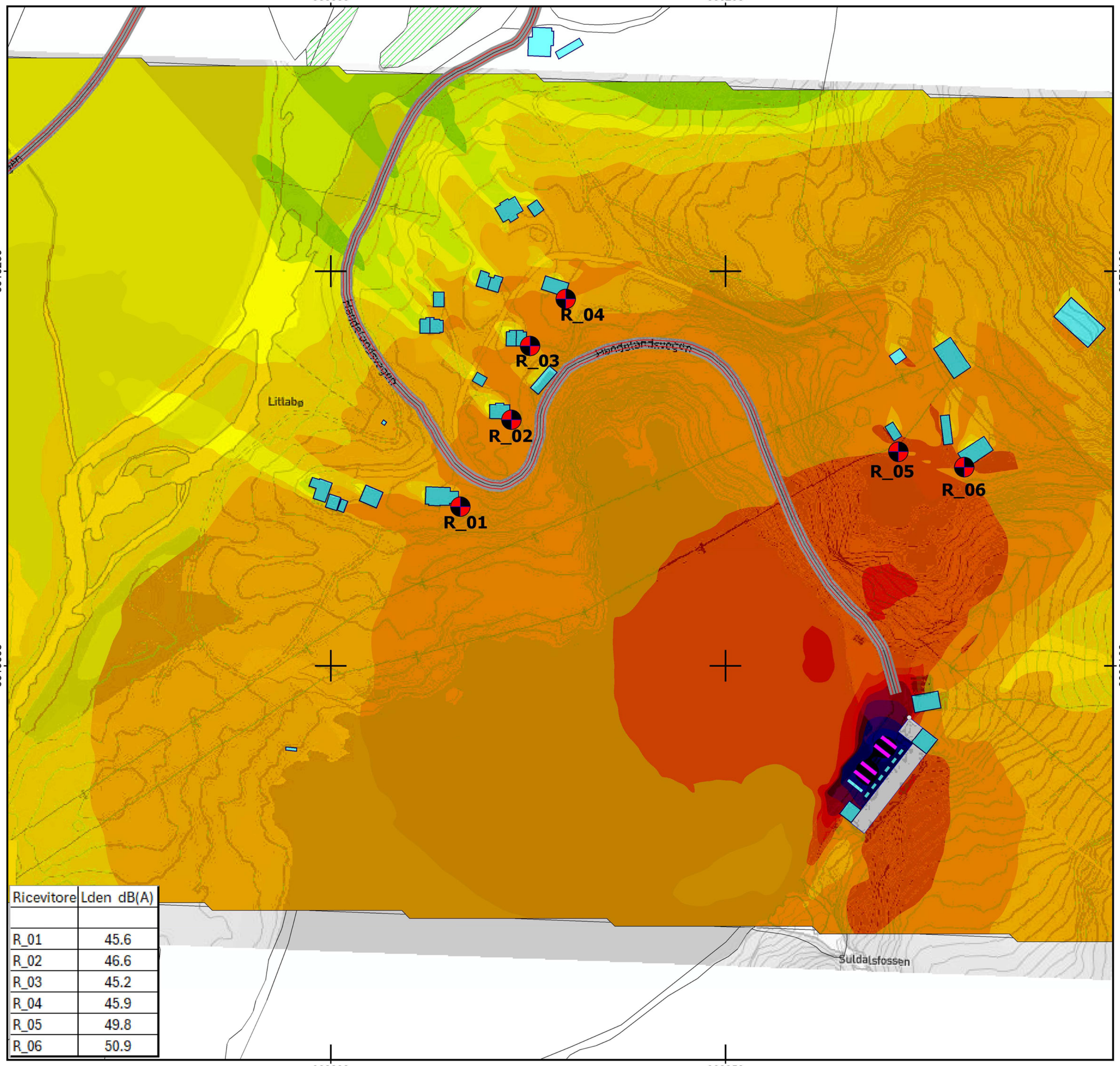

Ricevitore	Lden dB(A)
R_01	45.6
R_02	46.6
R_03	45.2
R_04	45.9
R_05	49.8
R_06	50.9

Customer:
Terakraft AS
Project: VPIA Datacenter
Project-No. 1027/2025

KRAFT

Map
4g24 win

Emissione_Gen4_OK_New Spectrum_Mappa_Win
Result number 47
Calculation in 4 m above ground

Project Scenario with 4 gen running - 24h/d

Project engineer: Ing. Luigi Motta
Created: 9/3/2025
Processed with SoundPLAN 9.1, Update 8/27/2025

Lden
dB(A)

< 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90

Signs and symbols
- Road axis
- Emission line
- Sorgente area
- Strada
- Edificio principale
- Foresta
- Ricevitore
- Area calcolo rumore

N

Length scale 1:2500
0 20 40 80 120 160 m

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PRODOTTI E SISTEMI PER L'ISOLAMENTO ACUSTICO

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