CONVERSION OF REDUNDANT BARN INTO 1 DWELLING
TYDDYN DEDWYDD, RHOSTYLLEN

Foul Drainage Proposal

NRW Ref: CAS-138223-W6V9
Planning Ref: P2021/0060

Existing Site Drainage

The site currently consists of a 3-bedroom farmhouse and a 2-bedroom self-contained flat. Both properties discharge foul sewerage into separate septic tanks which we understand have gravity piped outfalls to drainage fields in the lower field to the east.

The site benefits from two separate water quality exemptions for effluent discharge to ground of 2.0cu.m or less.
Refer to Exemption Ref Nos. EPR/WE5298AC/A001 and EPR/VE5598AW/A001.

Refer to Appendix 1 Existing site layout.

Proposed Site Drainage

There are 2 proposed properties:

1. **P/2017/0295,** 3-bedroom dwelling (full planning granted – Under Construction)
2. **P/2021/0059** proposed 3-bedroom barn conversion (this application)

Following discussions with NRW we are proposing to replace the two existing septic tanks on site with two package treatment plants with discharge to ground and connecting 2 properties to each (one existing, one proposed).

Government guidance on private sewerage in Welsh Government Circular 08/2018 considers use of a package treatment plant a betterment over use of a septic tank.

We are proposing to replace the septic tanks for two 10 PE GRAF One2clean treatment plants. These are high performance system which achieves sustainable discharge values with an efficiency factor of up to 99% and generate a low volume of sludge.

The daily discharge rate for each will be a maximum of 1.5cu.m. (existing 3-bed, proposed 3-bed) which is below the 2.0cu.m permitted under the water quality exemptions already in place for the site. As the site is located within the River Dee and Bala Lake Special Area of Conservation, we understand this proposal can potentially allow NRW / LPA to screen out proposals without the need to undertake a Habitats Regulations Assessment (HRA).

We are also proposing to construct new drainage fields for both WTP's. It is unclear on the actual size of the of the existing components so following successful percolation tests (Vp=55) we are proposing to replace the existing with new correctly sized drainage fields which will incorporate a sampling chamber. Access for the treatment plant and drainage field will be provided for future maintenance via the farmhouse driveway which will include a turning facility for a tanker.

The grazing field will be also fenced off to keep the treatment plants and drainage fields separate.

Existing calculation:

Septic tanks have an allowance of phosphate loading between 10 – 12 mg/l in the effluent discharged.

Septic Tank 1 serves 3- bedroom Farmhouse)
3 bed (5 person), 5 x 150L x 10 mg/l = 7,500 mg/l Ptot.

Septic Tank 2 serves 2- bedroom self-contained flat)
3 bed (5 person), 5 x 150L x 10 mg/l = 7,500 mg/l Ptot.

Proposed Calculation:

We are proposing to replace the septic tanks with a new GRAF One2clean treatment plants with a treated effluent discharge to ground.

WTP 1 will serve 3-bedroom farmhouse and 3-bedroom dwelling (PE=10)

Using a GRAF One2clean treatment plant the phosphate loading is reduced to 1.6 mg/l in the effluent discharge

10 PE x 150L x 1.6 mg/l = 2,400 mg/l Ptot.
Overall reduction from 7,500 mg/l to 2,400 mg/l.

WTP 2 will serve 2-bedroom self-contained flat and a 3-bedroom barn conversion (PE=10)

Using a GRAF One2clean treatment plant the phosphate loading is reduced to 1.6 mg/l in the effluent discharge

10 PE x 150L x 1.6 mg/l = 2,400 mg/l Ptot.
Overall reduction from 7,500 mg/l to 2,400 mg/l.

Maintenance

All properties will be responsible for the future maintenance and operation of the treatment plant. Residents will make annual contributions to a management company set-up by our client.

Maintenance is based on the following requirements and includes both self-checks (by residents) and specialist maintenance work to be carried out by fully trained engineers.

The self-checks and self-tests are described precisely in the logbook that is supplied along with every Graf Wastewater system. These checks are summarised in the table below:
System

System Component	Operation	Notes	Frequency
Control panel	Inspection	Check control panel has a green light and no warning signals can be heard	Daily
Visual inspection	Inspection	Check water levels, and discharge pipes are clear of blockages	Monthly
Operations log	Record	Read operating hours for air compressor and valves	Monthly
Air filters	Inspection/ maintenance	Check any air filters on control cabinets and clean if necessary	Monthly

Maintenance should be carried out by a specialist Company approximately every 12 months. The maintenance checks undertaken during these visits are detailed in the table below:

System Component	Operation	Notes	Frequency
Visual inspection	Inspection	Check accessibility to the system, tank lid secure, baffle watertight, correct water levels. System components in correct place	Annually
System analysis	Inspection	Take measurements of sludge storage volume, activated sludge, pH and oxygen and the concentration of clear water discharge	Annually
System functions	Inspection/ maintenance	Check that the system is functioning correctly on all stages; charging, aeration, discharge and sludge return	

Andy Jones
Drainage Engineer
Dated – 14th June 2024

Appendix 1

Site layout



SITE LAYOUT PLAN @ 1:1250

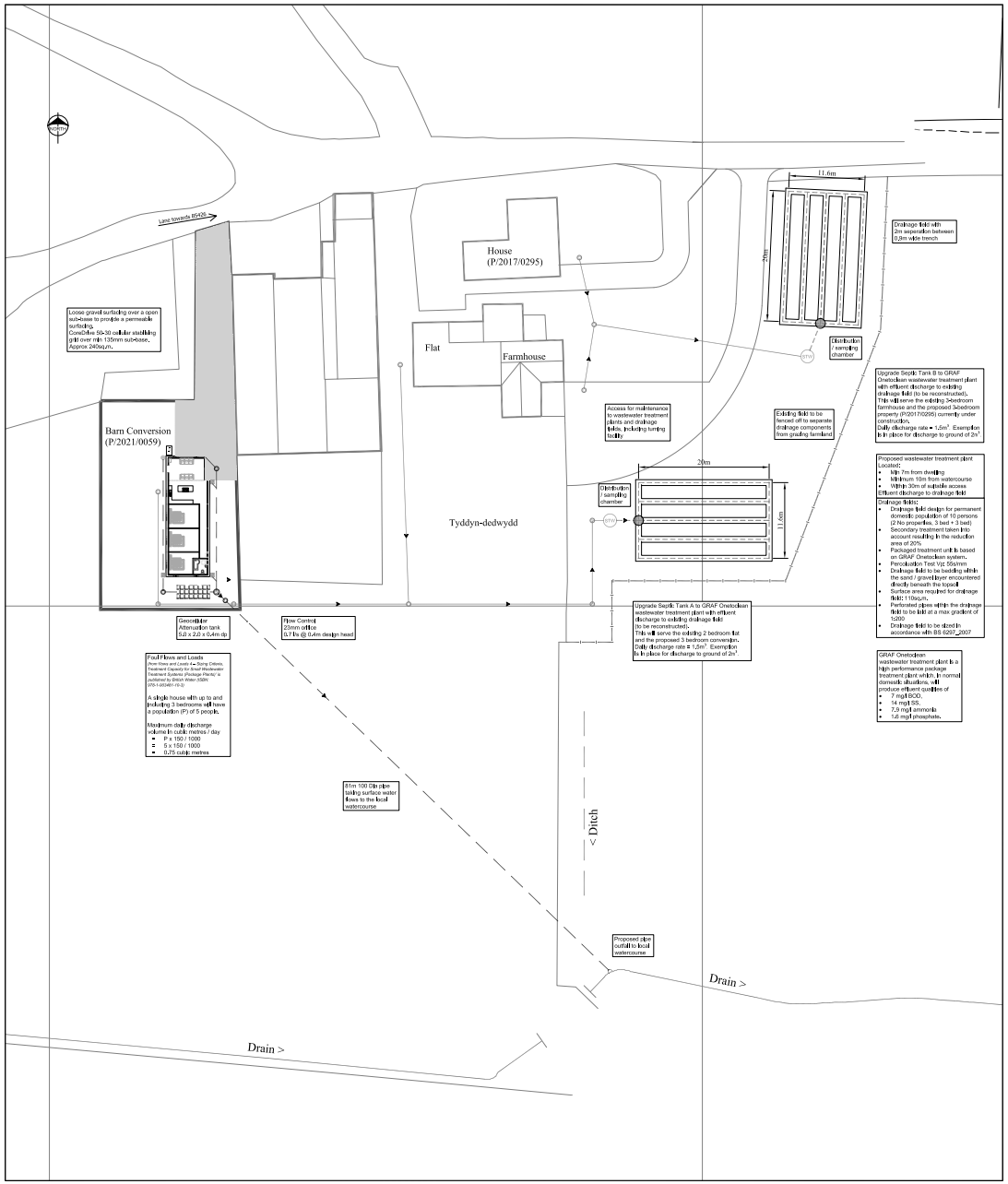
1 = Approval for 3 Bedroom dwelling with new septic tank under P/2013/0380
2 = 3 Bedroom Farm House Dwelling and 2 bedroom Flat attached
3 = Proposed 4 bedroom Barn Conversion under P/2021/0059
A = Flat Septic Tank (Existing)
B = Farm House Septic Tank (Existing)

Project Information	
Client	Mr Baker
Address	Barn at Tyddyn Dedwydd Frondeg Rhostyllen LL14 4ND
Project	Barn Conversion

Drawing Information			
Title	Existing Sewerage Treatment Arrangemetn Plan		
DWG No.	TYDDYN731	Date	15/02/23
Scale	As Shown	Revision	
Sheet	A3 Sheet 1 of 1		

Appendix 2

Proposed Drainage Layout




Water Butt


SUDS Planter


Wetland


Cellular Storage


Flow Control

SUDS Strategy

The prime function of SuDS, as with conventional drainage, is to provide effective surface water drainage, ensuring the greatest degree of flood risk protection over the long term both within and downstream of the development and prevent pollution. However, SuDS approaches can bring wider benefits too. Appropriately designed, constructed and maintained, SuDS are more sustainable than conventional drainage systems and can help to:

- Reduce run-off surface water flow-rates and/or volumes and hence reduce the risk of flooding
- Encourage natural groundwater re-charge
- Reduce pollutant concentrations in storm water
- Provide habitat for wildlife.

There are many site-specific factors which will influence the choice of any single or combination of SuDS devices used within a development. The primary factors are:

- Whether the development is domestic, commercial or industrial
- Whether the underlying ground is contaminated. If so, infiltration systems will most probably not be permitted.
- Whether the underlying ground is permeable enough for infiltration systems to be considered.
- Whether the ground water levels are deep enough for infiltration systems to be considered
- Whether the site is steeply sloping and its general topography
- The availability of space inside the development for each potential SUDS facility.
- Health & Safety aspects should the development be likely to be inhabited or used by children.

To ensure no increased flood risk to offsite land and development, disposal of surface water to the ground is encouraged and runoff volumes will be reduced through the SuDS management train where ground conditions permit. Where ground conditions are unsuitable, a discharge to an open water body / sewer will be necessary with rates restricted to the existing site conditions.

SUDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	Not suitable: Architectural proposals for the development involve a pitched roof arrangement which are not suitable for green roofs.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site, and reduces treated water consumption.	Not suitable: Additional costs of installation would have severe effect on viability of the development. Running and maintenance costs would not be acceptable to our client. The ability to restrict peak flow rates and short-term peak volumes is non-existent where a official storm event occurs. Water butts will be provided on rear RWP for garden re-use.
Infiltration	Reduces total run off volume from the development	Not suitable: Site investigation has determined the site is underlain by clay which will not allow for infiltration
Permeable Surfacing (Infiltration) Permeable Surfacing (Tanked)	Reduces total run off volume from the development. Can be used to enhance quality of run -off water. Can be used to enhance quality of run -off water. Sub -base provides 'source' storage and reduces the volume of storage downstream. The storage can be created with selection of the stone fill or use of plastic box systems. Impermeable membrane at base of construction to prevent impact on pavement stability	Not suitable: Site investigation has determined the site is underlain by clay which will not allow for infiltration May be suitable: Long term maintenance required and risk of reduction in permeability. Specialist maintenance required to maintain porous surfaces. No services to run beneath areas of permeable surface (due to presence of base impermeable barrier which is very difficult to excavate through and reinstate if required). Spatial constraints of site do not allow alternative routes for services along plot frontages. Difficult to install small areas of tanked systems that require very small flow controls which can lead to maintenance issues. Construction sequence can make it difficult to construct without use of a sacrificial road base surface to provide protection during construction. Can be used to provide treatment only with no attenuation but will incur additional costs to non permeable surfacing.
Swales, basins and ponds	Provide areas for above ground surface run off storage. Swales also allow settling of particulate matter, improving water quality.	Suitable: Small shallow dry SUDS basins can be considered appropriate providing sufficient space is available.
Rain Gardens	Collect and retain run -off to help improve water quality, prior to discharge in piped system or infiltration	Suitable: SUDS Planters can be provided on RWPs at front of property.
Geocellular storage	Suitable for sites with insufficient space for basins etc. Suitable for sites where topography prevents the use of open basins etc. Can be very effective infiltration devices subject to ground conditions.	Suitable: May be required if sufficient above ground storage is not available due to site levels design.
Large Pipes, conduits and tanks	Suitable for sites with insufficient space for basins etc. Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. Generally be suitable for adoption by the statutory water company.	Not Suitable: Other more sustainable means of drainage using SUDS methods is available within application boundary.

Surface Water Flow Rates

Site Area = 810sq.m.

Existing Brownfield Run-off Rates

(Based on 120sq.m. existing barn roof area only)

1yr = 0.8 l/s (26 mm/hr rainfall)
30yr = 2.1 l/s (65 mm/hr rainfall)
100yr = 2.7 l/s (83 mm/hr rainfall)

Existing Greenfield Run-off Rates

1yr = 0.6 l/s
30yr = 1.9 l/s
100yr = 2.5 l/s
QBAR = 0.7 l/s

Proposed Run-off Rates

1yr = 0.7 l/s
30yr = 0.7 l/s
100yr = 0.7 l/s

Drainage Strategy

Existing Drainage

A piped network currently drains into a holding tank serving the farm and all outbuildings before the flows are passed forward to the watercourse approximately 80m east of the application boundary.

Proposed Foul

There are no public sewers within the vicinity of the site. The site currently drains to 2 No. septic tanks which benefit from 2 No.Water Quality Exemptions for discharge to ground of 2 cubic metres or less.

We are proposing to replace the septic tanks with 2 high performance wastewater treatment plants and reconstruct the drainage fields. This will provide a significant betterment on the existing situation and additional flows will still be within the the permitted 2.25cu.m. exception volume.

Proposed Surface Water

1. Collection for re-use

The developer is not proposing the use of rainwater harvesting for re-use within the dwellings. Rainwater harvesting alone would not be adequate to deal with the surface water flows from the site and provision will be required for an overflow to a Level 2 or lower priority runoff destination. Therefore RWH systems are not considered a cost effective solution for managing surface water and a lower priority runoff destination is required.

Water butts will be installed on rear RWPs for garden re-use.

SUDS Planters will be installed on front RWPs

2. Infiltration

Recent ground works on site have determined the site is underlain with clay and will therefore not be suitable for infiltration techniques to dispose of surface water flows from the site. The proposed access / driveway will be loose gravel with a open sub base. This will provide storage with slow infiltration to the underside strata and also allow for evapotranspiration. This will assist with meeting the 5mm Interception requirement.

3. Watercourse

There is a network of un-named watercourses and ditches which flows east following the topography. Existing surface water connections from the existing farm and outbuilding barn have been confirmed and we are proposing to link the existing situation but with betterment on flow rates.

4. Highway Drain

There are no surface water sewers within the vicinity of the site

4. Surface water sewer

There are no surface water sewers within the vicinity of the site

5. Combined sewer

There are no surface water sewers within the vicinity of the site

5mm Interception

Interception - The retention of the first part of a rainfall event to prevent surface water runoff occurring.
Key facts:

- The majority of rainfall events in the UK are less than 5 mm in depth
- Rainfall runoff from paved surfaces contains a range of pollutants: many associated with vehicle emissions.
- Pollutant concentrations tend to be highest in the early stages of a rainfall event
- If the first 5 mm of every event was prevented from leaving the site, the total volume of runoff discharged into the receiving streams and rivers through the year would be a relatively small proportion of the total runoff generated by the site

Porous paving driveway meets criteria

120sq.m. roof area requires 0.6cu.m. Interception

This can be provided with a 325 litre water butt (garden re-use and car washing) and 3 No. Planters min. 1.0 x 0.6 x 0.6m deep.

Maintenance / Responsibilities

Maintenance of all surface water components will be subject to SAB approval and will be maintained by the property owner for the lifetime of the development

Maintenance requirements will be considered further at detailed design stage and a 'SUDS Management Plan' will be produced to address the frequency and type of maintenance activities.

Notes

1. This proposal provides a betterment on the surface water drainage from the existing situation with the incorporation of SUDS features and a flow control to limit the flows from the site.
2. The specification in all respects shall be in accordance with the current Wrexham County Borough Council Specification and Construction publication in force in the county at the time of construction.
3. All private drainage works are to comply fully with Part H of the Building Regulations.
4. All existing invert levels to be checked by the contractor at the start of works and any other discrepancies notified to the Engineer prior to commencing works. All levels are based on topographical survey information provided by others.
5. It is the responsibility of the Contractor to verify all information given with regards to existing services and drainage connections etc. prior to commencing the works.
6. The Contractor shall adhere to the CDM Regulations at all times.
7. Only trained personnel shall be permitted to enter confined spaces.
8. Drains trenches should not be excavated lower than the foundations of any building nearby unless either:
   a) The trench is within 1m of the foundation, the trench is filled with concrete up to the invert level of the foundation, or
   b) Where the trench is further than 1m from the building, the trench is filled with concrete to a level below the lowest level for the building equal to the distance from the build, less 150mm.
9. All SVP and RWP connections are indicative and shall be confirmed by the client.
10. Pipe gradients out of the building to connecting manhole to be laid at 1:40 in accordance with Building Regulations, Part H, Table 8.
11. Where pipe sizes are not indicated :
    100Ø to be used for foul
    100Ø to be used for surface water unless stated otherwise.
12. Minimum surface water gradients shall be:
    100Ø laid at 1:100 with the exception of the first connection which shall be minimum 1:80
13. Minimum 100Ø foul drainage gradient to be 1:80 with the exception of the first connection which shall be minimum 1:40.
14. Manhole covers to be marked FWS or SW as appropriate.
15. All manhole covers and frames shall comply with BS EN124. Covers in roads to be grade D400 and be 150mm deep. Manhole covers in car parking areas and drives to be grade B125 and covers in landscaping areas to be grade A15. All to be sized in accordance with Building Regulations Part H, Tables 11 & 12.
16. Private drains laid under adopted / private roads to be Class S granular bed and surround with a minimum of 1.2m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.
17. Private drains located under landscape areas or driveways / car parking bays to be Class B granular bed and surround with a minimum 0.6m cover, where this cannot be achieved a Class Z concrete bed and surround shall be provided.
18. Pipes have not been designed to accommodate construction traffic loading. The contractor is responsible for providing adequate protection to the pipes during construction.

Legend

- Application Site Boundary
- Proposed Foul Drain
- Proposed Surface Water Drain
- Water Butt (garden re-use)
- SUDS Planter (at RWP Outlet)
- Cellular attenuation
- Porous Gravel Paving
- Wastewater Treatment plant (GRAF Onsticlean)
- Foul Drainage Field

Client: MARK BAKER

Project: UPPER BARN
TYDDYN DEDWYDD
RHOSTYLLEN, WREXHAM

Title: DRAINAGE STRATEGY

DRAWING NUMBER	REVISION	SCALE at A1	1:250
SK / 01	E	DATE	June 2024
		DRAWN	AJ

Appendix 3

Pecolation Test

Foul Percolation Test Results Undertaken by client in lower field.

Date: 9th April 2024

Weather: Wet / Windy

Test Hole 1	Test Hole 2	Test Hole 3
Percolation test	Percolation test	Check water table
300mm x 300mm x 800mm deep	300mm x 300mm x 800mm deep	1500mm x 600mm x 2000mm dp
300mm topsoil over sandy gravely strata	300mm topsoil over sandy gravely strata	300mm topsoil over sandy gravely strata becoming clayey at base

Results:

Test Hole 1				Test Hole 2			
	Time (seconds)		Vp		Time (seconds)		Vp
Test 1	6,970	/150	46	Test 1	6,900	/150	46
Test 2	7,620	/150	51	Test 2	7,860	/150	52
Test 3	10,20	/150	68	Test 3	10,020	/150	67
Test Hole 1 Average Vp = 55				Test Hole 1 Average Vp = 55			
Average VP of Test Holes 1 and 2				**55**			

Drainage field for wastewater treatment plant:

P x Vp x 0.20 = At

10 x 155 x 0.2 = 110sq.m

Using a 0.9m wide trench a total length of 122m will be required within the drainage field.

2m separation between trenches to be provided.

Appendix 4

GRAF One2clean Packaged Treatment Plant

Manufacturers Product Information

Prüfinstitut für Abwassertechnik GmbH

PERFORMANCE RESULTS

Otto Graf GmbH
Carl-Zeiss-Str. 2 - 6, 79331 Teningen, Germany

EN 12566-3
Small wastewater treatment systems for up to 50 PT

Small wastewater treatment system one2clean
SBR plant in one two-zone polypropylene tank

Test report PIA2014-216B14.01.e

Nominal organic daily load*	0.27	kg/d		
Nominal hydraulic daily load	0.75	m³/d		
Material	polypropylene			
Treatment efficiency (nominal sequences)			Efficiency	Effluent
	COD		94.2 %	43 mg/l
	BOD_5		98.0 %	7 mg/l
	SS		96.3 %	14 mg/l
	NH_4-N**		98.3 %	0.5 mg/l
	N_{tot}**		87.0 %	7.9 mg/l
	P_{tot}		80.2 %	1.6 mg/l
Electrical consumption	0.63	kWh/d		

**at a test influent of ≥ 300 mg/l BOD_5 (mean)*
***determined for temperatures ≥ 12°C in the bioreactor*

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration of performance nor the CE marking.

Notified Body No.: 1739

Certified according to ISO 9001:2008

DAkkS Deutsche Akkreditierungsstelle D-PL-17712-01-00

Prüfinstitut für Abwassertechnik GmbH
geprüft - tested - testé

Elmar Lancé November 2014

Wastewater Treatment Solutions

WASTEWATER TREATMENT SYSTEMS & SEPTIC TANKS



ADVANCED WASTEWATER TREATMENT SYSTEMS

ONE 2 CLEAN

SEPTIC TANKS

Welcome to Graf UK

By Matthew Rolph, Managing Director, Graf UK



World's largest injection moulding machine

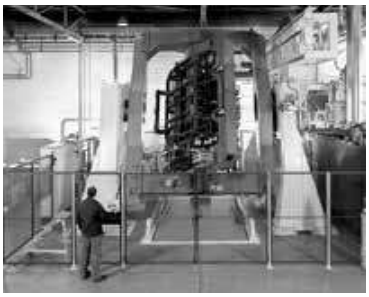
For more than 50 years, the GRAF brand has represented high-quality plastic products. Our Carat wastewater tanks represent the state of the art. Our long-standing partner KLARO, which joined our group of companies in 2014, has grown over the last 10 years to become the European market leader in small SBR treatment systems with airlift technology. Our small wastewater treatment systems are already being used by 240,000 satisfied customers. When you buy a GRAF wastewater treatment system, you benefit from the experience gained from more than 300,000 satisfied wastewater customers and the quality of two established brands in local wastewater disposal.

Quality comes first

GRAF uses state-of-the-art production facilities. This is the only way to guarantee superlative quality at attractive prices. A high standard of quality in production is an essential foundation for unique products. End-to-end quality assurance and a high level of automation guarantee maximum reliability in production. GRAF broke into new ground by using injection embossing to make the Carat wastewater tank. To manufacture this tank, GRAF commissioned the development and construction of the world's largest injection moulding machine.



Blow moulding



Rotational moulding

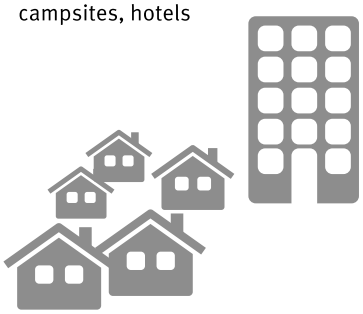
How to choose a wastewater treatment system

Wastewater solutions for:
e.g. domestic properties



- one*2clean* **one-tank system** (› page 6)
- **Septic tank** (› page 15)
- **Anaerobix** (› page 15)

Wastewater solutions for:
e.g. villages, office buildings, campsites, hotels



- one*2clean* **two-tank system** (›› page 6)
- **Advanced wastewater treatment multi-tank system** (›› page 9)

Wastewater solutions for:
e.g. holiday homes



- **Advanced wastewater treatment multi-tank system** (›› page 9)
- **Septic tank** (›› page 15)
- **Anaerobix** (›› page 15)

The Benefits of injection moulding systems

Plastic – clear advantages
Because of their low weight, plastic tanks can be installed without heavy equipment. This means that they can be easily transported and installed in locations that are difficult to access. Plastic tanks, have smooth inner surfaces that will not corrode.

Sustainability starts with production
GRAF products help to protect the environment, so it goes without saying that they are also manufactured in an environmentally friendly way. Injection-moulding a plastic part usually requires up to 2.7 kilowatt hours of electricity per kilogram of plastic. GRAF needs just 0.38 to 0.5 kilowatt hours.

The injection moulding process therefore consumes up to **85% less energy** than normal.

The heat generated during manufacturing is processed by a modern heat recovery system and is used to heat the production and logistics buildings.

Durable products: reliable investment
Right from the product development stage, GRAF attaches great importance to durable design. Our decades of experience combined with modern production techniques guarantee that our plastic tanks last for over 50 years. GRAF offers a warranty of up to 25 years for its wastewater tanks. A 2 year warranty is offered for SBR technology. The efficiency of our wastewater treatment systems is regularly monitored by independent institutes. All products manufactured by GRAF are also 100% recyclable.

Benefits of the Carat system

The only wastewater underground tank of it's kind!

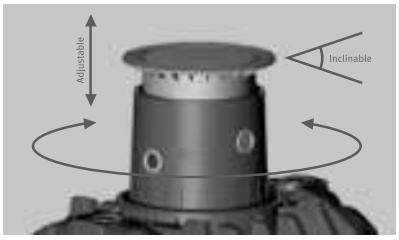
Unique manufacturing process

The GRAF Carat underground tank is unlike any other underground tank in the world. It is the largest tank of its kind to be manufactured by injection compression moulding. This technique provides the tank with unbeatable stability and ensures that each component is produced with the highest of accuracy.

Unlike other underground tanks, the wall thickness is equal in all areas of the tank. The production tolerances are kept to a minimum, resulting in a product of the highest quality, which is strong, accurate, reliable and extremely user friendly.

To manufacture the Carat range, one of the worlds largest injection moulding systems had to be developed.





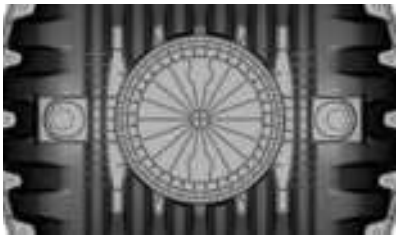
The tank that turns it head for you

The GRAF Carat underground tank has a rotating tank dome. The tank dome can be aligned with the connections independently of the tank - this makes installation much easier! All installation pipes are connected using the five standard lip seals. The Carat telescopic dome shaft connects the system to the ground surface. The height of the tank can be smoothly adjusted to suit the local conditions and it can be tilted by 5°. The whole system is flush with ground level.



Flush with ground level

The Carat underground tank has numerous seals to efficiently stop dirt getting into the tank. This means that groundwater cannot get into the tank and, thus, dirt particles cannot contaminate the wastewater. The seals are in the intersection between the tank and the tank dome and between the tank dome and the telescopic dome shaft. All supply pipes connected to the tank dome are also sealed with five lip seals as standard.



Ribbed tank base

The tank base of the Carat underground tank is extremely stable thanks to the numerous ribs. These enable the Carat to be installed in groundwater up to the middle of the tank. Furthermore, the stable base means the tank is very robust for transportation to site. The tank base has already proven its excellent rigidity in numerous computer simulations during the development process. Please follow our installation instructions for this purpose (can also be downloaded at www.grafuk.co.uk).



Telescopic dome shaft Mini

- With PE cover
- Suitable for pedestrian loading
- Weight 9kg
- Adjustable earth covering across upper tank surface

plus 140mm - 340mm earth covering

Order no. 371010



Telescopic dome shaft Maxi

- With PE cover
- Suitable for pedestrian loading
- Weight 15kg
- Adjustable earth covering across upper tank surface

plus 140mm - 440mm earth covering

Order no. 371011



Telescopic dome shaft cast iron

- Suitable for vehicle loading - with child-proof cast iron cover up to 3.5t
- Weight 55kg
- Adjustable earth covering across upper tank surface

plus 140mm - 440mm earth covering

Order no. 371020



Tank dome Mini



Tank dome Maxi



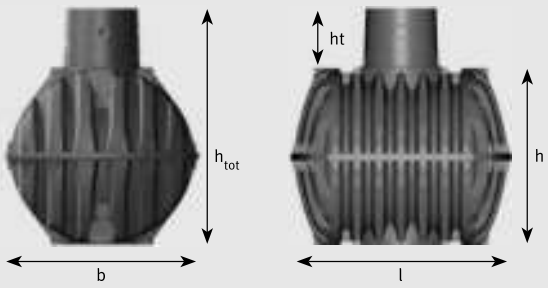
Tank dome Micro

Dimensions

Volume [l]	Width b [mm]	Length l [mm]	Height h [mm]	Height h_{tot} [mm]	Height of tank dome ht [mm]	Inner Ø of tank dome [mm]	Weight [kg]	Order no.
2,700 (700 US gal.)	1565 (61.6")	2080 (81.9")	1400 (55.1")	2010 (79.1")	610 (24.0")	650 – 800 (25.6 – 31.5")	120 (265 lbs.)	372028
3,750 (1,000 US gal.)	1755 (69.1")	2280 (89.8")	1590 (62.6")	2200 (86.6")	610 (24.0")	650 – 800 (25.6 – 31.5")	150 (331 lbs.)	372029
4,800 (1,250 US gal.)	1985 (78.2")	2280 (89.8")	1820 (71.6")	2430 (95.7")	610 (24.0")	650 – 800 (25.6 – 31.5")	185 (408 lbs.)	372030
6,500 (1,700 US gal.)	2190 (86.2")	2390 (94.1")	2100 (82.7")	2710 (106.7")	610 (24.0")	650 – 800 (25.6 – 31.5")	220 (485 lbs.)	372031

Technical data

Max. earth covering (without groundwater vehicle loading)	1200 mm (47.2")
Max. vehicle weight	Suitable for vehicle loading (3.5 t) Higher loads on request
Earth covering required for vehicle loading	800 – 1200 mm (31.5 – 47.2")
Groundwater stability	up to middle of tank
Earth covering required for groundwater stability	800 – 1000 mm (31.5 – 39.4")
Connection	DN 100 / DN 150 / DN 200 on top



The one2clean system

The only wastewater underground tank of it's kind!

- ✓ Only one tank with just one chamber required
- ✓ Less energy consumption and less wear
- ✓ No mechanical elements in the wastewater
- ✓ No pumps in the wastewater
- ✓ No electrical components in the wastewater
- ✓ Incredibly low volume of sewage sludge







one*2clean* set-up kit

- Conventional wastewater treatment systems require up to three pumping processes. one2clean only requires one pumping process, which saves energy and extends the lifetime of the air compressor – the core part of the system
- Rugged clear water lifter manufactured in one seamless piece. No connectors or screws necessary
- Simple maintenance via an integrated, self-cleaning sampling container

one*2clean* system control

- The one2clean has a compact controller
- The microprocessor control system ensures simple operation and maintenance

Wastewater tank

- Telescopic cover
- State-of-the-art manufacturing for maximum stability
- Suitable for vehicle loading in conjunction with telescopic vehicle dome shaft
- 100% watertight and corrosion-resistant
- Can be installed in groundwater up to the middle of the tank

Technical data

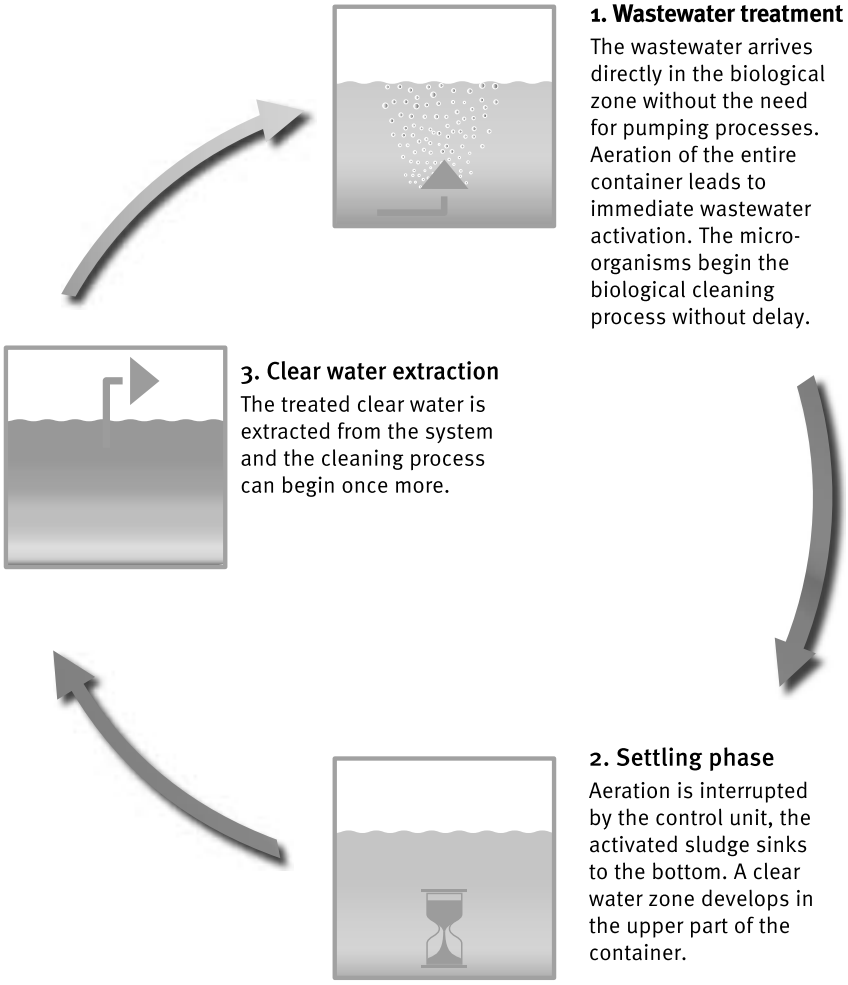
System	one*2clean*
System conformity	EN 12566-3
Purifying technology	fully biological SBR lifting technology
One-tank systems available up to	9 inhabitants | 1,350 l/d
Two-tank systems available up to	18 inhabitants | 2,700 l/d
Maintenance interval	1 – 2 per year
Warranty for underground tank	10 years
Warranty for purifying technology	2 years
Cleaning performance	7, 14, 0.5

Control	
Holiday mode	Manual
+D Removal of nitrogen	●
+C Carbon infeed	○
Logbook function	●
Operation	4 keys
External control cabinet for installing control unit outdoors	○
Annual power consumption	230 kWh (5 inhabitants | 750 l/d)

Parameter	%	mg/l
COD (chemical oxygen demand)	94.2%	43
BOD_5 (biochemical oxygen demand)	98.0%	7
SS (suspended solids)	96.3%	14
NH_4-N	98.3%	0.5
N_{total}	87.0%	7.9

Results of practical testing undertaken by the Prüfinstitut für Abwassertechnik (Testing Institute for Wastewater Technology), Aachen

● Standard equipment
○ Available as options
– not available



1. Wastewater treatment

The wastewater arrives directly in the biological zone without the need for pumping processes. Aeration of the entire container leads to immediate wastewater activation. The micro-organisms begin the biological cleaning process without delay.

2. Settling phase

Aeration is interrupted by the control unit, the activated sludge sinks to the bottom. A clear water zone develops in the upper part of the container.

3. Clear water extraction

The treated clear water is extracted from the system and the cleaning process can begin once more.

Incredibly low volume of sewage sludge

- Aeration of the entire wastewater tank
- Immediate wastewater activation
- Minimisation of the sludge
- Less sludge removal
- Cost savings

Conventional wastewater treatment systems | **one2clean**



Minimum maintenance costs

- Simple construction
- High-quality components
- As much technology as necessary, as little technology as possible.
- Integrated sampling point

Minimum power consumption

- one2clean has only one pumping process, reducing energy consumption and running costs
- Economical motor valve
- Energy-optimised membrane compressor

one2clean only needs 3 steps to produce clear water

The wastewater treatment is carried out in one chamber in just one tank. This eliminates unnecessary pumping processes and sludge return.

one2clean is odourless

The entire volume of wastewater is immediately activated with oxygen using the unique one2clean technology. The final process of the one2clean produces an odourless, clear treated water for extraction to soakaway or waterway.

one2clean already meets the needs of tomorrow

one2clean achieves sustainable discharge values with an efficiency factor of up to 99%! This offers high investment security – even if legal requirements become stricter.

One-tank system

Inhabitants [max.]	Max. daily flow [l/d]	Max. organic load [kg BOD5/d]	Total volume [l]	Volume [l]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]
5	750	0.3	3,750	3,750	2280	1755	1880	150
7	1,050	0.42	4,800	4,800	2280	1985	2110	185
9	1,350	0.54	6,500	6,500	2390	2190	2390	220

Two-tank system

Inhabitants [max.]	Max. daily flow [l/d]	Max. organic load [kg BOD5/d]	Total volume [l]	Volume [l]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]
10	1,500	0.6	7,500	2 x 3,750	5160	1755	1880	300
14	2,100	0.84	9,600	2 x 4,800	5160	1985	2110	370
18	2,700	1.08	13,000	2 x 6,500	5380	2190	2390	440

one2clean accessories

GRAF EPP control cabinet - Easy, flexible application

- Easy access for maintenance
- Function checking is simple as the control unit is located immediately next to the sytem
- Ideal solution for large distances from the house (>20m)
- Flexible use of the proven GRAF EPP control cabinet in a plastic external column
- Lockable housing in sturdy, weather-resistant plastic
- Integrated double power socket for easy maintenance



GRAF Plastics external control cabinet S for EP control cabinet (size upto 7 inhabitants)



GRAF Plastics external control cabinet M for EP control cabinet (size upto 18 inhabitants)

Carbonator (Carbon dosage)

Sewage treatment plants require a constant inflow of wastewater into the tank in order for them to work correctly. The seasonal occupation of holiday homes is a challenge for wastewater treatment systems that rely on constant inflow to keep the microorganism poulation stable. Any destabilisation of the microorganisms within the system incurs extra operating costs.

The Carbonator was especially designed to keep wastewater treatment systems with seasonal inflow stable and working correctly. The additional Carbonator module automatically feeds the systems with nutrients that keep the microorganisms alive when there is no wastewater inflow.

Benefits

- Regardless of system - suitable for other treatment plants (one2clean compatible
- Individual adjustment of dosage
- Low power consumption
- Fast installation
- Simple operation

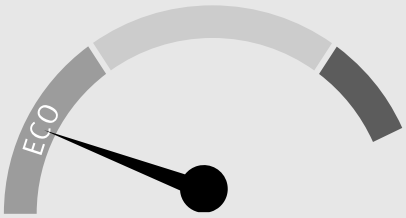
Empty pipe seal DN 100

- Air-tight seal for empty pipe
- No insulating foam required
- Clean, professional solution



Minimum power consumption

- one2clean has only one pumping process, reducing energy consumption and running costs
- Economical motor valve
- Energy-optimised membrane compressor



Only 46 kWh per person and per year!

*Based on a 5PE One2Clean plant

Advanced wastewater treatment systems

- ✓ No live electrical parts in the water
- ✓ Low power consumption
- ✓ Optional automatic adjustment to living situation (underload detection)
- ✓ Optional remote monitoring
- ✓ High-quality components mean low maintenance costs







Super-quiet control cabinet

- Extremely low noise thanks to EPP housing and very quiet air compressor
- Battery-free power failure detection
- Very easy installation
- Interchangeable plug-in components

High-tech installation kit

- Integrated self-cleaning sampling container
- Each lifter manufactured as a single piece.
  No connectors or screws necessary
- Colour-coded and pre-assembled
- Special lifter design prevents sludge from leaking in
- Lifters easy to remove for maintenance without the use of tools

Wastewater tank

- Telescopic cover
- State-of-the-art manufacturing for maximum stability
- Suitable for vehicle loading in conjunction with telescopic vehicle dome shaft
- 100% watertight and corrosion-resistant
- Can be installed in groundwater up to the middle of the tank

Technical data

System	Advanced WWT Systems
System conformity	EN 12566-3
Purifying technology	fully biological SBR lifting technology
One-tank systems available up to	9 inhabitants | 1,350 l/d
Maintenance interval	1 – 2 per year
Warranty for underground tank	10 years
Warranty for purifying technology	2 years
Cleaning performance	7, 14, 0.5 (5-18PE)/ 12, 20, 12 (22-50PE)

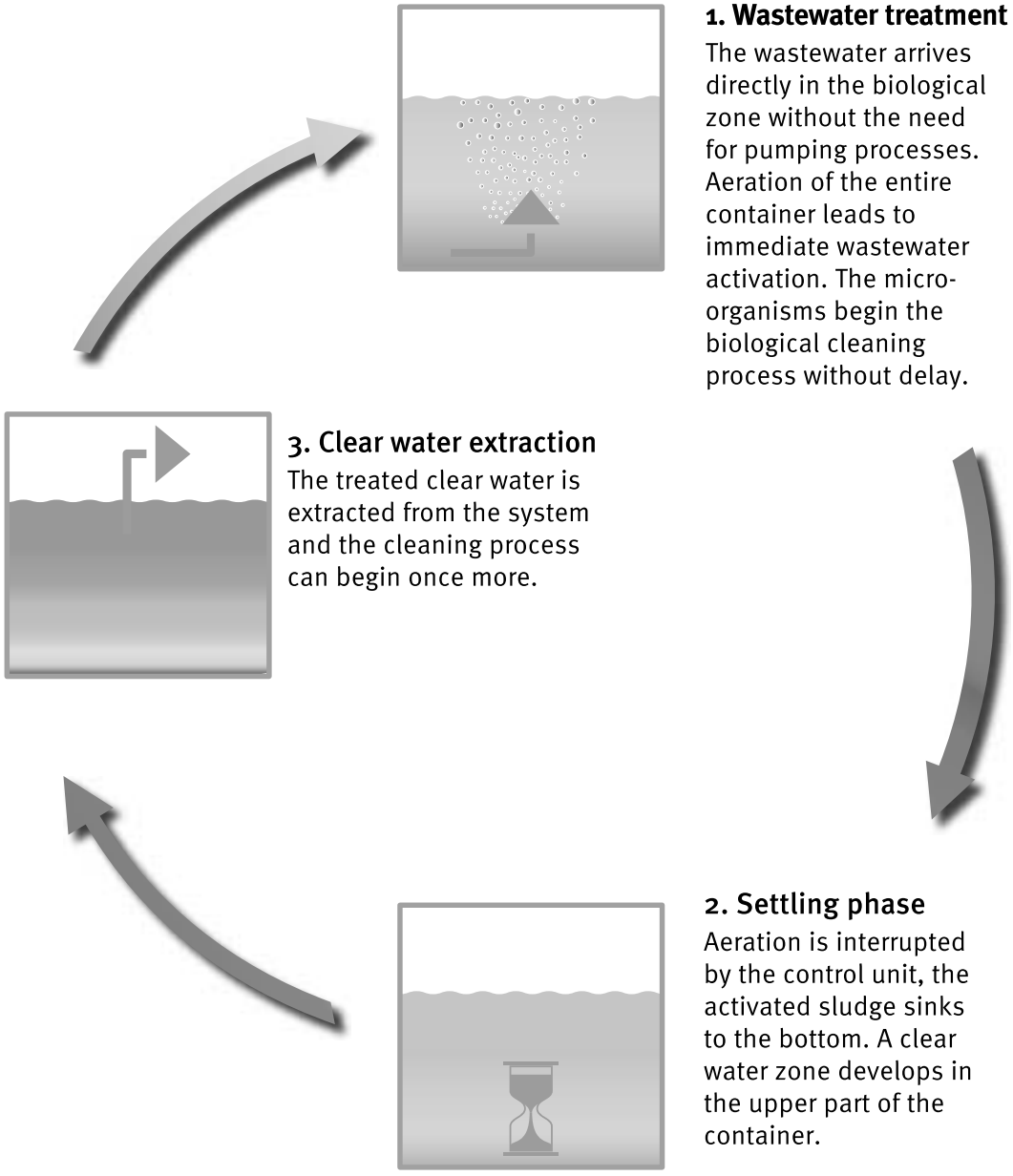
Control	KL24plus (+K)
Holiday / economy mode (underload detection)	Automatic
Back pressure monitoring	●
+R Remote transmission (GSM modem)	○
+P Phosphate removal	○
+C Carbon infeed	○
+H Hygiene package (Disinfection)	○
+D Removal of nitrogen	○
Control power failure recognition	●
Temperature sensor to protect against overheating	●
Logbook function	●
Operation	14 keys
Serial interface for software updates	●
External control cabinet for installing control unit outdoors	○

Parameter	%	mg/l
COD (chemical oxygen demand)	94.2 /91.9%	43/51
BOD_5 (biochemical oxygen demand)	98.0/95.9%	7/12
SS (suspended solids)	96.3/94.4%	14/20
NH_4-N	98.3/65.4%	0.5/12
N_{total}	87.0/57.1%	7.9

Results of practical testing undertaken by the Prüfinstitut für Abwassertechnik (Testing Institute for Wastewater Technology), Aachen

● Standard equipment
○ Available as options
— not available

Advanced wastewater treatment systems



1. Wastewater treatment

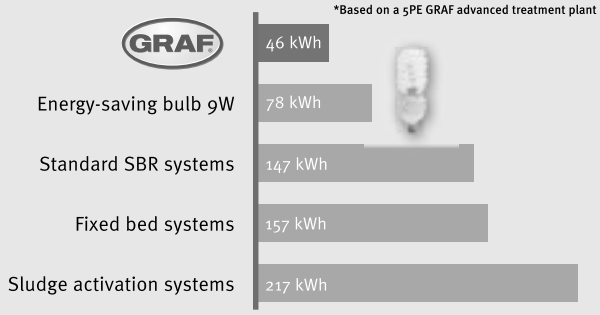
The wastewater arrives directly in the biological zone without the need for pumping processes. Aeration of the entire container leads to immediate wastewater activation. The micro-organisms begin the biological cleaning process without delay.

2. Settling phase

Aeration is interrupted by the control unit, the activated sludge sinks to the bottom. A clear water zone develops in the upper part of the container.

3. Clear water extraction

The treated clear water is extracted from the system and the cleaning process can begin once more.



Minimal power consumption per inhabitant[1)]

1)The diagram indicates the annual power consumption of various wastewater treatment systems. Source: “wwt”, edition 6/2007 “The wastewater treatment system as a permanent solution”, page 15, table 3, practical data; One2Clean: test report by PIA (Prüfinstitut für Abwassertechnik GmbH, Testing Institute for Wastewater Technology), Aachen, test number PIA2014-216B14.01.e



Advanced wastewater treatment one-tank systems

Inhabitants [max.]	Max. daily flow [l/d]	Max. organic load [kg BOD5/d]	Total volume [l]	Volume [l]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]
5	750	0.3	3,750	3,750	2280	1755	1880	150
7	1,050	0.42	4,800	4,800	2280	1985	2110	185
9	1,350	0.54	6,500	6,500	2390	2190	2390	220

Advanced wastewater treatment multitank system

Inhabitants [max.]	Max. daily flow [l/d]	Max. organic load [kg BOD5/d]	Total volume [l]	Volume [l]	Length* [mm]	Width* [mm]	Height [mm]	Weight [kg]
10	1,500	0.6	7,500	2 x 3,750	5160	1755	1880	300
14	2,100	0.84	9,600	2 x 4,800	5160	1985	2110	370
18	2,700	1.08	13,000	2 x 6,500	5380	2190	2390	440
22	3,300	1.68	9.600	2 x 4,800	5160	1985	2250-2450	440
28	4,200	1.92	13,000	2 x 6,500	5380	2190	2530-2730	530
35	5,250	2.10	17,000	2 x 8,500	15500	2040	2515-2715	780
40	6,000	2.40	20,000	2x 10,000	15500	2240	2715-2915	930
50	7,500	3.00	26,000	4x 6,500	11360	2190	2850-3050	1060
60	9,000	3.60	26,000	4x 6,500	11360	2190	2850-3050	1060

Advanced wastewater treatment system accessories

Plastic external control cabinet M

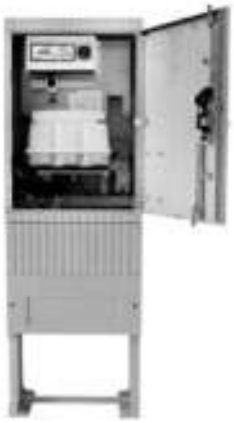
for up to 18 inhabitants

Order no. 107773



Plastic external control cabinet L

for up to 22-40 inhabitants



Benefits

- Easy access for maintenance
- Function checking is simple as the control unit is located immediately next to the system
- Ideal solution for large distances from the house (› 20 m)
- Flexible use of the proven GRAF EPP control cabinet in a plastic external column
- Lockable housing in sturdy, weather-resistant plastic
- Integrated double power socket for easy maintenance



Easy, flexible application for the GRAF EPP control cabinet M



EPP control cabinet
Part of the wastewater treatment system



GRAF Plastics external control M cabinet for EP control cabinet (size up to 18 inhabitants)

+K Convenience package

Convenience package: control with larger display and keypad. Underload detection by a pressure sensor in the control.

Standard

KL24plus



- SD card slot for easy logbook transfer
- Automatic underload detection
- Suitable for phosphate precipitation and UV module
- Large display and 14 keys for comfortable operation
- Automatic logging
- Battery-free power failure detection
- High-contrast display with blue backlighting
- Durable, gas-tight membrane keypad

+O Outlet with clear water pump



Lift the clear water when the outlet pipe is lower than the water course.

On request

+D Removal of nitrogen

The +D package for denitrification (removal of nitrogen) results in the clarified water quality satisfying very strict requirements. The GRAF systems thereby attain a N_{total} value (total parameters of inorganic nitrogen compounds) of less than 25 mg/l.

Order no. 107520

+P Phosphate removal package

Phosphate in water results in a massive build-up of algae. The GRAF +P package ensures the safe removal of phosphate and therefore great water quality

On request



+C Carbon infeed

Solution for weekend homes

The addition of carbon as a nutrient allows the purification process to continue and prevents the biology from dying off.

On request

+R Remote transmission

Remote monitoring allows error messages to be transmitted to mobile phones and operating data to be queried by text message. Convenient remote wastewater treatment system control by GSM is also possible.



- Greater efficiency
- Greater operating reliability
- Optimised service intervals
- Greater customer benefit thanks to monitoring service
- Low-cost remote diagnosis in the event of a fault without the service fitter having to come on site

Order no. 107117

+H Hygiene package

Disinfection using the +H package satisfies even the most stringent of purity requirements for a GRAF wastewater treatment system. Without the use of chemical substances, it reliably kills off germs and microorganisms. The clarified water therefore complies with the EU Bathing Water Directive.

On request



- Easy to operate
- Maintenance-friendly thanks to easy-to-remove module
- Fitted in downstream shaft

Accessories for small wastewater treatment systems

Sampling point, internal

For two- and multitank systems

Order no. 107170

Empty pipe seal DN 100



- Air-tight seal for empty pipe
- No insulating foam required
- Clean, professional solution

Order no. 107613

Filling granulate for external cabinets

Prevents soil moisture from rising into the external control cabinet. Required amount: 1 bag per external control cabinet for 12 – 28 inhabitants; 50 l bag

Order no. 107607

Voltage transformer

- From 110 V – 230 V
- Up to 300 W (LA 200)

Order no. 107421

Odour filter



For DN 100 ventilation openings; reliably filters out unpleasant odours; filter insert of multi-layer mesh with impregnated activated carbon

Order no. 104018

Filter insert



For odour filter; replace at least every two years or when odour is perceptible

Order no. 104024

SBR hose package (Advanced)

Includes:
1 x Ø 19 mm and 3 x Ø 13 mm PVC hose; colour-coded for Advanved WWT system
Length: 20 m

Order no. 107192

SBR hose package (One2Clean)

Includes:
1 x Ø 19 mm and 1 x Ø 13 mm PVC hose; colour-coded for One2Clean system
Length: 20 m

Order no. 107668

Large advanced wastewater treatment systems

Special requirements

Systems for more than 50 inhabitants work on the same principle as small wastewater treatment systems and use the SBR process. Because of the special requirements involved, all systems for more than 50 inhabitants are planned as individual projects. Our experienced team of engineers and technicians will help you to plan your project. We take all local circumstances into account from the concept planning phase to implementation.







Options

+D +P +C +H +R

The proven options of the advanced wastewater treatment systems are also available on request for large systems.

10 years warranty on wastewater tanks

2 years warranty on technology

QUALITY MADE IN GERMANY

Download sizing form www.graf.info

Inhab. [max.]	Max. daily flow [l/d]	Max. organic load [kg BOD5/d]	Volume [litres]	Length [mm]	Width [mm]	Product code
75	12,250	3.60	2x 16,000	9900	2500	G50036
90	13,500	5.40	2x 22,000	12900	2500	G50038
100	15,000	7.20	2x 22.000	12900	2500	G50040
150	22,500	9.00	2x 32,000	17700	2500	G50042
200	30,000	10.80	4x 22,000	26400	2500	G50044
250	45,000	15.00	1x 52,000 2x 32,000	13300	8700	G50046
300	45,000	18.00	1x 52,000 2x 32,000	13300	8700	G50048
350	52,500	21.00	3x 22,000 2x 38,000	19900	5600	G50050
400	60,000	24.00	3x 22,000 2x 44,000	21400	5600	G50052
450/500	75,000	27.00/30.00	3x 22,000 4x 32,000	27500	5600	G50054
550/600	90,000	33.00/36.00	3x 26,000 4x 32,000	16200	11800	G50056
650/700	105,000	39.00/42.00	2x 32,000 4x 38,000	27500	5600	G50058
750/800	120,000	45.00/48.00	1x 38,000 3x 22,000 6x 28,000	26200	8700	G50060
850/900	135,000	51.00/54.00	1x 54,000 3x 22,000 6x 34,000	29100	8700	G50062
950/1000	150,000	57.00/60.00	1x 54,000 3x 22,000 6x 38,000	30500	8700	G50064

External control cabinets



L metal external cabinet

XL metal external cabinet

Concrete external cabinet

To plan your system, we need the following information:

- What type of project? (Domestic, hotel, commercial etc.)
- How many people will use the system and what is the water consumption per head?
- What legal requirements apply to wastewater at the location?
- Local power grid

Carat Septic Tank

Two chambers

Floating and removable material is extracted from domestic wastewater in mechanical wastewater tanks. This is purely mechanical cleaning.



Benefits

- Low weight: can also be installed in difficult local conditions without a crane
- Low maintenance: maintenance or cleaning work can be performed through the shafts
- Tanks can be used as rainwater harvesting systems after thorough cleaning

12566-1*

Hydraulic efficiency **99.9 %**

*Refer to the installation instructions for CE-compliant Septic tanks

Carat S Septic tank

Inhabitants [max]	Total volume [l]	Capacity [l]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]
4	2,700	2,700	2080	1565	2010	145
11	3,750	3,750	2280	1755	2200	175
18	4,800	4,800	2280	1985	2430	220
30	6,500	6,500	2390	2190	2710	260

One complete system consists of: Carat underground tank with baffle. Also available without baffle as a one-chamber wastewater tank.

Anaerobix – Wastewater Treatment System with Biological Filter

Simple and low-cost

- Anaerobix is the new low-cost anaerobic filter system for wastewater tanks in Graf tanks
- Filled with the carrier material supplied, it increases the cleaning performance of a wastewater tank several times over. The large surface of the recyclable plastic carrier material (141 m^2/m^3) allows the biofilm responsible for the cleaning process to cover a large area.

The benefits of the Anaerobix system at a glance

- Very good cleaning performance: efficiency over 90%, PIA-certified (Testing Institute for Waste Water Technology)
- No power consumed, no electrical or mechanical components (e.g. pumps or float switch) in tank
- Largely maintenance-free
- Installation in proven Graf tanks
- Easy to install with standard DN 100 pipes
- Very good value for money



Technical data

System	Anaerobix
Purifying technology	Anaerobic system
One-tank systems available up to	3,750 l/d
Maintenance interval	1 – 2 per year
Warranty for underground tank	10 years



Anaerobix single-tank system

Tank volume	2,700 litres	3,750 litres	4,800 litres	6,500 litres
Max. daily flow [l]	1,200	2,250	2,850	3,750

Limit values	
BOD_5 (biochemical oxygen demand)	75 %
SS (suspended solids)	90 %

Warranty clause:
The warranty mentioned in this brochure only refers to the tank in question and not to the accessories. Within the warranty period we grant free replacement of the material. Further benefits are excluded. Pre-condition for warranty benefits are proper handling, assembly and installation according to the mounting guidelines.

N.B. Protect tanks from frost when installed above ground! In case of groundwater installation, please contact us for further information prior to purchase!

For all indications of measurements in this brochure we reserve a tolerance of +/- 3%. The useage volume of the tanks may be up to 10% lower than the tank Volume, depending on the connecting option.

Technical modifications and further development of the various products are subject to change. Errors excepted.



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