Bavarian Environment Agency

Checklist and recommended courses of action

for safe and reliable drinking water supply by small water utilities in Bavaria

wasser

der Bundeswehr Universität München

Bavarian Environment
Agency

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Water Supply in Bavaria by Small Water Utilities – Challenges for the Future

Is our water supply on solid foundations?

Public water supply in Bavaria is characterised by a large number of small water utilities and waterworks. These small water utilities are currently facing various challenges, as does the German and Bavarian water supply sector as a whole. These include more stringent quality requirements, ageing waterworks, as well as adjustments of the supply system, which are required due to the effects of climate change and the demographic development of the population within the supply area. In many areas, a fall in the demand of water and the subsequent decrease in revenue comes with an increase in costs due to stricter requirements which the water supply has to meet.

Sustainable, economical, with legal certainty

That is not, however, the only reason why water utilities are required, more than ever, to continually question current circumstances and optimise the economic efficiency and sustainability of their businesses. The goal must be to provide a water supply to the **customer** which is **sustainable, safe and reliable and follows economic principles**! As part of this process, each water utility should answer the following crucial questions for itself:

- Do the waterworks and operations management comply with current regulations?
- Does revenue from the service charge and the basic fee cover the accrued costs for the water supply?
- Are calculations for the water supply transparent and easy to understand for the customer?

The content of this manual should be of fundamental interest to all water utilities.The selection of topics in this publicaton is primarily aimed at small to very small water utilities in Bavaria with a water delivery of less than 100,000 m^3 per year (supply for a population of approx. 1,500). In these cases, the water supply is often in the hands of a few people, who are responsible for all areas of the water supply and resources including the technical structure and calculation.

By looking at the following **key issues of water supply**, the status quo of your own water supply can be determined with manageable effort and expense! Existing fundamental legal or technical shortcomings can thus be identified and appropriate measures for the improvement of the status quo can subsequently be introduced by following the **recommended courses of action**.

As an initial step, every water utility can work through the following „key issues for water supply“ and determine the existing qualification levels of staff in the business, the state of the waterworks and the organisational structure of the company. The „key issues for water supply“ represent a selection of the important points of a comprehensive checklist, which can be found in Appendix 2. This selection should enable every water utility to address this important issue with a minimum time investment.

This checklist is only intended for internal use on an individual basis by the respective business! It does not claim to be exhaustive and does not replace regulations; rather, it represents a cross section of the most important requirements for a safe and reliable drinking water supply. The listed requirements comply with the specifications, which exist in a more detailed form in in the valid legal policies, standards and guidelines. A comprehensive list of rules and regulations is available to members of the German Technical and Scientific Association for Gas and Water (*DVGW – Deutscher Verein des Gas- und Wasserfaches e.V.* www.dvgw.de/angebote-leistungen/regelwerk/regelwerk-online) on the website.

How the effects of various measures (e.g. construction of a new water tank, modernisation of the pipeline network) on the „water price“ or the „water fees“ (refer Chapter 3.1) can be roughly estimated by using simple means is shown in the **calculation examples in Chapter 3** which follow the chapter on recommended courses of action.

The current checklist, as well as, the recommended actions stem from the Bavarian Environment Agency (LfU) project „Limitations of the Economic Efficiency of Smaller Water Utilities with regard to Requirements and Security of Supply „, in which the University of the German Federal Armed Forces in Munich has inspected 25 „smaller“ water utilities. A detailed description and the background of the related University of the German Federal Armed Forces in Munich project can be found in Appendix 1.

1 Key issues for water supply – checklist extract

Key points of fundamental importance for a safe and reliable water supply are compiled here. These key issues for water supply represent an extract of important guidelines from the detailed checklist, which can be found in Appendix 2.

Every water utility should work through the following list and determine the existing qualification levels of staff in their company, the state of the waterworks and the organisational structure of the company. A tick in the „Yes“ box means that the relevant requirement is fulfilled. If the answer is „No“, a deficit is identified from which a corresponding need for explanation or action can be derived. The column headed „Basis“, refers to the relevant set of rules (standard or guideline).

1.1 Members of staff

No.	Description	Based on	Yes	No
1	The technical manager and all employees have the required qualifications according to the *DVGW W 1000**, refer Figure 1.	*W 1000**	☐	☐

water utility	• without own water extraction • without own water treatment • only water distribution	A1	plant mechanic, field of application: pipe system technology; plant mechanic specialised in supply technology certifiied network technician in the field ofwater or equivalent
	• with own water extraction • with simple water treatment**) • with water distribution	A2	specialist in water supply technology; supply and disposal specialist for the field of water supply or equivalent
	• with own water extraction • with more extensive water treatment • with water distribution	B2	certified master technician in the field of water; certificed technician specialised in supply technology or equivalent

**) A simple form of water treatment within the context of this information sheet is limited to deacidification, deferrization and manganese removal

Figure 1: Minimum qualification requirements for a technical manager of a water utility, supplying a population up to 5,000 (according to *DVGW W 1000* (2016-01))

No.	Description	Based on	Yes	No
2	All employees are able to fulfill their assigned tasks (e.g. capacity utilisation, equipment, decision-making competence).	*W 1000**	☐	☐
3	All employees are informed about the current status of relevant legislation, accident prevention regulations, technical rules and company-specific instructions in relation to their area of responsibility and can refer to these documents at any time.	*W 1000**	☐	☐
4	All technical staff extend their knowledge through advanced training, further development and training measures in their perceived areas of specialised task.	*W 1000**	☐	☐

* DVGW – Standard

1.2 Qualitative safety and reliability of supply

No.	Description	Based on	Yes	No
1	There is knowledge of water quality and the potential changes in its quality in the pipe network.	*W 400-3**	☐	☐

* DVGW – Standard

1.3 Quantitative safety and reliability of supply

No.	Description	Based on	Yes	No
1	There is redundancy in the extraction (two independent catchment areas or interconnection with neighbouring suppliers).		☐	☐
2	There is an action plan existing for the event of insufficient availability of high quality drinking water, as demanded by Article 16 paragraph (5) Drinking Water Ordinance (§ 16 Abs. 5 TrinkwV).	*W 1000* / W 1020* / TrinkwV***	☐	☐

* DVGW – Standard
** TrinkwV – Drinking Water Ordinance (Trinkwasserverordnung)

1.4 General technical guidelines

No.	Description	Based on	Yes	No
1	Buildings related to drinking water supply must be protected from unauthorised interference.	*W 1050**	☐	☐

* DVGW – Standard

1.5 Facilities for water supply

1.5.1 Water extraction

No.	Description	Based on	Yes	No
1	A designated water protection area is in operation which complies with the current requirements in relation to the extent and "catalogue of prohibitions" (information and collaboration with Regional State Office for Water Management (WWA)).	*W 101* / LfU-Merk-blatt 1.2/7***	☐	☐
2	Water extraction facilities are protected against unauthorised access by means of object protection devices, alarm messages are sent to a permanently manned unit.	*W 101* / W 1050**	☐	☐
3	Regular visual inspections of the catchment area, the closing-off structure, the borehole construction as well as borehole installations are carried out and are documented.	*W 125**	☐	☐
4	An operating logbook is kept.	*W 127* / EÜV****	☐	☐

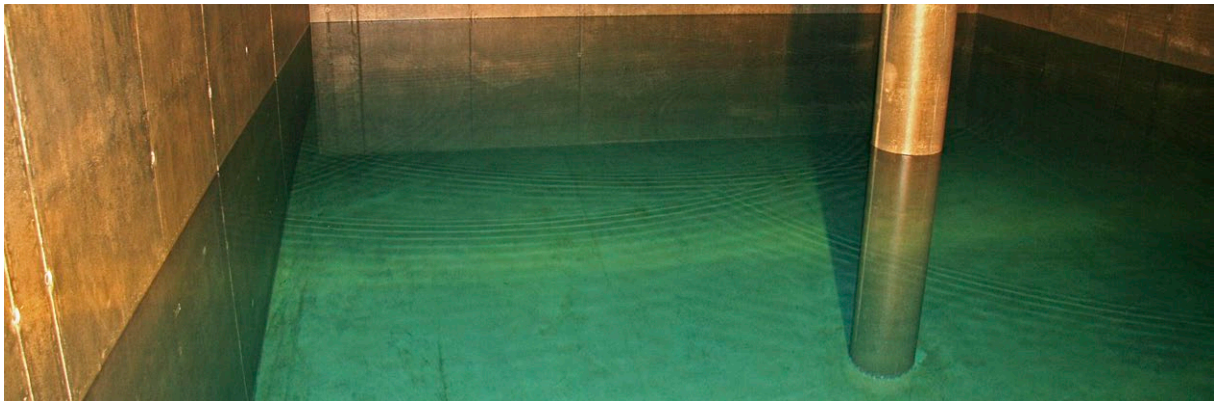
* DVGW – Standard
** LfU-Merkblatt 1.2/7 – Bavarian Environment Agency Information Sheet
*** EÜV – Regulation on self-monitoring (Eigenüberwachungsverordnung)

1.5.2 Water treatment

No.	Description	Based on	Yes	No
1	The required quality of the drinking water is guaranteed in accordance with the Drinking Water Ordinance even in the case of poor raw water quality occurring at a time of maximum utilisation of the plant.	*W 202 (A)**	☐	☐
2	The raw and drinking water is regularly tested in accordance with the Drinking Water Ordinance (Trinkwasserverordnung).	*W 202 (A)* / TrinkwV 2001** / EÜV****	☐	☐
3	In the event of a disinfection facility failure, sufficient disinfection is possible (redundant or mobile systems).	*W 290**	☐	☐

* DVGW – Standard
** TrinkwV – Drinking Water Ordinance (Trinkwasserverordnung)
*** EÜV – Regulation on self-monitoring (Eigenüberwachungsverordnung)

1.5.3 Water storage



No.	Description	Based on	Yes	No
1	As a rule, the water reservoir consists of at least two chambers.	*W 300-1**	☐	☐
2	Access to the water chamber is not directly above the uncovered water surface.	*W 300-1**	☐	☐
3	The surfaces of the water-bearing surfaces of the water reservoir are in good condition, dimensionally stable and watertight.	*W 300-2**	☐	☐

* DVGW – Standard

1.5.4 Water distribution

No.	Description	Based on	Yes	No
1	The pipeline network is up-to-date (recommendation: changes for the previous two years have been incorporated).	*GW 120 (A)**	☐	☐
2	Regular inspections and maintenance of the operating equipment and parts are carried out.	*W 392* (Table 2)*	☐	☐
3	To monitor the distribution system (determination of water losses, early detection of pipe damage, data generation for the planning of maintenance work) the quantity of delivered water is measured.	*W 400-3**	☐	☐
4	Once a year, every valve is put into operation.	*W 392**	☐	☐
5	Parts of plants located on third-party, private property are secured through easements.		☐	☐

* DVGW – Standard

1.6 Operational and organisational security

1.6.1 Management systems

No.	Description	Based on	Yes	No
1	The company has documented its instructions for action in a operation and organisational manual for its employees.	*W 400-3**	☐	☐
2	The causes of faults are documented.	*W 1000**	☐	☐
3	There are instructions for the immediate elimination of faults and the restoration of operation.	*W 1000**	☐	☐
4	Responsibilities and authority of the employees during the provision of services are clearly regulated and documented.	*GW 1200**	☐	☐
5	The company is involved in benchmarking projects.	*W 400-3**	☐	☐

* DVGW – Standard

1.6.2 Fault-clearing stations

No.	Description	Based on	Yes	No
1	There is a twenty-four-hour emergency service for repairing faults.	*GW 1200* / DIN 2000***	☐	☐
2	The telephone number of the fault-clearing station is known to the public (e.g. telephone book, sticker/tag on gas/water meter, listed in customer information sheets and customer magazines, signs, signposts).	*GW 1200**	☐	☐
3	Every incoming fault message is documented in a comprehensive manner.	*GW 1200**	☐	☐

* DVGW – Standard
** DIN – German Institute for Standardization (Deutsches Institut für Normung e.V.)

1.6.3 Customer information and complaint management

No.	Description	Based on	Yes	No
1	Information on the origin and quality of the water, preparation, pricing, investments, compensation payments, etc. are available for the customers (e.g. contact person, website of the water utility).		☐	☐
2	A contact person for complaints is known to the customer.		☐	☐

1.6.4 Collaborations

No.	Description	Based on	Yes	No
1	The scope of entering into collaboration with neighbouring utilites (e.g. fault clearance service, staff qualification, purchasing of materials…) for the purpose of optimisation the has been examined in order to optimise the expert and competent execution of important tasks in the provision of drinking water supply.	*W 1000**	☐	☐

* DVGW – Standard

1.7 Legal and business basics

No.	Description	Based on	Yes	No
1	The permit or approval required under water law is valid.	*WHG**	☐	☐
2	Requirements in accordance with the water law permit or approval are fulfilled.		☐	☐
3	Appropriate, fair depreciation of acquisition and production costs or of replacement cost was carried out.	*KAG***	☐	☐
4	The last calculation of water fees took place less than 4 years ago.	*KAG***	☐	☐
5	The calculation is based on cost recovery.	*KAG***	☐	☐

* WHG – Federal Water Act (Wasserhaushaltsgesetz)
** KAG - Community Charges Act (Kommunalabgabengesetz)

A more comprehensive audit of your water utility can be carried out using the detailed checklist in Appendix 2.

2 Recommended courses of action for small water utilities

Every water utility should be firmly based on three pillars:

- Safe and reliable resources
- Safe and reliable technical structure
- Safe and reliable operational organisation

Within the scope of the project „Limitations of the Economy of Small Water Utilities with regard to the Requirements and Reliability of Supply“ conducted by the University of the German Federal Armed Forces in Munich, a large amount of data was collected from a selection of small water utilities in Bavaria. As a result, it was possible to identify areas in which there is either a need for action in the case of many water utilities, or in which companies stood out by their positive attitude towards other suppliers.

This results in the following key areas for action with associated recommendations for small water utilities, which support a safe and reliable supply of drinking water to customers. Here, only the most pressing recommendations are cited!

A step-by-step review should be carried out using the checklist (key questions under point no. 1 or, in more detail, in Appendix 2) and the following recommended courses of action, to assess the need for action which will optimise the current situation. Checklist and recommended courses of action are no substitute for the perusal and application of the rules.

Even a journey of a thousand miles begins with a single step

(Lao Tzu)

2.1 Staff situation

The biggest influencing factor on safe and reliable water supply is the **staff** employed by each and every water utility. The technical manager and technical staff must be trained and qualified according to the requirements of the currently applicable specifications (refer Figure 1). Exceptions apply to technical managerial staff (usually known as water officers (*Wasserwarte*)) who have been employed in their position since before the year 2000.

In addition, the possibility of employing sufficiently qualified staff should be considered by **collaborating** with other water utilities!

Regular staff training must be carried out!

- Qualified staff
- Introduction and implementation of innovations into your own water supply system by trained staff.
- Legal certainty by complying with the applicable set of rules.

2.2 Water utilities

- Water treatment

Drinking water should be delivered to the customer in a state of natural purity. **Water treatment**, which is required due to previous contamination by human activity (e.g. nitrate), should always be regarded as a **last resort solution**. This should always be the **exception / transitional** solution.

If the rehabilitation of water production is not possible in the long term, a closure and an alternative possibility of water extraction (e.g. new borehole, collaboration with neighbouring water utilities) should be considered.

- Supply of naturally pure drinking water to the customer
- No cost for treatment

To ensure safe and reliable disinfection, the specified maximum **turbidity values in the raw water** (Federal Enviromental Agency, 2012) must be complied with (even after, for example, long dry periods followed by torrential rainfall).

- Safe and reliabe disinfection
- Reducing the risk of pathogens in drinking water delivered to customers.
- Legal certainity

- Supply Network

To guarantee **continuing improvement of the supply network status**, objectives for the condition should be determined. A concept for future pipeline renewal should follow these objectives. The potential necessity for having to renew major parts of the supply system at the same time can be avoided by following a **condition-based maintenance strategy** (which means carrying out targeted repairs following inspections of the supply network). An average net renewal rate of approx. 1.5 % per year is recommended.

- Sustainable network planning
- No future excessive financial demands due to imminent „complete refurbishment“
- Reduction of network losses

Updated loss statistics should be kept, particularly in relation to the analysis of **non-revenue water**. The aim should be to achieve a reduction of specific losses within a range of <0.05 m^3/km*h (for a rural community, this equates to „small losses“ according to the DVGW W 392, Table 4). As-built drawings of the pipeline network are a basic prerequisite not only for this situation.

- Savings on energy costs for water extraction, material costs etc. if water treatment is required
- Overview of damage black spots in the pipeline network

An important parameter, for example, for the pipeline network is the **daily and hourly peak** demand for water. This data should be collected and documented.

- Correct dimensioning of system components for peak demand

2.3 Organisation

The water utility should translate the rules set out in the regulation into specific instructions for its own company and summarise these in an **operational and organisational manual**. As a minimum requirement according to the Drinking Water Ordinance, **action plans** for possible scenarios that could occur in the field of water supply need to be checked with regard to their level of up-to-dateness.

- Clear and well-thought-out approach to exceptional situations
- Clear allocation of tasks to employees

In all areas of water supply, the compilation and maintenance of documentation is highly recommended (e.g. pipeline network, complaints management, facility management). It is obvious that good documentation requires a great deal of motivation since additional effort and expenditure is required initially which will only pay off at a later date. However, there are a number of advantages which should not be underestimated.

- Overview of all aspects of water supply
- Faster solutions to occuring problems
- When handing over tasks, new staff do not have to start from the beginning
- In the area of complaint management, reliable information can be given to customers, thus ensuring customer satisfaction
- An increase in the number of problems in certain areas can be detected at an early stage
- Customer queries can be answered quickly and verifiably
- Inquires by authorities can be answered in a comprehensible manner
- Basis for the entry into a benchmark survey

Collaborations should not be confined to the field of purchasing material. In order to meet the requirements for employee qualification and to fulfil the tasks of the fault clearance service, it is often useful to collaborate with neighbouring water utilities, e.g. via special-purpose agreement[1] or operational management contracts. Further options can be found in the **Code of Practice** for water utilities "**Operational Collaboration**" (September 1999; a few remaining copies are still available from the Bavarian Environment Agency, Unit 95). This Code of Practice is currently being revised.

1 Refer to Act on Communal Cooperation (KommZG) in the version officially published on 20 June 1994, as last amended on 22 December 2015.

- Ensuring the required employee qualifications
- Reduction of costs
- Increased operational safety and reliability
- Regulated holiday replacements

In order to ensure reliable supply to the customer, if it is not yet available, a redundancy in the water supply needs to be created. Therefore, the wateradministration recommends a **„second, independent pillar“**, for the water availability (water extraction or external procurement).

- Increased safety and reliability of supply

Planning which is not limited to one's own area of supply can provide certain advantages e.g. when using the same ground water body. In this way, one can better assess the supposed safety, reliability and redundancy through a joint analysis of the catchment area or develop solutions for additional safety and reliability measures in form of **Interconnections**.

- Increased safety and reliability of supply
- Regional risk assessment of impacts on a jointly used groundwater body

Within buildings and structures of the water supply, also in the case of older waterworks, the currently valid interests of '**Health and Safety at Work**' are to be implemented. This applies, in particular, to the area of **stepladders**, the wearing of protective clothing and ensuring equipment safety.

- Minimising workplace hazards
- Exercising duty of care to their employees
- Compliance with the derectives on Health and Safety at Work and with the requirements on Occupational Health and Safety.

The implementation of **expert support** for the construction of new facilities is strongly advised. The authorities responsible for planning and implementation should be involved at an early stage. Further information on the new construction and refurbishment of water supply systems is available in the Bavarian Enviroment Agency (*LfU – Landesamt für Umwelt*) brochure „Saving Costs and Energy in Drinking Water Supply“ (Bavarian Enviroment Agency, 2015).

- Elimination of error during the planning phase of water supply systems
- Cost savings through avoidance of oversizing
- Cost savings through reduction in refurbishment requirements.

Participation in the Assessment of Efficiency and Quality of Municipal Water Supply in Bavaria (*Effizienz- und Qualitätsuntersuchung der kommunalen Wasserversorgung in Bayern (EffWB)*) can assist small water utilities to optimise processes and it supports the specifically targeted development of water utilities. As part of this **benchmarking** project, Bavarian water utilities can compare themselves with other companies on a voluntary and anonymous basis, thereby identifying their potential internal shortcomings (refer also Chapter 3.4, *Calculation Examples, Scenario VI*).

- Comprehensive data collection in the water utility
- Independent assessment of one's own company through experts
- Identification of optimisation potential

2.4 Legal requirements

The **validity** and the degree of implementation of the content of the **water law permit/approval should be checked**.

- Resource protection
- Compliance with regulatory framework

It should be checked whether the **water protection areas** comply with the current requirements.

- Sustainable resource protection
- Reduced costs in water treatment

2.5 Billing

According Article 8 paragraph (6) sentence 1 of the (*KAG - Kommunalabgabengesetz*), a calculation of the water charge should be carried out, if the current one is elder than four years.

- Current calculation of charges
- Compliance with the regulatory framework in accordance with the Community Charges Act (*KAG - Kommunalabgabengesetz*)
- Ensuring the required cost coverage

For the calculation, the **depreciation periods** for the individual system components should be determined appropriately. For example, pumps generally have a shorter technical life span than pipelines[1].

1 References:
1) Ecker, Kommunalabgaben in Bayern, RdNr. 5.4.5; AfA-Table for the industry sector „Energy- and Water Supply“ www.bundesfinanzministerium.de/Web/DE/Themen/Steuern/Steuerverwaltungu-Steuerrecht/Betriebspruefung/AfA_Tabellen/afa_tabellen.html
2) Thimet (Hrsg.), Kommunalabgaben- und Ortsrecht in Bayern. Praxiskommentar und Satzungsmuster mit Erläuterungen, Loseblatt

- Including the life span of facility components in the calculation

The **depreciation and residual book values** of the water supply facilities should be updated accordingly.

- Current knowledge of the book value of the water supply facilities for the calculation
- Current values for the items depreciation and interest which are included in the calculation

Depreciation can be taken into acccount by a cost calculation, based on the **acquisition and production costs** or on the **current replacement values** (refer Chapter 3.3).

- Depreciation on the current replacement value allows the creation of a „financial base“ for upcoming refurbishments

A **calculation** according to the provisions of the Community Charges Act (*KAG - Kommunalabgabengesetz*) is also offered by third parties e.g. agencies for public consulting.

- Preparation of calculation by experts
- Legal certainity in case of further appraisal by external bodies

The following chapter provides information on the calculation of charges and seven different scenarios with different effects on water consumption fees.

3 Calculation of charges – fundamentals and calculation examples

3.1 Prices and fees

The legal system differentiates the charges, which the consumer has to pay for the supply of water, in prices and water fees, depending on whether the water supply is organised under **private law (prices)** or whether it is under **public law (water fees)**.

In order to determine the fees, comprehensive statutory regulations are set out in the Community Charges Act (*KAG - Kommunalabgabengesetz*) and the municipal byelaws of the states. In accordance with established case law, the principles of the calculation of water fees are also applicable to the calculation of prices. In this publication, only the term „water fees“ will be used hereinafter.

3.2 Fundamentals of the Community Charges Act (KAG - Kommunalabgabengesetz)

Basically, according to the Community Charges Act (*KAG - Kommunalabgabengesetz*), the following interstate principles apply to the calculation of water fees:

The **principle of proportionality**, i.e. the fees must be proportionate to the service rendered.

The **principle of cost recovery**, i.e. the water fees must cover long-term costs arising from the supply of drinking water and waste water disposal (EU Framework Directive).

The ban on cost **overrun**, i.e. the fees may not be significantly higher than is necessary to cover the cost of the facility.

The **principle of equality**, i.e. consumers must not be treated indiscriminately differently.

In principle, the costs to the water utility can be passed on to consumers via water fees (or prices) or also via **contributions** (in case of acquisition, production, improvement or renewal).

In business management, a distinction is made between two calculation principles, **the principle of net substance conservation** and the **principle of real capital preservation.** In case of the net-substance-conversation principle, investments made in the past are taken into account in the calculation by determining a replacement cost value for the components of the waterworks. In the case of the net-substance-conversation principle, the costs incurred in the past are depreciated over a certain period of time.

According Bavarian Community Charges Act (*Bay.KAG - Bayerisches Kommunalabgabengesetz* in the version published 4th of April 1993, last amended by the Act of 11th of March 2014), since 1st of August 2013 a calculation is possible based on both approaches.

3.3 Specific characteristics of the Bavarian KAG

According Article 8 paragraph (2) Bay.KAG the cost covering principle applies both to the upper limit and the lower limit for the calculation of water fees. Permanent below-cost selling contradicts the applicable EU legal framework and is neither in the interests of the water utilities nor of the municipalities. On the other hand, the debtor is obliged to use public water supply systems and drainage systems, which have been publicly financed. However, in this case, the debtor is identical with the consumer, which entails a binding obligation for the consumer to use the local water supply. For this case, cost recovery, laid down in Article 8(2) Bay.KAG therefore sets the upper limit for the calculation of the water fee.

The collection of a basic fee is permissible as long as this does not prevent adequate billing on the basis of metered consumption for the majority of consumers (Article 8(2) Bay.KAG). Calculation of the water fees on the basis of consumption must be linear and must serve the careful and economical use of water. For commercial enterprises, a water fees degression may be calculated if the enterprise implements water-saving measures (Article 8(5) Bay.KAG).

The calculation of water fees must be made in advance. Water fees may be calculated for a long-termperiod, which may not exceed four years. That means, water fees must be calculated anew at least every four years. A possible funding surplus of costs in the previous assessment period **must** be compensated for in the subsequent assessment period and a funding deficit of cost **shall** be compensated for in the subsequent assessment period (Article 8(6) Bay.KAG).

Depreciation:

It is recommended to include the item „depreciation for wear and tear" into the calculation of water fees. As of 1 August 2013, an amendment to the Bay.KAG came into effect. This amendment relates inter alia to Article 8(3) Bay.KAG. It states the following:

> *„[2]The depreciation is based on **acquisition and production costs or replacement values,** which must be reduced by contributions and similar charges and can be reduced by grants. [3]… [4]Additional proceeds resulting from a depreciation of replacement values compared with a depreciation of acquisition and production costs or from the fact that grants are not deducted shall be returned to the institution, including appropriate interest."*

The replacement value is the price which, at the relevant point in time, would have to be paid for an intended renewal of an existing facility with a facility of comparable type and quality.

Since the replacement costs are usually higher than the acquisition and production costs due to the inclusion of price increases, higher depreciation amounts than in the depreciation for acquisition and production costs are the result. The additional proceeds generated as a result of the above-mentioned amendment to the Bay.KAG are to be reintroduced to the institution as stated in the legislative text. The tax implications of the generation and use of such additional proceeds are dependent, inter alia, on the form of business organisation and should be examined separately for each respective situation, in particular, in relation to when corporate income tax and trade tax are due.

Example for the depreciation on acquisition and production costs:

A depreciation over the foreseeable utilisation period of the part of a facility, for example, if a new pump has an estimated working life expectancy of 10 years, the acquisition costs are depreciated over a period of 10 years. After this period, the investment part must be fully depreciated (100 %), so that the depreciation amount is calculated from the cost of production and the depreciation period (e.g. 10 years – in this case: 100 % in 10 years results in an annual amount of 10 % of the production costs). This is how the technical deterioration of facilities is factored into the calculation by means of depreciation. Uniform depreciation at a constant interest rate over the complete depreciation period is useful in avoiding high water fee fluctuations.

If a part of the facility reaches the end of its life expectancy sooner than anticipated, the residual value can be depreciated at a higher amount in the current calculation period. If, for example, a pump with an acquisition cost of € 10,000 and a planned working life expectancy of 10 years breaks down after five years (€ 5,000 have already been depreciated), and the next water fee calculation is only due in two years time, € 2,500 per year should be factored in for the next two years for the defective pump. Depreciation beyond the calculation period in which the plant had to be decommissioned is not permissible (Bavarian High Administrative Court (BayVGH), Judgment of 1 December 1997, Case no. 23 B. 96.851). In the case of very expensive facility parts, however, the increased

depreciation over a comparatively short period of time results in an increase in funding shortfall in the subsequent calculation, which can subsequently be included in the next calculation period.

Since depreciation quantifies the technical deterioration of the facility, the book value of the respective assets decreases each year by the depreciated amount (e.g. the above-mentioned pump has a residual value of € 10,000 in the first year and € 9,000 in the second year, then € 8,000, etc.).

Example for depreciation on replacement values:

In order to determine the price for the replacement of an existing facility part, there are several possibilities.

- Possibility 1: A planner determines the acquisition cost
- Possibility 2: Acquisition costs are determined by index method
- Possibility 3: Acquisition costs are determinedby quantitative method.

For the depreciation of replacement values, these values must be determined for the relevant valuation date. In order to avoid time-consuming and costly expert assessments, the index method and the quantity method have become established.

In the case of the quantitative method, all assets are calculated by type and quantity on the valuation date and multiplied by the unit prices valid at that time.

This method assumes that unit prices exist. It is not suitable for the calculation of special forms of construction.

The determination of replacement values according to the index method is particularly relevant (taken from gazette (AIIMBI) No 10/2013 p. 346).

Example:

In 1985, an office building with building costs of € 100,000 wasconstructed. This building was to be depreciated over a period of 40 years (€ 2,500 / a). Therefore, the residual book value as of 1 January 2016 amounts to € 22,500 (= € 100,000 - € 2,500 / a * 31 a) for a depreciation of the building over the past 31 years. This residual book value indicates the imputed value of the building after a usage period of 31 years. For 2025, a new office building is planned.

In order to create a „financial base“ for the construction of the new office building, the replacement value of the existing building will be included in the calculation. For this purpose, the announcement by the Bavarian Ministry of the Interior of 17 July 2013, Reference IB4-1521.1-50, is chosen as a basis for the construction price index. The price indices for the construction industry of the Federal Statistical Office in May 2015 form the basis for calculation.

The following indices are obtained:

Index year of commissioning 1985: 58 (Index 1)

Index calculation year 2014: 109,6 (Index 2)

$$\text{Replacement value} = \frac{\text{Acquisition and Production Costs} * \text{Index 2}}{\text{Index 1}}$$

$$\text{Replacement value} = \frac{€\ 100{,}000 * 109.6}{58}$$

Replacement value = € 188,966

Since the current building is depreciated over 40 years (depreciation on use 2.5 %), an amount of € 4,724 (= € 188,966 / 40 a) is set as an annual depreciation.

Conclusion of depreciation on acquisition and production costs in comparison with replacement values:

The total depreciation, net of all income subsidies and government grants since initial operation, equals the imputed depreciation. This amount is included in the water fee calculation on the cost side.

Compared to the € 2,500 annual depreciation on the acquisition and production costs for the office building, the amount then increases to € 4,724, which is entered into the calculation (refer Calculation Example Scenario I). In the case of the next calculation, the increased depreciation value on the replacement value is then re-adjusted and will iincrease again. In order to present this effect graphically, the above example assumes that the calculation is re-carried out every two years. As a result, the depreciation to be included in the calculation changes in accordance with the increase in the replacement value. This is illustrated in Figure 2.

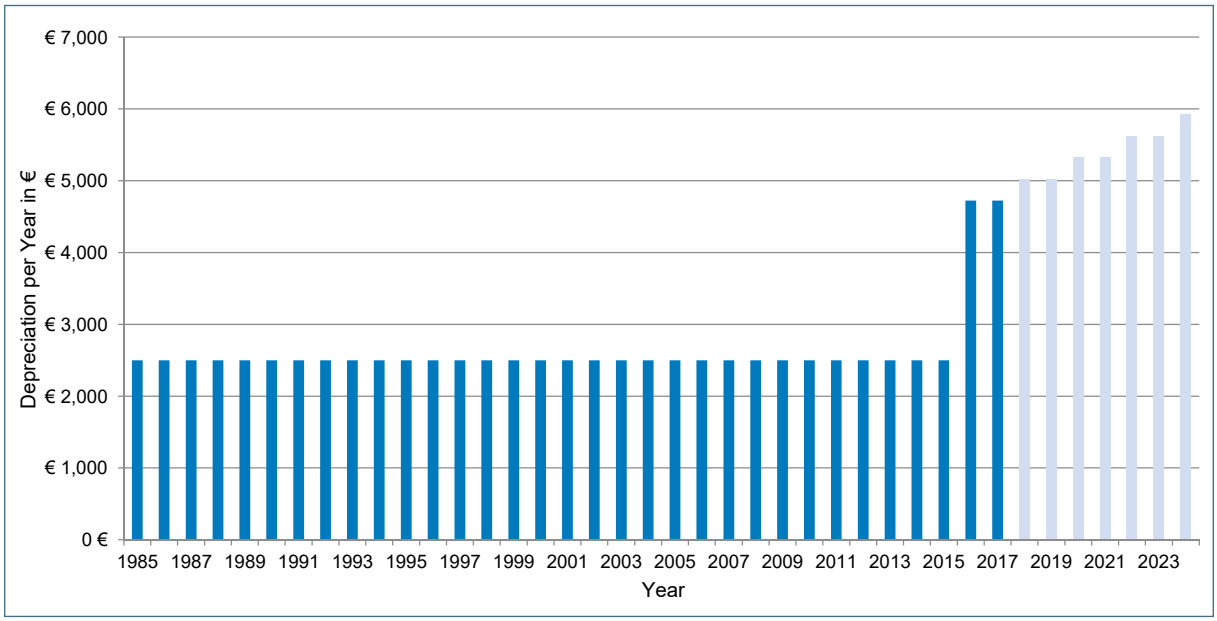


Figure 2: Amount of depreciation over time (from 1985 until 2015 on aquisition and production costs, since 2016 on the replacement value).

It becomes clear that, after just a few years, there is a considerable difference between depreciation on acquisition and production costs and depreciation on replacement values. This difference is, on the one hand, noticeable in higher water fees for customers and; on the other, the water utility can build up reserves, which can be used for investments at a later date. As previously mentioned, tax implications would need to be examined separately for each individual case. The example does not take into account any other taxes incurred, such as corporate income tax and trade tax.

3.4 Calculation

The total amount of all facility parts equals the book value of the company's capital which is tied up in fixed assets. This means that if the acquisition costs of the entire facility of the company were originally € 300,000 and a total of € 100,000 has been depreciated since initial operation of the facility the book value of the plant would be € 200,000. The book value of fixed assets minus income subsidies and government grants is subject to an imputed interest rate; the corresponding interest rates are also included in the calculation on the cost side. The level of „reasonable interest" paid as required by the legislator has not yet been the subject of water fees disputes, which is why no explicit legal framework exists. By entering the imputed interest on the cost side, the fee calculation takes into account that the company's capital is not freely available, but is tied-up in the facility and that, consequently, the company suffers losses in that this capital cannot be invested to generate interest earnings. The loss of value due to inflation is factored in at this point.

For the company, the following individual items may be found on the cost side:

- personnel cost,
- material cost,
- administrative costs,
- taxes,
- other taxes,
- imputed depreciation and
- imputed interest on the capital tied up in assets and, under certain circumstances,
- contribution due to funding shortfall of the previous four-year calculation period.

On the revenue side of the water fees calculation, invidual items such as the following may be found:

- basic fee
- water consumption fee,
- other income
- contribution due to funding surplus from the previous calculation period.

Calculation examples:

The influence of different measures on the water consumption fee is to be illustrated by means of seven fictional sample scenarios.

All figures are randomly chosen.

Conditions for all examples: All investments are financed by water fees and are not allocated to contributions!

Initial scenario – Scenario 0

The following basic conditions apply to the initial scenario:

- Company form: in-house operation
- Population: 1,700
- Household connections: 625
- Supplied volume: 75,000 m^3
- Water consumption fee: € 0.64 / m^3 (net)
- Basic fee: € 36.00 / a (net)
- Working hours of the water officer: 30 % of full-time equivalent

Funding shortfall in retrospect (from four-year calculation): € 52,000

Staff cost: Technician for water supply engineering: € 34,000 / a

Master technician in the field of water: € 38,400 / a

The imputed average annual depreciation is assumed in the Initial Scenario with € 17,325.

The interest on the invested capital is derived from the proof of assets and is determined using the half-value method[1] (interest rate of 50 % over the entire period). In the Initial Scenario, the interest is assumed to be € 15,750 per year.

The initial values of the **initial calculation** resulted from considerations within the last 4-year period (post-calculation). Based on these values, a new water fees calculation (pre-calculation) is now carried out.

In the initial calculation, with a water consumption fee of € 0.64 / m^3 and a basic water fee of € 36.00 /a remaining at the same level, an funding deficit of € 51,820 (Table 1) after the calculation period

(2015 – 2019) would occur if no further measures were taken.

For each scenario, expenditures distributed to the constant, supplied water quantity (75,000 m^3), with the basic fee remaining at its level. Thus, a new water consumption fee is calculated for each scenario.

1 for methods for calculating interest in detail, refer to Nitsche, Vermögensnachweis und kalkulatorische Kosten nach der KommHV, Nr. 135 ff.

Table 1: Initial calculation – Scenario 0

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		0.64	0.64	0.64	0.64
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculations	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.3 of full-time equivalent - FTE)	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 17,325	€ 17,325	€ 17,325	€ 17,325
Average return on invested capital	€ 15,750	€ 15,750	€ 15,750	€ 15,750	€ 15,750
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Cost for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection fees	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENDITURE		**€ 83,455**	**€ 83,455**	**€ 83,455**	**€ 83,455**
Revenue from usage fees		€ 48,000	€ 48,000	€ 48,000	€ 48,000
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 70,500**	**€ 70,500**	**€ 70,500**	**€ 70,500**
Total		**€ -12,955**	**€ -12,955**	**€ -12,955**	**€ -12,955**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -51,820**

Overview of the following calculation scenarios:

Scenario I: Compared to the initial situation, a cost-covering water consumption fee is to be levied. A new office building is planned for 2025 (comparison of depreciation on acquisition and production costs and replacement values).

Scenario II: Compared to the initial situation, a cost-covering water consumption fee is to be levied and an existing water storage tank was renovated internally (depreciation on acquisition and production costs).

Scenario III: In addition to Scenario II, more extensive treatment increases the specialist demands on the staff, and the proportion of working hours within the supply of water in relation to the total working hours in the company rises from 30 % (0.3 FTE) to 40 % (0.4 FTE)).

Scenario IV: In addition to Scenario III, a redundancy for the water supply was created. This „second pillar“ consists of a transition structure and a 1,000 m connecting pipeline (depreciation on acquisition and production costs).

Scenario V: In addition to Scenario IV, a pipe network of 50 m needs to be repaired. This does not constitute an investment and must therefore be included and completed within the four-year period.

Scenario VI: In addition to Scenario IV, participation in benchmarking requires the implementation of a reporting body; an operation and organisation manual is to be implemented and this measure is to be certified using the technical safety management system TSM.

Scenario VII: Compared to the initial situation, a cost-covering water consumption fee is to be levied and the local network is to be renewed. The main and supply lines of the local network have a length of 6 km (depreciation on acquisition and production costs).

Scenario I (Comparison of depreciation methods: depreciation on acquisition and production costs versus depreciation on replacement value):

Compared to the initial scenario, a **cost-covering water consumption fee** is to be levied. In 1985, an office building was built amounting to € 100,000. This building is depreciated over a period of 40 years (€ 2,500 / a). As a result, the remaining book value as of 1 January 2016 amounts to € 22,500 (= € 100,000 - € 31,000 * € 2,500 / a). **A complete renovation of this building is planned for 2025**.

The following two methods show how depreciation on replacement values differs from depreciation on acquisition and production costs.

Method 1: Depreciation on acquisition and production costs

Since the office building will no longer be used after 2025, an annual depreciation of € 2,500 will be included into the calculation (Table 2 in line „Average Depreciation“, already includes € 17,325). Since a cost-covering water fee was calculated in comparison to the initial scenario, it rises from

€ 0.64 / m³ to € 0.812 / m³ (Table 2).

This would mean an additional **annual** cost of € 31.39 for a household of four persons with a daily water consumption of 125 l per day and per person compared with the initial situation.

However, with the new office building, there would be a sharp rise in fees as of 2020 as the costs for the new building would have to be included into the calculation. These costs would increase additionally by the interest due for a loan on the construction sum, since it is assumed that the building must be financed 100 % through a bank loan.

Table 2: Scenario I Method 1 (depreciation on acquisition and production costs)

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		0.812	0.812	0.812	0.812
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculations	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.3 of full-time equivalent - FTE)	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 17,325	€ 17,325	€ 17,325	€ 17,325
Average return on invested capital	€ 15,750	€ 15,750	€ 15,750	€ 15,750	€ 15,750
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Cost for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection fees	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENDITURE		**€ 83,455**	**€ 83,455**	**€ 83,455**	**€ 83,455**
Revenue usage fees		€ 60,900	€ 60,900	€ 60,900	€ 60,900
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 83,400**	**€ 83,400**	**€ 83,400**	**€ 83,400**
Total		**€ -55**	**€ -55**	**€ -55**	**€ -55**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -220**

Method 2: Depreciation of the office building to be renovated on replacement values

In order to save money for the renovation of the office building, the planned office building is included in the calculation with replacement values in the next calculation cycle. For this purpose, the building price index according to the announcement by the Bavarian Ministry of the Interior from 17 July 2013 Reference: IB4-1521.1-50 is chosen as the benchmark. Price indices for the construction industry by the Federal Statistical Office dated May 2015 are the basis.

The following indices apply:

Index Year of Intial Operation 1985: 58 (Index 1)

Index Calculation 2014: 109,6 (Index 2)

$$\text{Replacement value} = \frac{\text{Acquisition and Production Costs} * \text{Index 2}}{\text{Index 1}}$$

$$\text{Replacement value} = \frac{€\ 100{,}000 * 109.6}{58}$$

Replacement value = € 188,966

Depreciation on replacement value = € 188,966 * 2.5 % = € 4,724

The new depreciation for the calculation is as follows: € 17,325 – € 2,500 (depreciation acquisition and production costs) + € 4,724 (depreciation replacement value) = € 19,549

If this measure is included in the calculation, water consumption fees increase in comparison to the Method 1 „depreciation on acquisition and production cost" to € 0.03 from € 0.812 / m^3 to € 0.842 / m^3 with the basic fees remaining equal. (Table 3).

This would mean an additional **annual** cost of € 5.48 for a household with four persons and a daily water consumption of 125 l per person per day as opposed to Method 1. Compared to the initial scenario, annual costs would increase by € 36.87.

The water utility, in return, could generate increased proceeds for the office building amounting to € 2,250 (= (€ 0.842 - € 0.812) * 75,000 m^3) per year. (refer to line „Revenue usage fees" of Tables 2 & 3). Thus, a minimum of € 20,250 (9 * € 2,250) could be saved by the end of the depreciation period in 2025. This amount may increase due to interest and subsequent calculations which are also based on depreciation on replacement value.

The difference between a depreciation on replacement values and a depreciation on acquisition and production costs is demonstrated in the following comparison:

	Replacement value	Acquisition and production costs
Revenue water utility	• increased	• constant
Profit water utility	• profit can be used for further investments	• none
Water fees	• increased	• constant
Interest for new loans	• reduced by the proportion of accumulated funds	• must be fully taken into account
Advantages	• saved from "initial capital" for future investments • gradual increase of water fees • planned ahead calculation	

Tax implications, particularly the decrease of corporate income tax and trade tax, which can result through depreciation on replacement values, are to be examined separately for each indvidual case!

Table 3: Scenario I Method 2 (replacement values)

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		0.842	0.842	0.842	0.842
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculation	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff cost (0.3 full-time equivalent - FTE)	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average Depreciation	€ 17,325	€ 19,549	€ 19,549	€ 19,549	€ 19,549
Average return on invested capital	€ 15,750	€ 15,750	€ 15,750	€ 15,750	€ 15,750
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and function al equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 85,679**	**€ 85,679**	**€ 85,679**	**€ 85,679**
Revenue usage fee		€ 63,150	€ 63,150	€ 63,150	€ 63,150
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 85,650**	**€ 85,650**	**€ 85,650**	**€ 85,650**
Total		**€ -29**	**€ -29**	**€ -29**	**€ -29**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -116**

Scenario II:
In comparison to the intial scenario, a **cost covering water consumption fee** is to be levied; additionally, **the coating of the inside of an existing water storage tank** was **renewed**.

Investment costs for the water storage tank (500 m^3):

A total of € 150,000 were spent on the coating of the tank, on hydraulic equipment, on electrical and remote control technology as well as on preparing the surface.

Depreciation on acquistion and production costs:

These measures are to be depreciated over a period of 30 years (depreciation on use = 3.33 %). This means a depreciation of € 5,000 per year for the water storage tank. The new average depreciation per year amounts to € 22,325 (€ 17,325 of the initial calculation + € 5,000).

For possible depreciation of replacement values, refer to Scenario I!

Interest:

In the case of the water storage tank, the interest according to the half-value method is equal to the interest-bearing capital which amounts to half of the production costs, i.e. € 75,000 on the capital bears interest at a rate of 4.5 %. Thus the value of the average interest on the invested capital increases by € 3,375 from € 15,750 (initial calculation) to € 19,125.

If these measures are included in the calculation, the water consumption fee increases in comparison to Scenario I by € 0.284 / m^3 from € 0.64 / m^3 to € 0.924 / m^3 with constant basic fee (Table 4).

Compared with the initial situation, additional **annual** costs of € 51.38 would be incurred for a household with four persons with a daily water consumption of 125 l per person per day.

Table 4: Scenario II

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		0.924	0.924	0.924	0.924
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculation	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.3 full-time equivalent - FTE)	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200
Electricity cost	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 22,325	€ 22,325	€ 22,325	€ 22,325
Average return on invested capital	€ 15,750	€ 19,125	€ 19,125	€ 19,125	€ 19,125
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection fees	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 91,830**	**€ 91,830**	**€ 91,830**	**€ 91,830**
Revenue from usage fee		€ 69,300	€ 69,300	€ 69,300	€ 69,300
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 91,800**	**€ 91,800**	**€ 91,800**	**€ 91,800**
Total		**€ -30**	**€ -30**	**€ -30**	**€ -30**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -120**

Scenario III:
More extensive treatment increases the specialist demands on the staff, and the proportion of working hours within the supply of water in relation to the total working hours in the company rises from 30 % (0.3 FTE) to 40 % (0.4 FTE)).

Therefore, the staff costs for the water utility increase by € 5,160 from € 10,200 for a supply engineering technician to € 15,360 for a trained master technician in the field of water.

If these measures are included in the calculation, the water consumption fee increases in comparison to Scenario II by € 0.069 / m^3 from € 0.924 / m^3 to € 0.993 / m^3 with constant basic fee (Table 5).

Compared with the Scenario II, additional **annual** costs of € 12.60 would be incurred for a household with four persons with a daily water consumption of 125 l per person per day.

Table 5: Scenario III

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		0.993	0.993	0.993	0.993
Basic fee € / a		36.00	36.00	36.00	36.00
Average deficit shortfall from previous four-year period calculations	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff cost (0.4 full-time equivalent - FTE)	€ 10,200	€ 15,360	€ 15,360	€ 15,360	€ 15,360
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 22,325	€ 22,325	€ 22,325	€ 22,325
Average return on invested capital	€ 15,750	€ 19,125	€ 19,125	€ 19,125	€ 19,125
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 96,990**	**€ 96,990**	**€ 96,990**	**€ 96,990**
Revenue from usage fee		€ 74,475	€ 74,475	€ 74,475	€ 74,475
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 96,975**	**€ 96,975**	**€ 96,975**	**€ 96,975**
Total		**€ -15**	**€ -15**	**€ -15**	**€ -15**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -60**

Scenario IV:

In addition to the measures described in Scenario III, a **redundancy for the water supply** was created. This „second pillar“ consists of a transition structure and 1,000 m connecting pipeline.

Investment costs for second pillar:

For the building, € 20,000 were invested for the construction and € 300,000 for the connecting pipeline.

Depreciation on acquisition and production costs:

These measurements are to be depreciated over a period of 50 years (depreciation for use = 2.00 %). This means a depreciation of € 6,400 per year for these measures. The new average depreciation amounts to € 28,725 per year (€ 22,325 (Scenario III) + € 6,400) according to the proof of assets.

For a possible depreciation on replacement values, refer Scenario I!

Interest:

In the case of second a pillar, the interest according to the half-value method is equal to the interest-bearing capital which amounts to half of the production costs, i.e. € 160,000. This capital bears interest at a rate of 4.5 % (amounting to € 7,200). Thus the value of the average interest on the invested capital thus increases by € 7,200 from € 19,125 (Scenario III) to € 26,325.

If these measure are included in the calculation, the water consumption fee increases in comparison to Scenario III by € 0.181 / m^3 from € 0.993 / m^3 to € 1.174 / m^3 with constant basic fee (Table 6).

Compared with Scenario III, additional **annual** costs of € 33.03 would be incurred for a household with four persons with a daily water consumption of 125 l per person per day.

Table 6: Scenario IV

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		1.174	1.174	1.174	1.174
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculation	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.3 full-time equivalent - FTE)	€ 10,200	€ 15,360	€ 15,360	€ 15,360	€ 15,360
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of motor vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average Depreciation	€ 17,325	€ 28,725	€ 28,725	€ 28,725	€ 28,725
Average return on invested capital	€ 15,750	€ 26,325	€ 26,325	€ 26,325	€ 26,325
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative & functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 110,590**	**€ 110,590**	**€ 110,590**	**€ 110,590**
Revenue from usage fee		€ 88,050	€ 88,050	€ 88,050	€ 88,050
Revenue from from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 110,550**	**€ 110,550**	**€ 110,550**	**€ 110,550**
Total		**€ -40**	**€ -40**	**€ -40**	**€ -40**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -160**

Scenario V:
In addition to the measures taken in Scenario IV, 50 m of pipeline network is to be repaired. This does not constitute an investment measure and, thus, must be included in and completed within the four-year period.

The repair costs are estimated at € 12,500 (i.e. approx. € 250 / m). This means, that these costs are included in the calculation at a rate of a quarter (€ 3,125) for each year as this measure must be completed within the four-year calculation period.

If this measure is included in the calculation, the water consumption fee increases in comparison to Scenario IV by € 0.042 / m^3 from € 1.174 / m^3 to € 1.216 / m^3 with constant basic fee (Table 7).

Compared with Scenario IV, additional **annual** costs of € 7.67 would be incurred for a household with four persons with a daily water consumption of 125 l per person per day.

Table 7: Scenario V

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		1.216	1.216	1.216	1.216
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculations	€ 52,000	13,000	13,000	13,000	13,000
Staff costs (0.3 full-time equivalent - FTE)	€ 10,200	€ 15,360	€ 15,360	€ 15,360	€ 15,360
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Repair pipeline network (50 m)		€ 3,125	€ 3,125	€ 3,125	€ 3,125
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 28,725	€ 28,725	€ 28,725	€ 28,725
Average return on invested capital	€ 15,750	€ 26,325	€ 26,325	€ 26,325	€ 26,325
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 113,715**	**€ 113,715**	**€ 113,715**	**€ 113,715**
Revenue from usage fee		€ 91,200	€ 91,200	€ 91,200	€ 91,200
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 113,700**	**€ 113,700**	**€ 113,700**	**€ 113,700**
Total		**€ -15**	**€ -15**	**€ -15**	**€ -15**
Funding surplus (+); funding deficit (-) after 4-year period:					**-60**

Scenario VI:
In addition to **Scenario IV**, there are plans for participating in a **benchmarking exercise**, for implementing a **reporting body**, and **implementing an operation and organisation manual**; this measure is to be certified in accordance with the technical safety management system **TSM**.

Participation in benchmarking:

Participation in the basic module benchmarking for water utilities with a network supply of up to 0.5 million m^3/a will cost approx. € 500. As a rule, the State of Bavaria will support participitation of this group of companies with a one-off payment of 500 € within the course of the triennial principle rounds. Hence, there will be no costs incurred by small water utilities except for the working time, the collection of data and filling in the data entry form. According to a circular issued by the Congress of Bavarian Municipalities (*Bayerischer Gemeindetag*) to all Bavarian municipalities dated 12 March 2009, the internal costs allocated to data collection amount to 8 working hours. As the resulting costs are so low, they can be covered by standard staff costs.

Setting up a reporting body:

The Gas and Water Standard GW 1200 issued by the German Association for Gas and Water (DVWG Arbeitsblatt GW 1200) forms the basis for a reporting body. If it can be assumed that smaller companies will have difficulties in providing the necessary staff and material resources, an appropriate collaboration with a neighbouring water utility is recommended.

In the following example, costs amounting to € 150 / week are budgeted for the transfer of this task to a neighbouring water utility (this equates to € 7,800 / year (€ 150 / week times 52 weeks)). The following is included:

- receiving reports
- during working hours: forwarding to the technical staff in charge
- outside of working hours: adopting measures to mitigate possible dangers

This collaboration comprises qualified support by the other water utility on request. Billing of this service is done on an hourly basis (€ 60 / h). In this example, it is assumed that a support of 5 hours per month is required. This equates to € 3,600 / year (€ 300 / month times 12 months). Thus, the annual costs amount to € 3,600 + € 7,800 = € 11,400.

Introduction and implementation of an operation and organisation manual:

The implemention of an operation and organisation manual requires staff and material resources as well as, if need be, consultancy services by a safety engineer.

In this example, the following costs for the implemention of an operation and organisation manual are budgeted:

Consulting service by safety engineer: 2 days at € 600	→ € 1,200
Purchase of operation and organisation manual	→ € 1,500
Hardware, Software (documentation)	→ € 3,000
	= € 5,700
Customising operation and organisation manual: + 0.1 full-time equivalent - FTE	→ € 5,160

Starting from the second year, only the staff costs of € 5,160, which increased by 0.1 full-time equivalent - FTE, are included in the calculation (new staff costs: € 15,360 (Scenario IV) + € 5,160 = € 20,520).

Certification of this measure by TSM (Technical Safety Management System):

Following their adoption and implementation of the operation and organisation manual, these measures are to be reviewed and confirmed by an external body. The cost of a certification amounts to approx. two times the daily rate of the examiner. This equates to approx. € 1,500. Furthermore, a basic charge of € 750 as well as € 700 are to be paid for the section, which relates specifically to drinking water. Hence, the total costs amount to € 2,950.

Compared with Scenario IV, the water consumption fee increases by € 0.25 / m^3 from € 1.174 / m^3 to € 1.424 / m^3 with constant basic fees if these measures are included in the calculation (Table 8).

Table 8: Scenario VI

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		1.424	1.424	1.424	1.424
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculations	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.5 full-time equivalent - FTE)	€ 10,200	€ 20,520	€ 20,520	€ 20,520	€ 20,520
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Services of reporting body		€ 11,400	€ 11,400	€ 11,400	€ 11,400
Preparation and implementation of operation and organisation manual		€ 5,700			
TSM certification		€ 2,950			
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 28,725	€ 28,725	€ 28,725	€ 28,725
Average return on invested capital	€ 15,750	€ 26,325	€ 26,325	€ 26,325	€ 26,325
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 135,800**	**€ 127,150**	**€ 127,150**	**€ 127,150**
Revenue from consumption fee		€ 106,800	€ 106,800	€ 106,800	€ 106,800
Income from basic fee		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 129,300**	**€ 129,300**	**€ 129,300**	**€ 129,300**
Total		**€ -6,500**	**€ 2,150**	**€ 2,150**	**€ 2,150**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -50**

The implementation of these measures for the improvement of the organisational security of the company would result in additional annual costs of € 45.63 for a household with four persons with a daily water consumption of 125 l per person per day as opposed to Scenario IV.

Scenario VII:
Compared to the initial scenario, **a cost-recovering water consumption fee** is to be levied and the **local pipeline network** is to be renewed. The main and supply pipes of the local pipeline network have a length of 6 km.

Investment costs for renewal of local pipeline network (6 km): € 900,000 are invested for the renewal

Depreciation on acquistion and production costs:

These measures are to be depreciated over 60 years (depreciation on use = 1.66 %). The depreciation on the new pipeline network amounts to € 15,000 per year. Compared with the initial scenario, the new average depreciation is € 32,325 per year (€ 17,325 (initial calculation) + € 15,000).

For a possible depreciation on replacement values, refer to Scenario I!

Interest:

In the case of the renewal of the pipeline network, the interest according to the half-value method is equal to the interest-bearing capital and, thus, amounts to half of the production costs, i.e. € 450,000. The capital bears interest at an interest rate of 4.5 %. Thus the value of the average interest on the invested capital increases to € 36,000 (€ 15,750 (initial calculation) + € 20,250).

If these measures are included in the calculation, the water consumption fee increases in comparison to Scenario IV by € 0.642 / m^3 from € 0.64 / m^3 to € 1.282 / m^3 with constant basic fee (Table 9).

Compared with the initial scenario, additional annual costs of € 117.17 would be incurred for a household with four persons with a daily water consumption of 125 l per person per day.

Table 9: Scenario VII

	Initial value	2016	2017	2018	2019
Water consumption fee € / m^3		1.282	1.282	1.282	1.282
Basic fee € / a		36.00	36.00	36.00	36.00
Average funding deficit from previous four-year period calculations	€ 52,000	€ 13,000	€ 13,000	€ 13,000	€ 13,000
Staff costs (0.3 full-time equivalent - FTE)	€ 10,200	€ 10,200	€ 10,200	€ 10,200	€ 10,200
Electricity costs	€ 6,500	€ 6,500	€ 6,500	€ 6,500	€ 6,500
Rent/ Lease	€ 2,000	€ 2,000	€ 2,000	€ 2,000	€ 2,000
Building and property maintenance	€ 1,000	€ 1,000	€ 1,000	€ 1,000	€ 1,000
Maintenance of water supply systems	€ 6,000	€ 6,000	€ 6,000	€ 6,000	€ 6,000
Maintenance of vehicles	€ 4,000	€ 4,000	€ 4,000	€ 4,000	€ 4,000
Motor vehicle tax	€ 500	€ 500	€ 500	€ 500	€ 500
Average depreciation	€ 17,325	€ 32,325	€ 32,325	€ 32,325	€ 32,325
Average return on invested capital	€ 15,750	€ 36,000	€ 36,000	€ 36,000	€ 36,000
Membership contributions paid by associations	€ 400	€ 400	€ 400	€ 400	€ 400
Costs for professional development	€ 200	€ 200	€ 200	€ 200	€ 200
Professional journals	€ 150	€ 150	€ 150	€ 150	€ 150
Uniforms and protective clothing	€ 80	€ 80	€ 80	€ 80	€ 80
Inspection charges	€ 1,500	€ 1,500	€ 1,500	€ 1,500	€ 1,500
Administrative and functional equipment	€ 350	€ 350	€ 350	€ 350	€ 350
Miscellaneous operating expenses	€ 4,500	€ 4,500	€ 4,500	€ 4,500	€ 4,500
EXPENSES		**€ 118,705**	**€ 118,705**	**€ 118,705**	**€ 118,705**
Revenue from usage fee		€ 96,150	€ 96,150	€ 96,150	€ 96,150
Revenue from basic fees		€ 22,500	€ 22,500	€ 22,500	€ 22,500
REVENUE		**€ 118,650**	**€ 118,650**	**€ 118,650**	**€ 118,650**
Total		**€ -55**	**€ -55**	**€ -55**	**€ -55**
Funding surplus (+); funding deficit (-) after 4-year period:					**€ -220**

Appendix 1 Description of the project content for determining the data base for these recommended courses of action

The public water supply in Bavaria is characterised by a large number of small water utilities and facilities. Roughly 42 % of a total of around 2,260 water utilities supply less than 100,000 m³ / a into the pipeline network. These are 945 water utilities, which provide in total only about 4 % of the water supplied in Bavaria (environment statistics for Bavaria 2013). Particularly in the rural areas of Bavaria, these water utilities ensure the supply of water of several hundred thousand citizens.

These small water utilities are facing a number of different challenges as does, indeed, water management as a whole in Germany and Bavaria. These challenges include meeting higher quality requirements and also necessary adjustments of the supply system due to the effects of climate change and migration processes in the settlement of the supply area. Both the more demanding requirements for drinking water supply as well as decreasing drinking water consumption with fixed costs remaining constant lead to a fall in revenue for water utilities.

This forces all water utilities to question and optimise the economic efficiency of their business activities. At the same time, very little information is available on the tasks carried out by water utilities which go beyond fulfilling the qualitative requirements. There is even less data available on the economic efficiency of these water utilities. There is evidence that small infrastructure companies have higher specific costs under the same conditions (Günthert, Reicherter, 2001). Such information is important as far as a forward-looking approach to water supply in Bavaria is concerned. This is particularly important in the context of the political discussion on strengthening collaboration between municipalities.

Within the scope of the research project „Limitations of the Economic Efficieny of Small Water Utilities with regard to Requirements and Reliability of Supply“, the University of the German Federal Armed Forces in Munich was commissioned by the Bavarian Environment Agency (LfU) to collect data from selected companies. The purpose of this research project was to assess the biogeographic conditions as well as the economic and technical constraints under which water utilities operate and to which extent they are actually fulfilling the task of providing a sustainable and reliable supply of water.

A total of 25 companies across Bavaria were analysed directly on site to obtain data for further evaluations. Participation in this survey as well as the provision of company-specific data were voluntary.

On-site surveys consisted of a joint inspection of the water supply facilities, including all related parts, as well as a joint survey in the form of a more detailed questionnaire on the water supply of the respective water utility. The companies were asked to consult the political and commercial management as well as the technical staff to be able to answer the questions from the different fields.

The questionnaire consisted of about 270 individual questions on the processes of water supply, staff, operational and organisational management as well as on business matters in order to document the performance of each water utility.

Based on the analysis of the collected data and the impressions gained on site, the present recommended actions and checklist were prepared.

Appendix 2 Checklist for reliable supply of water

The requirements listed in the checklist below comply with the specifications, as noted in detail in the applicable regulations, standards and guidelines.

The checklist does not claim to be complete and do not replace any set of rules.Rather, it represents a cross-section of the most important requirements for the supply ofreliable drinking water. It is only intended for internal, individual use by the respective company!

As a first step, every water utility can work through this list and determine the existing level of staff qualification in the business, the state of the water utility and the organisational structure of the company. A tick in the „Yes“ box means that the relevant requirement is fulfilled. If the answer is „No“, a deficit is identified from which a corresponding need for explanation or action can be derived. The column headed „Basis“ refers to the relevant set of rules (standard or guideline).

A comprehensive list of rules and regulations is available to members of the German Technical and Scientific Association for Gas and Water (DVGW) on their website. (www.dvgw.de/angebote-leistungen/regelwerk/regelwerk-online).

The most important „Key questions to water management“ can be found as an extract of this list in Chapter 1 „Key issues of water supply - checklist abstraction“. These key questions are highlighted in the following list.

1 Members of staff

No.	Description	Based on	Yes	No
1	The technical manager and all employees have the required qualifications according to the *DVGW W 1000**, refer Figure 1.	*W 1000**	☐	☐
2	All employees are able to fulfill their assigned tasks (e.g. capacity utilisation, equipment, decision-making competence).	*W 1000**	☐	☐
3	All employees are informed about the current status of relevant legislation, accident prevention regulations, technical rules and company-specific instructions in relation to their area of responsibility and can refer to these documents at any time.	*W 1000**	☐	☐
4	All technical staff extend their knowledge through advanced training, further development and training measures in their perceived areas of specialised task.	*W 1000**	☐	☐
5	The technical staff has the appropriate training, experience and knowledge to carry out the necessary professional tasks.	*W 1000**	☐	☐
6	The technical manager has the necessary powers to act on his own responsibility in security-related matters.	*W 1000**	☐	☐
7	Technical managers are answerable for their areas of responsibility and tasks are clearly defined.	*W 1000**	☐	☐
8	Materials and tools as well as monitoring of the test intervals are documented.	*W 1000**	☐	☐
9	Records of the tasks and activities of the staff are created.	*W 1000**	☐	☐
10	The records are regularly checked by the person in charge or a commissioner.	*W 1000**	☐	☐
11	When assigning tasks to third parties, they were examined and found suitable to provide the offered service.	*W 1000**	☐	☐

No.	Description	Based on	Yes	No
12	The monitoring and control of the assigned tasks and areas of activity of the service providers is guaranteed.	*W 1000**	☐	☐
13	The monitoring of the service providers is documented.	*W 1000**	☐	☐
	The drinking water supplier is in the position, as and when required, to process the following areas of activity properly and professionally and to guarantee their completion:			
14	• Definition of corporate objectives, e.g. maintenance targets	*W 1000**	☐	☐
15	• Crisis manangement	*W 1000**	☐	☐
16	• Definition of staffing and structure	*W 1000**	☐	☐
17	• Requirement for advanced training and professional development of staff	*W 1000**	☐	☐
18	• Selection of service provider and guarantee of monitoring	*W 1000**	☐	☐
	The following areas of activity can also be provided by a qualified service provider:			
19	• Supply concept	*W 1000**	☐	☐
20	• Rehabilitation concept	*W 1000**	☐	☐
21	• Planing, construction, operation and maintenance of drinking water supply system with relevant documentation	*W 1000**	☐	☐
22	• Updated plans / system documentation / network plans	*W 1000**	☐	☐
23	• Monitoring of water protection areas	*W 1000**	☐	☐
24	• Quality control of raw water and drinking water as well as guaranteeing adequate drinking water quality	*W 1000**	☐	☐
25	• Water provision, resource management	*W 1000**	☐	☐
26	• Operation and maintenance of technical equipment	*W 1000**	☐	☐
27	• Organisation and implementation of on-call service	*W 1000**	☐	☐
28	• Network monitoring, controlling	*W 1000**	☐	☐
29	• Risk management of the individual processes of drinking water supply	*W 1000**	☐	☐
30	• Corrective action plans according to the German Drinking Water Ordinance (*TrinkwV***)	*W 1000**	☐	☐
31	• Acquisition and management of land rights and rights of way	*W 1000**	☐	☐
32	• Procurement of supplies and services	*W 1000**	☐	☐
33	• Material management / warehousing	*W 1000**	☐	☐

No.	Description	Based on	Yes	No
34	• Keeping a directory of fitters	*W 1000**	☐	☐
36	• Customer services	*W 1000**	☐	☐
37	• Contractual and and legal affairs, particularly of water rights	*W 1000**	☐	☐
38	• Occupational health and safety	*W 1000**	☐	☐
39	• Protection of the environment	*W 1000**	☐	☐
40	• IT security	*W 1000**	☐	☐
	Staff have the following specialist and appropriate equipment in order to carry out the tasks:			
41	• Plans and drawings	*W 1000**	☐	☐
42	• Measuring instruments	*W 1000**	☐	☐
43	• Tools	*W 1000**	☐	☐
44	• Equipment (tapping unit etc.)	*W 1000**	☐	☐
45	• Protective equipment (gas concentration measurement equipment, fire extinguishers etc.)	*W 1000**	☐	☐
46	• Personal protective equipment in compliance with the regulations of the German Ordinance on the Use of Personal Protective Equipment (*PSA-Benutzungsverordnung*)	*W 1000**	☐	☐
47	• Motor vehicles	*W 1000**	☐	☐
48	• Equipment for IT and communication	*W 1000**	☐	☐
49	• Office equipment and social amenities	*W 1000**	☐	☐
51	Staff comply with the relevant health requirements for the control, testing and commissioning of water storage tanks.	*W 300**	☐	☐
52	Professional publications (securing drinking water quality, occupational health and safety, emergency care, protection of the environment) are accessible to employees.	*W 1000**	☐	☐
53	Participation in training programmes is documented.	*W 1000**	☐	☐
54	Employees of the on-call service are regularly, at least once a year, instructed, according to their area of responsibility, and receive advanced training and professional development.	*GW 1200**	☐	☐
55	In the case of instructions, the deadlines stated in regulations and legal requirements are met.	*W 1000**	☐	☐
56	Regular training in relation to substance properties and handling of chemicals is carried out.	*W 204**	☐	☐

* DVGW – Standard
** TrinkwV – Drinking Water Ordinance (Trinkwasserverordnung)

2 Qualitative safety and reliability of supply

No.	Description	Based on	Yes	No
1	There is knowledge of water quality and the potential changes in its quality in the pipe network.	*W 400-3**	☐	☐
2	Measures against groundwater contamination, which may lead to impairments or failures, are specified in the corrective action plan or in the instructions.	*W 101**	☐	☐
3	A suitable network of monitoring boreholes is operated with regard to the potential for extensive hazards.	*W 101** / *(W 108*)*	☐	☐
4	The responsible authority shall provide regular information events for the general public on the contents of legal regulations, as well as on issues and developments in the protection area, in order to raise public awareness in relation to groundwater protection.	*W 101**	☐	☐

* DVGW – Standard

3 Quantitative safety and reliability of supply

No.	Description	Based on	Yes	No
1	There is redundancy in the extraction (two independent catchment areas or interconnection with neighbouring suppliers).		☐	☐
2	There is a corrective action plan as per Section 16 Paragraph 5 Drinking Water Ordinance (*§ 16 Abs. 5 TrinkwV*) for the event of insufficient supply of potable water meeting the required standards.	*W 1000** / *W 1020**	☐	☐
3	Emergency supply is available.		☐	☐
4	Emergency supply is ready for operation within a specified period of time.		☐	☐
5	The emergency supply pipeline is always carrying water.		☐	☐
6	Measuring devices are available to record and document the daily peak load.	*W 400-3**	☐	☐
	If the supply of water for firefighting is guaranteed by the public drinking water supply, the following must be observed:			
7	• The demand for water for firefighting is met according to regulations	*W 405** / *W 300-1**	☐	☐
8	• The minimum supply pressure of at least 1.5 bar in the pipeline network is maintained while water for firefighting is tapped.	*W 405**	☐	☐
9	• Hydrants for fire extinguishing purposes are installed at a reasonable distance along the pipeline network.	*W 331** / *W 400-1**	☐	☐

* DVGW – Standard

4 General technical requirements

No.	Description	Based on	Yes	No
1	Buildings related to drinking water supply must be protected from unauthorised interference.	*W 1050**	☐	☐
2	No heating oil or heat pumps are used in protection zones I and II.	*W 621**	☐	☐
3	Recording and documentation of parameters is carried out of measurement readings and at measuring points as specified in Table 4, *W 400-3**.	*W 400-3**	☐	☐
4	Pumps are monitored according to *DVGW W 614**, Table 1.	*W 614**	☐	☐
5	Pumps are inspected according to *DVGW W 614**, Table 2.	*W 614**	☐	☐
6	Motors are monitored according to *DVGW W 614**, Table 3.	*W 614**	☐	☐
7	Motors are inspected according to *DVGW W 614**, Table 4.	*W 614**	☐	☐
8	Valves are inspected according to *DVGW W 614**, Table 5.	*W 614**	☐	☐
9	Monitoring and measuring devices are inspected and maintained according to *DVGW W 614**, Table 6.	*W 614**	☐	☐
10	Operating equipment such as dehumidifiers, air-conditioning systems, heating systems, pipelines, drainage pipes / receiving waters, pressure vessels and hoists are inspected and maintained according to *DVGW W 614**, Table 7.	*W 614** / *W 621**	☐	☐
11	For reasons of energy economy, rooms with an uncovered water surface (open filter area) were structurally separated from other operating rooms in terms of ventilation.	*W 621**	☐	☐
12	Protection of the technical facilities against corrosion by high-quality coating.	*W 621**	☐	☐
13	Electrical equipment is inspected and maintained by a qualified electrician or under the supervision a qualified electrician.	*W 614**	☐	☐
14	Use of air dehumidifiers in the rooms of the water utility.	*W 621**	☐	☐
15	In rooms with high ceilings, the dehumidifier is placed on the floor.	*W 621**	☐	☐
16	In long and narrow rooms with low ceilings, the dehumidifier is placed at one end of the room, whereby the drying air is directed to the opposite end of the room using a hose or duct.	*W 621**	☐	☐
17	The dehumidifiers are tested annually and, if necessary, serviced by a refrigeration specialist.	*W 621**	☐	☐
18	Staff facilities and switch rooms as well as workshops are heated to the temperature as stipulated in the workplace ordinance.	*W 621**	☐	☐
19	Specially provided, clean and disinfected rubber boots, clothing, equipment and tools are used for the inspection of the facilities.	*W 291**	☐	☐

* DVGW – Standard

5 Facilities for water supply

5.1 Water extraction

No.	Description	Based on	Yes	No
1	A designated water protection area is in operation which complies with the current requirements in relation to extent and "catalogue of prohibitions" (information and collaboration with Regional State Office for Water Management (WWA)).	*W 101* / LfU-Merk-blatt 1.2/7***	☐	☐
2	Water extraction facilities are protected against unauthorised access by means of object protection devices, alarm messages are sent to a permanently manned unit.	*W 101* / W 1050**	☐	☐
3	Regular visual inspections of the catchment area, the closing-off structure, borehole construction as well as borehole installations are carried out and are documented.	*W 125**	☐	☐
4	An operating logbook is kept.	*W 127* / EÜV****	☐	☐
5	Manholes and entrances are equipped with burglar-proof covers and doors.	*W 127**	☐	☐
6	The wellhead protection zone is completely covered by grass cover and is free of trees.	*W 101**	☐	☐
7	An inspection of the wellhead system, a check for leaks, an examination of the condition as well as a performance test are carried out at least once a month.	*W 127**	☐	☐
8	When a borehole is operated, a borehole record is kept, which is updated regularly.	*W 125**	☐	☐
9	Areas belonging to protection zone I are the property of the water utility or a limited personal easement is appointed.	*W 101**	☐	☐
10	The wellhead protection zone is fenced.	*W 101**	☐	☐
11	The fencing is inspected regularly.	*W 127**	☐	☐
12	Collection of operating data (water level measurements, volume flow, delivery head of the pump, operating hours, power consumption, analysis) is carried out and entered immediately into appropriate archive systems.	*W 125**	☐	☐
13	The water protection zone is signposted accordingly. Signposting is checked once a year.	*W 101* / EÜV****	☐	☐
14	Measuring instruments and measuring equipment are checked and, if need be, replaced at regular intervals (in compliance with applicable legal calibration regulations).	*W 127**	☐	☐
15	Tributary pipes connected to the spring are examined at regular intervals (e.g. every 5 years) by camera inspection.	*W 127**	☐	☐
16	Boundaries of the protection zones are located on suitable topographical features or property boundaries and indicated on site with a signposting / marking.	*W 101**	☐	☐
17	A monitoring plan exists with all requirements concerning work and measurements, which must be carried out during operation.	*W 125**	☐	☐
18	The wellhead and location of the pipeline are marked and documented in the existing as-built drawings.	*W 127**	☐	☐

No.	Description	Based on	Yes	No
19	Buildings containing the wellhead are documented in detail in existing as-built drawings (areal photographs of the site, geological conditions, pictures, calibration, etc.).	*W 127**	☐	☐
20	Regular measurements of the following parameters of springs are taken: trubidity, spring discharge including all overflows, pH value, conductivity and temperature of the spring water, extracted water quantity.	*W 127**	☐	☐

* DVGW – Standard
** LfU-Merkblatt 1.2/7 – Bavarian Environment Agency Information Sheet 1.2/7
*** EÜV – Regulation on self-monitoring (Eigenüberwachungsverordnung)

5.2 Water treatment

No.	Description	Based on	Yes	No
1	The required quality of the drinking water is guaranteed in accordance with the Drinking Water Ordinance even in the case of poor raw water quality occurring at a time of maximum utilisation of the facility.	*W 202 (A)**	☐	☐
2	The raw and drinking water is regularly tested in accordance with the Drinking Water Ordinance (Trinkwasserverordnung).	*W 202 (A)* / TrinkwV ** / EÜV****	☐	☐
3	In the event of a disinfection facility failure, sufficient disinfection is possible (redundant or mobile systems).	*W 290**	☐	☐
4	Treatment of the raw water for drinking water is carried out in compliance with the German Drinking Water Ordinance (TrinkwV) 2001.	*W 202 (A)**	☐	☐
5	When disinfection is applied, the water is, to a large extent, guaranteed to be free of turbidity and particles.	*W 290**	☐	☐
6	The disinfection system (e.g: UV system) is preceded by turbidity measurement.		☐	☐
7	Room irradiation of a UV system of at least 400 J / m2 was confirmed by a biodosimetric test of the facility in compliance with *DVGW W 294**.	*W 290**	☐	☐
8	The treatment facilities are protected against unauthorised entry and access.	*W 202 (A)**	☐	☐
9	A complete and up-to-date documentation of the operation as well as of the procured and utilised processing material is carried out.	*W 202 (A)**	☐	☐
10	Turbidity values in the outflow of the particle-separating stage are at a maximum of 0.1 FNU-0.2 FNU (preferably lower).	*W 290**	☐	☐
11	The disinfecting system is designed in such a way that a sufficient concentration and exposure time of the disinfectant or a sufficient irradiation during the use of the UV disinfection is guaranteed.	*W 290**	☐	☐
12	When using chemical disinfectants, the amount of disinfectant added and the concentration of disinfectant in the treated water are monitored and documented.	*W 290**	☐	☐
13	For the disinfection within the scope of drinking water treatment, only the chemicals and processes approved in compliance with the Drinking Water Ordinance 2001 are used.	*W 290* / W 202 (A)**	☐	☐

No.	Description	Based on	Yes	No
14	Ozonisation is not carried out as a final treatment step (formation of biodegradable substances).	*W 290**	☐	☐
15	When using surface water for drinking water extraction without passing a subsurface passage, turbidity and particle elimination is always carried out prior to disinfection (which complies with the *DVGW 213-1**).	*W 290**	☐	☐

* DVGW – Standard
** TrinkwV – Drinking Water Ordinance (Trinkwasserverordnung)
*** EÜV – Regulation on self-monitoring (Eigenüberwachungsverordnung)

5.3 Water storage

No.	Description	Based on	Yes	No
1	As a rule, the water reservoir consists of at least two chambers.	*W 300-1**	☐	☐
2	Access to the water chamber is not directly above the uncovered water surface.	*W 300-1**	☐	☐
3	The surfaces of the water-bearing surfaces of the water reservoir are in good condition, dimensionally stable and watertight.	*W 300-2**	☐	☐
4	Ventilation openings are not located directly above the water surface.	*W 300-1**	☐	☐
5	Supply air is pre-cleaned via a suitable filter system.	*W 300-1**	☐	☐
6	No daylight can enter into the water storage tank.	*W 300-1**	☐	☐
7	The water storage tanks are watertight.	*W 300-2**	☐	☐
8	Cleaning of the tanks can only be done if clean clothing and special, colour-coded rubber boots are worn.	*W 291**	☐	☐
9	The water storage tank and the surrounding area are protected against unauthorised access. The security measures are regularly checked.	*W 400-1* / W 300-1* / W 1050**	☐	☐
10	Regular functional tests of all components and equipment are carried out during operation.	*W 300-2**	☐	☐
11	A documentation of operation is kept for each drinking water tank.	*W 300-2**	☐	☐
12	Flowmeters and water level measuring devices are installed in each water chamber.	*W 300-1**	☐	☐
13	Electrical, measuring, control and regulation devices comply with VDE** regulations.	*W 300-1**	☐	☐
14	Regular inspections are carried out on windows, doors, manhole coverings, ventilation and air-conditioning systems, shut-off and control elements as well as drainage and drainage systems.	*W 300-2**	☐	☐
15	There is a lightning protection system.	*W 300-1**	☐	☐
16	The operating house and water chambers have separate air-conditioning systems.	*W 621**	☐	☐

* DVGW – Standard
** VDE – Association for Electrical, Electronic & Information Technologies (Verband der Elektrotechnik, Elektronik und Informationstechnik e.V.)

5.4 Water distribution

No.	Description	Based on	Yes	No
1	The pipeline network is up-to-date (recommendation: changes for the previous two years have been incorporated).	*GW 120 (A)**	☐	☐
2	Regular inspections and maintenance of the operating equipment and parts are carried out.	*W 392* (Table 2)*	☐	☐
3	To monitor the distribution system (determination of water losses, early detection of pipe damage, data generation for the planning of maintenance work) the quantity of delivered water is measured.	*W 400-3**	☐	☐
4	Once a year, every valve is put into operation.	*W 392**	☐	☐
5	Parts of plants located on third-party, private property are secured through easements.		☐	☐
6	The pipelines are calibrated and recorded in as-built drawings.	*W 400-2**	☐	☐
7	A pipeline network plan is available.	*GW 120 (A)**	☐	☐
8	Comprehensive documentation of all inspection procedures is prepared.	*W 392**	☐	☐
9	A network documentation is provided for the tasks of the water utilities as well as for the requirements of third parties.	*GW 120**	☐	☐
10	A water quantity measurement with calibrated measuring devices is carried out for billling the customers.	*W 400-3**	☐	☐
11	The water meters, which are commonly used for the supply of water, are replaced by valid, calibrated meters after the expiry of the valid calibration period of six years.	*W 400-3**	☐	☐
12	Measuring the quantity of water is used to monitor distribution facilities (determination of efficiency, determination of non-revenue water, early detection of pipe damage, data collection for network simulation).	*W 400-3**	☐	☐
13	The extent, distribution and development of non-revenue water is known.	*W 400-3**	☐	☐
14	Damage statistics are compiled promptly as they occur.	*W 400-3*	☐	☐
15	Determination and evaluation of pipe damage rates are carried out.	*W 400-3* (p. 32)*	☐	☐
16	All changes in the pipeline network are documented promptly.	*W 400-3**	☐	☐
17	The positions of the valves in pipelines are indicated by sign-posts.	*W 400-2**	☐	☐
18	Pressure, flow and level control are properly dimensioned in relation to the flow rate and operating pressures.	*W 335**	☐	☐
19	Facilities for pressure, flow and level control are regularly checked by trained staff for their condition.	*W 335**	☐	☐
20	The shafts are watertight.	*W 358**	☐	☐
21	Shaft covers for entry are easy and safe to operate and can only be opened with a special tool.	*W 358**	☐	☐

No.	Description	Based on	Yes	No
22	Frost protection of shafts and installation parts is guaranteed.	*W 358* / W 127**	☐	☐
23	A frost protection system for pipelines and associated valves is in operation.	*W 400-3**	☐	☐
24	A sump for the collection and removal of water in the shaft is available and is equipped with a drainage pipeline connecting to the natural receiving water.	*W 358**	☐	☐
25	Regular ventilation of pipes is ensured by suitable fittings.	*W 334**	☐	☐
26	Decommissioned water pipes are sealed at the end points.	*W 400-3**	☐	☐
27	Decommissioned water pipes are being removed.		☐	☐
28	Rinsing plans with information on the timing of rinsing, speed and quantity are defined on the basis of operating experience.	*W 400-3**	☐	☐
29	During rinsing, turbidity (qualitative), rinsing times and quantity are documented.	*W 400-3**	☐	☐
30	When repairing asbestos cement pipelines, the Dangerous Substances Directive *TRGS 519*** must be observed.	*W 400-3**	☐	☐
31	Pumps within the drinking water supply network are effectively supplemented with a speed control.	*W 617**	☐	☐
32	The "maximum hourly load" Q_{hmax} is provided at the connection point of the pressure booster system.	*W 617**	☐	☐
33	Position of the optimum efficiency of the pressure booster system is at the normal operating point.	*W 617**	☐	☐
34	Accessibility of the pressure booster system (hoisting devices) for assembly and maintenance is guaranteed.	*W 617**	☐	☐
35	For the start of a pressure booster system, softstarters are used to reduce mechanical stress.	*W 617**	☐	☐
36	In the case of a long-term zero flow, the pumps of the pressure booster system are switched off after about 4 to 6 minutes for economic reasons.	*W 617**	☐	☐
37	A manual emergency operating level for the pressure booster system was set up on site .	*W 617**	☐	☐
38	The structure of the pressure booster system is protected against unauthorised intervention.	*W 617**	☐	☐
39	At the pressure booster system, on-site checks are carried out and documented at regular intervals by technical staff.	*W 617**	☐	☐
40	For the disinfection of pipes, neither potassium permanganate nor hydrogen peroxide nor chloramination are to be used.	*W 290**	☐	☐
41	An annual renewal rate of the pipeline network of 1.5 % – 2 % will be implemented.		☐	☐

* DVGW – Standard
** TRGS – Dangerous Substances Directive (Technische Richtlinie Gefahrstoffe)

6 Operational and organisational security

6.1 Management systems

No.	Description	Based on	Yes	No
1	The company has documented its instructions for action in a operation and organisational manual for its employees.employees.	*W 400-3**	☐	☐
2	The causes of faults are documented.	*W 1000**	☐	☐
3	There are instructions for the immediate elimination of faults and the restoration of operation.	*W 1000**	☐	☐
4	Responsibilities and authority of the employees during the provision of services are clearly regulated and documented.	*GW 1200**	☐	☐
5	The company takes part in benchmarking projects.	*W 400-3**	☐	☐
6	In order to meet the requirements with regard to drinking water quality in water distribution systems and with regard to the aesthetic requirements for drinking water supply, the operating facilities provide for the highest possible level of cleanliness.	*W 400-3**	☐	☐
7	There is no direct connection between drinking water pipelines and sewage systems.	*W 400-3**	☐	☐
8	There is no direct connection between drinking water facilities and non-drinking water installations (also in the area of consumption installations (household installation)).	*W 400-3**	☐	☐
9	Changes (new construction, refurbishment, ...) to water supply systems are approved and checked for compliance with the regulations.		☐	☐
10	A business logbook is kept.		☐	☐
11	The data of the operating logbook are continuously recorded in digital form by the IT department.		☐	☐
12	Preventive measures for faults are defined.	*W 1000**	☐	☐
13	A crisis team is in place.	*W 1002**	☐	☐
14	A crisis management is in place.	*W 1002**	☐	☐
15	Regular practice sessions are held for dealing with emergency situations.	*W 1002**	☐	☐
16	Definitions and regulations of crisis management are documented.	*W 1002**	☐	☐
17	In the event of a crisis there is the possibility of obtaining support from other suitable official organisational units.	*W 1002**	☐	☐
18	The assessment of the supply system includes a hazard analysis and a risk assessment.	*W 1001**	☐	☐
19	The procedures for risk management are documented in writing.	*W 1001**	☐	☐
20	Important information and messages can be received at any time and forwarded for processing to the responsible person or body.	*W 1000**	☐	☐

No.	Description	Based on	Yes	No
21	Commissioned specialist companies have demonstrated their expertise and technical suitability to the water utility.	*GW 1200**	☐	☐
22	Direct contact between the company's own or third-party employees with the drinking water, up to the transfer point to the customer, is avoided.	*W 400-3**	☐	☐
23	Vehicles with the required materials and tools can be used in the event of faults to immediately avert hazards.	*W 1000**	☐	☐
24	A preventive strategy or, rather, an inspection strategy, is pursued as it is more cost-effective. **Event-based maintenance or failure strategy**, i.e. repair only in response to damage or external events and measures **Preventive and periodic maintenance or preventive strategy**, i.e. maintenance and repair measures at defined time intervals. **Preventive and condition-oriented maintenance or inspection strategy**, i.e. maintenance which is based on the ascertained actual state and on the development trends of the facilities in comparison to a defined desired state.	*W 400-3**	☐	☐
25	Absence of individual employees (leave, illness, training measures) is documented.	*W 1000**	☐	☐
26	There are instructions which guarantee the immediate elimination of faults and the continuation of operation.	*W 1000**	☐	☐

* DVGW – Standard

6.2 Fault-clearing stations

No.	Description	Based on	Yes	No
1	There is a twenty-four-hour emergency service for repairing faults.	*GW 1200* / DIN 2000***	☐	☐
2	The telephone number of the fault-clearing station is known to the public (e.g. telephone book, sticker/tag on gas/water meter, listed in customer information sheets and customer magazines, signs, signposts).	*GW 1200**	☐	☐
3	Every incoming fault message is documented in a comprehensive manner.	*GW 1200**	☐	☐
4	The exchange of information between the reporting body and the fault clearing station is guaranteed.	*GW 1200**	☐	☐
5	A list of questions and measures for incoming fault messages as well as all company documentation are available in the reporting office for the on-call service.	*GW 1200**	☐	☐
6	The emergency vehicles have communication devices, tools, devices and materials for averting hazards.	*GW 1200**	☐	☐
7	Employees have relevant instructions, an up-to-date directory of important telephone numbers, as-built drawings and information on the particularities of network operation.	*GW 1200**	☐	☐
8	The reporting office is avialable at any time for receiving fault messages.	*GW 1200**	☐	☐

No.	Description	Based on	Yes	No
9	The person who reports a problem is given a set of instructions based on a previously prepared catalogue of recommended actions.	*GW 1200**	☐	☐
10	Instructions are brief, factual and unambiguous.	*GW 1200**	☐	☐
11	The internal transmission of the fault report is made without delay.	*GW 1200**	☐	☐
12	All essential data of the fault rectification are recorded.	*GW 1200**	☐	☐
13	Documented data and any other evidence are kept for a minimum for 6 years or until the final settlement of a cause of damage.	*GW 1200**	☐	☐
14	The documentation of the fault contains the following information: name and address of the detector (telephone number, if applicable), type and extent of the fault, location of fault, date, time, type and time of implemented measures, cause of the fault (third-party responsibility?).	*GW 1200**	☐	☐
15	Organisational structure and procedures of the on-call service, the specific tasks of the staff working in the on-call service and the procedure in the event of a fault are laid down as written instructions.	*GW 1200**	☐	☐

* DVGW – Standard
** DIN – Standard

6.3 Customer information and complaint management

No.	Description	Based on	Yes	No
1	Information on the origin and quality of the water, treatment, pricing, investments, compensation payments, etc. are available for the customers (e.g. contact person, website of the water utility).		☐	☐
2	A contact person for complaints is known to the customer.		☐	☐
3	Incoming complaints are documented in writing.		☐	☐

6.4 Collaboration

No.	Description	Based on	Yes	No
1	The scope of entering into collaboration with neighbouring utilities (e.g. fault clearance service, staff qualification, purchasing of materials…) for the purpose of optimisation the has been examined in order to optimise the expert and competent execution of important tasks in the provision of drinking water supply.	*W 1000**	☐	☐
2	There are collaborations between water utilities, authorities and farmers or foresters for implementing a form of agriculture which is responsive to the location and protecting the groundwater.	*W 101**	☐	☐

* DVGW – Standard

7 Legal and business basics

No.	Description	Based on	Yes	No
1	The permit or approval required under water law is valid.	*WHG***	☐	☐
2	Requirements in accordance with the water law permit or approval are fulfilled.		☐	☐
3	Appropriate, fair depreciation of acquisition and production costs or of replacement cost was carried out.	*KAG****	☐	☐
4	The last calculation of water fees took place less than 4 years ago.	*KAG****	☐	☐
5	The calculation is based on cost recovery.	*KAG****	☐	☐
6	There is access to the relevant set of rules for the supply of drinking water.		☐	☐
7	The extracted annual quantity is less than the annually permitted extraction quantity.		☐	☐
8	The maximum amount of water extracted daily is less than the permitted daily extraction quantity.	*W 101**	☐	☐
9	The latest review of the legal regulations for the drinking water protection area is not older than 10 years (all potential hazards in the protected area are provided for and regulations comply with state-of-the-art technology).	*W 101**	☐	☐
10	The requirements of the parameters to be analysed according to the drinking water regulation are met.		☐	☐
11	The provisions of the operational safety are complied with.		☐	☐
12	The provisions of the Radiation Protection Ordinance are complied with.	*W 202 (A)**	☐	☐
13	The records of acquisition and production costs are up-to-date.		☐	☐
14	The documentation of residual value of all facilities is up-to-date.		☐	☐
15	The documentation of the annual depreciation values is up-to-date.		☐	☐
16	The interest on fixed assets is taken into account in the calculation.		☐	☐
17	Depreciation is taken into account in the calculation.		☐	☐

* DVGW – Standard
** WHG – Federal Water Act (Wasserhaushaltsgesetz)
*** KAG – Community Charges Act (Kommunalabgabengesetz)

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