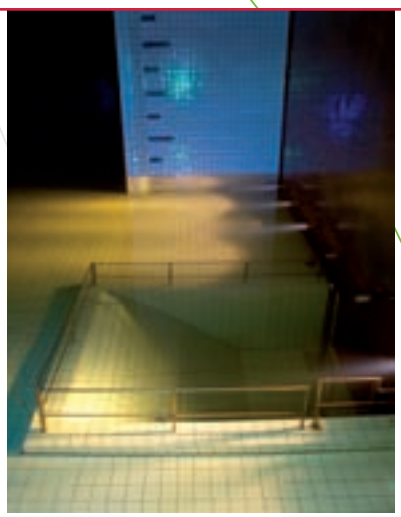
Water for Berlin

clear water - clear information

Berliner Wasserbetriebe


Mach mich
nass!

Contents



Drinking water

Wastewater

Water for Berlin

As part of our public obligation to the city government and the people of Berlin, we are the sole provider for water supply and wastewater disposal. We see it as our duty to offer this service from one source using state-of-the-art technology.

Water is our element. We extract groundwater from our vast groundwater reserves, pump it to local waterworks and process it further to make it ready for drinking. Our water is an all natural product. Without any added chemicals. Rich in minerals and refreshing to taste - just as nature would have it.

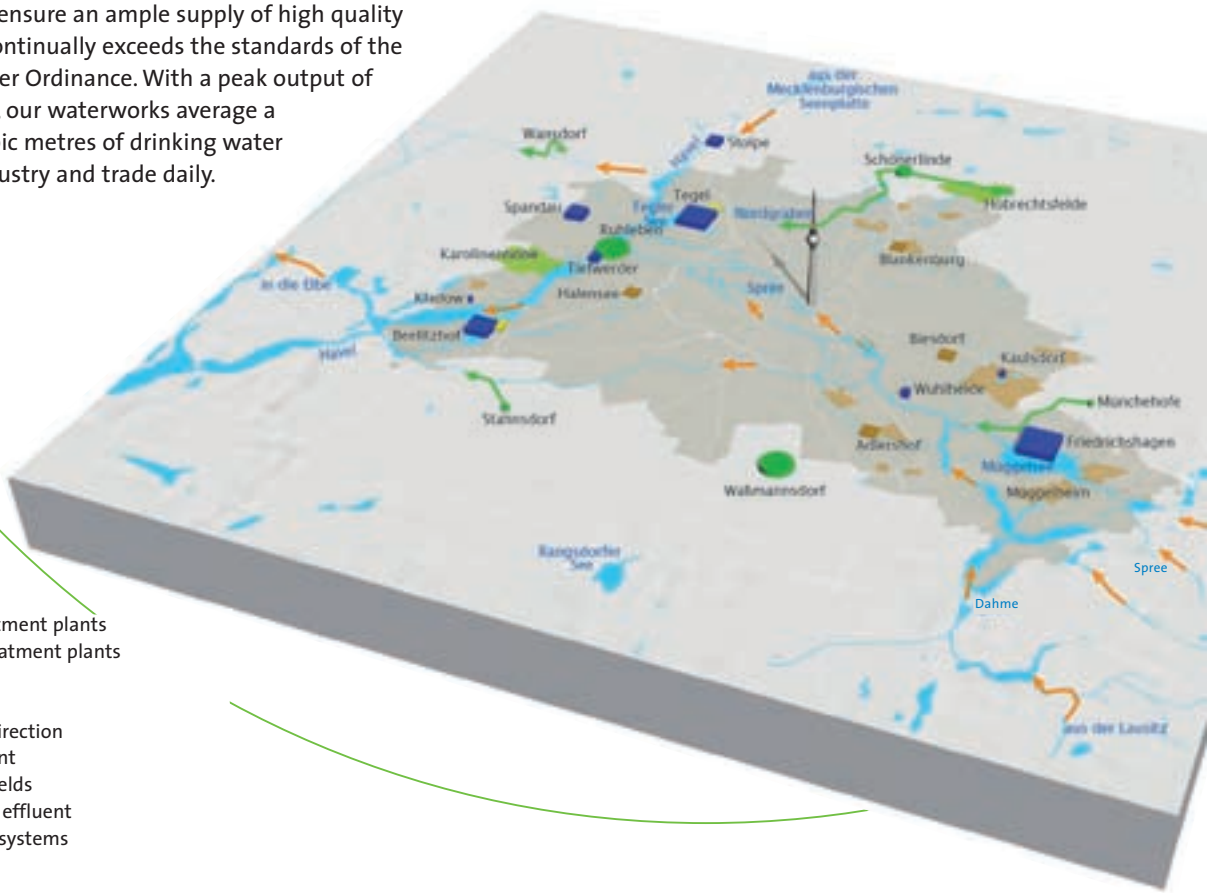
Used water is wastewater. Collected in sewers and pumped to local treatment plants, Berlin's wastewater is treated by means of the latest in environmental technology and then discharged to the surface waters of the region free and clear of any pollutants.

We at Berliner Wasserbetriebe are the largest water supply and wastewater disposal company in Germany.
We supply drinking water to 3.4 million people in Berlin and over 300,000 inhabitants in the surrounding region, and we take care of their wastewater disposal needs as well.

Our modern facilities ensure an ample supply of high quality drinking water that continually exceeds the standards of the German Drinking Water Ordinance. With a peak output of 1 million cubic metres, our waterworks average a supply of 550,000 cubic metres of drinking water to the population, industry and trade daily.

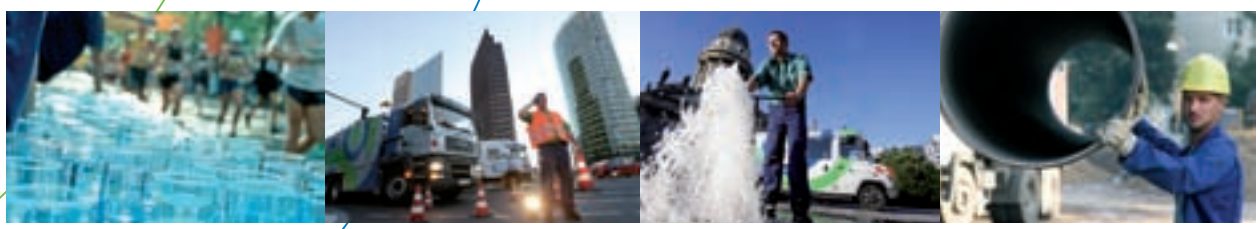
Our wastewater treatment plants process approx. 620,000 cubic metres of sewage each day. These state-of-the-art facilities are further equipped with the latest in process engineering for biological nutrient removal. This is only one of the means by which we guarantee to fulfil all requirements specified by the water authorities to safeguard and keep our lakes, rivers and streams clean.

And that is not the only way we provide services for the city of Berlin.
We also contribute to the treatment and regulation of our groundwater reserves. We provide surface water treatment services for the Tegeler Lake, bank filtration to re-fill the Grunewald lakes, and actively participate in current research initiatives for new environmental technologies. Last but not least, we are also one of the largest employers and investors in the region, with a full scale vocational education program for young professionals.



- 6 wastewater treatment plants
- 2 surface water treatment plants
- 4 retention filters
- 9 water works
- flow or pumping direction
- discharge of effluent
- former irrigation fields
- irrigation fields for effluent
- trough and trench systems


Berliner
Wasserbetri



Tap water - a refreshing source

The quality of Berlin's drinking water is indeed outstanding. In July 2003, drinking water in 270 German cities with a population of more than 40,000 was tested in the largest comparative study carried out to date. One of the top performers, Berlin's water was awarded the grade "Good Plus", consistently meeting all requirements as stipulated by local drinking water regulations and EU guidelines. Berlin's water is of the same quality as, or indeed better than, bottled water.

Drinking water is the best monitored product in Germany. It must have properties which enable unlimited quantities of it to be used a whole life long without any health hazard. In order for water to be called drinking water and to be considered a foodstuff, it must adhere to all the standards and regulations put forward by the German Drinking Water Ordinance, one of the strictest regulatory bodies in the public sector worldwide.

In the summer of 2003, the members of the drinking water commission stated: "Never, for as long as valid test results have been available, have the Germans had as clean water as they do today. No other industrial state is comparable."

Best quality guaranteed

The drinking water quality requirements set by law are even higher than those for bottled water. Subject to constant monitoring, drinking water is regularly sampled and tested at 180 extraction points all over the city.

Such tests also include examining the chemical composition of the water in question. In order to detect any contaminants or pollutants in drinking water early on, raw water from wells is sampled and subjected to frequent testing. This is

just one of the many ways in which the waterworks do their part to ensure the quality of our groundwater resources for drinking water purposes.

High in calcium and magnesium, yet low in chlorides and sulphates, Berlin's drinking water is an excellent thirst quencher. Equally refreshing when fizzy, appropriate appliances for carbonation are available from most local shops.

Low in nitrates, Berlin's drinking water is ideal for preparing baby food. At 1.2 to 4.6 milligrams per litre, Berlin's water is well below the 50 milligrams per litre stipulated by the Drinking Water Ordinance.

Some test results:

		Average values mg/l	limit values of the Drinking Water Regulations mg/l
Nitrate	*NO_3*	*3,2*	*50*
Calcium	*Ca^{2+}*	*122*	
Magnesium	*Mg^{2+}*	*10,4*	
Sodium	*Na^{+}*	*35*	*200*
Sulphate	*SO_4^{2-}*	*128*	*240*
Chloride	*Cl*	*53*	*250*

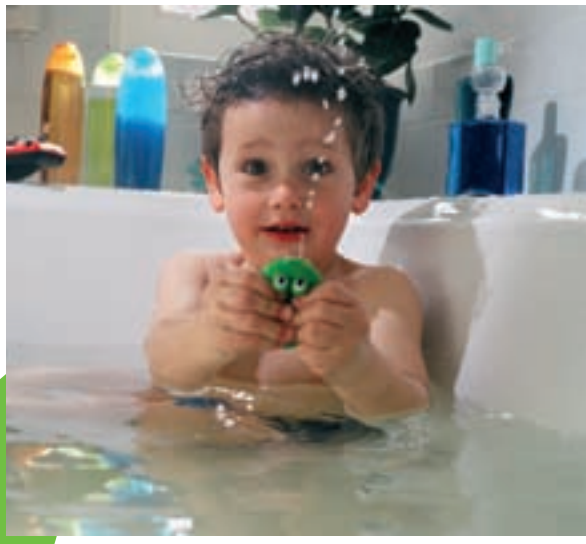
Hard water – a regional phenomenon

Water is a very good solvent by nature. As it travels through various layers of soil, it absorbs many natural substances and minerals, including calcium and magnesium, which in turn influence the hardness of the water. The amount of these substances varies depending on the geological conditions underground. In general, the higher the mineral content, the harder the water. Calcium and magnesium are therefore also referred to as hardeners.

There is a link between drinking water hardness and the correct use of soap and detergents in households. Detergents work best in soft water. The softer the water, the less detergent required. Dosing recommendations for hardness ranges 1 to 3 should be clearly indicated on packaging and are standard for this industry.

At 15.5° to 25.2°dH (degrees German hardness), Berlin's water is hard. This puts it at 3 (hard). The hardness of water is measured according to the international unit millimole per litre (mmol/l). One degree of hardness (°dH) equates to 0.179 mmol/l, 10 mg/l CaO (calcium oxide). The hardness range 3 (hard) is for water which has over 2.5 mmol/l total hardness (over 14°dH).

For more detailed information on the quality of Berlin's water, please consult our website at **www.bwb.de**.



Modern technology in appliances is water conserving by nature

Waste not want not is true the world over. However, special attention need not be paid to water conservation or more ecological uses of stormwater in Berlin. Unlike other areas of the world, our capital city has substantial groundwater reserves, more than we could ever use. The city is virtually built on water. Unnecessary measures in the area of water conservation simply serve to increase the cost of quality management and sewer network maintenance that make up a major part of our water price. What you don't use, you lose. Modern appliances and household technology serve to guarantee an effective use of drinking water at all times. So one can rest assured that, while readily making use of the ample supply of water available to us, nothing will go to waste.

To soften or not to soften – that is the question

Like food, our drinking water does not have to be softened or otherwise additionally treated once it leaves the local waterworks. Nevertheless, hard water is not always ideal. It increases the consumption of soap and detergents and leads to the formation of mineral scale, especially in hot water appliances. At temperatures above 60°C, lime flocculates and causes build-up. This increases energy needs and may cause water pipes in appliances to get clogged more often than not. The choice of whether to use a softener to offset these negative side-effects lies with the consumer.

Lead – a problem today?

Our Drinking Water Ordinance in Germany stipulates that as of the 1st of December 2003, one litre of water may not contain more than 0.025 milligrams of lead.
From the 1st of December 2013 onwards, the limit will be 0.01 milligrams per litre. Berlin's drinking water already meets the standard at less than 0.005 milligrams of lead per litre. Nevertheless, old lead pipes do pose a danger of contamination. This is particularly dangerous for babies and toddlers. Therefore, we recommend replacing old lead pipe installations as quickly as possible. We at Berliner Wasserbetriebe are in the process of replacing the few remaining house connections made from lead. Property owners are responsible for installations inside their buildings. This problem does not affect our water mains under the city's streets as they are made out of cast iron or steel.

You may ask yourself what you can do if your building still has lead pipes. The easiest thing to do is to let the water run in the morning for a few minutes until it is really cool – especially if it has been standing in the pipe for any length of time. It is the most effective and inexpensive way to get clear water. As a precautionary measure, it is then recommended that suitable bottled water be used for babies and toddlers.

Drinking water – to a large extent chlorine-free?

Drinking water coming from groundwater reserves is considered free of germs and therefore does not need to be chlorinated. Only after pipe bursts and other repairs to the pipe network do these areas require brief chlorination for the purpose of disinfection. In addition, Berlin's drinking water does not contain other additives, such as fluoride.

Tips

Hard water day-to-day

- **Tea**
  Tea fans appreciate soft water. Yet even hard water quickly becomes soft with a little trick: simply allow it to bubble up two to three times in an open kettle. This causes the lime scale to deposit at the bottom of the kettle. Let the water cool, boil it again, filter it and then pour it over the tea.

- **Coffeemaker**
  If the coffee maker is calcified, use either a conventional lime scale remover or vinegar or citric acid. This serves to loosen the lime so that it can be easily removed.

- **Bath tub**
  Limescale stains in the bath tub can be gently removed with special products available from chemist's shops.

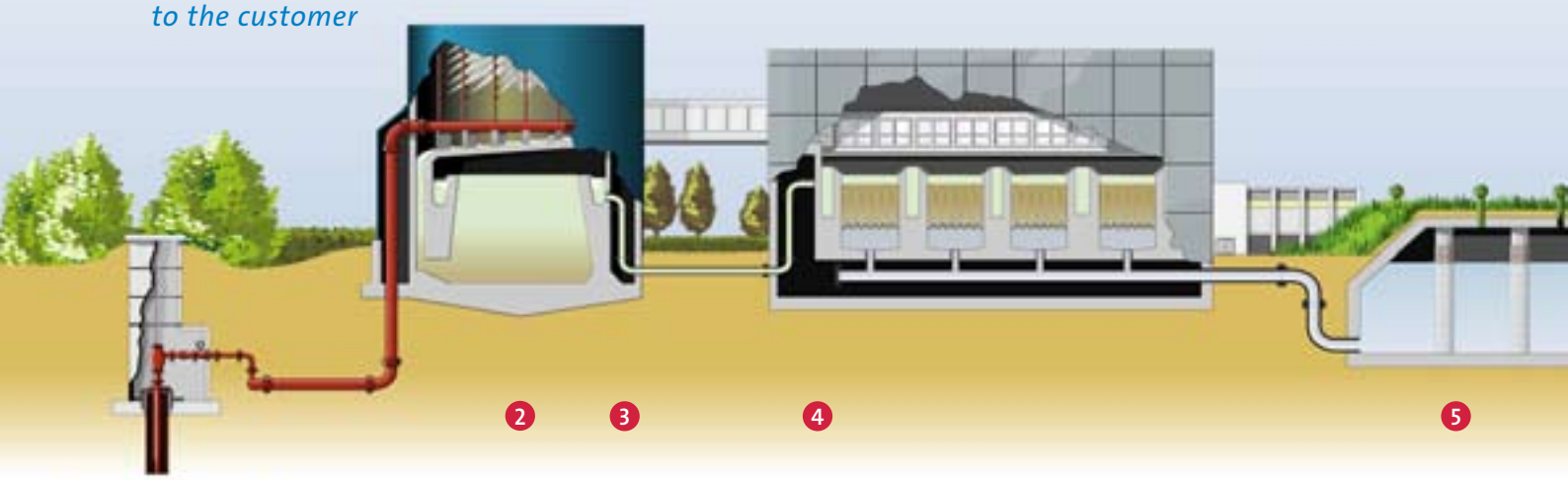
- **Washing machine**
  The soap and detergent industry's dosage recommendations for individual hardness ranges are listed on each packet of detergent. In order not to unnecessarily contaminate the wastewater, you should only use the amount of detergent recommended.

- **Dishwasher**
  Special salts for dishwashers soften water. These must be used regularly.

- **Steam iron**
  Steam irons can be filled with boiled water. Distilled water is not necessary.

- **Pre-set your boiler**
  Limescale only deposits at water temperatures above 60°C. In most cases, lower temperatures suffice in the home. We therefore recommend that you set your hot water boiler so that this temperature is not exceeded. This saves energy and prevents limescale deposits. We do not recommend the common practice of boiling water and then adding cold water to reach the required temperature.

From the well to the customer



Where does our water come from?

On it's way through the network: How water reaches the consumer

Nine waterworks supply Berlin and the surrounding areas with drinking water. Our waterworks are located near lakes and rivers, or in extensive forest areas, and make use of groundwater reserves. Groundwater comes from percolated storm and surface water, so-called bank filtrate. As percolation is a slow process through many different layers of soil, our water undergoes a thorough natural cleaning. The result is groundwater of the best quality.

Aeration

Each of Berlin's residents uses an average of 110 litres of water per day.

Each day, an average 550,000 m³ of drinking water is made available to households, industry and trade.
A maximum of 1 million cubic metres is possible. Groundwater is pumped from over 700 wells between 30 m and 170 m deep to waterworks, where it is further processed and stored in special tanks.

Depending on demand, water is then pumped from the tanks into our extensive pipe network, which has a length of 7,800 kilometres. The waterworks and intermediate pumping stations are connected via a closely knit network of transport pipes. This is why the drinking water in the network almost always comes from several waterworks simultaneously.

Supply on demand

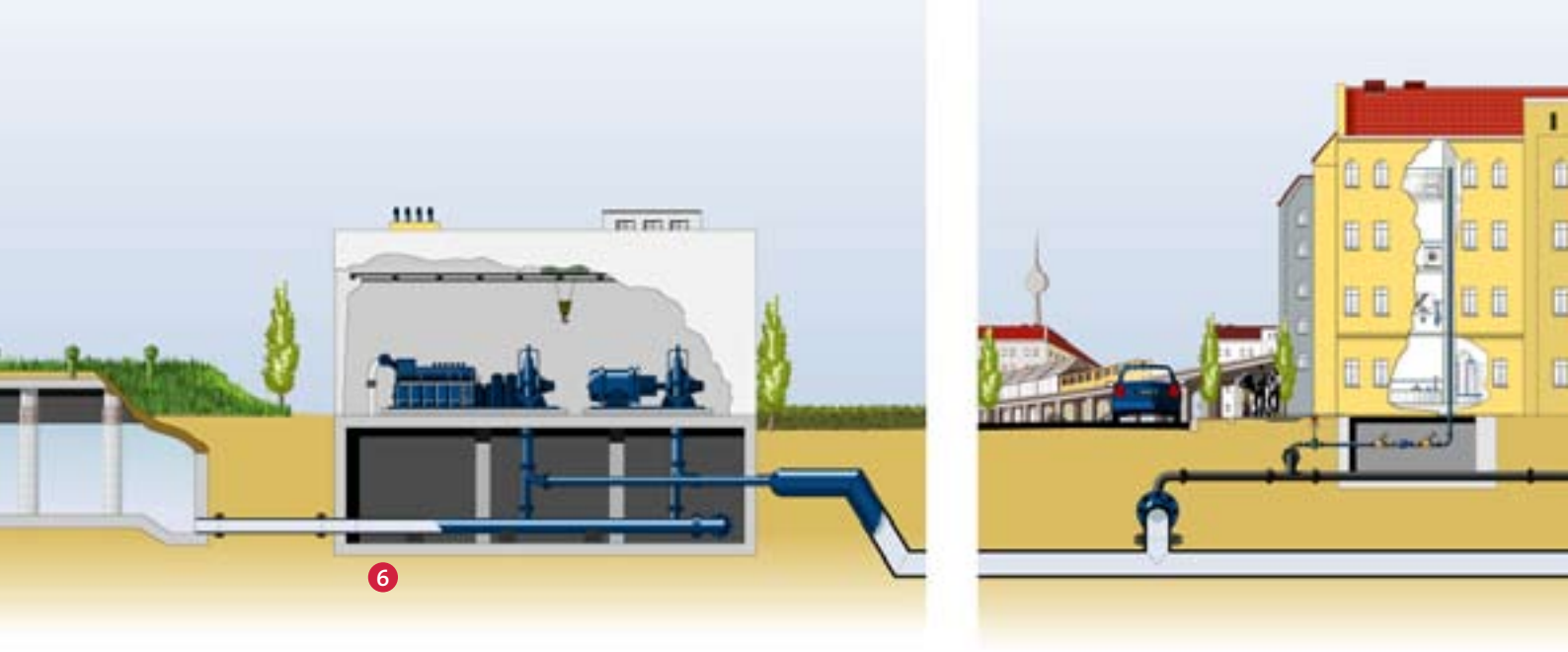
During times of peak consumption, bottlenecks in supply are offset by a remote control system for the waterworks and their respective pumping stations. Thanks to this system, an unlikely breakdown of one of the waterworks would never lead to a local collapse in water supply. During low consumption periods, e.g. at night, individual waterworks can therefore be temporarily switched off in order to control supply.

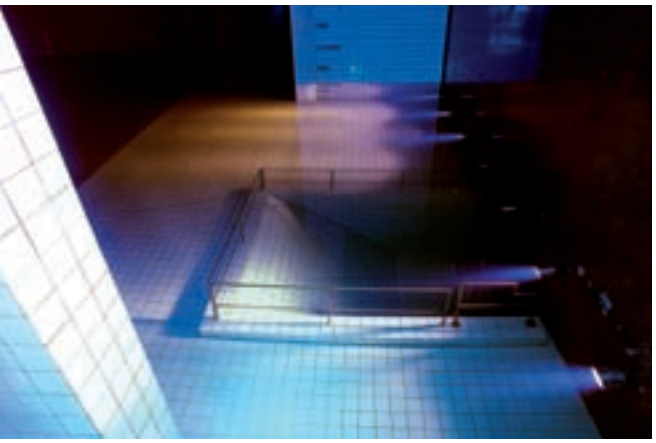
Just one of many milestones, this central remote control system is located in the Friedrichshagen waterworks and serves the entire region.

Berlin's geographically lowest district is Wannsee in the southwest at 32 m above sea level (so-called Normal Null (NN) or Amsterdam level); Buch in the northeast is the highest district at 64 m above NN. Due to these differences in altitude, the pipe network is divided into a northern and southern high city zone and a low city zone in the area of the glacial valley.

Today, there are 7,800 km of drinking water mains and water supply pipes beneath Berlin's roads.
Most of these, around 6,300 km, are water mains with a diameter of 5 to 30 cm. A length of 1,500 kilometres of such pipes have a diameter of up to 1.40 m. Sixty-four percent of these are made from grey cast iron, 10% from steel, 12% percent from reinforced concrete, 13% from ductile cast-iron pipes and one percent are plastic and concrete pipes used for house connections. Any lead pipes still remaining are in the process of being replaced.

The average age of a water main in Berlin is 52 years; the oldest pipes are around 120 years old.





Clean water tank

When new mains and supply pipes are laid today, ductile cast iron pipes are used for pipes up to a size of 30 cm; steel pipes are the material of choice for larger cross-sections. In addition, the new pipes are lined with cement mortar on the inside to prevent corrosion. Plastic pipes are used for house connections.

Keeping an eye on the pressure

In Berlin, there are around 270,000 house connections to the supply mains. In addition, there are approx. 62,000 hydrants and 90,000 shutoff valves. Pressure and flow rates are constantly monitored at numerous points along the network. The average pressure lies between 4.5 and 5.5 bar. This guarantees that even the top floor of a five-storey building can be easily supplied with fresh water. High buildings or buildings situated on higher ground have their own booster stations to support this process. Berlin no longer operates water towers for boosting.

Waterworks: Groundwater becomes drinking water

1. **Deep wells**
Approx. 700 deep wells are in operation for nine waterworks. They are between 30 m and 170 m deep. These are mainly vertical wells, which supply between 40 m³ and 400 m³ of raw water per hour. Two horizontal filter wells can supply up to 1,600 m³ of raw water, per well, per hour.

2. **Aeration system**
Raw water does not contain any free oxygen. Therefore, it is sprayed through nozzles in the aeration chambers or passed over weir overfalls so that it can absorb the oxygen in the air and replenish itself.

3. **Reaction tanks**
Raw water contains dissolved iron and manganese. These elements chemically react with oxygen in the water and form flocs, which then settle to the bottom of the reaction tanks. It takes 15 to 60 minutes for the water to undergo this settling process.

4. **Rapid filter system**
The remaining iron flocs and manganese are removed from the water in the rapid filter system. This takes place in filter tanks that have a two metre thick sand filter. If the sand gets clogged, it can be flushed clean with air and water.

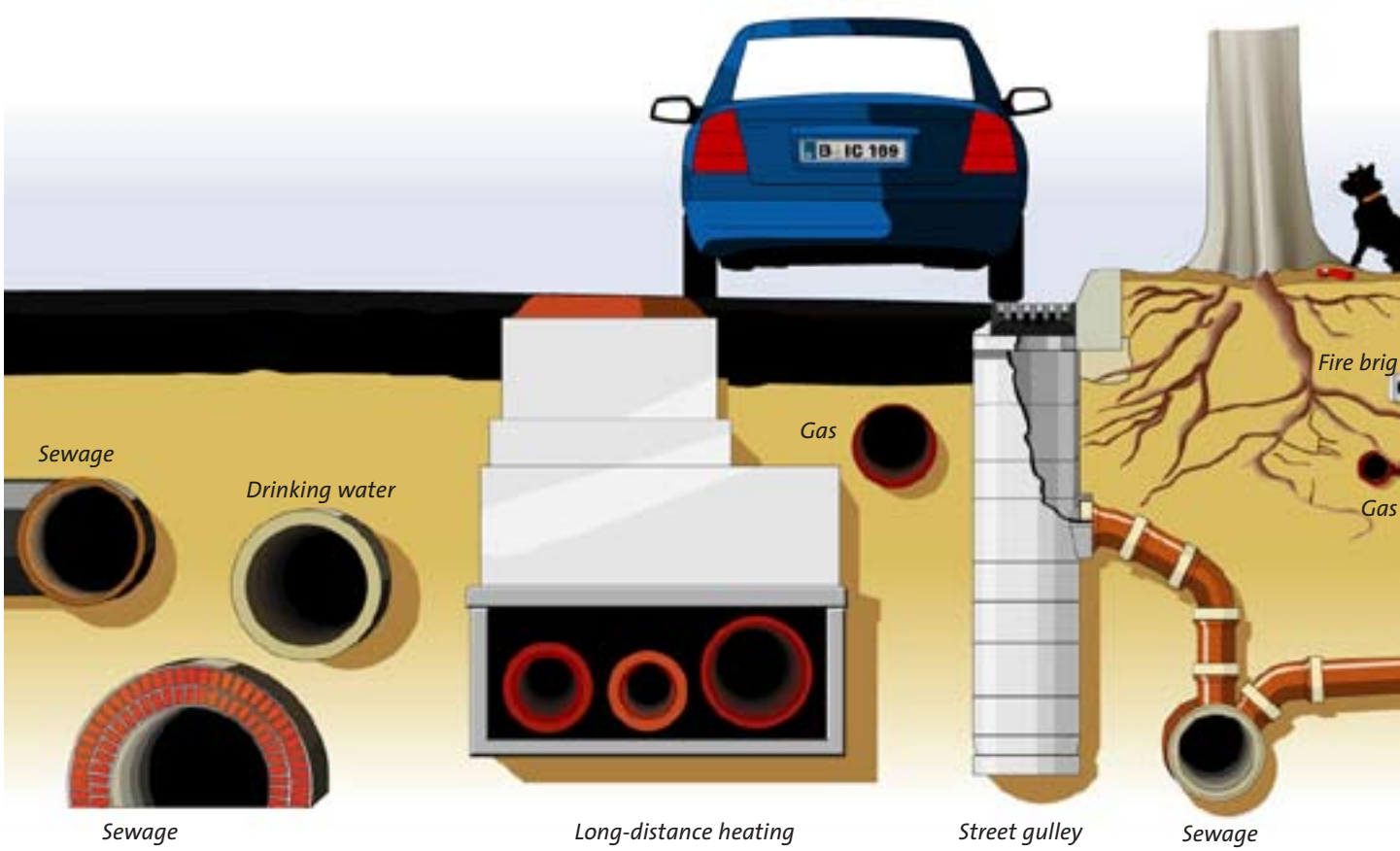
5. **Clean Water tank**
Raw water is now clean water. It is stored in the clean water tank. Relatively consistent quantities of water are extracted from the wells. However, drinking water consumption fluctuates depending on the time of day and day of the week. The clean water tank is therefore not only a storage facility but also serves to meet fluctuating supply needs and balance demand.

6. **Pumping station**
The pumping station contains clean water pumps which pump drinking water through the pipes to the consumer. These pumps are driven by electric or diesel motors. This guarantees a steady supply of water, even in the event of a blackout.

On the way to the customer

We at Berliner Wasserbetriebe have divided our supply area into six water districts. Each district has a service network operating centre, whose staff are responsible for the servicing and maintenance of the mains and pipes. Each year they carry out around 20,000 jobs in repairs, of which 3,500 jobs alone are due to pipe bursts in supply and house connection pipes. This by itself requires around 28,000 road excavations per year. On a routine basis, we annually check more than 70,000 fittings in the pipe network and renew numerous signs. In addition, around 10 km of pipes are cleaned annually and lined with cement mortar in order to improve their flow rate. Moreover, all water mains are systematically checked for leaks every four years. As a result, Berlin has a very low rate of unaccounted-for water. This amounts to less than five percent of total annual water delivery.

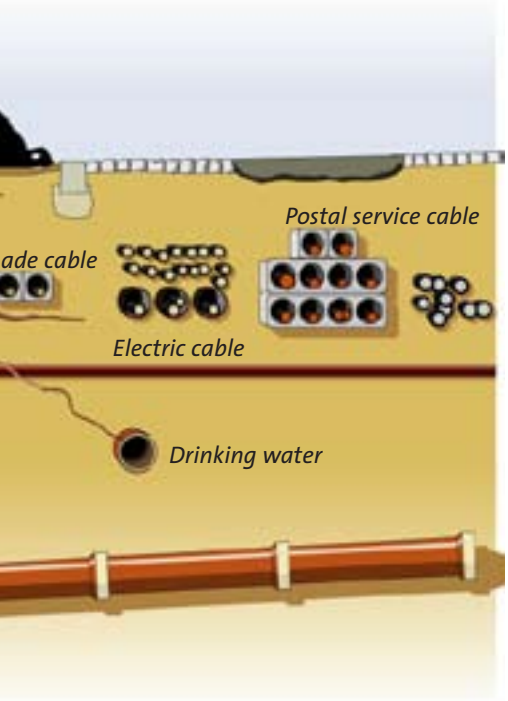
A cut trough a road



Metering – an exact science

A house connection pipe connects the water main in the road to the shut-off valve behind the water meter. Everything behind the meter flowing into the house is then the obligation of the houseowner. House connection pipes up to the meter area are serviced and maintained by Berliner Wasserbetriebe.

At the end of each connection pipe, you will find a water meter that keeps track of the customer's exact level of water consumption. All water meters are property of Berliner Wasserbetriebe. They are checked and calibrated every five years. Around 50,000 water meters are replaced each year. This is the responsibility of our state-approved testing facility for cold water measuring instruments.



A water meter can also be used to discover leaks in house pipes. If all water taps and tapping points in the building have been shut off, the small cog wheel on the water meter should stand still. If it doesn't, then there is a leakage at some point in the system and a plumber should be notified.

Most people, namely those who live in apartment buildings, never see their water meters. Water consumption in Berlin is normally billed as part of the rent; the rate depends on the size of the apartment. We at Berliner Wasserbetriebe bill the respective property owner for the metered water consumption of each building on an individual basis.

Brief explanations

What are water mains?
Water mains are pipes through which water is transported over greater distances. They are mainly located under streets and are between 40 cm and 1.40 m in diameter.

What are supply pipes?
These are the pipes which branch off the water mains; they are mostly located under the pavement and are up to 30 cm in diameter.

What is a house connection pipe?
This is the name of a pipe which branches off the supply pipe and connects it to the water meter installation on a piece of property.

What types of materials are used in Berlin for laying new drinking water pipes?
- *cast iron*
- *steel*
- *plastics*

Rehwiese

Berlin's treasures lie at a depth of 150 metres

There are strict safety precautions for the wells.

We at Berliner Wasserbetriebe extract groundwater from deep layers which formed during the Ice Age 10,000 years ago. This formation is also called the Berlin-Warsaw Glacial Valley. The underground consists of sand and gravel up to a depth of 150 m with embedded boulder clay and clay seams. These many water-bearing layers contain freshwater. Beneath these layers is a contiguous layer of clay, around 100 m thick. It separates the "freshwater stratum" from the deeper underlying "saltwater stratum".

An extraordinary quantity of good quality groundwater is in vast abundance in Berlin. In order to safeguard this natural treasure, water protection zones have been specified in the immediate vicinity of water extraction points. Depending on the proximity to the wells, any type of activity which could present a danger to the groundwater reserves is either completely prohibited or permitted only in special cases.

There are three protection zones, a far zone (Zone III), a near zone (Zone II), and a containment area (Zone I).

The boundaries of the protection zones are determined by "isochrones". These are lines which are calculated from the time it takes the water to flow to the well. Isochrones are determined by the groundwater's flow direction and velocity. How fast and where the water flows is calculated on the basis of the property of the soil and its permeability.

Formation of new groundwater

Drinking water is taken from groundwater reserves which are constantly renewed by means of bank filtration of storm and surface water. Furthermore, groundwater can also be artificially replenished with treated surface water.

Storm water and surface water slowly pass down through layers of sand and gravel. Many pollutants can already be filtered out in the upper soil layers by these means alone. This is a thoroughly natural cleaning process. The thicker the soil layer which covers the underlying groundwater reservoir, and the more clay and silt it contains, the lower the risk of groundwater contamination.

However, groundwater contamination can still pose a great risk to our drinking water supply. Therefore, water protection zones with restricted access have been specified for such catchment areas.

There is no severe groundwater contamination in the catchment area of the wells used for Berlin's drinking water supply. Yet there are no guarantees. For example, industrial contamination was discovered in the influent of the Johannisthal waterworks, which is no longer in operation. This made it necessary to carry out comprehensive measures for the rehabilitation of the aquifer.

Spree

Havel

Prohibitions within Zone III

In the latest Berlin Protection Zone Regulations, Zone III is subdivided into Zone III A (500-1000 day isochrone) and III B (10-30 year isochrone). This area must be protected against non-degradable or minimally-degradable chemical and radioactive substances. Zone III includes an area extending approximately 2.5 km around the wells, depending on geological properties in the area.

Within this perimeter, anything which could contaminate the reserves or impair the taste of the groundwater is strictly prohibited. This includes discharging wastewater, cooling water and condensation or even rainwater (except storm water run-off from roofs) into the ground.

Housing complexes and industrial and commercial facilities must be hooked up to the local public sewer network.

Parking, washing or repairing motor vehicles (including oil changes) on unpaved soil is not permitted.

Prohibitions within Zone II

Zone II corresponds to the 50-day isochrone and includes a diameter of at least 100 m around the wells. It serves to protect the groundwater hygienically. Above all, it affords protection against germs and micro-organisms that can cause disease. Pathogenic substances are almost completely biologically degraded after a flow duration of 50 days (50-day isochrone). Apart from the restrictions in Zone III, all other activities which entail the continuous presence of people and animals or removal or destruction of the upper soil layer are deemed high risk, and therefore, strictly prohibited. These include the construction and renovation of buildings, excavations (pits, trenches, etc.) and the transport and storage of liquids hazardous to water as well as the transport of rubble and waste. Parking, washing or repairing motor vehicles on unpaved soil is also not allowed.

Furthermore, it is prohibited to keep animals for commercial purposes, use natural fertilisers, weed killers, biocides and pesticides as well as to erect camping and car parking facilities or docking facilities for boats.

Prohibitions within Zone I

The containment area, Zone I, is a 10 m wide strip on both sides of a row of wells. Very strict safety regulations apply here as well.

Any activity involving the upper layer of soil in the immediate vicinity of groundwater extraction facilities, above all any activity that would lead to a risk of con-tamination, is strictly prohibited. This does not include servicing work on wells or the regeneration of wells by the Berliner Wasserbetriebe.

The regulations for the Berlin water protection zones have been issued by the Senate Department for Urban Development. They are published in the law and regulatory gazettes for Berlin. Anyone deliberately or negligently in violation of these prohibitions is thusguilty of infringement of the regulations and will be subjected to large fines.

Wannsee

Due to extensive recreation areas and dense settlement, groundwater protection is a particular problem for Berlin. Many industrial sites are located next to bodies of water or in the immediate vicinity of a waterworks. Most of the water protection zones along the rivers Havel, Spree and Dahme are also highly frequented recreation sites for local people. There are tens of thousands of boats, as well as people who go bathing, wind-surfing, fishing and so on. Here we trust people to behave responsibly and protect our water resources however they can.

A clean matter

Helping nature:
Plants clean river and lake water, which then percolates into the

Havel meadows Stolpe

There is an ample supply of groundwater in Berlin and the surrounding areas due to favourable geological, hydrogeological and climatic conditions. Nevertheless, we cannot draw unlimited amounts of drinking water from this region, even with its abundant water resources, without certain considerations. Our groundwater reserves need to be managed in an enviromentally sound and feasible manner to guarantee that there is enough to go around for generations to come. Quantity and quality vary somewhat from catchment area to catchment area, so individual waterworks must come up with different solutions for the management of groundwater resources for each respective area. They must take into careful consideration any deficit in the amount of water available and also pay close attention to any potential hazards due to industrial and / or natural contamination.

Our supply area:

Berlin has an area of 880 km2 and a population of 3.4 million. It extends 45 km at its widest point from east to west, and 38 km from north to south. The River Spree flows through the city's districts from east to west, forming a 7 km wide valley, bounded in the north and south by high areas. It then flows into the valley of the River Havel near Spandau. These valleys are part of the so-called Berlin-Warsaw Glacial Valley formed by the water masses which melted after the Ice Age. They are filled with sand and gravel at a depth of 30 to 50 meters. These gravel layers contain the groundwater resources which serve as the basis for Berlin's drinking water supply.

Soil acts as a filter

Groundwater does not always form purely of its own accord.Therefore, we at Berliner Wasserbetriebe replenish groundwater with treated surface water. This is achieved by impounding water into shallow earth basins or into natural ponds and ditches. As the soil in Berlin is mostly made of sand, water can percolate easily through it and flow down to the groundwater reservoir. The upper layers of soil act like a giant filter. The natural cleaning power of the soil physically, chemically and biologically improves the quality of the water so that it is comparable to natural groundwater. On the way to the wells, percolated water reaches the same temperature as groundwater.

Tegeler See

Apart from the Kuhlake in the Spandau Forest, all the water bodies of the Grunewald lakes area (Schlachtensee, Krumme Lanke, Grunewaldsee, Hundekehlesee and Waldsee) act as natural soakaways. Earth basins have been built near the Tegel and Spandau waterworks. In and around the Stolpe waterworks, surface water from the Rivel Havel is filtrated on the Havel meadows.

Phosphorus out – everything is clear

Surface water can be further treated before it is used for filtration purposes. To improve the quality of surface water bodies, it is necessary to reduce the nutrient level of the water to prevent unnecessary algae growth. To this end, a flocculating agent is added to the water to extract phosphates and nitrates. After this, the water is then filtered and discharged to the surface water bodies of the area. To give an example of how effective this procedure is: water from the Wannsee lake is discharged into the Grunewald lakes; it normally contains a pre-treatment level of 0.4 milligrams of phosphorus per litre. This quantity of nutrients favours algae growth and therefore endangers the biological equilibrium of the lakes. After being treated in the Beelitzhof surface water treatment plant, the water contains less than 0.01 milligrams of phosphorus per litre. As a result, water quality in Schlachtensee lake and other lakes has improved considerably and algae bloom has been greatly reduced. In the summer months, this can clearly be seen by all. Another example is the surface water which flows into the Tegeler Lake. It has been treated in the surface water treatment plant in Buddestraße since 1985, also with measurable success.
This plant not only treats effluent which is discharged from the Schönerlinde waste-water treatment plant and carried along the Nordgraben and the Tegeler Fließ, but also other water pumped through a supply pipe from the Oberhavel. This increases the water exchange rate in the lake, and has had a visibly positive effect on the overall quality of this body of water.

Soakway for groundwater replenishment Spandau

Surface water treatment plant in Tegel

Familiar sights in the city

On second glance: you can see us everywhere

Customer service at work

Hydrant
(Underground hydrant) on roads or footpaths. Do not block or park on them! The square white sign with a red edge all round is used to indicate hydrants.

Fitting
Found on roads or footpaths, used for shutting off or opening wastewater pressure pipes. The green sign indicates their position.

Manhole
Each sewer has an opening to the surface every 60 meters or so. Through these openings, sewer workers can enter the sewers, bring in cleaning equipment, remove blockages and / or sewer sludge and repair damage.

Slide valve fitting
Found on roads or footpaths for shutting off pipes. The blue sign indicates their position.

Road gully
Rainwater and other water from the road is carried into the stormwater or combined sewers through the road gullies. Any solids carried along in the water settle in the silt chambers.

Manhole cover
This decorated cover can be found in front of many tourist features in the city.

The white sign with red borders
indicates the location of a hydrant. The hydrant is located on a 100 mm diameter water pipe. It is located four metres to the right and 8.2 metres in front of the sign.

Construction works sign
These signs show that construction works are underway.

Official traffic sign:
"Ban on vehicles with a load of more than 3,000 litres of substances hazardous to water".

Official traffic sign
"water protection zone". Located 500 m from drinking water wells. Caution with substances hazardous to water!

Drinking water wells
On the River Havel near Lindwerder. Any activity involving the upper layers of soil and any contamination in the immediate vicinity of the wells is strictly prohibited. Restrictions in activities and conditions for use must also be observed within the near protective zone up to 200 m and in the far protective zone up to 2.5 km from the wells.

At the emergency outlets of pumping stations and at rain outlets, it is very dangerous to bathe in summer or to walk on the ice in winter!

House water meters
These are located in the basement or in the shaft between the connection pipe and the building pipes.

The blue sign
Indicates a shut-off valve. It lies on a 100 mm diameter pipe. The figures under the T give the distance from the sign: 2.5 metres to the left and 2.2 metres straight ahead in front of the sign.

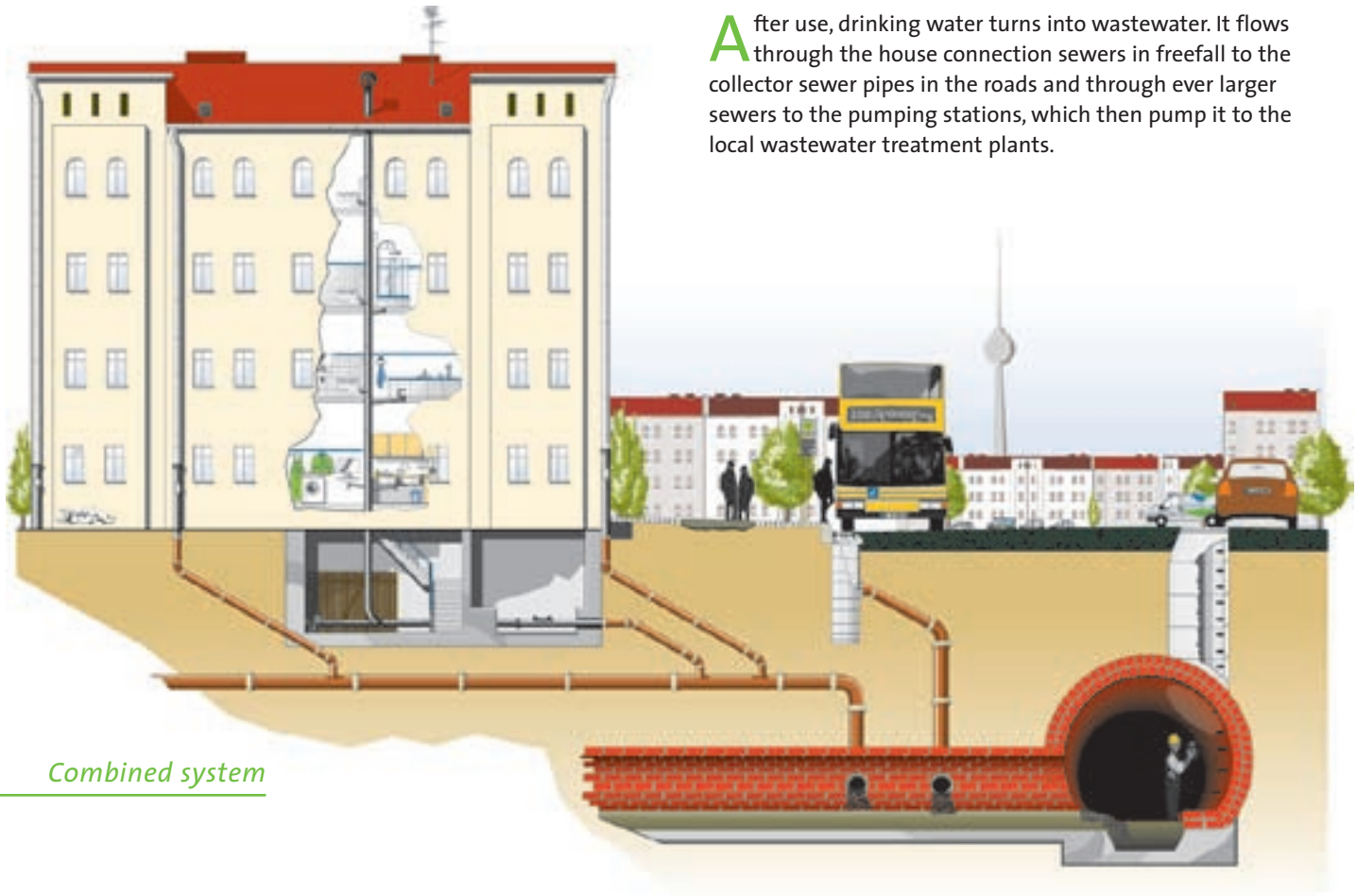
The green sign
Indicates a shut-off valve in a wastewater pressure pipe. It lies on a 400 mm diameter pipe. The figures below the T give the distance from the sign: 2.8 m straight ahead in front of the sign.

Observation pipe
Used for checking groundwater levels.

An underground world of its own

Berlin's sewer network is 9,500 km long. That is equivalent to the distance from Berlin to Peking.

After use, drinking water turns into wastewater. It flows through the house connection sewers in freefall to the collector sewer pipes in the roads and through ever larger sewers to the pumping stations, which then pump it to the local wastewater treatment plants.



Combined system

Berlin underground

Berlin is divided into honeycomb-like drainage areas, whose boundaries are not identical with those of the Berlin residential districts. Drainage areas follow the courses of rivers and shipping canals as well as the varying levels of terrain. Sewers always lead to the lowest point of a drainage area, where there is a pumping station which then pumps the wastewater on to the wastewater treatment plants.

At a total length of 9,500 km, the sewer network includes 4,270 km of wastewater sewers, 3,250 km of surface water sewers and 1,900 km of combined water sewers. Around three quarters of the city area of Berlin are set up as one separate sewer network system and one quarter as a combined sewer network system.

The combined system

In the combined system, wastewater and storm water are transported together through one type of a sewer. This system has definite advantages, especially in the inner city, where there is very little space under the roads. For planning purposes, it is necessary to take into account the amount of storm water expected to go through the network at any given point in time. In order to keep the network economical and relieve the network system and treatment plant of excess incoming storm water, there are storage and stormwater overflow facilities situated at fixed points along the sewer network as well as in the proximity of local pumping stations. During a storm, several thousand cubic metres of water can be held back in the sewers of the combined system. This prevents dirty water from the sewer network from overflowing into the lakes, rivers and streams of the area. During heavy rainfall, local wastewater treatment plants are not in a position to handle all the incoming water at once. If they were to do so, they would be overloaded and the delicate biological treatment process would be permanently disrupted.
To prevent this, the maximum capacity of the pumping stations is limited to the maximum treatment capacity of the respective wastewater treatment plant. If the level of storm water exceeds the storage volume of the combined water sewer, the storm water and wastewater which is not held back by the pumping station then passes untreated through the stormwater overflows into the combined sewers and is subsequently discharged into the lakes and rivers of the area. However, this is the exception and not the rule.

The separate system

In the separate system, wastewater and stormwater are collected in two separate sewer systems. Wastewater from households and businesses flows from wastewater sewers to pumping stations, which then pump it on to wastewater treatment plants. The advantage here is that the amount of wastewater going through the system is fairly uniform and occasional large quantities of stormwater due to bad weather conditions do not have to be transported to the treatment plant through the sewers and pressure pipes.

For this purpose, special stormwater sewers collect and discharge rainfall and other precipitation to nearby lakes, rivers, streams and / or sewers. In areas with permeable soil, stormwater percolates where it falls. For roads with heavy traffic, stormwater sewers have been installed to ensure run-off and to take away any pollutants that may occur as a result. Around 60 percent of the sewer network is made from vitreous clay pipes. Road sewers range from 20 cm in diameter up to 2.80 m for main collector sewer pipes and up to a size of 4.20 m wideby 3.20 m high for masonry sewers. The smallest house connection sewer is 15 cm in diameter.

Material information

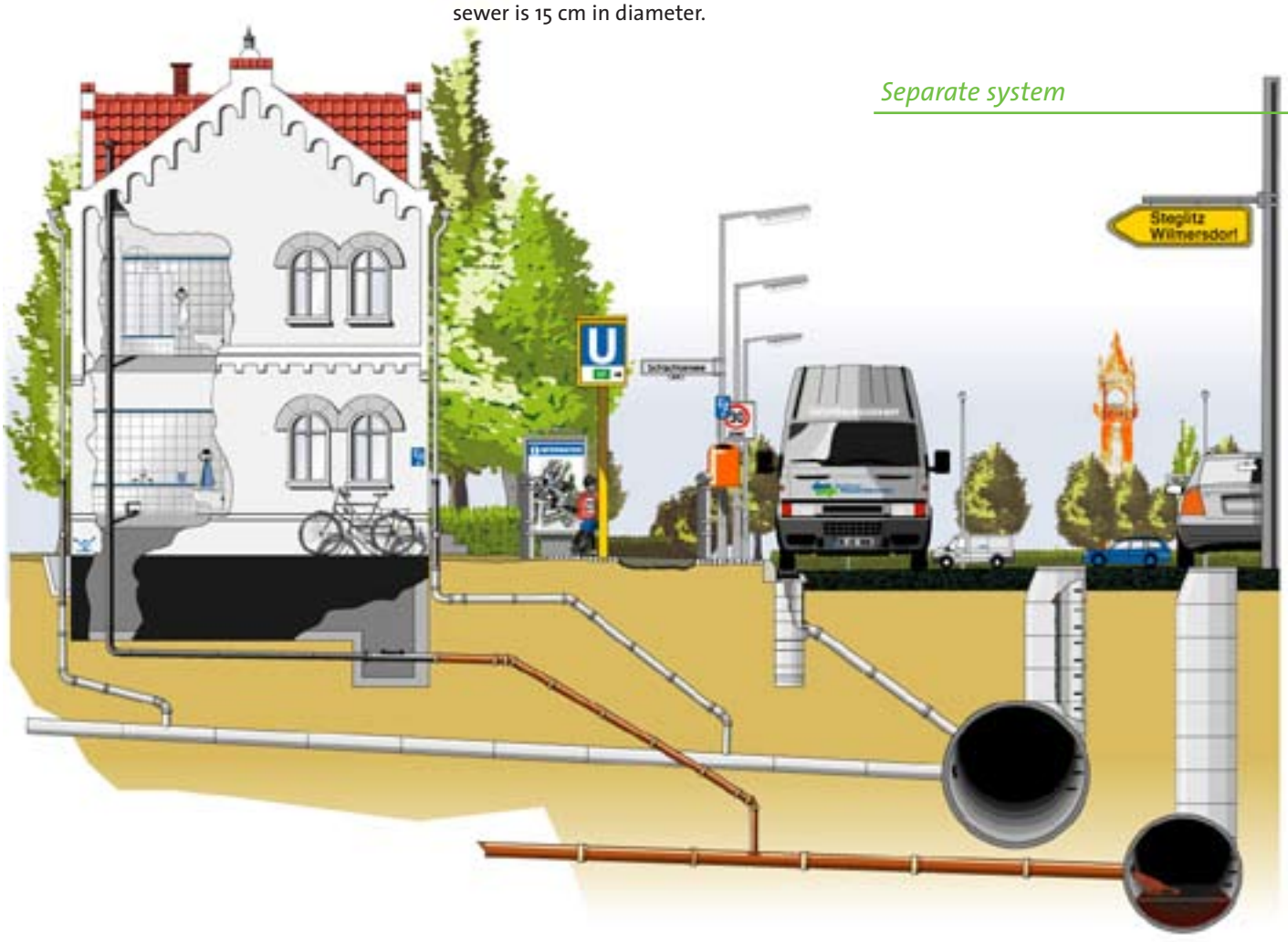
The following materials are used for the sewer network:

- vitreous clay
  for wastewater and combined water sewers
- concrete
  for stormwater sewers
- reinforced concrete
  for all types of sewers
- concrete and masonry
  for all types of sewers, if a special section is required due to local circumstances

Open hatches during heavy rainfall

There are more than 160 emergency outlets and stormwater overflows in Berlin. They are located on the rivers Spree, Havel, Panke, and on the Landwehr Canal, the Teltow Canal, and the Neukölln and Berlin-Spandau shipping canals. There are also several stormwater retention tanks at strategically important points along the network. They catch the combined water during short and heavy storms in order to prevent it from overflowing into the local lakes and rivers. When the rain subsides and the pumping stations and wastewater treatment plants are again running at normal capacity, the excess contents of the tanks can be pumped to the works, where it can be treated and further discharged. During long, sustained heavy rainstorms, it is possible to treat storm water in the tanks directly.

Separate system



Retention filter at the pumping station Adlershof

Intensive cleaning of grass and vegetation

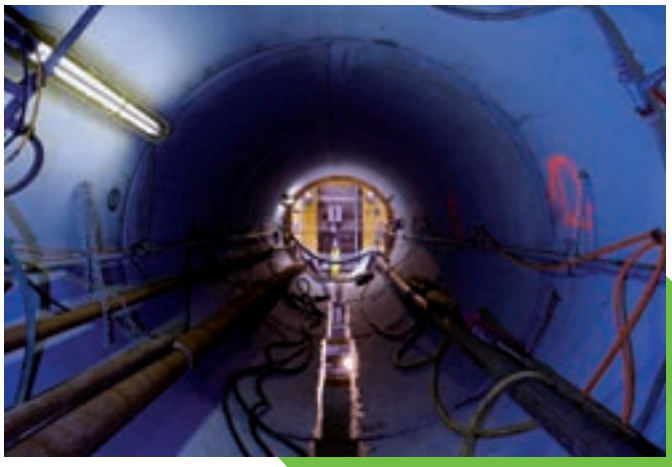
Within the metropolitan area, there are more than 100 reservoirs and storage basins both underground and above ground to hold around 900,000 cubic metres of rainwater. You could easily fill the Olympic Stadium with this amount of water – if you wanted to use it as a reservoir! Depending on the position and type of basin, the dirt is removed from the rainwater or it is intermediately stored with the contamination before flowing into the sewage treatment plant. Retention filters (soil drainage basins) are special types of such purification plant. These filters clear dirty rainwater from heavily used streets and commercial areas by filtering and retaining soluble contamination from the water using a substrate and reed plants.

Berliner Wasserbetriebe has already built four retention filters at the Biesdorfer quarry pond, in Adlershof, in Blankenburg and at Halensee. The filters have a mineral substrate with added reed plants. The rainwater collected in the canals first flows into a basin in which the accompanying dirt is deposited. The separated contamination, such as phosphor, nitrogen and heavy-metals are then bound together in the substrate and in the plants within the actual filter.
The reed plants ensure that the filter does not get blocked. After passing through the filter, the water is then freed from 80 % of all filterable solids – on which accumulate the heavy metals, among other things – and from 70 % of the phosphorous compounds. In addition to wide ranging clean-up operations in the canalisation, the aim of these plants is to achieve a good ecological condition in the Spree-Havel river system by 2015.

Full steam ahead to the sewage treatment plant

The pressure lines in which the waste water is pumped by the pumping stations to the sewage treatment plants are for the most part comprised of cast iron. They have a diameter of 15 cm to 1.60 m. Additional materials are: steel pipe on the exterior with a coating of bitumen or a synthetic-coating or ductile cast iron with bitumen coating and an interior cement mortar lining. The canals feed the waste water to one of 148 pumping stations within the metropolitan area.
The pumping stations are connected to each other by a 1,100 km network of pressure pipes. The main pumping stations feed the waste water via these pressure pipes to the sewage treatment plants. They are the control centres for automatically connecting, main and rain pumping stations which are monitored and remotely controlled from here.
Soon, all pumping stations in Berlin will be monitored and controlled by a single switch room.

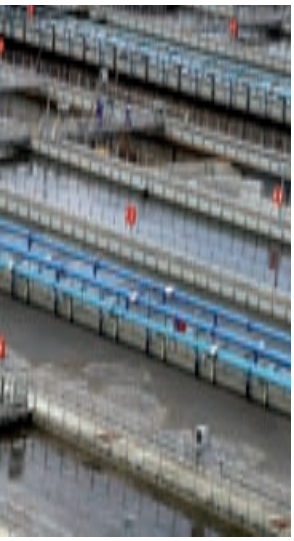
Wastewater pumping station Hohenzollerndamm



New construction of a sewage pressure pipe

Let's clarify that

Wastewater is dirty water



Biological wastewater treatment

Wastewater consists of used water from households and businesses, stormwater and other forms of precipitation. Domestic sewage includes water from sanitary installations and kitchen sinks as well as dishwater and water from cleaning or bathing. Stormwater in particular also contains a lot of dirt from roofs, courtyards, gardens, roads and other open public spaces.

Wastewater can be further contaminated by both soluble substances and solid matter. Solid and / or other organic material floats in water or gets deposited in the sink. Once it has settled, this material can be removed. Soluble substances can only be separated from water by means of special biological or chemical treatment methods. There are also semi-soluble substances called colloids. Colloids cause the water to be turbid. All of these substances are made up of organic and mineral compounds.

In our wastewater treatment plants, 95% of all solid and / or organic material can be removed from raw water. The following parameters are used in assessing the degree of pollution of wastewater: biological oxygen demand (BOD), chemical oxygen demand (COD) as well as the level of certain nutrients, such as phosphorus and ammonium. BOD is the quantity of oxygen which is consumed by microorganisms through the degradation of organic substances within five days at 20°C. COD is the estimated consumption of potassium chromate, which is produced during the chemical oxidation of organic water compounds. It is given as the oxygen equivalent in milligrams per litre.
To ensure the best of treatment, effluents (or treated wastewater) are regularly checked at the outlets of the wastewater treatment plants. Berlin's effluents are well within the legal range. Current levels can be found on the internet at **www.bwb.de**.

Aeration tanks, in the background digestion tanks

Nutrients

Phosphorus and nitrogen compounds are important nutrients for plants in general and for aquatic plants in particular. The nutrients in bodies of water accumulate over time due to their presence in raw water and in other sewage washed out from areas used for agricultural purposes. This itself promotes rapid algae growth and is a self-perpetuating cycle. Dying algae settle on the bottom of the lake or river where they are consumed by micro-organisms. This in turn releases phosphates and nitrogen that further accumulate in the body of water and consume oxygen, thus depleting the water quality. Therefore, to improve this situation, it is our goal to prevent as much accumulation of such nutrients as possible.

The lower the nutrient content of a river or lake, the clearer its water. Each person produces around three grams of phosphorus, in the form of phosphates, and twelve grams of nitrogen per day that land in the common everyday household wastewater. In Berlin the phosphate concentration level – converted into phosphorus – in the effluent of the wastewater treatment plants is not allowed to exceed the limit of 0.5 milligrams per litre. In Berlin's wastewater treatment plants, the annual average limit lies between 0.3 and 0.7 milligrams per litre. This means that 95% of the phosphates in wastewater can be removed in our treatment plants, thus making a great contribution to achieving clear lakes and rivers.

Heavy metals

Heavy metals get into the wastewater through industrial effluents and via households.
The heavy metal content in Berlin's wastewater is low overall. Chromium, nickel and cadmium are only found in minute quantities. The most frequently occurring heavy metal in Berlin's wastewater is zinc. Its concentration lies between 0.2 and 0.5 milligrams per litre and one third of it stems from industry. The remainder stems from zinc coated building installation pipes and roof gutters.

Wastewater treatment works: cleaning of wastewater

1 Wastewater pumping station
2 Screening plant
3 Grit chamber
4 Primary treatment tank

From the sewer to the river

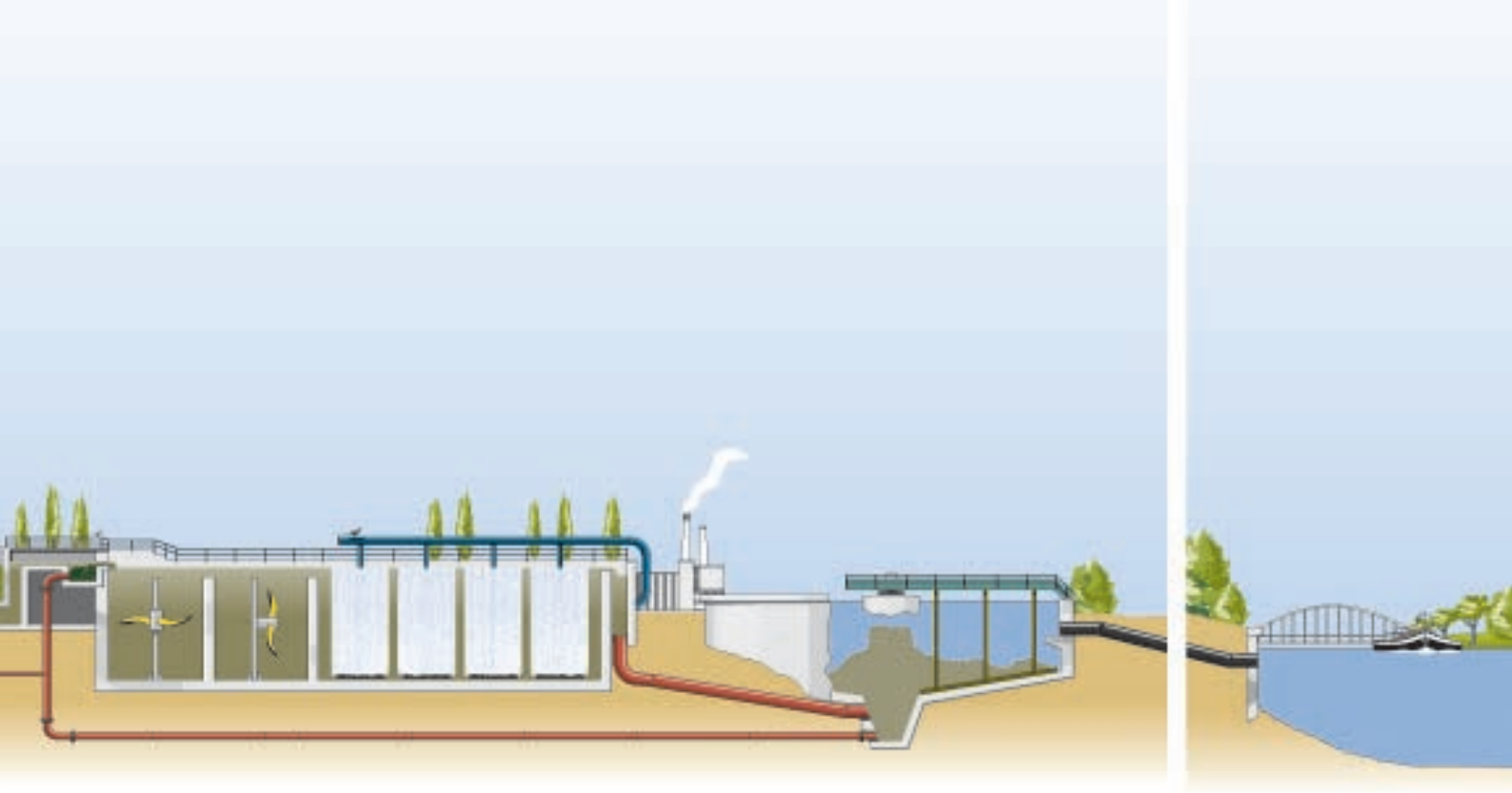
Six wastewater treatment plants clean sewage from Berlin and surrounding regions

Aeration tank

In such densely populated regions as Berlin, particularly high requirements are set for cleaning wastewater. During dry weather conditions, Berliner Wasserbetriebe's six wastewater treatment plants clean approximately 620,000 cubic metres of wastewater per day. Treated wastewater or effluent flows into the River Spree and the River Havel directly or via the Erpe, the Panke, the Nordgraben or the Teltow Canal. These bodies of water are slow moving and have a low volume.

For primary treatment, raw water which is pumped by the **pumping stations** through pressure pipes to the wastewater treatment plants initially passes through the mechanical treatment stage.

Coarse solid materials such as paper, textiles, wood and plastic are removed in the **screening plants**. Automatic rakes remove any waste stuck on the screen. Then it is collected, dewatered in containers, and disposed of.



5 Aeration tank

6 Final clarification tank

Final clarification tank

The wastewater then flows through the **grit chamber**. It consists of long channels in which coarse mineral solids such as sand, gravel and stones settle on the floor at a flow velocity of around 30 cm per second. These solid materials, now called grit, are pushed by scrapers into hoppers and pumped into grit washing tanks. There, the grit is freed of organic substances, dewatered and later disposed of.

In the **primary settlement tanks** the flow velocity of the wastewater is reduced to around 1.5 cm per second so that lighter, undissolved substances can settle out to the floor of the tank. The floatable particles collect on the water's surface. The sludge is pushed by scrapers into sludge hoppers. The sludge is stored temporarily and then pumped to the sludge treatment plant. Floating matter, which moves on the water's surface and mainly consists of grease, is removed by scrapers.

Moving on to the secondary treatment stage, the mechanically treated wastewater then flows into the **aeration tanks** of the first biological treatment stage. In this treatment stage, dissolved organic substances as well as phosphorus and nitrogen compounds are degraded. The degradation is carried out by bacteria and other microorganisms which form the aerated sludge. The first part of the aeration tanks is kept free of oxygen. This stimulates bacteria to consume phosphorus compounds in the wastewater in the subsequent oxygen-rich zone of the aeration tanks. The nitrogen compounds are reduced by other bacteria, which are also exposed to changing oxygen concentrations.

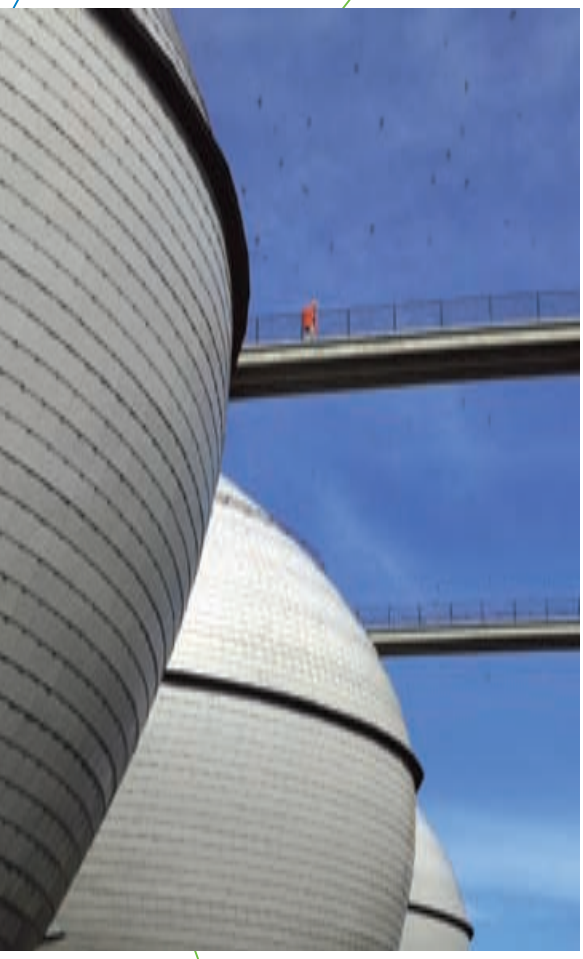
In addition to biological phosphorus removal, simultaneous chemical precipitation can be used if needed. In this case, the precipitant iron (II) sulphate is added to the aeration tanks in a dissolved form. Iron (III) phosphate is produced, which then mixes with the biological sludge.

The wastewater then flows through the secondary settlement tanks, or **clarifiers**. Here the activated sludge has several hours to settle out. Afterwards, it is pushed into hoppers and then mostly pumped back into the aeration tanks in order to maintain a constant level of micro-organisms for biological treatment. Finally, any excess sludge is passed on to the sludge treatment plant for further processing.

Ruhleben sewage sludge incineration plant

A valuable resource

Sewage sludge can be used to produce heat and electrical power.



Digestion towers in Ruhleben wastewater treatment plant

Apart from cleaning wastewater, wastewater treatment plants also treat sludge resulting from wastewater treatment so that it can be used or disposed of in an environmentally friendly manner. Sludge treatment in Berliner Wasserbetriebe's wastewater treatment plants is currently carried out in two ways.

In our wastewater treatment plant in Ruhleben, sludge consists of up to 95% water and is subsequently dewatered in centrifuges before further processing takes place. The dewatered sludge is now called sludge cake. The water contained in the sludge cake, still around 75 percent, evaporates on drying beds and the remaining solid material is incinerated thereafter. Depending on the amount of water left in the sludge, heating oil may have to be used in order to reach the specified combustion temperature of at least 850°C needed to prevent the formation of noxious odours caused by flue gas.

Bio-gas and compost

Sludge processing produces flue gas, which is initially cooled in heat recovery boilers and cleared of dust by means of electric filters. Once it is freed of most of the dust, it is then passed on to the flue gas purification plant for further cleaning; here, any other remaining harmful compounds can also be removed. Flue gas can then be re-used in the wastewater treatment plants to generate steam and electrical power. Left-over ashes are disposed of and used for landfill. More than one third of all sewage sludge produced is processed this way.

In the wastewater treatment facilities at Stahnsdorf, Waßmannsdorf, Münchehofe, Wansdorf and Schönerlinde, sludge is further treated in digesters. At a temperature of about 33° C, the whole process takes around 20 to 30 days. The bio-gas released by this process can be captured and burned to produce electricity or generate heat.

Finally, the "digested" sludge is dewatered in centrifuges, composted and used for recultivation. An alternative is to dry the sludge in rotary dryers and further process it for use as a dry granulate or as fuel in power plants.

Treated wastewater

Settling test of activated sludge

Wastewater is strictly regulated

Our laboratories at the Berliner Wasserbetriebe continually check the effluents of the wastewater treatment plants in order to be able to make any adjustments to the treatment processes at any given time. Sampling and testing of effluents coming from the treatment plants occur on a regular basis. Furthermore, any effluents coming from industry and/or commercial customers are also tested by the Berliner Wasserbetriebe's regulatory department. Around 20,000 companies are registered with our organisation and 5,000 of these are monitored routinely.

It is strictly prohibited by law to discharge substances hazardous to water into sewers. In addition to this regulation for commercial customers, the "Indirect Discharger Ordinance" clearly states that contamination is to be identified as the point where it first occurs and not where it is first discovered.
These legal requirements are there to safeguard those who have to work in and around the sewers. The same is true for everything related to the network and the treatment plant facilities. Just to list a few of the possible hazardous substances that would pose a risk: extra caution must be taken with cyanide, chlorinated hydrocarbons, heavy metals and/or other acids. All of these substances are potentially dangerous to human life and a great risk for all facilities.

A permit from the local water authority is required to conduct investigations at the wastewater treatment facility. Unannounced spot-checks may be carried out by the water authority to make sure that said facilities are compliant with all current regulations.

Environmental tips

Each of us can make our own contribution to environmental protection and keeping our water clean. Many substances which contaminate groundwater and surface water come from households. Here are a few tips to help you sort these out:

- *Any type of solid material belongs in the rubbish bin, not in the sink or toilet. Solids only serve to block up the sewers and require great effort to be removed once they reach the wastewater treatment facility. Common solids to be found in sewage are food leftovers, cigar and cigarette butts, textiles, condoms, tampons, sanitary napkins, cotton balls, razor blades, cat litter, etc. Also, used cooking oil should not be poured down the sink. Toilet bowl deodorisers are also unnecessary and serve to further pollute the water.*
- *No medicines are allowed to be put into the sink or toilet, as even state-of-the-art wastewater treatment plants are unable to remove all their active ingredients. Leftover materials can get into the groundwater and contaminate our drinking water reserves. Chemists take back unused medicines free of charge and ensure its safe disposal.*
- *Leftover paint, brush cleaners and solvents and other chemicals do not belong in the toilet, either. Apart from contaminating the water, they can also form explosive gases in the sewers. Small quantities should be collected and given to the local waste company. Larger quantities must be taken to the collection points of the Berliner Stadtreinigungsbetriebe (BSR – city waste collection service) directly.
Call (030) 75 92 - 49 00 to find out about collection dates and service point locations of BSR's mobile collection points.*
- *Detergents should be added according to the hardness range of the drinking water. This information is available by asking the water company or looking on the internet at www.bwb.de. Dosage recommendations are given on each package of detergent.*
- *Washing machines and dishwashers should only be used when full. You can easily do without heavy-duty detergents, which contain a lot of bleaching agents and optical brighteners, as well as fabric softeners. These substances are difficult to process in the wastewater treatment plants. It is better to use compact detergents or modular detergents and to know that there are no environmentally friendly detergents. Some simply pollute the environment more than others.*
- *Cleaning agents should be used sparingly. A squirt of vinegar is often enough to clean most surfaces.*
- *Machine and engine oils must be disposed of at petrol stations or through special companies. A car washing facility does not contaminate wastewater as much as washing your car at the side of the road does. No amount of propellants and lubricants may be allowed to get into the soil or water.*

Getting to the bottom of the matter

Drainage sewers must be cleared of grit and sludge so that wastewater and stormwater can flow through freely. We use state-of-the-art technology for this purpose because most of the sewers are not accessible.

Sewer inspection of the stormwater overflow system at Hohenstaufenstraße

Sewer cameras

Smaller sewers can be cleaned using simple water or jetting (high-pressure cleaning). A special cleaning apparatus is used, which is pulled through the sewer with the help of a cable winch. Sludge, sand and other deposits are then transported to the next manhole where they are suctioned up.

Pumps on the special vehicles, which Berliner Wasserbetriebe uses for jetting, can generate water pressure up to 100 bar. This pressure is 20 times higher than the pressure in the network. The pressure loosens deposits, swirls them up and flushes them to the next manhole, where they are suctioned up. In special modern sewer cleaning vehicles, the jetting is combined with sludge suction equipment. Water sucked up with the sludge is simultaneously filtered and used again to flush the system.

Accessible sewers at a height of 1.20 m are serviced by our staff directly when some of the deposits have to be shovelled away because they cannot be removed by scrapers.

Sewer operations employees also work underground to manually clean special structures such as stormwater tanks and coarse filtering equipment in the stormwater sewer network. Siphons (i.e. sewer underpasses below other installations, such as the underground railway) are cleaned by jetting.

Wastewater sewers can collapse or leak when penetrated by tree roots. Wastewater then leaches into the soil and can contaminate groundwater. The other way around, percolating groundwater that seeps into the pipes can increase the overall load at local wastewater treatment plants. Due to Berlin's high level of groundwater, this is a common occurrence here. Repair of the network then effectively serves to protect the environment. Therefore, wastewater sewers need to be inspected on a continual basis. Most large-scale sewers can be physically inspected by employees of the sewer operations service centre. The non-accessible sewers are inspected by use of CCTV equipment (closed-circuit television). Even house connection sewers, which are only 15 cm in diameter, can easily be examined this way.

Close-up of a sludge extractor vehicle

Evaluate and rehabilitate or repair

The CCTV vehicles are equipped with self-propelling, watertight cameras, as well as monitors, video recorders, computers and printers. All inspection videos are listed in Berliner Wasserbetriebe's sewer register.
This allows us to document the exact status and condition of pipes for future reference and for planning repair and / or rehabilitation works.
House connection sewers are inspected using portable versions of the CCTV equipment from the building shaft or by so-called "satellite systems" from the main sewer.

The sewer must be cleaned before cameras and repair robots can start work there. A sludge extraction vehicle in use. A repair robot being lowered into a manhole. Works in the sewer are supervised and monitored from the vehicle.

Stop!

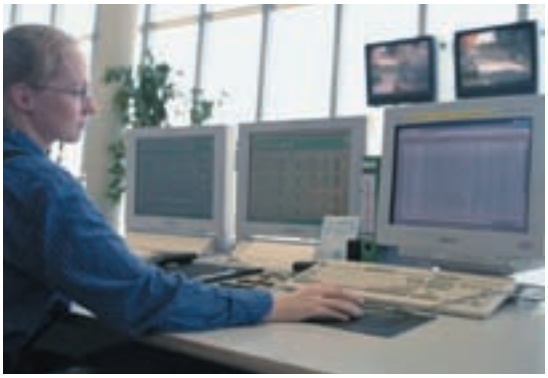
The following is not allowed to be discharged into the public sewer system:

- *Liquid and solid materials which could cause blockages in the wastewater treatment facilities or the network and make them difficult to clean; this includes rubbish from waste processing.*
- *Combustible, explosive, poisonous, radioactive and / or other materials which could put the safety of wastewater facilities and the network, as well as its personnel or the general public, at risk.*
- *Sewage which spreads lingering offensive odours, or which could develop explosive and / or poisonous gases and which could put the facilities at risk and make the treatment of wastewater difficult or disrupt operations altogether.*
- *Wastewater in sewers which exceeds 35°C.*
- *Wastewater in stormwater sewers which exceeds 30°C.*
- *Wastewater which has a ph-level below 6.5 or above 10.*
- *Wastewater which contains grease in a concentration higher than 300 mg/l.*

For more information on the predicted no effect concentration (PNEC) levels for poisonous or hazardous substances, contact the discharger monitoring depart-ment of Berliner Wasserbetriebe at ***030. 86 44 48 76.***

Computers register everything

State-of-the-art information technology in automation systems is used to operate and monitor most water and wastewater systems at Berliner Wasserbetriebe.



Nine waterworks, six wastewater treatment plants and 148 pumping stations work around the clock and are supervised via our modern control centres. Whereas many people used to be required to supervise, operate and maintain such extensive facilities, today much of the plant and network systems can be remotely operated and monitored via modern IT automation systems. Although drinking water needs to be supplied and wastewater disposed of around the clock, fewer and fewer works are now operated by people on site. Nevertheless, our specialists are indispensable. It requires experts to assess whether immediate action is required in the event of an emergency, e.g. if and when a major drop in pressure suddenly occurs. This is a sure sign of major damage to the network and demands immediate attention.

Help! Burst pipe!

As fast as the fire brigade and working around the clock

IT systems in the waterworks are the first to note significant drops in pressure. In many cases, the alarm signal also comes by phone. Customers, fire brigades and police report only around 1,500 burst pipes a year, due to the intensive, costly maintenance of the pipe network and sewers.

Call this tollfree number **0800 292 75 87** to reach the radio operator at Berliner Wasserbetriebe's emergency service centre. Emergency services are available around the clock.

Around 1,000 calls are received by the radio control centre each day. Calls include damage and breakdown reports from residents, from our own staff and from the works themselves. There are direct lines to the fire department and the police. The radio control centre provides precise information to emergency service teams about pipe bursts, defective hydrants, water meters damaged by frost as well as damaged or blocked sewers.

The emergency service team checks what needs to be done on site, localises the damage and shuts off all valves so that no further water or wastewater escapes. Minor repairs are carried out immediately. If necessary, our staff from the emergency service team will install an emergency water supply to bridge any supply gaps which might occur. All other work is then carried out by our local sewer network operating centre in the area. These centres are responsible for the servicing, maintenance, repair and / or dismantling of all pipe network facilities. In order to coordinate these works effectively, Berliner Wasserbetriebe has divided the city into network districts; one sewer service operating centre is responsible for each district.

A company with tradition

1852
Conclusion of a contract between the state government of Prussia and the English company Fox and Frampton to supply the city of Berlin with drinking water.

1856
The first waterworks of the Berlin Waterworks Company went into operation at the Stralauer Tor.

1873
The Berlin Waterworks Company was purchased by the city of Berlin.

Formation of a municipal construction commission for Berlin's sewers, headed by James Hobrecht.

1878
Founding of Charlottenburger Wasserwerke AG that supplied Berlin's southern suburbs.

Formal handover of the drainage facilities built to date to an operations director.

1937
Full ownership of Berliner Städtische Wasserwerke, public waterworks, was assumed by the city.

1945
Merger of Berliner Städtische Wasserwerke with Charlottenburger Wasser- und Industriewerke AG to form Berliner Wasserwerke, fully owned by the municipal government.

1949
The city of Berlin was divided. The water supply and municipal drainage facilities were split in half.

1951
Berliner Stadtentwässerung in East Berlin merge to form Groß-Berliner Wasser- and Entwässerungswerke.

1964
Founding of VEB Wasserversorgung und Abwasserbehandlung Berlin in East Berlin.

1967
The public utility Berliner Stadtentwässerung was changed to a municipal company owned by the Berlin city government and renamed Berliner Entwässerungswerke in West Berlin.

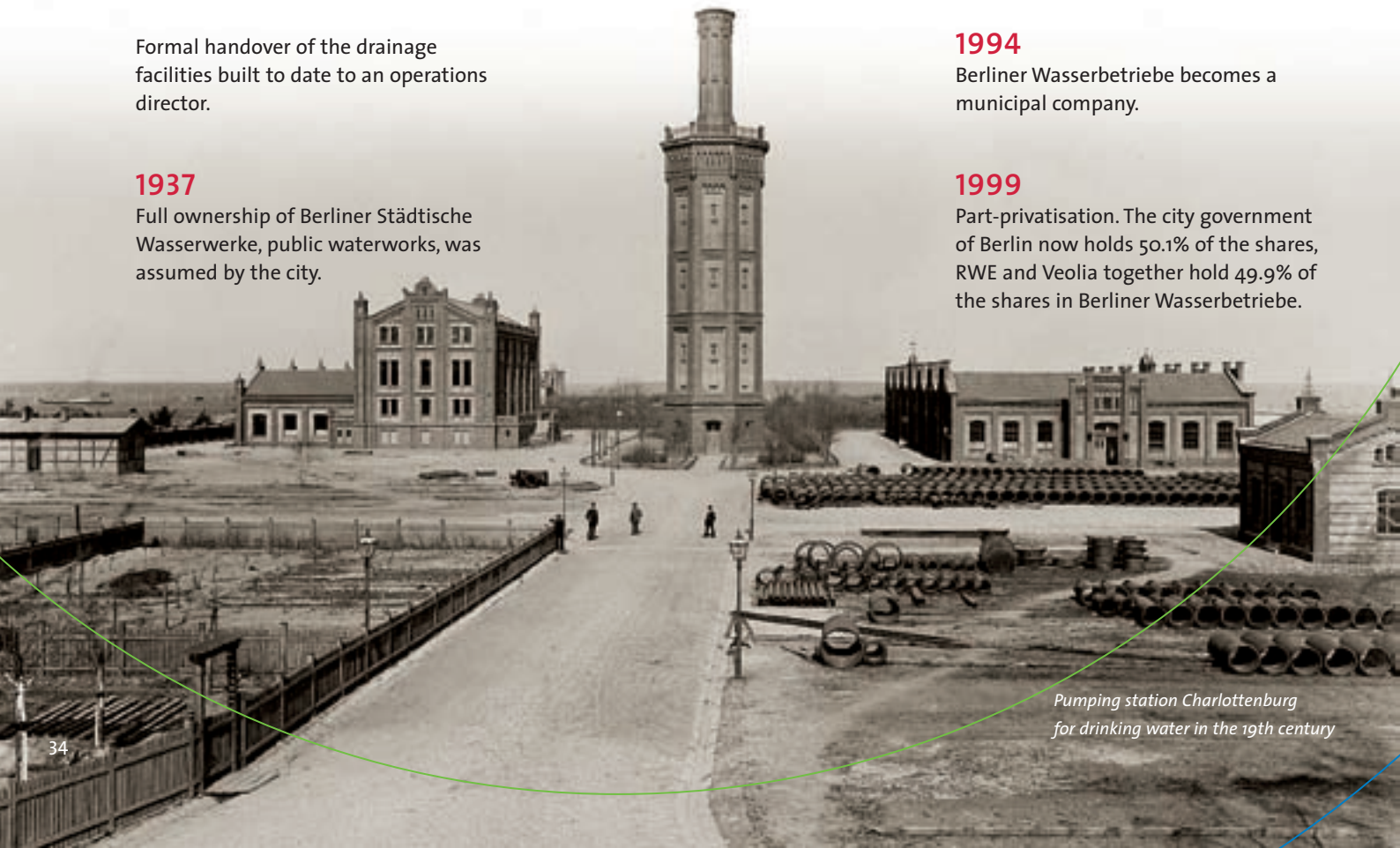
1988
Fusion der Berliner Wasserwerke und der Berliner Entwässerungswerke zu den Berliner Wasser-Betrieben in Berlin (West).

1990
Merger of Berliner Wasserwerke and Berliner Entwässerungswerke to form Berliner Wasser-Betriebe in West Berlin.

1992
Merger of Berliner Wasser-Betriebe and Wasserversorgung und Abwasserbehandlung Berlin to form today´s Berliner Wasserbetriebe.

1994
Berliner Wasserbetriebe becomes a municipal company.

1999
Part-privatisation. The city government of Berlin now holds 50.1% of the shares, RWE and Veolia together hold 49.9% of the shares in Berliner Wasserbetriebe.



Pumping station Charlottenburg for drinking water in the 19th century

One number serves all

0800 292 75 87

0800 bwb plus

This free telephone number provides a central entry point to the water utility's services.

Here you can ask all your questions regarding water-delivery or drainage contracts, invoices and payment. Additionally, we also answer all basic enquiries regarding private connections and water meters. You can also call to tell us your counter reading for invoicing, as well as to receive information on the quality of water and general information on water and Berliner Wasserbetriebe.

This service is available from **Monday to Friday, 7 am to 8 pm.** You can reach the emergency repair service department at the number above round the clock.

If you want to contact our customer service by e-mail, the address is **service@bwb.de**.

Information, instructions and the online service of Berliner Wasserbetriebe are all available round the clock at **www.bwb.de**.

You can arrange for tours of the waterworks and sewage treatment plants at **fuehrungen@bwb.de** or by calling directly. Our number is **+49 30 86 44 63 93.**

You can also get information on the 150-years history of water supply and sewage treatment in Berlin by visiting the museum in the waterworks at Müggelseedamm 307, 12587 Berlin. **www.museum-im-wasserwerk.de**.

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