



**GuD** GEOTECHNIK und  
DYNAMIK CONSULT GmbH

■ Investigation

■ Planning

■ Site supervision

■ Controlling

■ Occupational Health and Safety



Waste – Contaminated sites – Occupational Health and Safety





## Pollution Inspection

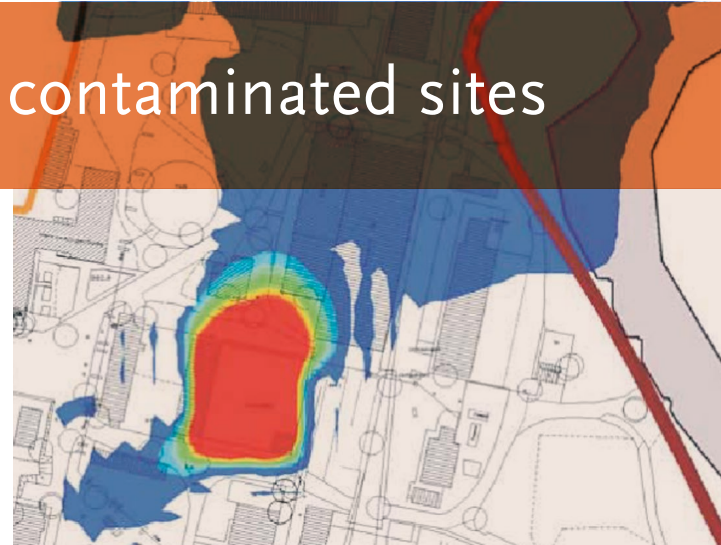
GuD Consult covers the **full spectrum of pollution inspections**. This includes final risk assessments. For these, our experts pay special attention to the importance of historical research, an area that unfortunately too often is omitted. Within the various stages of inspection, we choose our methodology based on a project's individual requirements. Thus, besides the traditional methods of drilling or pump-based sampling, for years now we have also incorporated special procedures such as semi-quantitative MIP static penetration testing, direct push sampling, groundwater flow rate measurement and groundwater flow direction measurement using GFI (groundwater flow imaging).

**An Initial State Report (ISR) is required for many industrial sites, according to the European Industrial Emissions Directive (IED).** An ISR is not the same as the traditional methodology for inspection of polluted sites. We create these types of reports especially for energy, metal processing and waste management facilities, which can have a particularly high environmental impact on soil, groundwater and air.

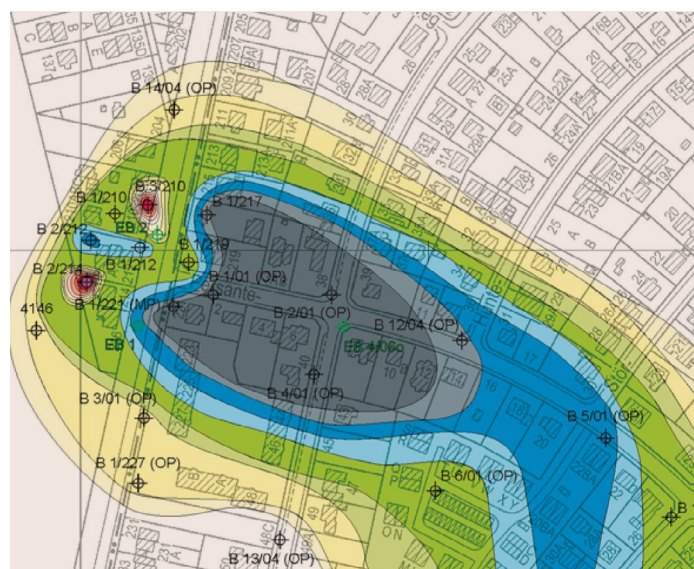
# Appropriate solutions for contaminated sites

## Dahlemer Weg, Berlin

The contamination of a plot of land at Dahlemer Weg in Berlin, caused by improper handling of solvents by a chemical cleaning plant from the 1950s through the 1970s, led to significant pollution of the soil and soil vapor with volatile chlorinated hydrocarbons (VCHCs), and the formation of a 500-meter-long and up to 300-meter-wide plume in the first and second aquifer, which was only first discovered in the 1980s.



Modeling of pollutant dispersion in the Rostock Gasworks Project



Since 1989 there have been several attempts at remediation measure, resulting in the partial overbuilding of the damaged area and the spread of the pollution beneath a residential area, which creates restrictions for remediation work. Therefore, the soil vapor was for the most part treated by exhaustion, and the groundwater contamination was treated using the "pump & treat" method. GuD Consult was commissioned in 2006 to supervise the ongoing decontamination measures and was tasked by the State of Berlin to create a plan for hydraulic decontamination treatment conformance. By 2011, the maximum load in the plume was able to be significantly reduced by way of a reorientation of the decontamination system. In the period from 1989 to the end of 2012, a total of about 10,000 kilograms of CHC to be removed. In addition, according to new investigations, further contamination areas could be detected, which will now also be remediated.

VCHC reduction in the contaminant plume "Dahlemer Weg" after reorientation of the decontamination system (gray = reduction of > 5,000 µg / l).

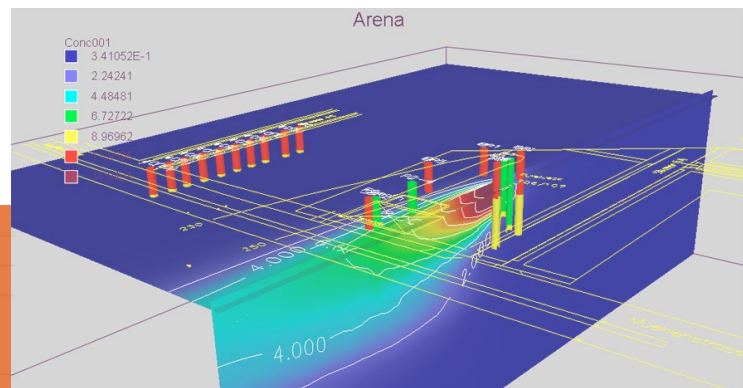
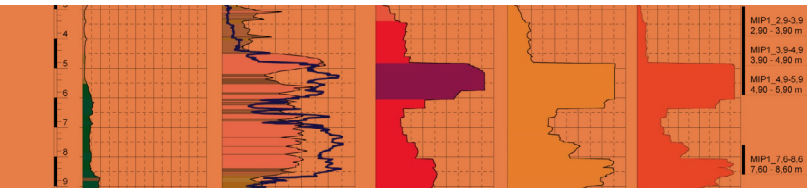


## Remediation and safeguarding of contaminated sites

The goal of our experts is to establish **reasonable efforts for inspection, planning and remediation**. They devote time to each individual case of subsurface and groundwater damage, so that no unnecessary measures are taken, and only the necessary measures are implemented in an expedient manner. The principle of proportionality is already anchored in the Federal Soil Protection Act. But this should not only apply to the relevant authorities in their determination of remedial actions, but also for inspections and planning. Our experts are committed to this principle. Here, the cost-benefit ratio takes center stage as much as does the protection of the environment and sustainable success of remedial actions taken. Increasing importance is also placed on ecological balancing of remedial actions.

**Traditional soil replacement or innovative methods?** “Off-the-shelf” methods of decontamination are never the best solution. Every contaminated site has its own specific requirements. In addition, over the decades the simple and small cases of pollution already have been remediated by and large, and only the “complicated cases” remain. It is exactly these types of cases, which require the engineering expertise that our professionals possess.

GuD Consult's specific background in classical geotechnical engineering and special heavy engineering gives our pollution experts the necessary know-how, not only to properly evaluate soil or groundwater damage, but also above and beyond that, to find the appropriate respective remediation procedures to comply with the applicable occupational safety and emissions protection standards. In addition to the traditional methods such as soil replacement by way of digging, large bore drilling, or “honeycombing”, or remedial actions such as “pump & treat”, we also employ innovative processes (for example: THERIS, thermal in situ remediation of volatile substances; ISCO, in situ chemical oxidation process; and OSBO, in situ soil cleansing). Within certain parameters, one can also trust in the abundance of soil-bound microorganisms, which often have only to be “awakened” (MNA, Monitored Natural Attenuation, or ENA, enhanced natural attenuation). At some sites with tar pollution, petroleum pollution or solvent pollution, the evidence of persistence was making remedial action no longer necessary.



Modeling of the contaminant plume in the O<sub>2</sub>-World project for the remediation planning.

## Rostock Gasworks

The former gasworks in Rostock is the biggest pollution site in Mecklenburg-Vorpommern with contamination of soil and groundwater mainly by PAH, phenols, cyanide, BTEX and TPH. For the safeguarding and remediation of the Stadtwerke Rostock, which was released by the state of Mecklenburg-Vorpommern, our experts planned a down-gradient safeguard system (approximately 6,800 square meters of steel sheet piling) on 700 linear meters, an upgradient drainage (horizontal filter well) with a downstream groundwater treatment plant (water activated carbon) at 450 meters and a surface sealing using a sealant and an occupation layer covering approximately 45,000 sqm. The foundation of this plan was a revised groundwater flow and contaminant transport model (MODFLOW) created by GuD Consult.

Manufacture of down-gradient steel-piling in Rostock.



## O<sub>2</sub>-World, Berlin

On a 150,000 square meter industrial site in Berlin-Friedrichshain (formerly Freight Rail Terminal East) on which, among other things, the 20,000 square meter hall O<sub>2</sub>-World was planned for construction, contamination of soil, soil vapor and groundwater at two sites was detected. At first, it was established that this was caused by a known and partially remediated residual petroleum-derived hydrocarbon (PDH) deposit in the vicinity of a former oil bunker, the location of which had been established for a number of years, so that no remediation was needed. Additionally, contamination of groundwater by volatile chlorinated hydrocarbons (VCHC), aromatic hydrocarbons (BTEX), and petroleum hydrocarbons (TPH) of unknown origin was discovered.

After intensive analysis of aerial photographs, historical maps and development plans, and after conducting geophysical surveys and exploratory digging, two local sources of pollution (buried barrels, and an old shaft) were located. Thereafter, a full soil contamination remediation plan was carried out by excavation in two phases (sheet piling troughs and large bore drillings) as well as “pump & treat” treatment for an approximately 100-meter-long groundwater plume with subsequent filtration of the purified water to support remediation. The remediation was carried out to successful completion after about a year and a half of monitoring. For the entire area, the point was reached where the ground soil exposure could be registered as free of potential contamination.

## Selective Demolition

Selective demolition can be the cardinal point in cost-effectiveness.

For all projects involving demolition, the driving cost factor is the disposal of hazardous waste. These costs are caused by the amount of hazardous materials in the construction materials, which are to be expected with all buildings built before the year 2000. Therefore, we identify the pollutants in advance in order to separate them during demolition and to dispose them separately. Only by these means is there also the possibility to achieve a meaningful recirculation of large batches of concrete, brick or steel.

With a comprehensive detection of pollutants and hazardous substances, maintained in a register of hazardous substances, as well as a demolition plan tailored to the specific structure, we create the basis for a resilient tendering of bids and a technically and economically optimized implementation, also taking into account the industrial safety and pollution control technical aspects. This is how we approach the traditional demolition of industrial buildings and industrial facilities, as well as the development of specific demolition plans such as those created for the ICC Berlin or the crane-based demolition of the State Library 'Book Towers', or a six-story precast concrete slab building at the Science Center in Adlershof, or two six-story office buildings in the newly constructed DRV data center.



Crane-based demolition at the construction site of the DRV data center.

## Gross-Berliner Damm, Berlin

As part of the site clearance (remediation and construction site clearance) of an approximately 80,000 square meter former industrial site on Gross-Berliner Damm in Berlin-Adlershof, our experts, commissioned by the State of Berlin, planned and supervised the demolition of 20 polluted buildings, ground surfaces and associated infrastructure. This included supervising the disposal of 30,000 cubic meters of material partly consisting of hazardous materials (asbestos, TPH, tar, etc.) and contaminated waste, including electronic verification and safeguarding of neighboring buildings from demolition and vibration monitoring during the work. In addition, an area of 4,300 square meters of soil and groundwater contaminated with BTEX and TPH were remediated by dredging, phased exhaustion, and "pump & treat" treatment. Approximately 12,000 tons of material and 100 cubic meters of gasoline and oil contaminant were disposed of as hazardous waste.



View of the groundwater treatment plant at Project Leuna.

## Old Leuna refinery

In the old chemical refinery site in Leuna, fuels were produced for over 70 years. The effects of war and damage, among other things, caused an estimated 10 million liters or more of fuel to enter the ground, which has polluted about 1.8 million tons of mostly groundwater-saturated soil. To prevent the outflow of contaminated groundwater, our experts planned a cut-off wall and supervised the construction work. The polluted groundwater removed from behind the wall is cleaned in a groundwater treatment plant and infiltrate behind the cut-off wall to balance the hydrologic regime.

Remediation of BTEX and TPH contamination  
by dredging (Groß-Berliner Damm).



# Safety for People and Environment

## Occupational Health and Safety

The proper handling of hazardous substances is particularly important in places where people and the environment must be protected against pollutants. Organizational and technical occupational safety measures should be favored in such cases. For all activities where pollutants or hazardous substances may be released, we develop occupational safety and emission control strategies as well as construction plans and safety plans. Additionally, GuD Consult employees are qualified as occupational safety coordinators as per BGR 128 regulations, and they can also carry out the traditional tasks of safety coordinator and health protection coordinator as per construction site ordinance.

"Last Resort" – Personal Protective Equipment (PPE)



## Quality Assurance

In addition to DIN ISO 9001 DQS certification, since 2006, GuD Consult also holds DIN EN ISO / IEC 17025: 2005 certification, and as such is accredited for comprehensive services in the specialized areas of contaminated waste, water, and soil, including sampling for solids (e.g. soil, waste) as well as groundwater, seepage and surface water, and is also approved to conduct inspections according to § 18 BBodSchG (federal ground contamination protection law).

For the chemical analysis of material samples, soil samples, water samples, combined soil-air-water samples and groundwater samples, we work exclusively with accredited testing laboratories. A long-standing collaboration with three test laboratories guarantees the highest level of continuity and reproducibility. All test results also undergo a technical plausibility assessment. In case of doubt, measurement or transcription errors can be corrected in consultation with the laboratories, therefore avoiding costs associated with unnecessary further inspections or expensive waste disposal.

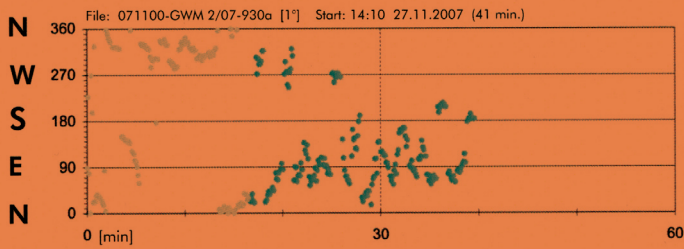
## Waste Management and Disposal Management

All construction projects generate waste that must be disposed of properly. With an appropriate waste and disposal management plan, we can ensure that waste with high levels of contamination are already separated during the excavation or demolition process, and that appropriate and economically sensible means of disposal are found. This reduces disposal costs. The more complex the spectrum of pollutants is, and the greater the proportion of waste with higher levels of pollutants, and especially hazardous waste is, the greater the optimization of the construction process will be, and the greater the elimination of costs associated with waste and disposal management will be, as well. Early involvement of our experts is a wise move. The best time to start is right at the conceptual stage in order to achieve maximum efficiency.

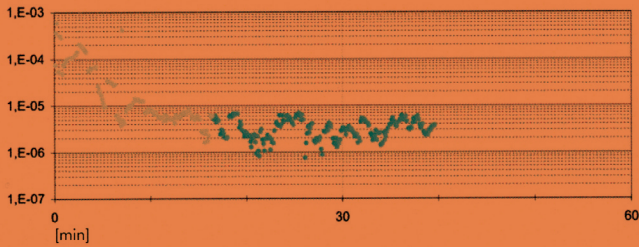
### Electronic procedure – no problem!

With the introduction and strict implementation of the Electronic Records Regulations, we upgraded in a timely manner and have a sufficient number of cards, card readers and appropriately trained experts. We have developed extensive experience with the procedures in the completion of numerous projects for clients such as the Deutsche Bahn AG (German Rail), the State of Berlin and private companies.

## Fließrichtung [°]

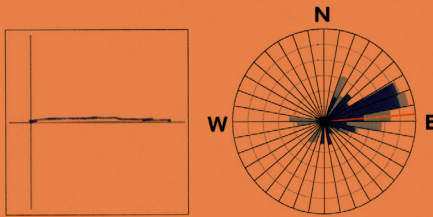


## Fließgeschwindigkeit $v_H$ [m/s]



- gültige Vektordaten
- Beruhigungsphase/ Fehlwerte

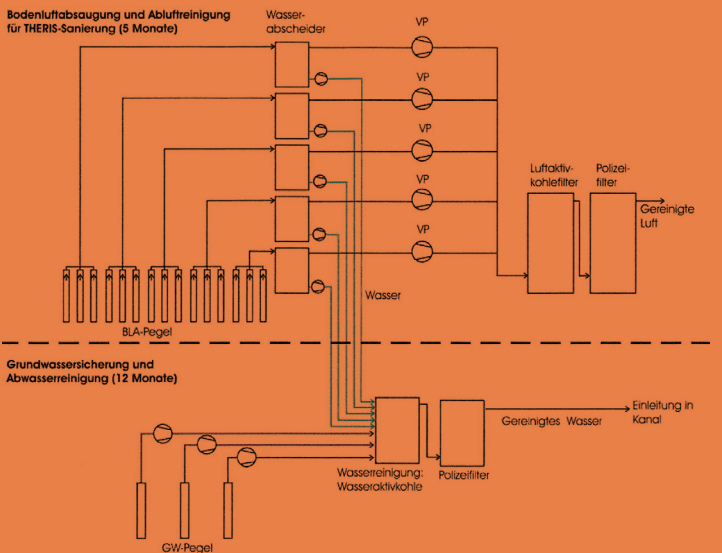
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Addition aller gültigen Vektoren: ( 202 )  
 Richtung: 86 °  
 Betrag: 1,6E-06 m/s  
 Mittel  $v_H$ : 3,4E-06 m/s

## ► Inspection

Evaluating a GFI (groundwater flow imaging) created by Phrealog.



## ► Remediation

Flow diagram for the thermal remediation (THERIS) of solvent pollution, created by reconsite.



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### Areas of activity:

site investigation • waste management • soil dynamics • foundation expertise • ground improvement • excavation pits • construction management • construction supervision • preservation of evidence • soil-structure interaction • soil mechanics • dam construction • landfill construction • dynamic pile tests • earthquake engineering • earthworks • vibration control • geotechnics • geotechnical evaluations geothermics • foundation engineering • ground water modeling • harbor construction • hydrology injections • marine geotechnics • monitoring reinforcements • numerical geotechnics • pile integrity testing • quality control • pipe jacking • rehabilitation design • damage expertise • contamination modeling • vibration measurements • health and safety • tunnel construction • waterfront structures • environmental geology • underpinning • highway engineering waterworks • water retention • water regulation