

# SoundPLAN<sup>®</sup> NOISE MODELING SOFTWARE

## SoundPLAN<sup>®</sup>



The most used software worldwide for many reasons

## SoundPLAN Version 7.0

**Cutting edge calculations with Dynamic Search**  
for complex noise modeling at lightning speed

**New Attribute Explorer**  
to inspect and alter attributes of objects in a spreadsheet

**Multi Threading and Distributed Computing**  
offer scalable high performance calculations

**New borrow function for the Network License**  
for working independent of the license server

**Innovative calculation techniques**  
complex building block type obstacles to model any scenario





# SoundPLAN®

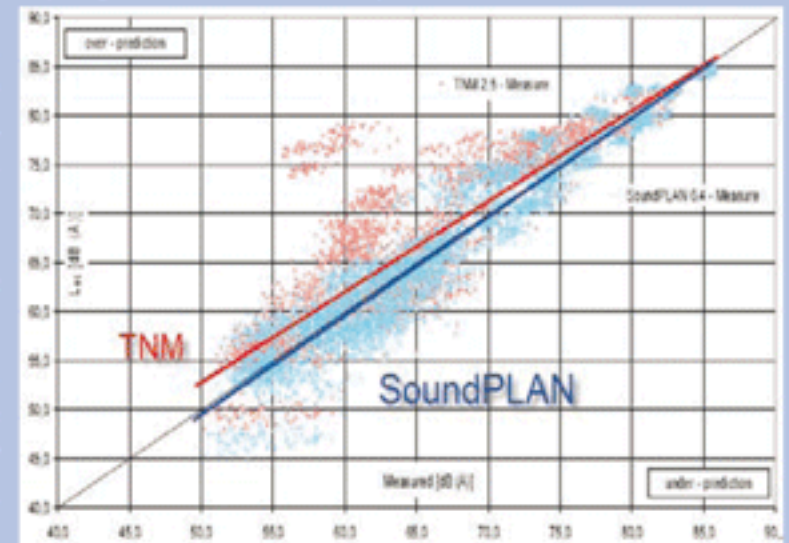
## with TNM<sub>1</sub> and Nord 2000 implementation

SoundPLAN is a regulation and standards based noise and air pollution modeling software used to evaluate any type or size of noise and/or air pollution scenario. TNM and Nord2000 are among the more than 50 relevant standards implemented. SoundPLAN is the only noise control software package that has implemented and tested both calculation methods that evaluate the phase relationship between the direct line of sight transmission and the phase shifted ground reflection. Software efficiency is paramount for these advanced

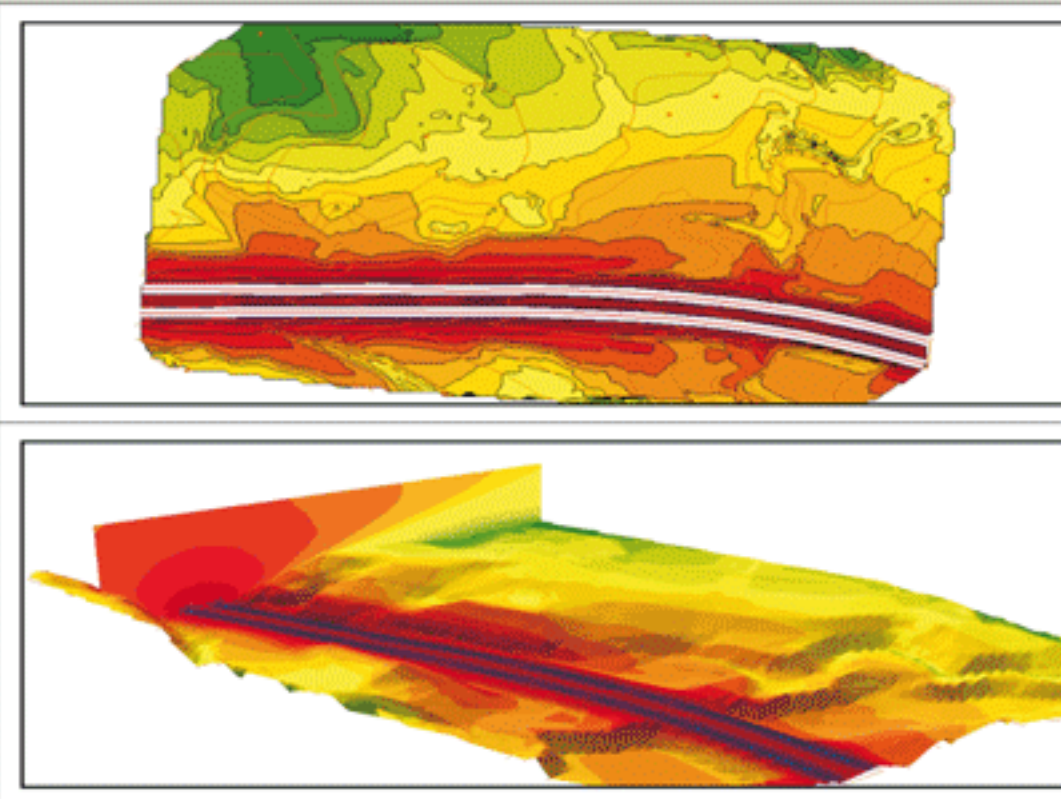
calculations, and SoundPLAN has achieved this efficiency. Comparisons between SoundPLAN's TNM implementation and TNM 2.5 show SoundPLAN's speed advantage with complex models to be more than 100 times faster. As TNM is mandated for government aid projects, SoundPLAN developed a practical bi-directional interface to TNM 2.5 so models can be easily exchanged.

1) TNM is a registered trademark of the US Government. SoundPLAN's implementation of the TNM method has not been tested, evaluated, or approved for use by any Agency of the United States Government.

The direct comparison of TNM2.5 and SoundPLAN to Measurement Data were derived from the TNM 2.5 validation project the US DoT provided.

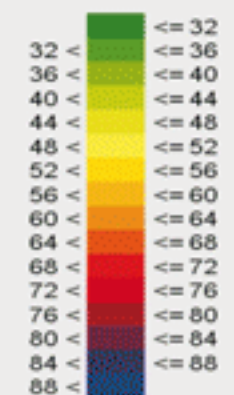


This example of SoundPLAN's TNM shows a section of freeway with complex terrain. The picture below depicts the terrain. The pictures to the right show a noise contour map and a cross-sectional noise map. Note: Only SoundPLAN has implemented spreading shown in 3D.



On a triangulated mesh of the terrain receivers are placed in a grid pattern and are calculated. The contouring is done on-line in the Graphics.

Noise level  
Lday  
in dB(A)



## Nord 2000

Nord2000 uses key innovations concerning phase effects in the propagation over a given terrain, reflection handling and the evaluation of wind and weather influence to improve the accuracy of noise modeling. The influences of ground reflections and reflections at walls and buildings are determined with a frequency dependant Fresnel zone. All the influences are assessed in part using

very complicated and time consuming mathematical calculations. Because of this, the creators of Nord2000 expected it would only be used as a reference model, but SoundPLAN's innovative Dynamic Search Model gave this standard such a boost in speed that it is now practical for noise mapping. SoundPLAN successfully and efficiently calculated the END noise map of Copenhagen using Nord2000.

Among its many advantages, Nord2000 offers emission models for road and rail, but uses the same propagation procedure for the propagation of industrial, road and railway sources, thus making it easier to compare the noise from different sources. Nord2000 is the parent to future, more accurate propagation models. SoundPLAN has the most experience with such complex models.



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## Optimal data organization for projects small and big

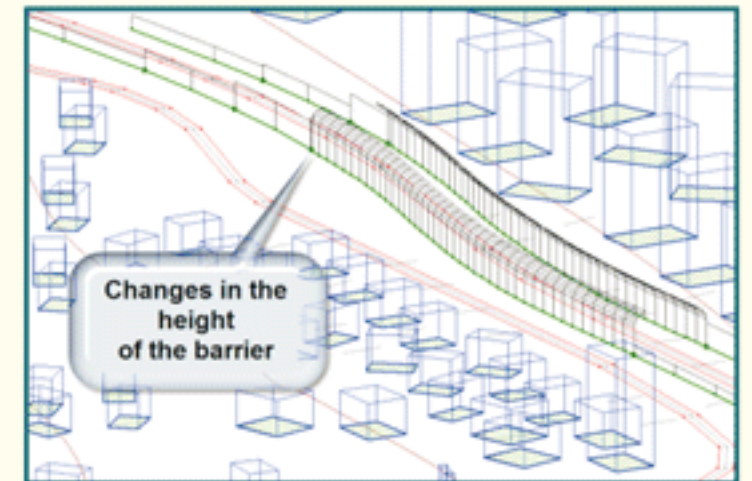
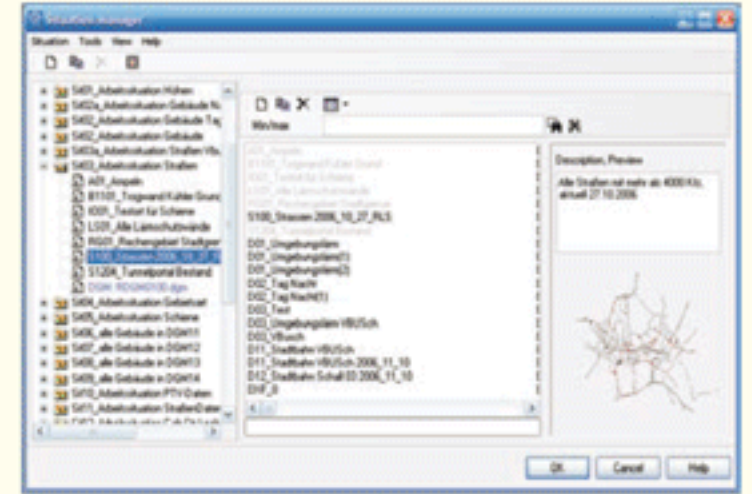
Good software accommodates a wide range of projects. Few projects have only a single scenario, no variants and no need to investigate alternatives. SoundPLAN works efficiently with simple projects, but its strengths are revealed when a project has multiple variants or covers a wide geographical area. SoundPLAN development has focused on how to efficiently work with complex projects where multiple scenarios are compared and multiple input data sources must be worked into a consistent model.

Situations, Geo-Files and Tiling are the tools used to organize data in manageable units that fit together for a complete, understandable scenario. Geo-Files host information, coordinates and descriptive attributes. The Situation acts as a directory that gathers Geo-Files and manages them as a scenario. With complex projects, it is paramount that static data is present only once, but still can be freely combined with variant data. SoundPLAN avoids creating redundant data.

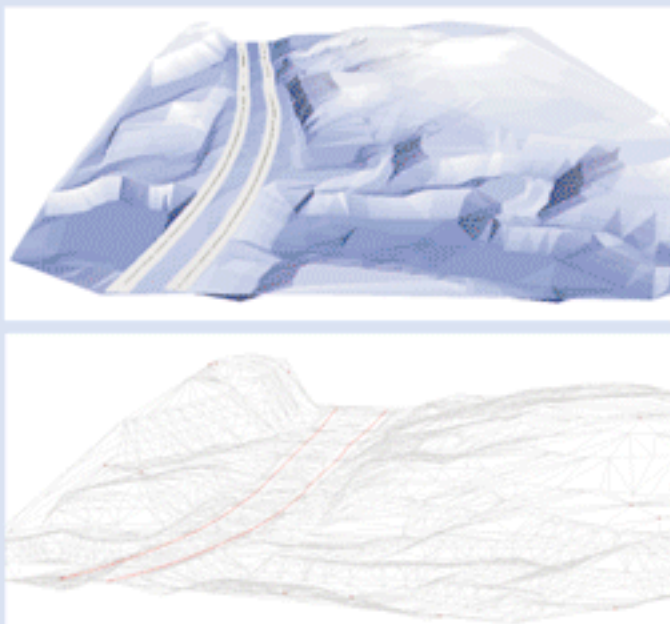
Tiling a huge project like the German train noise map allows a project to be processed in smaller units while

maintaining the single project status. Saving projects in multiple files and choosing to work on one or multiple files simultaneously, makes it possible to manage even the biggest project on a standard 32 bit system.

The top right picture depicts the Situation Manager in the Geo-Database with the available Situations on the left, the available Geo-Files in the middle and an information window to the right depicting the highlighted file. Creating new Situations and Geo-Files, moving Geo-Files with drag and drop from the pool into a Situation and writing descriptive texts for the Situation help keep track of the project. Good data management does not stop at the file level! SoundPLAN understands the importance of describing objects with varying attributes efficiently. A road, for example, will remain a single object even if the surface, width, traffic speed or composition changes. A requirement to make multiple objects every time an attribute changes creates exceedingly unnecessary objects. Fortunately, SoundPLAN allows single objects to show attribute changes at any coordinate.



## Digital Ground Models



The Digital Ground Model (DGM) plays a central role when creating 3D objects and during calculations. Data from laser scanning are often available in raw form and in pre-processed form with objects like trees, buildings and cars removed. SoundPLAN can triangulate this data for a continuous 3D surface and then load the raw data only for spaces within buildings to automatically calculate the differences between the 2 DGMs and assess the height of the buildings.

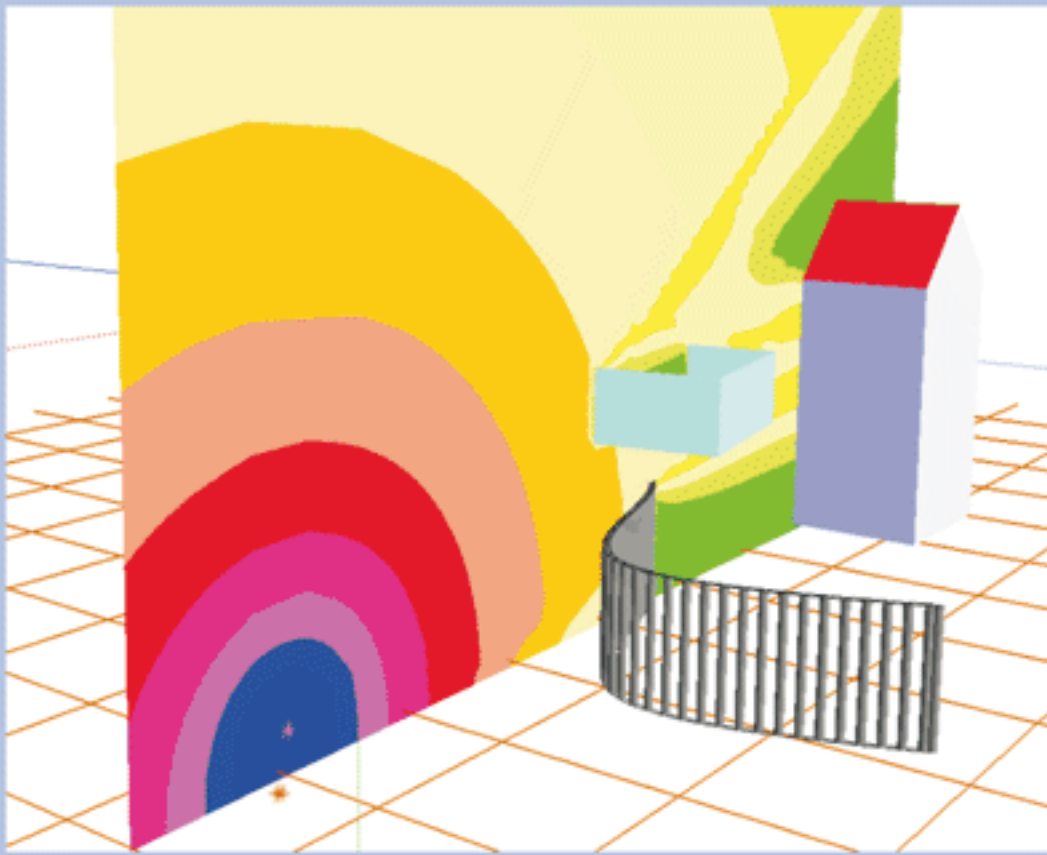
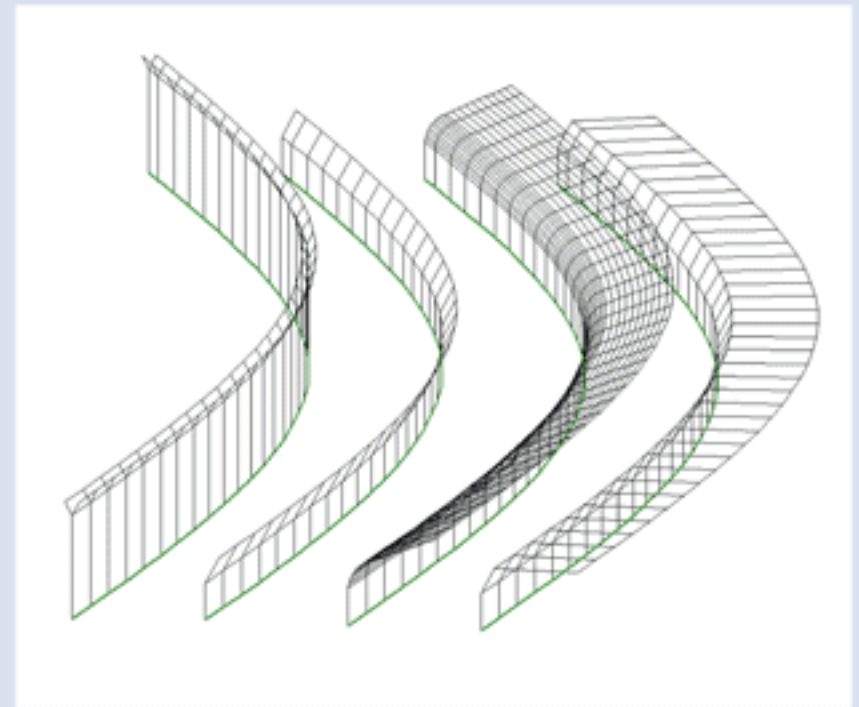
The DGM is preferred for calculations because elevation lines in themselves already represent processed data. A DGM derived from spot elevations is the most accurate terrain representation and a great way to check terrain (see pictures). SoundPLAN calculations generate these triangulated DGMs and use them for speed and accuracy reasons in the calculations.



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## Curved noise barriers, floating screens etc.

Noise protection walls for roads and railways force noise over the wall, thus causing it to travel farther. This additional distance is a direct measure for the effectiveness of a noise barrier. There are few options to optimize the geometry for maximum screening effect; the height of the barrier can be increased or the screening edge of the barrier can be moved as close to the road as possible. For safety reasons, roads have emergency lanes moving the noise protection barrier away from the preferred location. Because of these constraints, noise barriers in critical locations sometimes are designed with the top of the barrier leaning towards the road or covering the outer lanes. With the revised barrier entry, SoundPLAN can accommodate any barrier shape. The graphic to the right shows a “Y” barrier and barriers with different curvatures. SoundPLAN not only accommodates different shapes of barriers and berms, but also offers a model to enter and calculate the effect of tunnels and tunnel openings.



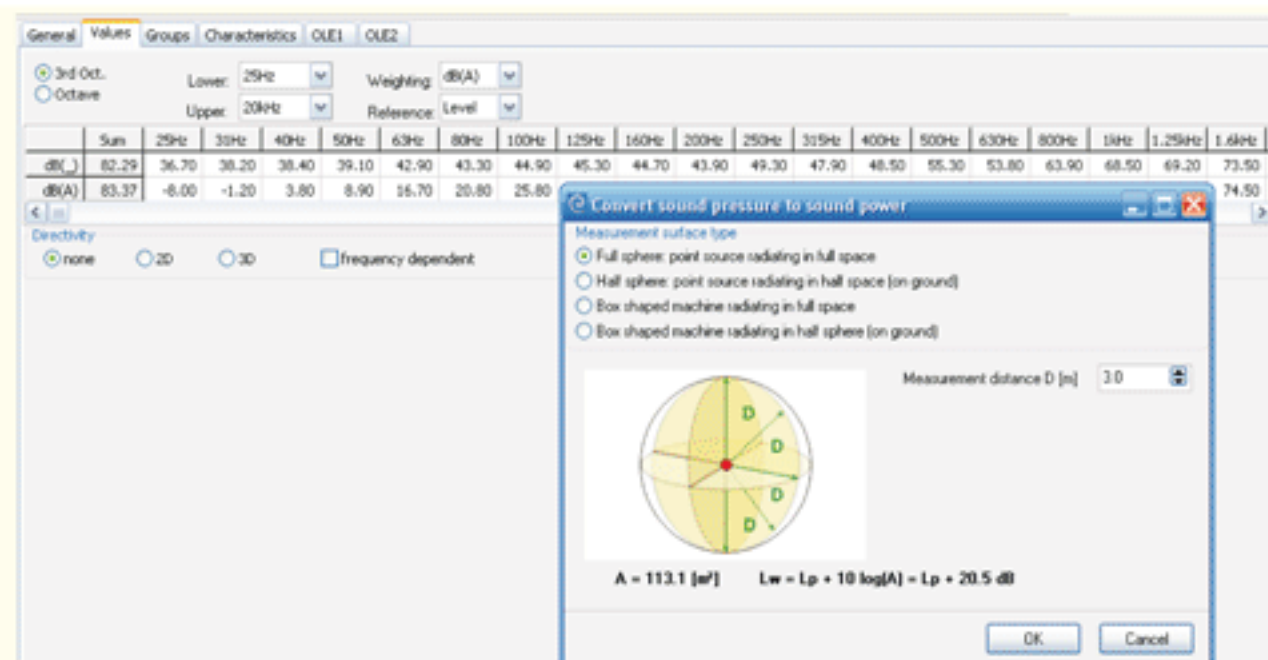
Industrial noise calculations are often used to solve problems in complex geometrical environments, unlike the simplified calculation methods defined in the accepted standards. According to the standards, noise always passes over a screen. Noise passing below a screen is never mentioned.

In power plants, a machine house may be built where noise will pass over, around and under it. SoundPLAN labels such an object a floating screen. In version 7, multiple floating screens in the same location can be used to construct complex scenarios. SoundPLAN searches for the paths yielding the highest noise input at the receiver. It can also calculate screens forming a slot from above and below.

## Sound Power / Sound Pressure

SoundPLAN minimizes work! Although sound power data is needed for industrial noise calculations, often the only data available is sound pressure data. Converting the data by hand would be costly, but SoundPLAN quickly calculates the equivalent sound pressure using the sound power values, a conversion model (see picture) and a reference distance.

Sources are either octave or third octave bands with user selected first and last frequencies. Converting a spectrum from dB(A) to linear or any other filter is as simple as pressing a button. Sources can be associated with either 2D, rotational or full 3D directivities.





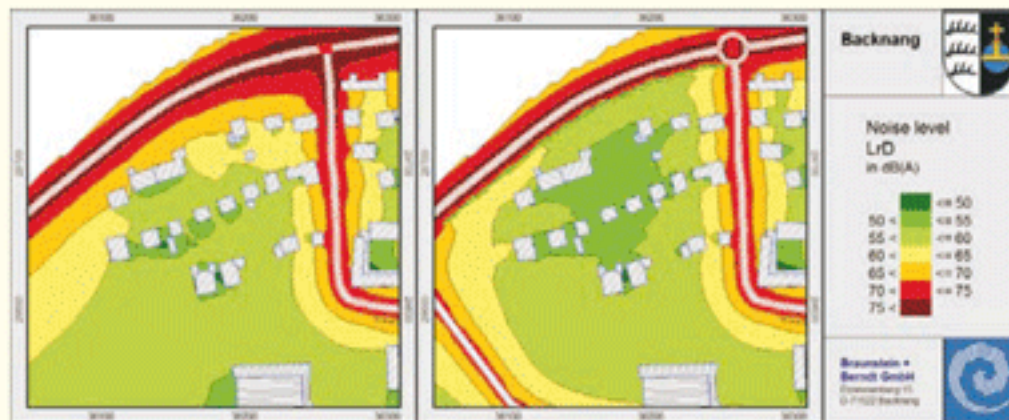
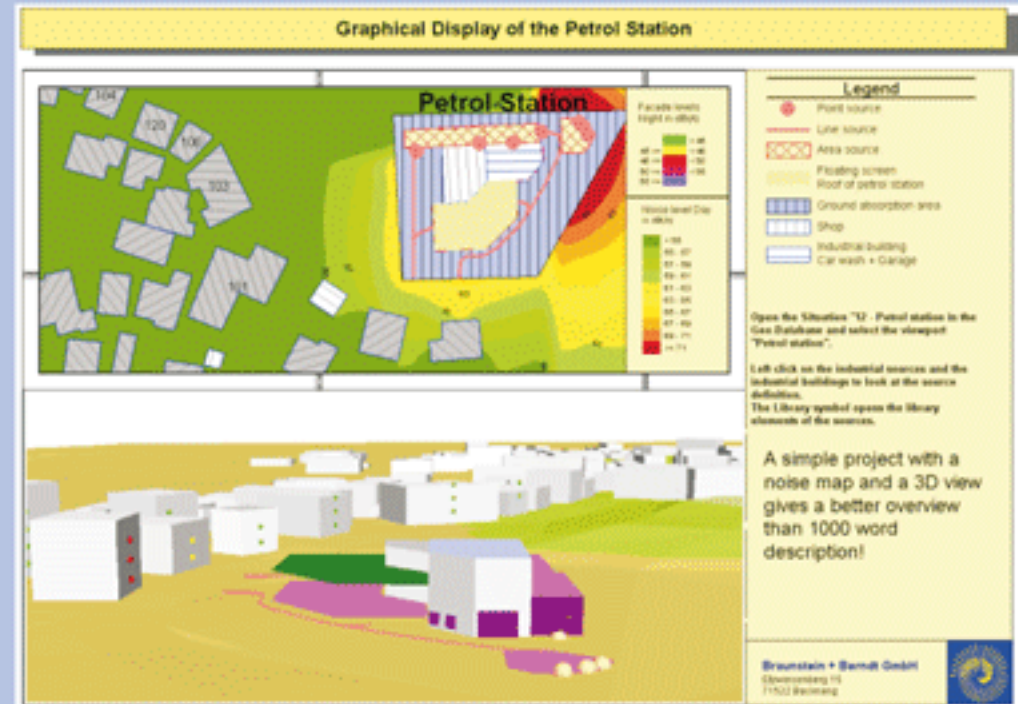
# SoundPLAN®

## Exceptional graphics flexible and professional

SoundPLAN Graphics are the best tool to illustrate a project, big or small. There is no need to export data to a graphics package as SoundPLAN contains all components needed to create, fine tune and store the graphics. Noise maps with smooth noise contour lines are probably the best known type of graphics. Difference maps display the differences between before and after scenarios. The 3D graphics

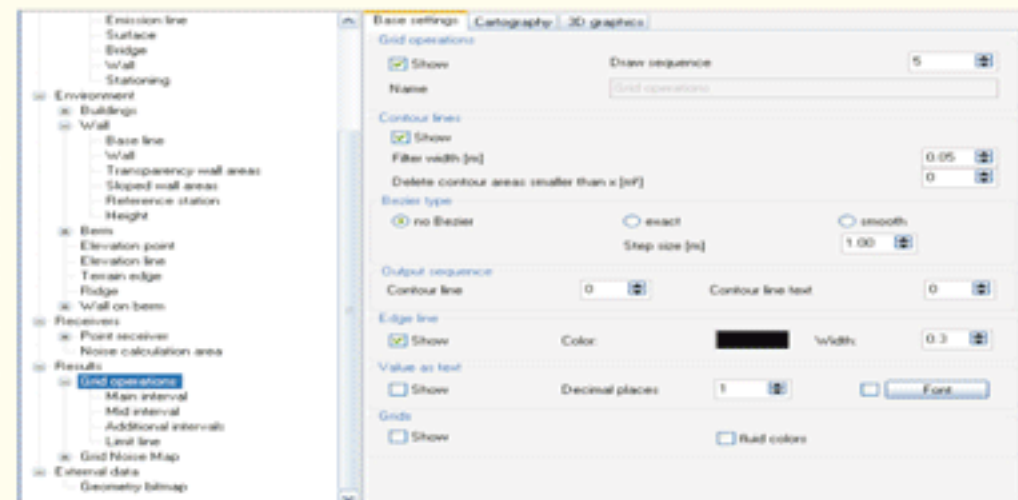
provide a better understanding of a situation. Façade Noise Maps depict noise levels at the level of the windows showing the maximum of the entire building or the maximum per façade.

SoundPLAN graphics are intuitive and easy to use. Get a free demo CD and experiment. All the graphics on this page are from the demo CD.



These graphics compare 2 traffic scenarios. The far left graphic depicts the scenario before measures were taken and the next shows the future plan with speed limits and a roundabout. Simple graphical presentations of 2 planning cases on a single sheet with the logos of the client and consulting company gives the plan a professional appearance.

A SoundPLAN map consists of multiple objects of many object types. A SoundPLAN sheet can contain different types of noise maps, and it can simultaneously display grid noise maps, façade noise maps and a cross-sectional map in the same sheet. Having multiple grid maps for different areas or multiple cross-sectionals in the same 3D-drawing is also an option. SoundPLAN allows customizing the appearance of various parts of the object for each object type.

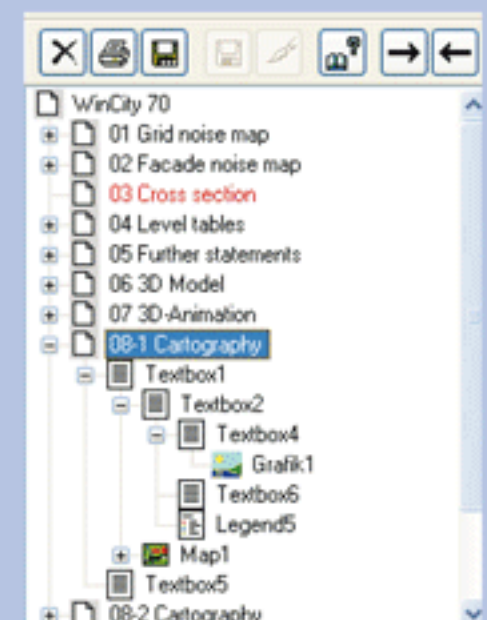


## Graphics, Templates and More

Reports are advertisement billboards for a company's capabilities and qualities, so the graphical presentation should be intuitive, impressive and interesting. SoundPLAN graphics offer a level of customization like no other noise simulation software.

"The sheet" is the SoundPLAN canvas for placing different noise maps and enhancing presentations with scales, descriptive boxes, bitmaps, etc. SoundPLAN saves all the sheets in a project. The Sheet Manager hosts the sheets and their components in a single, hierarchical tree, making it easy to keep track

of the sheets and simplifying copying components from one sheet to another. Changes to one sheet such as a new color scheme or logo can occur simultaneously on all sheets, saving time and ensuring accuracy. Sheets saved without data files serve as templates. Create a perfect plan, design a stunning plan description field, perfect the colors, scales and object definitions and save this plan as a template. Use it for other projects, filling it with the new information needed while maintaining a consistent "company style."



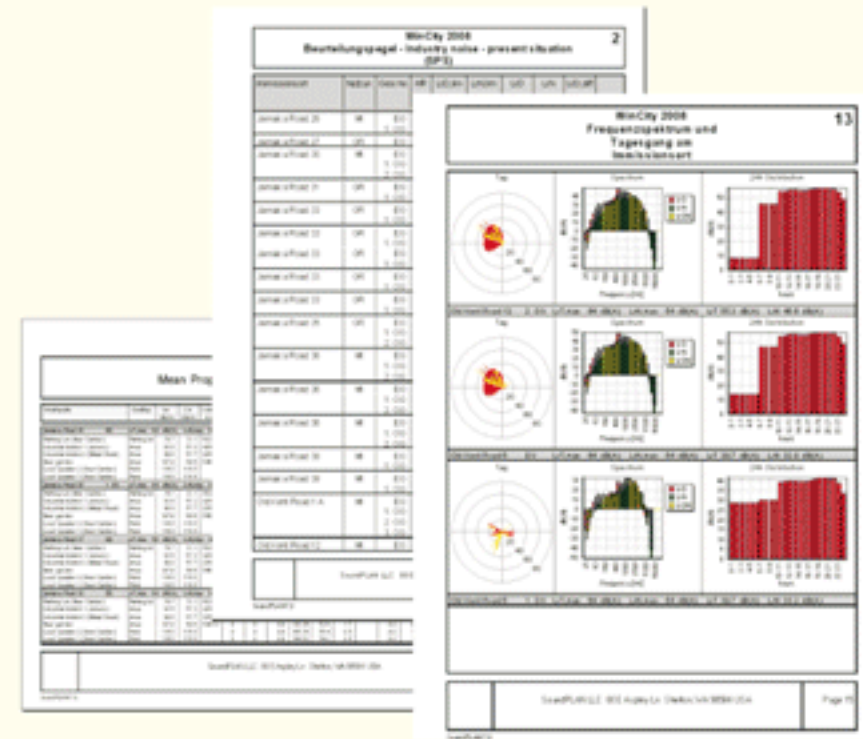


# SoundPLAN®

## Documenting projects built in spreadsheets

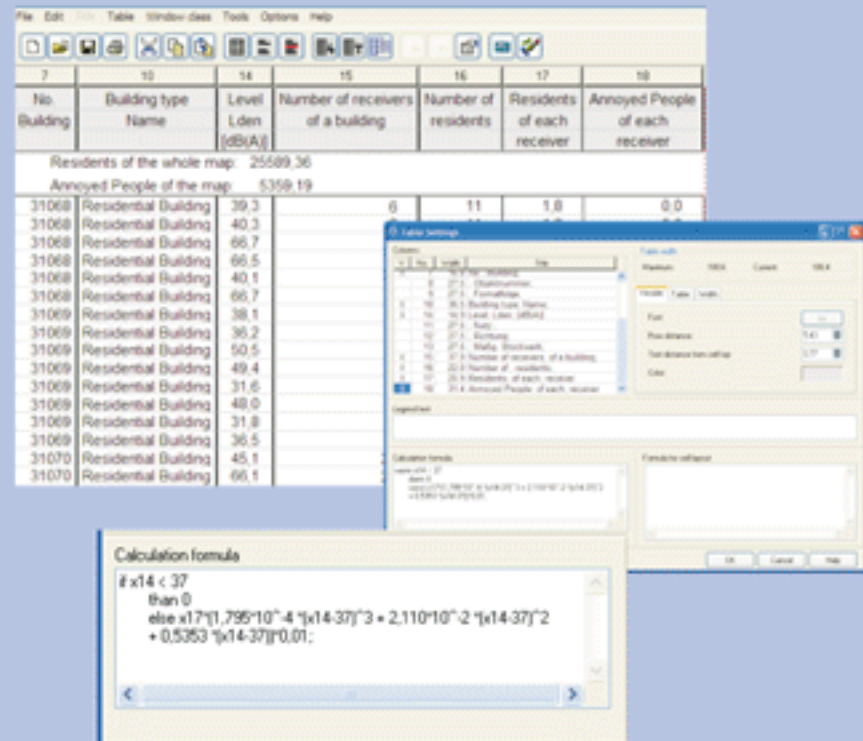
Noise modeling software is required to model noise propagation from source to receiver and to accurately, concisely document the findings. A project is only successful if the data and processes are documented and transparent to everyone. As part of the ISO 9000 quality assurance, SoundPLAN provides built-in documentation in several places. In the Geo-Database, Situations and Geo-Files are used for content descriptions. Alternatively, the attribute explorer and a source

documentation for road and railways could be used. The calculation process is documented in a spreadsheet containing a logbook. Result files contain all files and parameters used in the calculation. The results for a single calculation are documented in configurable master/detail type tables like the one to the right. Tables can be stored as templates to be used over and over, saving time and ensuring a precise, professional company presentation.



The SoundPLAN Spreadsheet is an absolutely unique tool for post processing calculation results. Receiver data from Façade Noise Maps, Meshed Maps or Single Receivers are loaded into a spreadsheet table. Other data pertaining to a receiver can be loaded into user created columns. Additional columns contain formulas to calculate new content such as the difference between 2 variants or the magnitude a noise limit is exceeded. The spreadsheet is used for the entire accounting of END statistics, with templates

making it manageable even for novices. This post processing toolbox allows unlimited ways to assess noise. For example, undergo separate calculations for road, rail, industry and aircraft noise, load all results into the spreadsheet and design formulae for each noise types specific annoyance, and then gather the total annoyance in an extra column. Because the SoundPLAN spreadsheet has direct access to all data, it is much more efficient and more practical than using an external spreadsheet like Excel.



## Hot Spots

In city-wide noise mapping projects, it can be difficult to show exactly where the real problems exist. Some streets are relatively narrow, so the bands of color depicting high noise levels may get lost. Secondly, the Grid Noise Map doesn't show the number of people subjected to these noise levels. SoundPLAN's Hot Spot presentation takes a giant step toward recognizing the severity of such problems. The results of Façade and Grid

Noise Maps combined with the number of people living in a specific building, form the basis of the Hot Spots. A grid is assumed and each cell polled for the number of inhabitants exposed to high noise levels in a given radius. The result depicts the noise exposure much more clearly than regular noise maps. Problem zones can be highlighted to show where funds and efforts should be applied to reduce noise.





# SoundPLAN®

## Indoors and outdoors an integrated approach

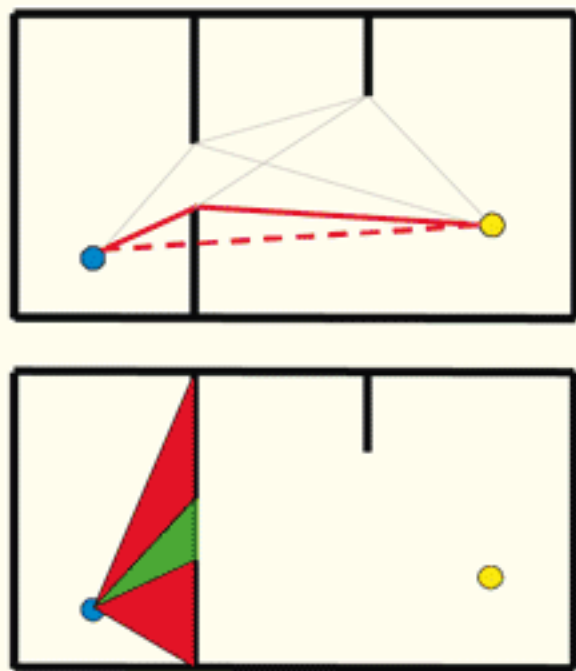
SoundPLAN integrates all types of noise modeling in one, flexible program. Noise modeling indoors and the transmission from indoors to outside and into the environment is fully integrated with noise modeling of other industrial sources, roads, railways, and even aircraft. There are opportunities throughout the modeling process where SoundPLAN saves time and money applying data already on hand. For example, if a power plant moves a shop location, there is no need to measure the sound power of

machines and evaluate their usage if measured total indoor noise levels are available. If the goal were to determine if an outside shell of the new building could be made of sheet metal rather than concrete blocks, enter the industrial building and calculate the noise at the noise sensitive receiver with the transmission coefficient of sheet metal and then with the coefficient of concrete blocks and compare.

Save time when designing alarm systems where indoor and outdoor

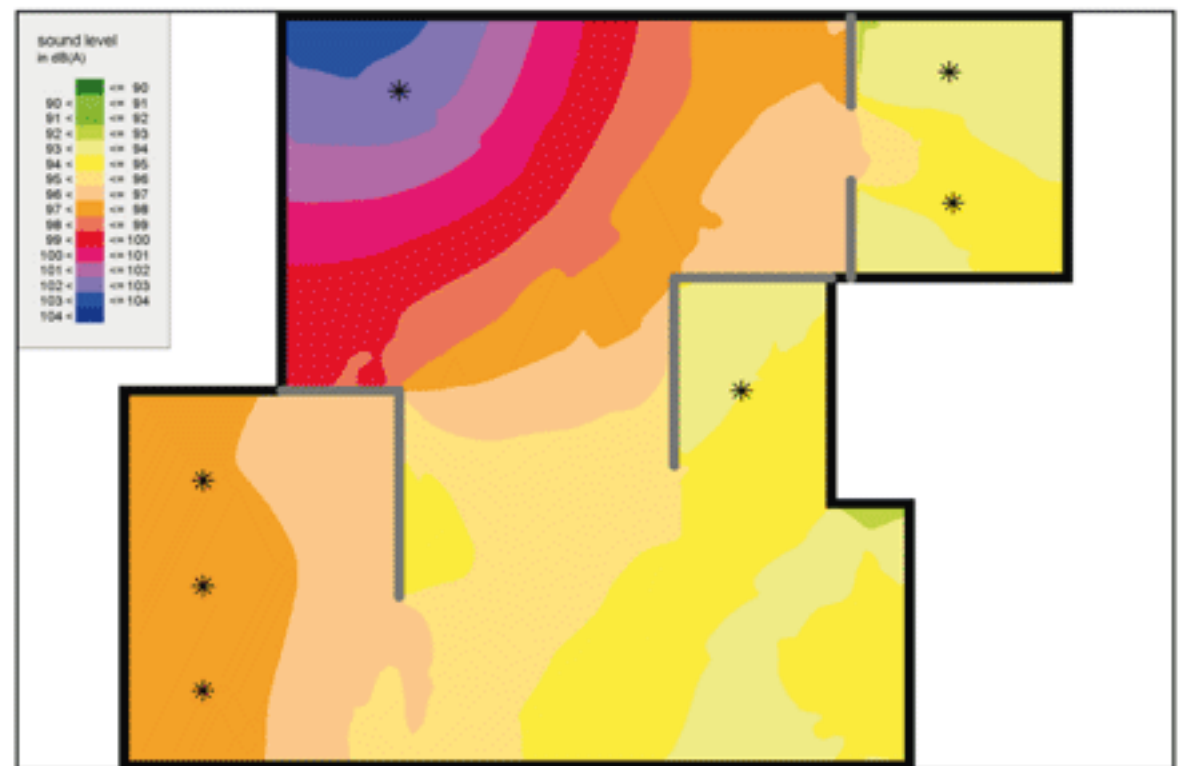
ambient noise levels are known or need to be simulated. Difference maps between the purely ambient noise and the combination need to show the noise from the alarm system increases by at least 10 dB. Using the meshed maps capability to interact with the documentation, a half interactive procedure to optimize the alarm system can be implemented. Only SoundPLAN provides indoor/outdoor calculation capabilities and the meshed map capability.

The new Indoor Factory module calculates the direct sound with screening functions for all relevant edges and evaluates the scattered noise separately.



direct  
scattered

**VERSATILITY:**  
Any floor plan.  
Full and half height walls.  
Openings between rooms.  
Transmission from inside to outside.



## Indoor Factory Noise Modeling

The Indoor Factory Noise model now has much faster calculation speeds, uses multi cores for the calculation, and maximizes flexibility of the building geometry. Based on the German VDI 3760, this model uses direct noise transmission from point to point with a separate evaluation of the scattered noise in the room. This approach is practical for noise calculations and gets the same results in a fraction of the time and at a fraction of the cost compared to software designed for concert hall noise.

Expert System for Industrial Noise augments the indoor and outdoor noise propagation models. It ranks the effectiveness of a noise control concept and compares the results to the costs to determine the best cost/effectiveness ratio. The Documentation and Spreadsheet internally creates the materials required for comprehensive, thoroughly documented reports. The Graphics present overviews and details such as before/after scenarios or the possibility of contouring

an industrial site frequency by frequency. SoundPLAN is the only software on the market providing the cost/effectiveness ratio and the only software with extensive internal report capabilities. SoundPLAN is famous for its superior graphic capabilities. Plus, all modules calculate all size projects for one cost, license additions can be delivered within 24 hours, and local distributors in more than 40 countries provide timely, qualified support if it is needed.



# Highlights of SoundPLAN Version 7.0

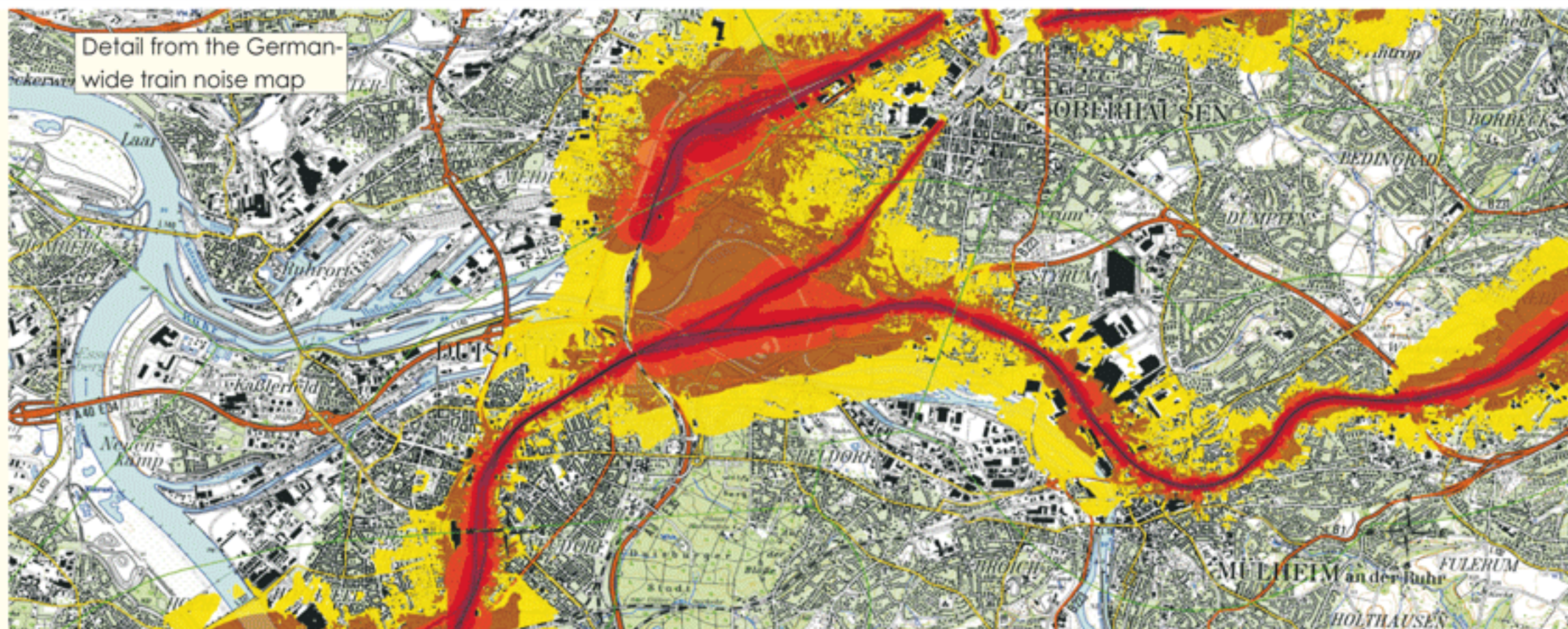
Although SoundPLAN is already the most flexible and one of the fastest programs of its kind, version 7.0 represents another major step forward for noise control software. A main feature of this version is the new calculation core employing the Dynamic Search scanning method. With this method unique to SoundPLAN, it is now possible to calculate huge noise maps with complex geometry and complex simulation standards like Nord 2000 and TNM, and to simulate details previously not possible in noise control

programs. This has been proven as SoundPLAN 7 was chosen and effectively used for the world's biggest noise map, the railway noise map for all of Germany.

With the new floating screening objects, cantilevered and curved barriers, and the ability to combine solid objects into complex structures, there is no longer any limit to the complexity of a scenario. Screening can be evaluated over, under and around all objects.

The Dynamic Search method ranks all sources for each receiver and

calculates them depending on the predicted contribution to the noise level. With help of a defined margin of uncertainty, sources are either fully calculated, interpolated or omitted. The ranking procedure requires each source be evaluated individually, so SoundPLAN adapted the projection method for all objects between source and receiver. SoundPLAN is now multiple times faster with even greater accuracy. With single and multiple reflections, the calculation speed is simply stunning. Check it out and compare for yourself.



## Odds and Ends:

The SoundPLAN Indoor Factory Noise model has been completely reworked to include any floor plan of a factory building and screening with full and half height walls. (See details in the separate indoor noise modeling pamphlet.) The GeoDatabase has major additions like the new Object Explorer that allows the objects descriptive attributes to be viewed and

manipulated in a spreadsheet format. It also has sort functions and a built-in formula interpreter that allow for maximum flexibility in documenting and adjusting attributes. Unlimited zooming makes it possible to zoom down to the smallest house in a country size project without declaring a new view-port! The network license borrow function makes it possible to

work independent of the network for traveling or visiting clients.

There are simply too many innovations in SoundPLAN 7.0 to list them all. Hands on evaluations can provide the complete picture. Email for a free demo CD today. See for yourself why SoundPLAN sets the standard for noise control software worldwide.

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