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Project memo

N2kR Change log

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Abstract heading

The program package "N2kR-TC" (Nord 2000 Road Type Cases) was developed in 2006 to accommodate introduction of the noise calculation method Nord 2000 Road. It contains a large number of Type Cases for calculated road noise. This reflects variations in geographic surroundings, weather conditions, and traffic parameters.

After 2006, the Nord 2000 methodology for sound propagation has gone through a few extensions and revisions, with a major change in 2019. Also, the road source method has been updated to support national developments. Since Sweeden recently pointed to Nord 2000 as the preferred national method, there has been a need to update the Type Case tool to include all method changes and to support current Swedish regulations. This memo summarizes this update, in form of a change log.

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0	2026-05-20	Draft
1	2026-06-25	Final

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1 How to download and installation N2kR-TC

1. Open the web site for N2kR-TC. The link is: https://www.sintef.no/projectweb/n2kr/
2. Get yourself acquainted with the descriptions on the web site
3. Download the setup program package (***N2kR-TC_Setup.msi***)
4. Download the zip file containing the precalculated data set (***N2kR-TC_PreCalc.zip***)
5. Unpack the data set to a disk folder (local on your computer or on your file network)
6. Install the program package
7. Run the ***N2rR-TC*** program
8. Open the menu item ***TC Source*** and select ***Local folder…***
9. Navigate to the disk folder where you placed the data set and click ***OK***.
10. When all is set correctly, you will see noise level numbers when clicking in the ***Cross Section*** figure.

2 Change log

- Basis is “ComPro 22”
  The pre-calculated data set for sound propagation has been updated to comply with the 2019 revision of Nord 2000. Specifically, this means compliance with the “ComPro 22” prototype.

- Validation
  The pre-calculations require a very large numbers (>100 mill.) of single point-to-point predictions. Since this is too much for the original ComPro prototype (Matlab code), a faster implementation at SINTEF (Fortran code) has been developed and validated against the prototype.

- Downwind in all directions
  One of the Weather Cases has been changed. The former case “SE Year” has been replaced with “SE 1.5 m/s downwind”. This case aims at representing sound propagation of the older method “Nord 96” (TemaNor report 1996).

- Swedish source model
  The road source model is extended to cover current Swedish regulations regarding road surface influence [1]. The new surface types “DAC 11 (SE 2024)” and “SMA 16 (SE 2024)” can be chosen.

- Changed algorithm for Lmax evaluation
  Calculation of sound propagation for Lmax is changed from a “max-hold spectrum” to a “representative A-weighted spectrum”. Pre-calculation of sound propagation must be done without knowledge of which actual spectra it applies to. For Leq type units this is not a problem. But, for N2kR-TC Lmax was evaluated separately for each frequency, without regard to source point position along the road. This gave attenuation spectra with deviating source point positions across the frequency range, and a tendency to overestimate end results.

  The algorithm is changed by introducing a representative source spectrum before evaluating Lmax propagation. This leads to use of the single source point that potentially gives maximum noise at the receiver. The reference spectrum is composed from a traffic mix 70-15-15 for light-medium-heavy vehicles respectively.

- Sixth highest for Lmax
  Two new Noise Units is added. Choosing “LAFmax6e (06-22)” or “LAFmax6e (22-06)” will give maximum noise level for day- or nighttime according to Swedish regulation[1]. The purpose is to provide expected noise level for the 6th most noisy single vehicle event.

  Additionally the former Noise Units “LAeq” and “LAmax” are renamed to “LAeq24h” and “LAFmax5%”. This just is to clarify. Calculations are not changed.

[1] Kunnskapscentrum om buller (2024-13-30) «Nord 2000 Användarhandledning för beräkning av buller från väg- och spårtrafik för svenskt bruk»

- Changed absorption coefficient
  For noise propagation involving sound reflection from constructions (screens and buildings), the absorption coefficient has been changed from 0.38 to 0.2. This may tend to increase noise levels in reflective environments, compared to former versions of the tool.

- Updated Porous Asphalt
  The Type Case 18 – Porous Asphalt is updated. Former versions of the tool did use a provisional model for impedance. The update complies with the "Hamet model" with parameters:

  - Flow resistance *Sigma* = 24000
  - Porosity *Omega* = 0.2
  - Shape factor *q2* = 2.5
  - Thickness *d* = 0.04

- Moved source 1 meter
  In former versions of N2kR-TC the source was located on (above) the centre line of the road. To support consistence with other calculation tools, the source is now located 1 meter off the centreline, meaning 1 horizontal meter closer to the calculation point.

- Adjusted Traffic Numbers
  Default numbers for traffic distribution are adjusted to comply with the Nord 2000 user's guide[2]. This effect the distribution over Light/Medium/Heavy and Day/Evening/Night as well as Speed, dependent on selected Traffic Case. Note that default numbers can be overruled in the User defined case.

- Changed GUI
  In addition to additions and adjustments mentioned above, a few minor changes are made to the GUI.

  - Version number changed to 2.0.
  - Number of axles for heavy vehicles is changed from 4 to 5.
  - In the menu item "TC source", several selection options are removed. This is because N2kR-TC no longer supports online download of pre-calculated data. The user must now download the complete data set manually and place it on disk before any result can be viewed. The only selection left in this menu item is to input the path to the data set on the disk.
  - Menu item Help -> About: Description text is updated.

- Corrected errors
  During development and testing of the updated N2kR-TC, errors were identified and corrected.

[2] Delta report (May 2006) «User's Guide Nord2000 Road»

- Determination of sound speed gradient related to wind was made with “common logarithm” (10-base). It is corrected to “natural logarithm” (e-base). The error led to reduction of refraction effects, i.e. it could tend to underestimate noise in long distance downwind, and overestimate in upwind.

- An error in implementation of horizontal source directivity for propulsion noise led to wrong source spectra. The error could case deviations in the order of 1-2 dB in single frequencies, but normally <0.5 dB A-weighted.

- Minor error in internal YDT sum. Unknown impact.