

Final Project Report (to be submitted by 20th September 2018)

Instructions:

- Document length: maximum 10 pages, excluding this cover page and the last page on project tags.
- We welcome the submission of Annexes (i.e. bachelor or master thesis, references, species lists, maps, drawings, pictures) to further HeidelbergCement's understanding and future use of your findings, however they will not be reviewed by the Jury, and we kindly ask for these to be sent separately to the National Coordinators.
- Please use the attached template for species data collected during the project and submit with the project report.
- Word/PDF Final Report files must be less than 10 MB.
- If you choose to submit your final report in your local language, you are required to also upload your final report in English if you wish to take part in the international competition.
- To be validated, your file must be uploaded to the [Quarry Life Award website](#) before **20th September 2018** (midnight, Central European Time). To do so, please log in, click on 'My account' / 'My Final report'.
- In case of questions, please liaise with your national coordinator.
- **You should not publish additional private information in your final report (e.g.: address, day of birth, email-address, phone number), just complete the categories we ask for below under "Contestant profile".**

The final reports should comprise the following elements:

For research stream projects:

- Abstract (0,5 page)
- Introduction :
 - For projects that are building upon a previous project, write a summary of actions that were already completed in the previous project.
 - Project objectives
- Methods: a detailed description of the methods used during the project is required.
- Results: the results of the project should be outlined and distinguished from the discussion.
- Discussion:
 - Results should be analysed and discussed with reference to region/country taking into account other publications.
 - Outline the added value of the project for science and for the quarry / company.
 - Recommendations and guidance for future project implementation and development on site is requested. Where possible, please mention the ideal timing and estimated costs of implementation.
- Final conclusions: a short summary of results and discussion.

For community stream projects:

- Abstract (0.5 page)
- Introduction
 - For projects that are building upon a previous project, write a summary of actions that were already completed in the previous project.
 - Project objectives
 - A short description of the site and the team members and the targeted audience of the project.
- Actions and activities: a detailed description of planned or implemented actions and outreach activities done to elaborate the project, list of stakeholders involved.
- Discussion:
 - Project teams should discuss the pros and contra and illustrate experiences.
 - Outline the added value of the project for biodiversity, the society and the quarry / company.
- Deliverables: practical implementation and development recommendations of the project are required. Where possible, please mention the ideal timing and estimated costs of implementation.
- Final conclusions: a short summary of the project findings and discussion.

1. Contestant profile

Contestant name:	Ute Straßburg, Tobias Mehnert
Contestant occupation:	Graduate physicist and cultural scientist
University / Organisation	Naturschutzverband Sachsen e.V.
Number of people in your team:	3

2. Project overview

Title:	Sustainable amphibian protection through the use of natural processes
Contest: (Research/Community)	community stream project
Quarry name:	Penig/Elsdorf

Abstract (max 0.5 pages)

Together with the operators of the gravel pit in Penig/Elsdorf, the “Naturschutzverband Sachsen e.V.” initiated the restoration of the gravel pit’s former alluvial fan as an open, water-dominated habitat for amphibians, reptiles and water-bound bird species and completed it as part of the “Quarry Life Award 2021” competition.

With knowledge of the fluctuation range of the water level and the terrain heights from the plan, a scenario for periodic flooding on the alluvial fan or – during low water phases – the guarantee of a permanent dam in the ponds was developed. The resulting terrain excavation formed the basis for a coordinated draft plan, which ultimately led to a quantity and cost estimate. The planning phase lasted only 2 months and was conducted at the draft level planning, as further investigations (soil) could not be carried out.

With a cost budget of €37,000, the overgrown alluvial fan was cleared of vegetation over 3,500 m² within 4 months, excavated extensively to a depth of 0.30 m and 8 gully-like pools and another pool at the edge of the reeds were created. Despite the extreme drought, permanent water was present in most of the gullies and ponds throughout the summer months. Last but not least, successful reproduction of the green toad in the ponds was already evident during the project period. In addition, pond frogs settled in the area and the little ringed plover was observed.

Numerous construction difficulties were overcome during the project. **Final Report (max. 9 pages)**

Introduction

Since regulation of almost all watercourses in the form of straightening, shoring and dykes, the landscape has lacked floodplain dynamics and thus water. This has led, in no small measure, to a dramatic decline in amphibian populations. This now also applies to the so-called “common species” such as the common frog and common toad. The amphibian ponds, which are often created as a substitute by nature conservation, can only partially guarantee the conditions required for successful amphibian reproduction. They are either too shallow – due to overgrowth in years of drought, or they are too deep – as then a fish population establishes itself in permanent water. In both cases, reproduction is only guaranteed to a very limited extent, since predators excessively reduce the number of amphibians, which are weak competitors. In the best case, people continue to improve things by regularly “simulating” the dynamics by intervening with construction machinery.

Together with HeidelbergCement, the Naturschutzverband Sachsen e.V. wanted to find a new solution at the site of the Penig/Elsdorf gravel pit and create a “dynamic water landscape” that offers good habitat conditions for amphibians and water-bound bird species without the need for permanent maintenance costs.

Since 1993, water levels in the residual lake at the Penig/Elsdorf gravel pit have been documented.

These water level measurements form the basis for the present project idea. Such data is only available in excavation ponds where operation is regularly documented and monitored. This, therefore, represents a valuable treasure trove of data, which is now being evaluated for its benefit to nature conservation and converted into practical measures.

The water level measurements in the residual lake for the period from 1993 to 2001 show an average water level fluctuation range of 1.60 m due to precipitation and an average water level of 232.40 m above sea level. Even between the floods of 2002 and 2013, the water level again fluctuated around a similar average level of 232.65 m above sea level. The lowest water level in the residual lake was measured on 06/06/2021, after three years of very little precipitation (“drought years” 2018 – 2020), at a level of 230.60 m above sea level. It is therefore reasonable to assume that in years with average precipitation, the water level averages around 232.50 m above sea level.

Using the aerial photos from Google Earth for the years 2010, 2016, 2018 and 2020, marked with the exact date of the flight, it is possible to compare the water levels with a landscape photo of the gravel pit. We evaluated these aerial photos specifically for the so-called “alluvial fan”, since this approximately 1.5-hectare area has not been used for years and is very well suited for species protection measures, due additionally to its location and topography.

The aerial photo from 11/10/2018 corresponds almost exactly to the water level measurement from 27/11/2018. It shows that the part of the alluvial fan near the bank is no longer flooded – like in the previous year – and

appears as a gravelly-sandy open land area. The altitude of the terrain in this sub-area, which can be taken from the plan, is between 231.39 m (bank, partly still flooded) and 232.00 m above sea level (landside, already dry for a long time). The associated water level was 231.85 m above sea level. The “drought years” 2018 - 2021 then led to a drop in water level of 1.25 m. It is therefore reasonable to assume that, with a level terrain removal of approx. 0.50 m and selective excavations of approx. 1 m depth,

a) Water is permanently present in these excavations both in years with normal water availability and in years with below-average precipitation and

b) when normal amounts of precipitation return and the water level rises towards the average height of 232.50 m above sea level, the site will be partially flooded again.

This would create the conditions for a periodically wet open country with a probability of flooding, and therefore a “dynamic water landscape”.

Since the alluvial fan dried up in 2018, natural succession had conquered the area. The formerly open sand and gravel areas were overgrown with softwood bushes or reeds, the biomass of which caused an annual increase in eutrophication and further elevation of the site.

After evaluating the water level measurements and aerial photos, the operator of the gravel pit and NaSa e.V. decided there was a realistic chance to push back the succession in parts of the alluvial fan near the banks to a state of periodically wet open land and thus to create a valuable habitat for amphibians and waders. This would be achieved by excavating the terrain and therefore returning it to the area of the changing water level of the residual lake. The excavation material thereby obtained would be used to model a flat shore and a land bar (separation of a lagoon-like bay) in the residual lake.

Goals of the Project

1. The partial areas close to the shore of the alluvial fan in the Penig/Elsdorf gravel pit that flows into the residual lake, which is no longer used and has since become overgrown, are to be converted into amphibian, reptile and wader habitats by various measures costing €37,000 (net) in the project period from November 2021 to September 2022. The goal is to create a mosaic of wet and periodically wet areas with different structure and characteristics, which will benefit amphibians such as natterjack toads, green toads, common toads, crested newts and smooth newts, reptiles such as sand lizards and grass snakes, waders such as little ringed plovers and snipes, and numerous insects.

2. Due to the documented water level fluctuations of the residual lake, it may also be possible to preserve the landscaped area as an open, water-dominated habitat and little to no maintenance measures will be necessary.

3. The developments in the area during the project period are documented including monitoring for amphibians.

4. The measure is intended to provide an example of the establishment of self-sustaining open land biotope structures using natural site processes.

Implementation

The first design ideas for the project were developed at the beginning of September 2021 in joint consultation between the operator and NaSa e.V. On the basis of the current plan, the submitted water level measurements and the historical aerial photos, an initial plan of measures was drawn up on the scale of 1: 1,000 for habitat design measures, in particular for the natterjack toad as the indicator species. This also included measures outside the alluvial cone and should be understood as a “future vision for species protection” for a larger section of the Penig/Elsdorf gravel pit. For the Quarry Life Award, the parts of the concept surrounding the alluvial fan were transferred to a new action plan, which then formed the basis for the competition project at the beginning of November (**Annex 1 – Action Plan from 04/11/2021**).

This was preceded by initial discussions and on-site inspections with the construction company, which subsequently implemented the project. As it was clear right from the start that the construction capacity of the gravel pit operator was insufficient to implement the measure and that it would be necessary to use an external company.

In coordination with the Berthold construction company and the gravel pit operator, a concept for the structural implementation and budget (originally €30,000 net) was developed. During the on-site inspections in autumn 2021, everyone involved could see that implementation of the measures would be challenging because the area is very wet. Therefore, the use of special technology was planned. It was decided that extensive soil removal of approx. 0.4 m should be undertaken, as well as the creation of gully-like ponds approx. 1 m deep and emplacement of soil in the flat banks and land bar (lagoon dam), using a long-arm excavator stationed at a few defined points and stabilised with excavator mats. It was planned to use the resulting surplus masses to cover an embankment from a construction road that was also laid out with excavator mats. The action plan of 04/11/2021 was established on the basis of these considerations.

After the project had been submitted to the competition and accepted, a favourable opinion on the project was requested from the lower nature conservation authority of the Central Saxony district office at the beginning of January. In order to rule out an exceptional permit for cutting and felling measures (no permit required until February 28th), we set ourselves a tight schedule and therefore hoped that the opinion would be processed quickly. At the same time, contract negotiations with the Berthold construction company and further construction work discussion were underway. It turned out that the emplacement of surplus mass outside the alluvial fan would have to be omitted in order to remain within budget. When discussing further implementation details, it also became clear that there was not enough rough-cut material in the gravel pit for construction of the lagoon dam. Delivery of the material would also be too expensive. We therefore had to reschedule, but we also wanted to avoid making too many cuts to the nature conservation objectives. As a result, the amended plan of measures

(Annex 2 – Amended Plan of Measures from 28/02/2022) no longer included the lagoon dam, but an additional pond on the alluvial fan, which we dubbed the “inner lagoon” in analogy to the original plan. This pond with permanent waterlogging at the reed edge should also be designed as a fish-free amphibian spawning ground and is particularly suitable for tree frogs and water frogs.

Overall, the excavation work should remain within a 4,000 m² area of the alluvial fan. This work area was to be demarcated on-site and would therefore represent the binding local range of construction measures. Specific sub-measures for this area were vegetation removal (herbaceous vegetation and trees), extensive soil removal up to a depth of 0.3 m, the creation of 8 gully-like ponds up to 1 m deep and the creation of another pond on the reed edge of at least 1 m deep. The gully shape of the ponds is analogous to the excavator tracks in excavation sites, whose characteristics are determined by the engineering, and therefore tackles the resulting soil damage. Another reason for choosing this pond shape is the weather-related erosion processes that take place in excavation sites. Bank edges created in small-scale work processes would quickly disappear again, which is why they were not used.

After several rounds of negotiations with the Berthold construction company, the construction contract was concluded on 23/02/2022, and now featured a fixed sum of approx. €37,000 net, which took into account increased fuel prices. In the meantime, we have also received the favourable opinion of the lower nature conservation authority of the Central Saxony district office.

In the last week of February, the project area was measured and staked out. The Berthold construction company then removed the vegetation on the alluvial fan over an area of 4,000 m² using both manpower and machinery. The water-saturated bottom of the alluvial fan presented a major challenge when using machinery. The mulcher got stuck several times and sank in the alluvial sand, so in the end, work had to be done by hand. The plan to mulch the area of the future pond (“inner lagoon”) also had to be abandoned because the area was far too wet.

The woody mulch material (willow and birch up to 4 cm thick) was deposited in heaps at the edge of the alluvial fan as an additional biotope element. In March 2022, a 4,000 m² area of the alluvial fan was once again free of vegetation.

The mowing work showed heavy construction equipment can only be used to a limited extent for the pending earthworks – despite the use of excavator mats. The ground, now free of vegetation, was however so saturated with water that it began to flow under greater pressure or vibration and every construction machine literally sank. Water discharged locally in many places. As part of the joint construction meetings with the gravel pit operator, construction company and ourselves, a technology was sought to implement the project despite the adverse conditions.

The following has been determined:

- Use of the long-arm excavator will be discontinued.

- Work with a smaller excavator will begin.
- Earthworks to create the flat bank are not necessary since the bank area is too wet to be able to drive on with the excavator.
- The excavated material will instead be deposited to form an irregularly shaped dam on the landward edge of the alluvial fan. When the water level rises, these areas would jut out of the water like islands and form breeding grounds for waders, for example.

From April 2022, a Kubota KX080-4α2 mini excavator with a total weight of 8.3 t was used.

Right on the first day of operation, the excavator sank into the wet ground despite the use of excavator mats. Mr. Berthold from the construction company therefore suggested a new technology. This required piling up the excavated soil material first to form a dam, on which the excavator can then drive. From this earth dam, the excavator can carry out further soil removal or gully excavation on both sides. The earthen dam is then removed again upon leaving. A test run was promising. However, this technology meant that more ground had to be moved.

After reaching these decisions, the earthworks on the alluvial fan began at the end of April 2022. As a result, regular construction consultations took place on-site, so that plan details such as the position of the gullies and the shape and size of the pond could be adjusted repeatedly. It was also possible to emplace a few cubic metres of soil into the residual lake as a flat bank. Finally, on 21/06/2022, the joint construction acceptance was performed. Amphibian monitoring then began in July 2022. Our amphibian specialist Ralf Habel examined the alluvial fan on 02/07/2022 (with night capture), 12/07/2022 and 08/06/2022.

Results

Overall, between February and June 2022, the following biotope design measures were implemented on the alluvial fan of the Penig/Elsdorf gravel pit at a cost of €37,000 (net):

- Areal removal of trees, bushes and herbaceous vegetation over 4,000 m²
- Areal soil removal up to a depth of 0.30 m over 4,000 m²
- Installation of deadwood structures and ground walls on the landside edge of the area being covered
- Installation of 8 gully-like ponds with a length of approx. 10 m and a depth of up to 1 m
- Installation of a pond at reed edge with a depth of up to 1 m
- Final tilling of the entire ground over an area of 4,000 m².

The construction costs per square metre of area total €9.25.

Despite the drought that has persisted since May, there was water in most of the gullies, also in the pool at the edge of the reeds. Amphibian monitoring provided evidence of successful reproduction of the green toad in the gullies and in the pond. Furthermore, pond frogs were also found in the pond. The little ringed plover was observed regularly on the alluvial fan.

The goals of the project were therefore achieved (Annex 3 – Photo Documentation).

Discussion

The project implementation has shown:

- Former, already overgrown alluvial areas around the banks of gravel and sand pits can be restored as valuable open land habitat characterised by water.
- This requires knowledge of the groundwater and surface water dynamics in the mining area.
- The soil composition of alluvial surfaces is inhomogeneous and unstable. They are saturated with water, even if they appear dry on the surface. The water is discharged by pressure and vibration and starts to flow.
- The greater the excavation of land, the better the outcome of the project, but the more difficult it is to undertake construction. Groundwater is not always highest at bank level.
- Earthworks on alluvial land require an adapted technology. The installation of temporary earth dams as a form of construction road represents one option to carry out earthworks even on water-saturated soil.
- Areal soil excavation of < 0.3 m does not cover all roots, not even those of herbaceous vegetation. The rhizomes of canary grass and reed reach much deeper into the ground. If the area is to be kept clear for a long time, soil excavation of at least 0.50 m is necessary. Tree roots reach deeper and may need to be removed individually.

- The efficacy of tilling the surface to remove vegetation has not yet been confirmed. It is possible this only crushes rhizomes allowing them to sprout again in greater numbers.
- The development of the project area depends on the water level in the residual lake and therefore precipitation in the coming years. If an elevated lack of precipitation persists, the extensive soil excavation measures carried out will not suffice to maintain open structures in the long-term because they were not deep enough.
- Unfortunately, the area not only became more attractive as an animal habitat, but also as a leisure retreat for people. Seclusion can only be guaranteed if illegal entry and driving is prevented consistently.
- It can also be achieved without complex planning, but a lot of improvisational skill is required from those involved.

To be kept and filled in at the end of your report

<p>Project tags (select all appropriate):</p> <p>This will be use to classify your project in the project archive (that is also available online)</p>	
<p>Project focus:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Beyond quarry borders <input checked="" type="checkbox"/> Biodiversity management <input checked="" type="checkbox"/> Cooperation programmes <input type="checkbox"/> Connecting with local communities <input type="checkbox"/> Education and Raising awareness <input type="checkbox"/> Invasive species <input type="checkbox"/> Landscape management <input type="checkbox"/> Pollination <input checked="" type="checkbox"/> Rehabilitation & habitat research <input type="checkbox"/> Scientific research <input type="checkbox"/> Soil management <input type="checkbox"/> Species research <input type="checkbox"/> Student class project <input type="checkbox"/> Urban ecology <input type="checkbox"/> Water management <p>Flora:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Trees & shrubs <input type="checkbox"/> Ferns <input type="checkbox"/> Flowering plants <input type="checkbox"/> Fungi <input type="checkbox"/> Mosses and liverworts <p>Fauna:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Amphibians <input checked="" type="checkbox"/> Birds <input type="checkbox"/> Insects <input type="checkbox"/> Fish <input type="checkbox"/> Mammals <input type="checkbox"/> Reptiles <input type="checkbox"/> Other invertebrates <input type="checkbox"/> Other insects <input type="checkbox"/> Other species 	<p>Habitat:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Artificial / cultivated land <input type="checkbox"/> Cave <input type="checkbox"/> Coastal <input type="checkbox"/> Grassland <input type="checkbox"/> Human settlement <input type="checkbox"/> Open areas of rocky grounds <input type="checkbox"/> Recreational areas <input checked="" type="checkbox"/> Sandy and rocky habitat <input type="checkbox"/> Scree <input type="checkbox"/> Shrub & groves <input type="checkbox"/> Soil <input type="checkbox"/> Wander biotopes <input type="checkbox"/> Water bodies (flowing, standing) <input checked="" type="checkbox"/> Wetland <input type="checkbox"/> Woodland <p>Stakeholders:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Authorities <input checked="" type="checkbox"/> Local community <input checked="" type="checkbox"/> NGOs <input type="checkbox"/> Schools <input type="checkbox"/> Universities

Fläche 4 (Böschung)

Vegetation abtragen, häckseln
Bauschutt entnehmen, Einbau als Baustraße
Häckselgut wieder einbauen
Häckselgut aus Fläche 1 einbauen

Fläche 2 (Flachufer)

Boden (Sandkies) in Wasser einbauen
460 m³ aus Fläche 1 und aus Rinnen

Rinnen

Bodenabtrag (Sandkies) bis 1 m Tiefe
in Form von Rinnen
3 m Breite, 15 m Länge
8 St., 360 m³

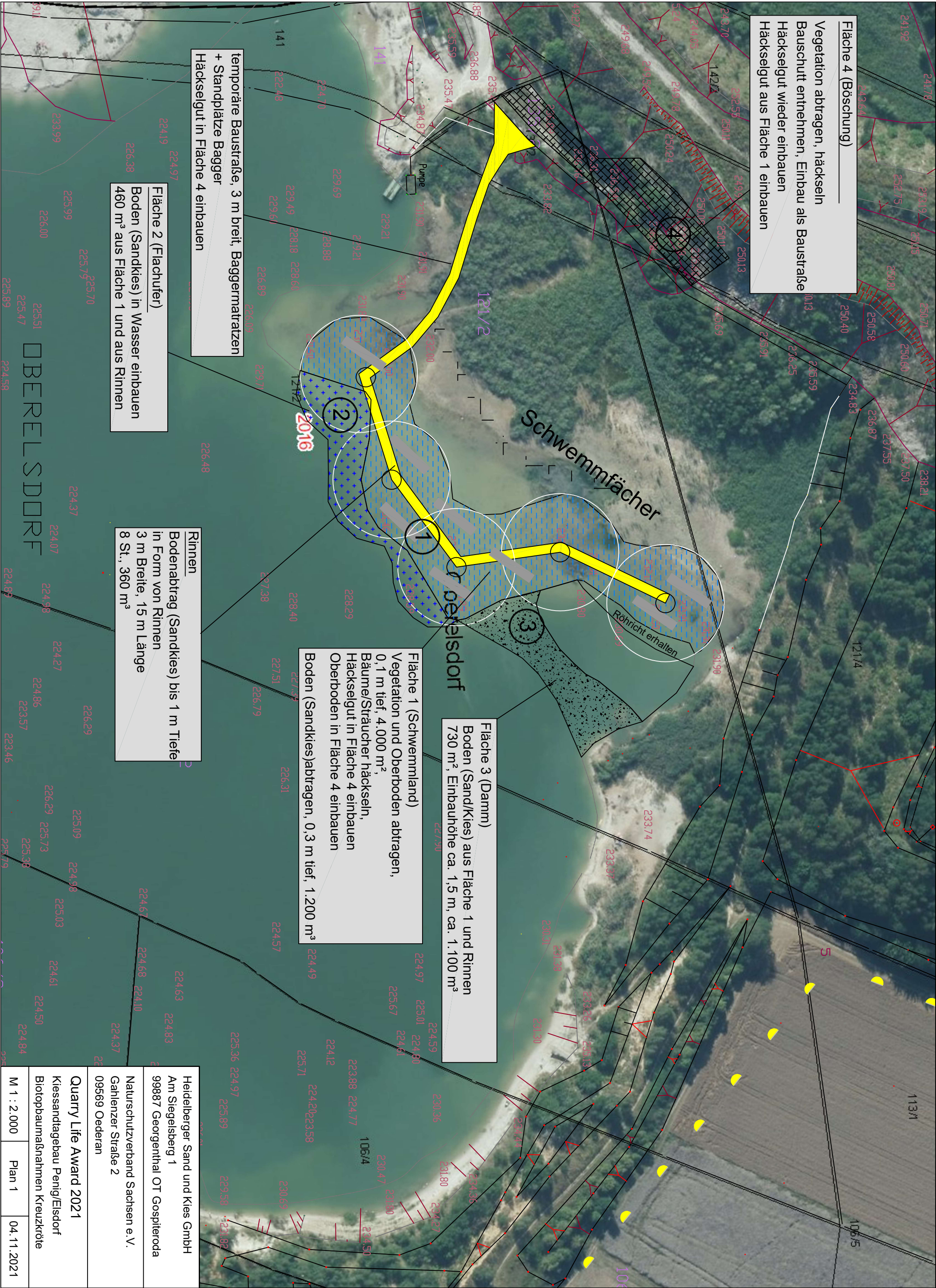
Fläche 1 (Schwemmland)

Vegetation und Oberboden abtragen,
0,1 m tief, 4.000 m²,
Bäume/Sträucher häckseln,
Häckselgut in Fläche 4 einbauen
Oberboden in Fläche 4 einbauen

Boden (Sandkies)abtragen, 0,3 m tief, 1.200 m³

Fläche 3 (Damm)

Boden (Sand/Kies) aus Fläche 1 und Rinnen
730 m², Einbauhöhe ca. 1,5 m, ca. 1.100 m³



Heidelberger Sand und Kies GmbH Am Siegelberg 1 99887 Georntal OT Gosptieroda		
Naturschutzverband Sachsen e.V. Gahlenzer Straße 2 09569 Oederan		
Quarry Life Award 2021 Kiessandtagebau Penig/Eisdorf Biotopbaumaßnahmen Kreuzkröte		
M 1 : 2.000	Plan 1	04.11.2021

Alluvial fans

Area 4 (embankment)

Remove vegetation, shred, remove rubble, install shredded material as construction road

Install shredded material from area 1

Area 3 (embankment)

Soil (sand/gravel) from area 1 and gullies 730 m², installation height approx. 1.5 m, approx. 1,100 m³

Area 1 (alluvial land)

Remove vegetation and topsoil 0.1 m deep, 4,000 m²,

Shred trees/shrubs, place shredded material in area 4, place topsoil in area 4

Remove soil (sand gravel), 0.3 m deep, 1,200 m

Install temporary construction road, 3 m wide, excavator mattresses + stands for excavator
chopped material in area 4

Area 2 (flat shore)

Install soil (sand gravel) in water 460 m³ from area 1 and from gullies

Gullies

Soil removal (sand gravel) up to 1 m deep in the form of channels 3 m wide, 15 m long 8
pieces, 360 m³

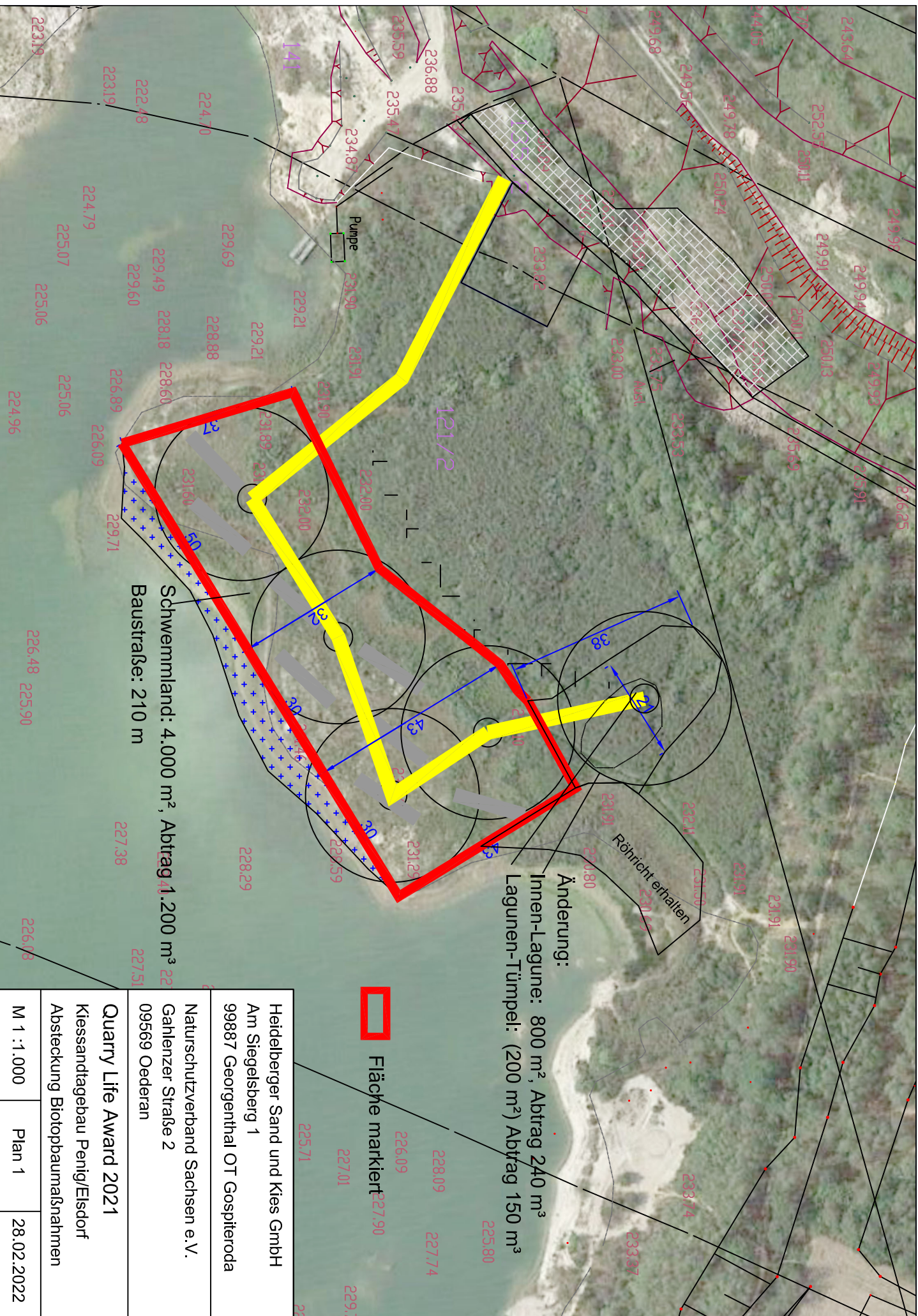
Heidelberger Sand and Gravel GmbH Am Siegelsberg 1

99887 Georgenthal OT Gospiteroda

Naturschutzverband Sachsen e.V. Gahlenzer Straße 2 09569 Oederan


Quarry Life Award 2021 Penig/Elsdorf Gravel Sand Mine Biotope Construction Natterjack

Toad



Änderung:
 Innen-Lagune: 800 m², Abtrag 240 m³
 Lagunen-Tümpel: (200 m²) Abtrag 150 m³

Schwemmland: 4.000 m², Abtrag 1.200 m³
 Baustraße: 210 m

 Fläche markiert

Heidelberger Sand und Kies GmbH
 Am Siegsberg 1
 99887 Georntal OT Gospiroda

Naturschutzverband Sachsen e.V.
 Gahlenzer Straße 2
 09569 Oederan

Quarry Life Award 2021
 Kiessandtagebau Penig/Elsdorf
 Absteckung Biotopbaumaßnahmen

M 1 :1.000 Plan 1 28.02.2022

Reed bed received

Modification: /

Enclosed lagoon: 800 m², removal 240 m³ lagoon pond: (200 m²) removal 150 m³

Area marked

Heidelberger Sand und Kies GmbH Am Siegelsberg 1
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Naturschutzverband Sachsen e.V. Gahlenzer Straße 2 09569 Oederan

Quarry Life Award 2021 Penig/Elsdorf Gravel Sand Mine Staking Out Biotope Construction Measures

Alluvium: 4,000 m², removal 1,200 m³

Construction road: 210 m

Fotodokumentation zum Abschlussbericht



Foto 1: Schwemmfächer vor Beginn des Projektes im April 2021



Foto 2: Langarmbagger, der letztlich nicht zum Einsatz kam

Fotodokumentation zum Abschlussbericht



Foto 3: Arbeiten zur Beseitigung der Vegetation



Foto 4: Schwemmfächer ohne Vegetation, März 2022

Fotodokumentation zum Abschlussbericht



Foto 5: beim flächigen Bodenabtrag eingesunkener Bagger, April 2022

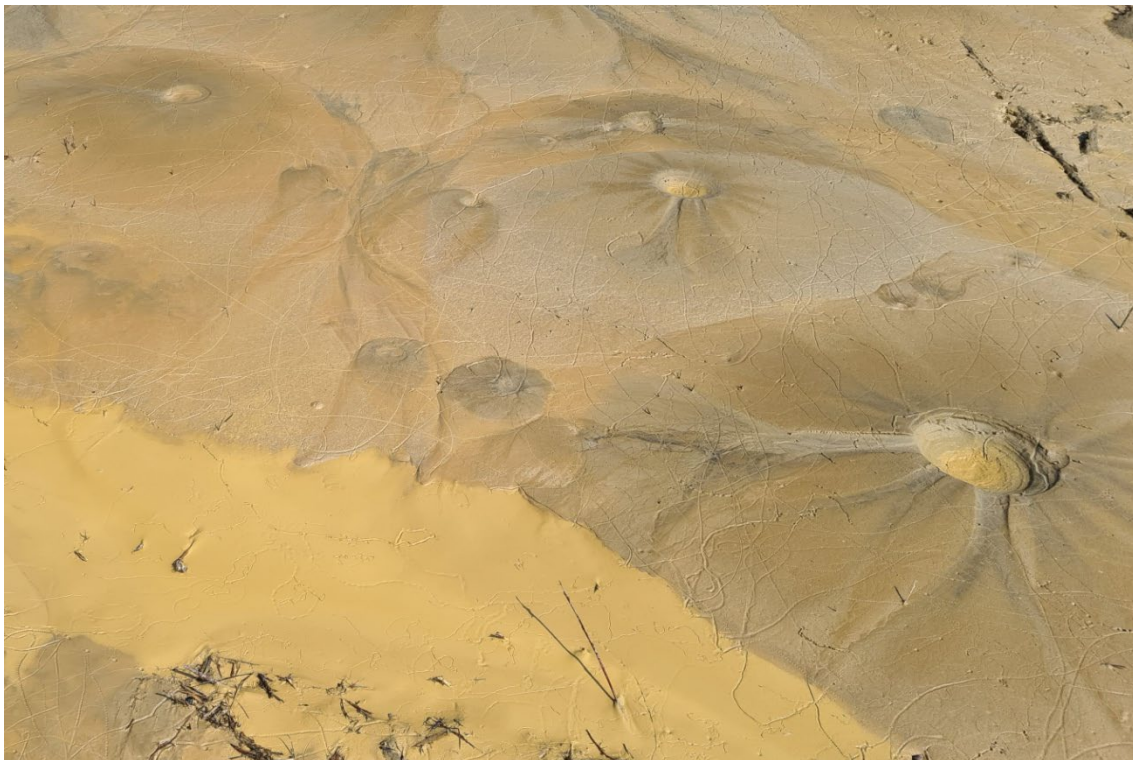


Foto 6: Wasseraustritte auf dem abgeschobenen Flächen des Schwemmfächers

Fotodokumentation zum Abschlussbericht



Foto 7: neue Technologie – Erddamm als Baggerstraße



Foto 8: eine der 8 Rinnen

Fotodokumentation zum Abschlussbericht



Foto 9: Tümpel am Schilfrand



Foto 10: Bauabnahme am 21.06.2022

Fotodokumentation zum Abschlussbericht



Foto 11: Fläche nach Oberboden-Fräsen



Foto 12: Rhizom des Rohrglanzgrases

Fotodokumentation zum Abschlussbericht



Foto 13: Kaulquappen in einer der Rinnen, Juli 2022



Foto 14: Wechselkröte auf dem Schwemmfächer, August 2022

Fotodokumentation zum Abschlussbericht



Foto 15: eine der Rinnen am 06.08.2022 nach langer Trockenheit

Photo Documentation for Final Report

Photo 1: Alluvial fans before the start of the project in April 2021

Photo 2: Long-arm excavator that was ultimately not used

Photo 3: Works to remove vegetation

Photo 4: Alluvial fan without vegetation, March 2022

Photo 5: excavator sunken during extensive soil removal, April 2022

Photo 6: Water discharge on the deflected surfaces of the alluvial fan

Photo 7: New technology – earth embankment as an excavator road

Photo 8: One of 8 gutters

Photo 9: Pools at the edge of the reeds

Photo 10: Acceptance of construction on 21/06/2022

Photo 11: Area after topsoil milling

Photo 12: Reed canary rhizome

Photo 13: Tadpoles in one of the gullies, July 2022

Photo 14: Green toad on alluvial fan, August 2022

Photo 15: One of the gullies on 06/08/2022 during a long drought