

Dipl.-Min. Dr Gerald Dehne

Publicly appointed and independent expert on clay and shale deposits

Evaluation of the clay deposit “Loickenzin/Klatzow”

Client

Bergwerk Magow GmbH

Pistoriusstr. 103 a

13086 Berlin

Dipl.-Mia. Dr. Gera)d Dehne

3744 Bad Sachsa, Merseburger Str. 14 Tel

05523/3482, Fax 05523/2828

Table of Contents

| | Page |
|--|----------|
| 1.) Assignment | 1 |
| 2.) Raw material situation | 2 |
| 3) Inventory valuation | 3 |
| 4.) Potential applications of clay raw materials | 4 |
| S.) Evaluation of raw material properties | 5 |
| 6) Planning and approval requirements | 7 |
| 7.) Cost estimation for the necessary planning work | 8 |
| 8.) Cost estimate for land acquisition | 9 |
| 9.) Cost calculation for spoil | 10 |
| 10.) Extraction costs | 11 |
| ii.) Reclamation costs | 12 |
| 12.) Groundwater | 13 |
| 13.) Relocation of the 20 kV power line crossing the BWE | 13 |
| 14.) Construction of internal access roads | 13 |
| 15.) Administrative costs | 14 |
| 16) Cost of goods sold (total) | 14 |
| 17.) Determination of the net market value | 15 |
| 18.) Concluding remarks | 16 |
| 19.) Statement by the expert | 18 |

List of appendices

Appendix

Confirmation from the Stralsund Mining Authority pursuant to Section 23 of the **1** Federal Mining Act

Project proposal by the Treuhandanstalt for the use of the BWE
Loickenzin deposit and the BWE
Altentreptow, east / 1994 2

Clay deposits Altentreptow / Loickenzin — a data collection —
DURTEC, 2009 3

Data documentation by Dr J. Sehomburg (DURTEC, 2011) 4

Quotation from FIM GmbH including data sheet, 2011 **5**

Regional Spatial Development Programme for the Mecklenburg Lake District
2011 6

Photographic documentation, July 2011 7

1. Contract

Bergwerk Klatzow GmbH commissioned the undersigned to verify the economic viability of the “Loickenzin/Klatzow” clay deposit

The clay deposit is a mining property (BWE) in accordance with Section 9 of the Federal Mining Act (BBergG), covering an area of approximately 113 hectares. It is situated in parcel 1 of the Loickenzin cadastral district and in parcels 1 and 3 of the Klatzow cadastral district, and is owned by Bergwerk Klatzow GmbH. The sub-area ‘Loickenzin/Klatzow’ forms part of the ‘Loickenzin’ mining property, which covers a total of 208 ha.

The relevant confirmations from the Stralsund Mining Authority pursuant to Section 23 of the Federal Mining Act (BBergG) are attached as Annex [I].

With regard to the assessment, we were provided with the following documents, amongst others:

[II] Project proposal by the Treuhandanstalt (Directorate for Potash, Ore Mining, Stone and Earth) regarding the exploitation of the Loickenzin BWE deposit (No. 169/90/634) and the Altentreptow BWE deposit, east (No. 245/90/643), 1994

[III] Clay deposits Altentreptow / Loickenzin — a data collection - by DURTEC dated 23 November 2009

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

[IV] Data documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011

The aforementioned documents are also attached as appendices.

In accordance with the terms of the contract, the relevant parameters for the report—primarily the deposit volume and area data—are mentioned only briefly with reference to the above-mentioned sources, as these are attached as appendices and have been accepted as the basis in accordance with the contract.

The focus is on setting out the technical applications and the associated financial verification.

2. Raw material situation

The geological and resource-related data listed below are largely derived from the project proposal by the Treuhandanstalt [II] and further documentation from DURTEC [III] and [IV].

The BWE deposit ‘Loickenzin/Klatzow’ is geologically and stratigraphically situated within the area of the Weichselian glacial ground moraine.

The deposit itself belongs to the so-called ‘Rupelton’, which comprises three varieties and can be geogenetically attributed to a Tertiary marine origin.

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

3. Reserve assessment

Based on the evaluation of the Treuhandanstalt’s 1994 project proposal [II], at least 24 million tonnes of the aforementioned “Rupelton” can be extracted.

It should be noted here that whilst the “Loickenzin/Klatzow” mining area covers 113 ha, only approximately 49 ha were evaluated in the reserve assessment (II). In this respect, the 24 million tonnes mentioned represent the absolute minimum.

The aforementioned area of 49 hectares is divided into the following sub-areas, the presence of which has been unequivocally confirmed:

| | |
|-----------------------|---|
| Klatzow sub-field: | 350,000 m ² (35 ha) = 14 million tonnes [II] |
| Loickenzin sub-field: | 143,000 m ² (14 ha) = 10 million tonnes [II] |

Accordingly, these areas have also been classified as ‘reserve areas for securing raw materials’ in the 2011 Regional Spatial Development Programme [VI]. A detailed map of the two areas can be found in Appendix [IV].

In this respect, the spatial planning requirements for the implementation of the mining project are met.

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

The above-mentioned reserve estimates have already taken into account mining losses resulting from the safety clearances and embankments in relation to the crossing railway line [II].

In order to obtain a framework operating plan in accordance with Section 55 of the Mining Act (BBergG), the following criteria must be taken into account in the planning process:

- the immediate proximity of the deposit to the town of Altentreptow to the east
- Presence of the FFH area ‘Tollensetal mit Zuflüssen’ to the east.
- Arable land in the immediate vicinity
- No contact with drinking water protection areas
- No biotopes requiring protection are known
- No involvement of or impact on nature conservation areas (NSG) or landscape conservation areas (LSG).

Even if restrictions were to be imposed in this regard, the above remarks regarding the ‘conservative’ reservoir assessment, it is guaranteed in any case that reserves of at least 24 million tonnes will be available.

4. Potential applications for clay raw materials

According to the statement by DURTEC dated 23 November 2009 [III], the clay raw materials can be used for the following applications:

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

Assessment of the clay deposit
“Loickenzin/Klatzow”

- Brick industry
- Clinker and roof tile industry

Wall and floor tiles (stoneware) Unglazed, frost-resistant

floor ceramics Ceramic engobes for roof tiles

- Expanded clay
- Sealing clay for waste management
- Water treatment

5. Assessment of raw material properties

On the basis of the available documentation (see above) regarding the mineralogical, geochemical and rheological properties, it was established that the clay raw material is primarily suitable for the production of sealing clays (bentonite), but can also be used for ceramic applications. This fact therefore forms the basis of the deposit assessment.

Dipl.-Min. Dr Gerald Dehne

Publicly appointed and sworn expert by the Hanover-Hildesheim
Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

The following section focuses primarily on its use as sealing clay,

In order to obtain a reliable estimate of the value added for a comparable deposit, the undersigned contacted FIM Friedland Industrial Minerals GmbH, which extracts and markets raw clay (bentonite) with virtually identical properties at its Friedland plant (D-17096 Friedland). In this respect, the regional and infrastructural connection is established, particularly as, geologically and stratigraphically (Tertiary, marine deposit), the material is virtually the same.

The raw material parameters of the so-called Friedland clay are attached as Annex [V].

The following criteria specified by FIM are crucial for use as sealing clay:

| | |
|---|-----|
| - Swelling-capable minerals suitable for alternating storage: | 44% |
| - Muscovite: | 12% |
| - Kaolinite/chlorite: | 11% |
| - Carbonates | 2% |
| - Pyrite | 1% |

In comparison, the values provided by DURTEC (III) showed the following:

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

| | |
|-----------------------------------|-----------|
| - Swelling interlayered minerals: | 35–40% |
| - Muscovite: | up to 15% |
| - Kaolinite/chlorite | 15–20% |
| - Carbonates | < 3% |
| - Pyrite | < 1 % |

From a mineralogical point of view, the differences are considered to be only marginal and therefore insignificant.

This is also reflected in the water permeability value, which is relevant for its suitability as a sealing clay.

Whilst FIM specifies a value of approx. $1.0\text{--}1.6 \times 10^{11}$ m/sec, the value for the clay raw material ‘Loickenzin/Klatzow’ is 1×10^{10} [III].

Similarly, the cation exchange capacity is identical at 50–60 mval/100g (FIM) and approx. 50 mval/100g.

6. Planning and approval requirements

Although the “Loickenzin/Klatzow” mining area is owned by Bergwerk Klatzow GmbH in accordance with Sections 9 and 23 of the Federal Mining Act (BBergG) and thus constitutes a legal title, the following planning must be carried out prior to the commencement of mining:

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

- Submission of a framework and main operating plan in accordance with Section 55 of the Federal Mining Act (BBergG) for the relevant sub-areas (each approx. 1 ha).
- Preparation of a corresponding landscape conservation management plan.
- Recording of circumstances relevant to species protection.
- Hydrogeological assessment
- Planning permission for the possible relocation of high-voltage power lines and the construction of access roads
- FFH or environmental impact assessment

7. Cost estimation for the necessary planning

Given that peripheral areas must also be taken into account with regard to the planning area, an assessment area of approximately 60 ha is assumed.

This results in the following costs:

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

| | | |
|-----------------------------|------------------------|------------------|
| Framework operating plan | approx. EUR | 20,000.00 |
| Landscape Management Plan | approx. EUR | 18,000.00 |
| Species conservation report | approx. EUR | 9,000.00 |
| Hydrogeological report | approx. EUR | 9,000.00 |
| Planning permission | approx. EUR | 8,000.00 |
| FFH or UVS | approx. EUR | 12,000.00 |
| Planning costs | approx. EUR | 76,000.00 |

8. Cost estimate for land acquisition

Although the deposit itself is owned by Bergwerk Klatzow GmbH, the surface rights must either be leased or purchased.

As Bergwerk Klatzow GmbH has decided to acquire the property, following a telephone consultation with the relevant valuation committee for Altentreptow, Demmin district (as at 18 May 2011), a standard land value of EUR 1.01 ^{per square} metre is to be expected for ‘arable land’.

The ‘arable land’ classification represents a conservative approach, as parts of the BWE field are also used as ‘grassland’ and ‘fallow land’,

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

whose standard land values are significantly lower at EUR 0.44/m² and EUR 0.13/m² respectively.

When determining the requirements for the land acquisition, the following must be taken into account:

As explained above, the stock assessment related solely to an area of approx. 49 ha, i.e. only approx. 43% of the BWE (113 ha), as this can be extracted ad hoc without any problems under the aforementioned regional planning conditions. Nevertheless, peripheral areas (embankments, safety strips, etc.) should also be taken into account when determining land requirements. In this respect, an area of 60 ha to be acquired should be assumed.

Consequently, the following costs should be taken into account for the purchase of the land:

| | |
|---|-----------------------|
| Land purchase (600,000 m² x EUR 1.01/m²) | EUR 606,000.00 |
|---|-----------------------|

9. Cost calculation for overburden

According to DURTEC (IV), an average overburden thickness of 10 m should be assumed.

In this respect, the volume of overburden to be removed can be estimated as follows:

Mining area: 493,000 m² x 10 m — 4,930,000 m³

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

Based on general experience regarding clay pits, the average cost for the removal and temporary storage of overburden, assuming a transport distance of up to 500 m, should be estimated at EUR 3.00 per m³.

Consequently, the figure for this item is:

| | |
|--|-----------------------|
| Overburden (4,930,000 m³ x EUR 3.00/m³) | EUR 14,790,000 |
|--|-----------------------|

10. Extraction costs

Given that Bergwerk Klatzow GmbH intends only to sell the raw clay from the clay pit, the following parameters must be taken into account for the extraction costs:

Dredging, loading onto dump trucks, transport up to a maximum of 500 m, and stockpiling. The cost of EUR 1.50 per tonne must be verified.

Consequently, this results in a share of the extraction costs of:

| | |
|--|--------------------------|
| Extraction (24 million tonnes x EUR 1.50 per tonne) | EUR 36,000,000.00 |
|--|--------------------------|

Dipl.-Min. Dr Gerald Dehne

An expert appointed and sworn in by the Hanover-Hildesheim Chamber
of Industry and Commerce
for deposits of clay and gypsum rocks

12. Groundwater

According to the data documentation by Dr J. Schomburg dated 25 May 2011 [IV], it can be assumed here that groundwater and surface water drain into the Tomey Stream.

In this respect, in this case — unlike in the 'Altentreptow, east' development plan - no costs for groundwater lowering should be included.

13. Rerouting of the 20 kV line crossing the BWE

This item is included on the basis of a 'conservative' approach, as the existing route of the 20 kV lines can most likely be retained if excavation is carried out using a method involving continuous backfilling.

flat rate **EUR 150,000.00**

14. Internal road construction

flat rate **EUR 50,000.00**

15. Administrative costs

flat rate (2% of market value, see Chapter 17) EUR 8,160,000.00

16. Production costs (total)

In summary, the following costs (rounded) for the exploitation of the “Loickenzin/Klatzow” coalfield must be verified:

| | | |
|------------------------------------|-----|---------------|
| Planning costs | EUR | 76,000.00 |
| Land acquisition | EUR | 606,000.00 |
| Overburden | EUR | 14,790,000.00 |
| Extraction | EUR | 36,000,000.00 |
| Reclamation (overburden) | EUR | 17,255,000.00 |
| Reclamation (pioneer plants, etc.) | EUR | 1,528,000.00 |
| Laying of high-voltage power line | EUR | 150,000.00 |
| Road construction | EUR | 50,000.00 |
| Administrative costs | EUR | 8,160,000.00 |
| | | |
| Total production costs | EUR | 78,615,000.00 |

This means that, with a forecast stock volume of 24 million tonnes and production costs of

EUR 3.28 / t

.

17. Determination of the net market value

As already mentioned in Chapter 5, the undersigned has received, as Annex [V], a current quotation from FIM stating that the current price for Rohton, which is of identical quality (see above), under the same terms of delivery

is EUR 17.00/t

, which, based on an estimated 24 million tonnes, amounts to a total value of

EUR 408,000,000.00

Subtracting the production costs mentioned in section 16 results in a net market value of

EUR 13.72 / t

Consequently, with a projected stock volume of approx. 24 million tonnes, the net market value is

EUR 329,280,000.00

.

18. Concluding remarks

To conclude, the following is a summary of the assumptions that led to the above assessment.

In the stock assessment within the BWE field 'Loickenzin/Klatzow' (113 ha), only an area of 49 ha was assumed to be suitable for extraction. In this regard, the Klatzow sub-field, covering 350,000 m², has been classified as almost entirely suitable for extraction, whilst in the Loickenzin sub-area only an area of 143,000 m² has been included in the assessment, as this area constitutes a contiguous clay complex and can be regarded as secured for extraction under regional planning regulations.

With regard to planning costs, the undersigned, as the owner of GEOTEKT GbR / Bad Sachsa, can draw on decades of experience in carrying out mining and reclamation planning.

With regard to the verification of overburden removal, mining and recultivation activities, it should be noted that the undersigned, as managing partner of MPL (Mineral Processing & Logistics) GmbH and Ührder Steinbruchgesellschaft mbH, also has many years of experience in these areas.

With regard to the direct comparison of the clay raw materials ‘Loickenzin/Klatzow’ and It should be explicitly emphasised once again that, from a geochemical, mineralogical, stratigraphic and rheological perspective, the “Friedland” deposits are virtually identical.

The key factor in assessing the market value is their suitability as high-quality sealing clay, which is based on the high proportion of swellable clays (e.g. montmorillonite). This means that these clays have very low water permeability, making them particularly well-suited for well and landfill construction.

Furthermore, they possess a very high cation exchange capacity. This criterion is crucial for their use in water and environmental remediation (adsorption of pollutants), including their application in nuclear waste disposal.

Products (e.g. clay granules) manufactured from these clays can, with appropriate processing, achieve an ex-works market value of EUR 120.00 to 130.00 per tonne.

Whilst so-called ‘ceramic’ clays (kaolinite, illite, etc.) are widespread in the Federal Republic of Germany and consequently have a significantly lower market value, swellable clays with the aforementioned properties are extremely rare.

Finally, it should be noted that in the estimation of reclamation costs (Chapter 11), a possible subsequent use was not taken into account; namely, use as a landfill site, which, given the technological properties of the clay, would of course also be possible.

This could generate additional value from the mining areas. However, it has been decided not to carry out such an assessment at this stage, as it is not possible to estimate future landfill requirements in the region, even in the medium term.

19. Statement by the expert

I hereby declare that I have carried out the valuation to the best of my knowledge, free from any obligation or personal interest in the outcome.

The report was prepared exclusively by the undersigned.

Bad Sachsa, 11 July 2011

- Dr Gerald Dehne -



Documents and sources used

- [I] Confirmation from Bergaintes Stralsund regarding the sale of the BWE Loickenzin/Klatzow dated 13 May 2011
- [II] Project proposal by the Treuhandanstalt (Potash /Mining/Stone/Earths) regarding the use of the BWE deposit at Loickenzin and the BWE deposit at Altentreptow/east of 1994
- [III] Clay deposits Altentreptow / Loickenzin — a data collection — DURTEC / 23 November 2009
- [IV] Data documentation by Dr J. Schomburg (DURTEC) dated 25 May 2011
- [V] Quotation from FIM GmbH including data sheet on clay from 9 June 2011

Dipl.-Min. Dr Gerald Dehne
of the Hanover-Hildesheim Chamber of Industry and Commerce
Publicly appointed and sworn expert
We have deposits of clay and gypsum rocks

[VI] Regional Spatial Development Programme for the Mecklenburg Lake District /
Regional Planning Association for the Mecklenburg Lake District / 2011

[VII] Evaluation criteria for industrial minerals, stones and earths / Part 1: Clays /
Geological Yearbook Series H, Issue 2, BGR Hannover, 1997

(VIII) Photographic documentation / July 2011

Dipl.-Min. Dr. Gerald Dehne

Publicly appointed and sworn expert by the Hanover-Hildesheim
Chamber of Industry and Commerce
for deposits of clay and gypsum rocks

APPENDIX 1

Confirmation from the Stralsund Mining
Authority pursuant to Section 23 of the Federal
Mining Act



Stralsund Mining Authority



Stralsund Mining Authority
PO Box 1138 - 10d01 6lrsalsui d

Jenckel Solicitors and Notaries Ms

Dörr, Notary

Hegelplatz 1

10117 Berlin

ElgG

EGAŸCEy

i1time2011

Handled by: Mr Rtiter

Tel: 03831/ 61 2139
Fax: 03831 / 61 2121

Email: v.rueter@ba.mv-regierung.de

www.bargamt-mv.de

Reg. No. 2386/11

Ref. 613/13052/1072/10

Ihr Zeichen / vom
NOT-502393-AM
Case No. D81/2011

Main Ref. / dated
Rü/Te

Telephone
61 21 39

Date
13 May 2011

**Loickenzin / Klatzow mining property, licence
number III-A-f-1072/93-169-2345, licence certificate
dated 2 May 1994**

here: Approval for sale of mining property pursuant to
Section 23 of the Mining Act

Reference: Application by Notary Ulrike Dörr, Berlin, dated 23 March 2011

Decision:

Pursuant to Section 23(1) of the Federal Mining Act (BBergG) of 13 August 1980 (Federal Law Gazette I, p. 1310), as last amended by Article 15a of the Act of 31 July 2009 (Federal Law Gazette I, p. 2585), the sale by legal transaction of the

Loickenzin / Klatzow mining property

by Mr
Manfred Wegener, Wassermannstraße
119, 12489 Berlin

to Bergwerk Klatzow GmbH
Pistoriusstraße 103a, 13086 Berlin

and the contractual agreement relating thereto has been approved. The certificate of approval is enclosed.

Information on legal remedies:

An appeal may be lodged against this decision within one month of notification. The appeal must be submitted in writing or recorded at the Stralsund Mining Authority, Frankendamm 17, 18439 Stralsund.

Hausanschrift:


Stralsund Mining
Authority,
Frankendamm 17
18439 Stralsund

Tel: 03831/6121-0
Fax: 03831/61 2121
Email: fu@bergamt-mv.de

1st copy

Customer service:

A separate decision on the application, containing its own legal basis, will be issued for the authorisation under Section 24 of the Mining Act; this will be sent directly to the purchaser.



Froben

Bergamtsleiter





Stralsund Mining Authority



Certificate of Approval

Pursuant to Section 23 of the Federal Mining Act (BBergG) of 11 June 1980 (BGBl. I p. 1310), as amended by Article 15a of the Act of 31 July 2009 (BGBl. I p. 256a),

Mr Manfred Wegener

, on the basis of the decision of 2 March 2011, the legal transfer of ownership and the contractual agreement relating thereto for the mining property

Loickenzin / Klatzow

des Bodenschatzes

clayey rocks for the manufacture of clay products

The approval applies to mining authorisation

No. Iil-A-f-1072/93-169-2345

Stralsund, 1 October 2011




Froben
Bergamtsleiter

ANNEX 2

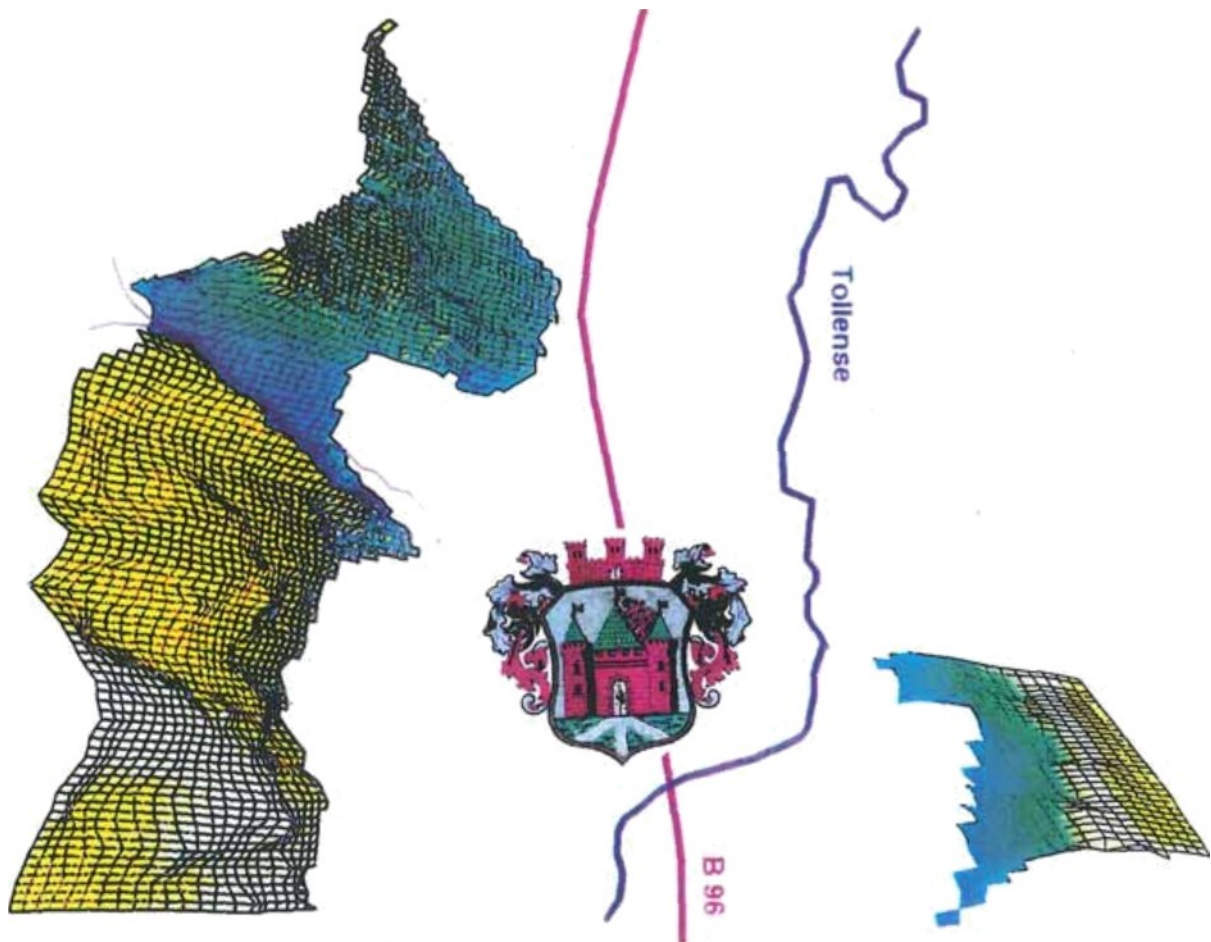
Project proposal by the Treuhandanstalt for the
exploitation of the BWE deposit at Loickenzin
and the BWE deposit at Altentreptow, east

1994

(Extract)

Project proposal

"Use of the BWE deposit at Loickenzin (Nos. 169/90/634, 640, 6441) and the BWE deposit at Altentreptow, east (No. 245/90/643) for the establishment of a roof tile factory"



Gliederung

1. Location
2. Investigation work
3. Ownership
4. Raw material situation
 - 4.1. Geology of the deposits
 - 4.2. Hydrogeological situation
 - 4.3. Reserves
5. Raw material characteristics
6. Technical infrastructure
 - 6.1. Transport links
 - 6.2. Micro-site structure for the establishment of an industrial enterprise
7. Environmental aspects
8. Market aspects
9. State funding instruments

10. Facilities

- Appendix 1 Location of the BWE fields Loickenzin and Altentreptow, east
 - Overview map Scale: 1:250,000
- Map 2** Soil investigation work in the Altentreptow area
 Site plan Scale: 1:25,000
- Appendix 3 Map of the mining fields (A) Loickenzin and (B)
x Altentreptow, east
ft: 1 : 25,000
- Appendix 4 Rupelton sub-field Loickenzin
 - Geological reserve -
- Appendix 4.1 Loickenzin sub-field
 - Stratigraphic sections 22 and 9 from the
 1967 exploration -
- Appendix 5 Rupelton Altentreptow mining field, eastern
 - Geological reserves -
- Appendix 5.1 Altentreptow Mining Field, East
 - 3-layer section 4 from the 1963 exploration -
- Appendix 6 Grain size distribution of composite sample BK 1E/93
 from the Loickenzin sub-field
- Appendix 7 Grain size distribution of composite sample BK 2/93
 from the Altentreptow mining area, east
- Appendix 8 X-ray overview images of the Loickenzin and
x Altentreptow clay deposits, East
- Appendix 9 Photographic documentation of test specimens from
x the small-scale technical trial
 1. Blank
 2. Roof tile

PROJECT PROPOSAL

a.: Bexgwexkaalgeatzua lozt1agaxstätte Z•o1cXazs1zt

(No. 169/90/634, 640, 6 4)

B: Mine property clay deposit *1tentreptow,éstlica

(No. 245/90/643)

1. Lage:

(A) Loickenzin clay deposit

Federal state: Mecklenburg-Western
Pomerania District: Altentreptow

| | | |
|---------------------|--------------|-----------------|
| Municipality: | Loickenzin | Parcel: 1 |
| Cadastral district: | Klatzow | Parcel: 1 and 3 |
| Parish: | Altentreptow | Parcel: 2 |

Topographical map no. (AV): 0408-34 Altentreptow

(B) Altentreptow clay deposit, eastern State:

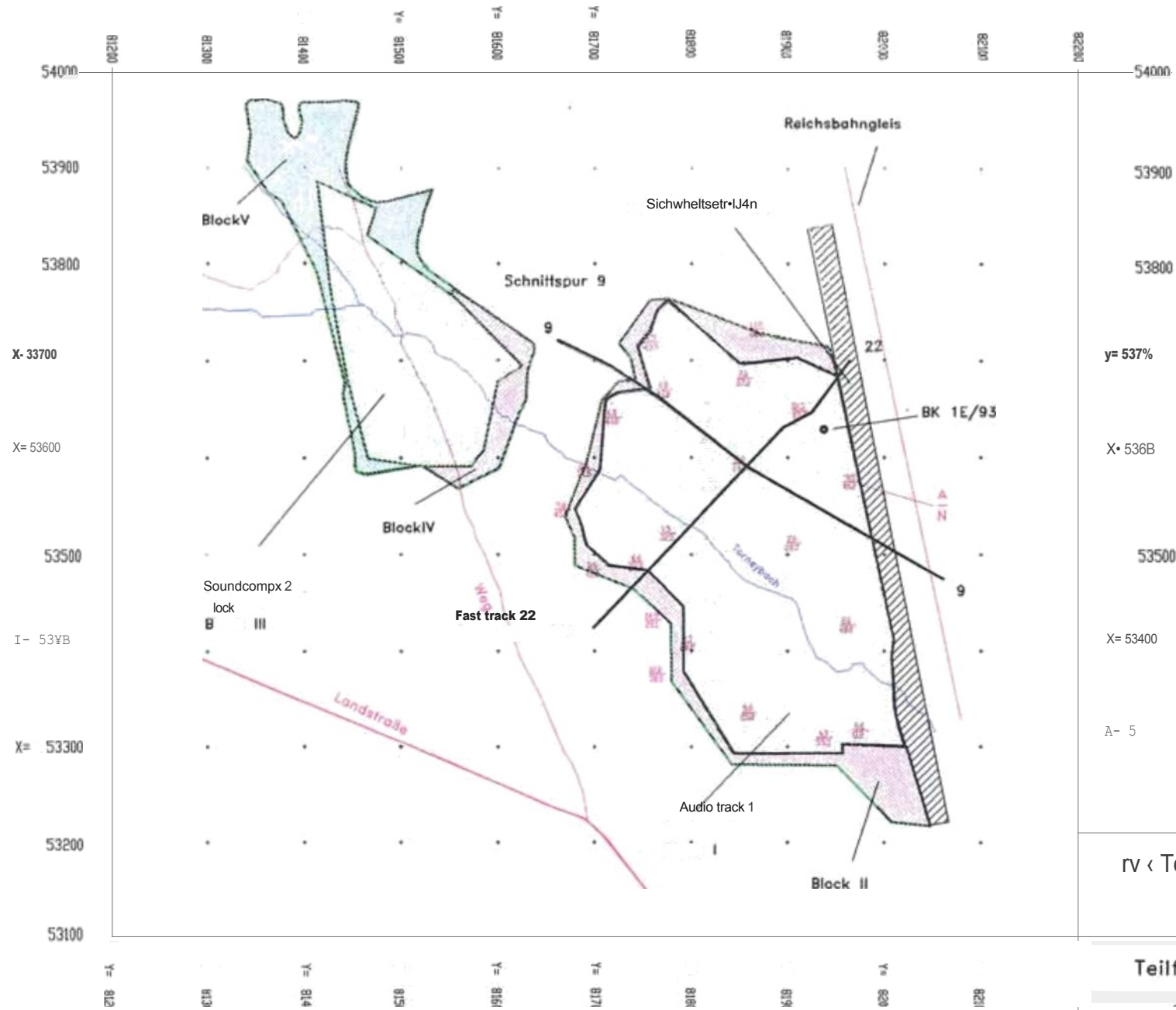
Mecklenburg-Western

Pomerania
District: Altentreptow

District: Altentreptow Parcel: 4

Topographical map no. (AV): 0408-43 Altentreptow **(see Annex**

1)



y= 537%

X= 536B

53500

X= 53400

A- 5

rv < Ton Loickenzin

Teilfeld Loickenzin

2. Exploratory work:

As early as 1953, 35 boreholes totalling approx. 427 metres revealed the presence of brick clay east of Altentreptow (REICHB, EB 1953). For a planned new brickworks This was followed in 1963 by geoelectric surveys using the Slingram method, as well as 32 exploratory boreholes totalling approximately 904 metres drilled into clay at the "Altentreptow" site within the Klatzow (west of Klatzow, west of the Tollene) and Altentreptow (south-east of Altentreptow, east of the Tollense) and only Slingram measurements in the Thalberg field (south-east of the town of Altentreptow on the western bank of the Tollense). Thick layers of Rupel clay were identified beneath Pleistocene overburden (DAUSS, EB 1964, see Appendix 2).

In the course of preparations for an expanded clay plant, clay exploration work was carried out in 1965 west of Altentreptow, along the Torneybach stream, comprising 66 boreholes with a total length of approx. 1,464 metres. metres of drilling (Lawrenz, EB 1966). Building on this, further exploration work followed in 1967, comprising 57 boreholes and 2,152 metres of drilling, meaning that in the Loickenzin sub-field, covering an area of around 16 hectares, a total of approximately 3,616 running metres of drilling were carried out (see Appendices 4 and 5). As part of the project proposal preparation, a further 40 metres of core drilling was carried out in 1993 in the BWE fields of Loickenzin and Altentreptow, each to the east, and mineral processing investigations were conducted (BK 1E/93 and BK 2/93).

3. BigeotumeverbAltoisaa

For both mining fields, the Treuhandanstalt Berlin holds the mining rights in the form of mining property, which may be sold to third parties for a fee.

The land situated above both clay deposits belongs to different owners and must be acquired, prior to the commencement the opening of the opencast mines, either by purchase or lease. If necessary, a transfer of land can be enforced by the mine owner. Lawsuits brought before the Federal Administrative Court regarding the legality of the Treuhandanstalt's mining rights have been dismissed in a landmark ruling. Accordingly, the extraction rights belong to the Treuhandanstalt.

Landowners or the federal states cannot dispose of the mining rights (Ref.: 7C 10.92 and 7C 11.92).

The Loickenzin mining field comprises 75 parcels of land, of which:

| | |
|-------------------------|---------|
| Private ownership | approx. |
| 80.0% Trust property | approx. |
| 16.0% church-owned | approx. |
| 2.7% Municipal property | approx. |
| 1.3% | |

The Altentreptow mining field, to the east, comprises 11 plots of land, of which:

| | |
|-------------------|------------------|
| Private ownership | approx. 45.5% |
| real estate | approx. set, p t |

The location of the mining fields is shown in Appendix 3.

The corner points of the two mining fields are defined by the following Gauss-Krüger coordinates:

A: RWE Loickenzin

| Control point | Right-hand value | Latitude |
|---------------|------------------|-----------|
| 1 | 45 81 720 | 59 54 880 |
| 2 | 45 82 520 | 53 54 300 |
| 3 | 45 82 440 | 59.53 800 |
| 4 | 45 81 960 | 59 53 760 |
| 5 | 45 82 100 | 59 53 060 |
| 6 | 45 91 800 | 59 52 980 |
| 7 | 45 81 610 | 59 51 060 |
| 8 | 45 01 060 | 59 51 860 |
| 9 | 45 81 080 | 59 53 380 |
| 10 | 45 91 040 | 59 54 320 |

Field area: 2,082,650 m²

B: BWE Altentreptow, east

| Corner point | Legal value | Elevation |
|--------------|-------------|-----------|
| 1 | 45 83 820 | 59 52 740 |
| 2 | 45 84 160 | 59 52 740 |
| 3 | 45 84 160 | 59 51 960 |
| 4 | 45 83 840 | 59 51 920 |
| 5 | 45 83 720 | 59 51 800 |
| 6 | 45 83 920 | 59 52 540 |
| 7 | 45 83 8:00 | 59 52 540 |

Area of the field: 269,553 m

4. Rohstoffsituation

4.1. Geology of the deposits

The BWE fields are situated within the area of the basal moraine of the Weichselian glaciation. The flat to undulating ground moraine landscape, with elevations between 20 and 40 m above sea level, is traversed by the deeply incised, roughly north-south-running Tollense Valley, which owes its formation to a late-glacial ice advance, the Tollense Glacier.

The borehole investigations carried out to date around Altentreptow have confirmed the presence of thick layers of Rupelt clay. According to the findings of W. von BÜLOW (1965) and According to O. GEHL (1967), the Tertiary sediments in the Altentreptow area lie between the Tutzpatz structure in the north-west and the Brunn structure in the south-east.

The relatively high elevation of the Rupeltone in this area is attributable to the dynamics of Pleistocene glacial ice. These Rupeltone deposits, formed as block-like bodies, lie within a Pleistocene sedimentary envelope. Earlier boreholes (Molkerei, 1907) encountered Tertiary sediments at depths of 7-230 m below ground level without penetrating through them.

A: La er t8tte Loickenzin

The Loickenzin mining field covers a total area of around 208 hectares and comprises the three sub-fields of Loickenzin, Klatzow and Thalberg. Of these, only the approximately 16-hectare Loickenzin sub-field has been sufficiently geologically explored; its natural boundaries are formed by the village of Loickenzin to the west and the Neubrandenburg-Stralsund railway line to the east.

Loickenzin sub-field

Within the study area, I which are separated by a Pleistocene interlayer (glacial till and sand, 60-80 m wide)

(Appendix 41.

Following the drilling work carried out in 1965 and 1967, the following standard profile can be established for the deposit:

| | | |
|------------|---|-------------|
| Overburden | Soil, humus-rich, peaty soil Peat soil, peat, meadow limestone - " - Sand Clay, compacted | Holocene |
| | Glacial loam Glacial marl Sand, gravelly Local moraine | Pleistocene |
| Topsoil | Rupel clay | Tertiary |

For clay complex I, consisting of the I and II blocks, it can be concluded that the Rupelton occurs in a secondary deposit in a stored position without Pleistocene interbeds and that its vertical extent extends well beyond the greatest exploration depths (down to -36.6 m above sea level). None of the boreholes reached the top of the formation.

The overburden thicknesses range from 0.4 m to 12.3 m, and the clay thicknesses from 29.4 m to 42.0 m (extrapolated, relative to -12 m above sea level).

The stratigraphic relationships of Clay Complex 2, comprising Reserve Blocks III to V, differ only slightly with regard to the Pleistocene overburden; however, the Rupel clay in Clay Complex 2 is partially underlain by Pleistocene sediments. Here, the average thicknesses of the overburden range between 1.6 m and 12.0 m, and those of the clay between 29.5 m and 44.2 m (extrapolated, relative to -12 m above sea level).

2. Teilfeld Klatzow

The clay deposits in this sub-area are to be interpreted as outcrops or upthrusts of the underlying strata, which are situated at a relatively high elevation here. Within the overall clay complex, a large number of clay saddles with relatively thin clay cover have been identified, separated by depressions with a thicker layer of Pleistocene sand.

The clay saddles are mostly relatively flat formations and often have an approximately symmetrical structure.

Near the upper edge of the clay, the clay often shows signs of Pleistocene influence as a result of compaction processes (sand lenses, isolated boulders).

The black-grey silty clay predominates in the ridges, whereas in the low-lying areas the greenish-grey clay dominates, which contains a small amount of Pleistocene material. In the Klatzow sub-field, 21 boreholes totalling approximately 640 linear metres were drilled in 1963.

3. Welt: *ibid.* Z'ha1beng

No boreholes were drilled in this sub-field; however, Slingram measurements are available which yielded two large, closely adjacent indications and suggest that the clay lies close to the surface across approximately 50% of the total area.

The geological structure is likely to be similar to that of the Klatzow and Altentreptow fields.

B: Altentreptow deposit, east

As part of the exploratory drilling in 1963, 11 boreholes totalling approximately 263 metres were drilled in the Altentreptow field, to the east, which confirmed the presence of two smaller deposits (covering an area of approx. 7.5 ha) and one larger complex of a size comparable to that of the Klatzow field. The boreholes were drilled in the area of the largest deposit.

The outermost western part appears to be overlain by Pleistocene strata to the west, as the clay was penetrated in boreholes 23/63 and 27/63. Within the clay complex, clay sills similar to those at the Klatzow field are evident.

4.2. Hydrogeological situation A:

Loickenzin deposit

1. Teilfeld Loickenzin

Groundwater

Approximately 3 km west of Loickenzin, two covered aquifers have formed in Pripsleben, with the upper Tertiary boundary lying at around -20 m above sea level. In the Loickenzin area, only the upper covered aquifer remains.

Taking into account the clay deposits at Loickenzin and Klatzow and their relatively high Tertiary top at over

At +30 m above sea level, the groundwater flow is blocked from proceeding eastwards. Given that the groundwater generally flows eastwards towards the Tollense, only the area south of Thalberg allows the groundwater to drain unimpeded from the plateau to the Tollense.

Within the surveyed deposit area, only the Pleistocene and Holocene sediments are aquiferous; no groundwater intersections were observed in the Rupel clay, and no confined groundwater was encountered in any borehole.

In the deposit area, both groundwater and surface water flow towards the Torneybach.

Surface water

The Torneybach, which crosses the deposit, has a catchment area of approximately 17 km^2 with an empirically estimated discharge of approx. $\frac{3}{\text{p}}$,

When mining the deposit, it must therefore be ensured that

- a) the small amount of groundwater flowing in from the waste rock must be channelled into the Torneybach stream by means of suitable drainage measures;
- b) in the event of a possible diversion of the Torneybach stream in the course of mining operations, the future quarry lake will take over the stream's discharge function.

2. Klatzow sub-field

and

B. Altentreptow sub-field, east

Water was encountered in 28 of the 33 boreholes drilled, at depths ranging from 1.0 to 7.0 m below ground level. In all boreholes, the water occurred within the Pleistocene overburden.

When mining these sub-fields, it should be noted that

- a) where the overburden consists predominantly of sandy layers, the pits must be protected against major water inflows and, where necessary, drainage measures for the foreland must be planned during development;
- b) during heavy rainfall, the subsidence of the upper clay layer could cause both the sands and the highly sandy sedimentary marl to slide;
- c) it is recommended that a cross-cut mining direction be adopted to cut through the geological units.

4.3. Reserves

A: Loickenzin deposit

In the Loickenzin deposit as a whole, approximately 36 million tonnes of rupelite are estimated to be present over an area of approx. 208 ha, of which approx. 10 million tonnes have been proven.

1. Teilfeld Loickenzin

According to the report dated 21 January 1969 by LAWRENZ (GFE Schwerin), the following reserves situation arises:

| Block | Area | Quantity | Variant | Note |
|------------|------------------------|----------------------|---------|---|
| Block I | 98,000 m ² | 6.61 million tonnes | 2 + 3 | excluding rail transport |
| Block I | 78,000 m ² | 5.29 million tonnes | 2 + 3 | taking the railway embankment into account |
| Block II | 11,400 m ² | 0.72 million tonnes | 1 + 3 | Boundary strip to Block I |
| Block III | 30,600 m ² | 2.14 million tonnes | 2 + 3 | separated by a buffer zone between Block I and II |
| Block IV | 5,600 m ² | 0.35 million tonnes | 1 + 3 | Boundary strip to Block III |
| Block V | 16,600 m ² | 1.17 million tonnes | 1 + 3 | Boundary strip to Block III |
| Total area | 162,200 m ² | 10.99 million tonnes | | excluding railway embankment |
| | 142,500 m ² | 9.67 million tonnes | | with railway embankment |

- Option 1: Total thickness, verified by drilling
- Option 2: Clay thickness, as verified by boreholes, relative to a mining depth of -12 m above sea level
- Option 3: Extrapolated thickness from boreholes, relative to -12 m above sea level, which did not reach this depth

Calculation of minimum reserves for roof tile works (approx. 3 million tonnes):

Block I 35.6 m average thickness (H) 33.3 m
 Block II average thickness (H)

Assumption: H 35 m
 Conversion factor: $1 \text{ m}^3 \text{ clay} = 1.9 \text{ t}$
 Specific volume: $1.9 \text{ t/m}^3 \quad 35 \text{ m} = 67 \text{ t/}^2$

For Block I, the following applies:

- Slope loss - Reichsbahn, calculated according to the survey report: $20:00 \text{ o } \text{lij}^2$ (approx. 50 m x 400 m)
- Slope loss - Reichsbahn at 22° General gradient of the final slope: $34,800^2$ (approx. 87 m x 400 m)
- Residual area at 22° : $63,200^2$
 $(98,000 \text{ p}^2 - 34,000^2)$
- Remaining stock, Block I at 22° : $2,250^3$
 $(63,200^2 \times 35.6 \text{ m})$
 4.27 million tonnes
 $(2,250^3 \quad 1.9 \text{ t/}^3)$

| | |
|--|--|
| Reserves Block II: | 380 3 (11,400 m ² × 33.3 m) |
| | 0.72 million tonnes (380 3 1.9 t/m ³ > |
| Reserves for Blocks I and II: (Clay Complex 1) | approx. 5.0 xio t (4.27 million tonnes + 0.72 million tonnes) |

Potential losses due to high-voltage power lines crossing the aforementioned area can be disregarded, as

- a) considerable reserves are expected in the thickness of the clay body, as none of the boreholes has penetrated the clay body,
- b) and the relocation of the power lines appears entirely feasible.

The average overburden thicknesses are
Block I = 5.2 m and in Block II = 9.1 m.

In summary, it can be concluded that for all 30-year-old DaehzlegolvarRas, the stock is estimated at approx. 3.0 tonnes t: within the storage blocks I and ZZ of Ta1 1f:al of the Rolckenzln, i.e. the Tonkom-complex 1 of the Rolckenzln deposit is entirely suitable for this purpose.

2. 'zell bel d x1aczov

The area of the clay deposit identified here has been estimated at approximately 350,000 m², and the average thickness of the clay layer encountered during drilling at 20 m. This suggests a total estimated reserve of around 14 million tonnes. The average overburden thickness is 10 m.

3. Field

In the Thalberg field, based on geophysical data, reserves similar to those in the Klatzow and Altentreptow fields can be estimated at approximately 12 million tonnes to the east, as the large, relatively continuous clay complex found here covers an area of approximately 300,000 m².

As the areas with overburden thicknesses of up to 20 m and 15 m respectively account for only 1-2% of the total area, the average overburden thickness here is likely to be significantly lower than in all other fields.

With a strong investor on board, it would be worth considering whether the costs incurred by carrying out exploration within Thalberg could be offset in the medium to long term by lower opencast mining costs.

B; Altentreptow deposit, east

According to the report by BAUSS (1964), the reserves for this field are estimated at approximately 12 million tonnes of peat, based on an area of 300,000 m² and a drilled peat thickness of 20 m.

The average overburden thickness has been drilled at 9 m. The slightly lower overburden thickness compared to the Klatzow field is explained by the fact that this deposit complex is not as fragmented as that in the Klatzow field.

The clay reserves at the Altentreptow site ensure the long-term supply of a ceramics plant. As the clays meet all material requirements in accordance with Table 1, Section B, the provision of 1uDS uLw0ltEel0vanter audio products (e.g. DicbtuDg8tOn) zusaCz1 I would like to.

5. Raw material characteristics

A: Loickenzin mining field

The grain size distribution can be found in Appendix 6.

With regard to the chemical composition, the following depth-dependent range of variation applies:

| | | | |
|--------------------------------|------|------|------|
| ÄO ₂ | 51.3 | 59.6 | M.-g |
| Al ₂ O ₃ | 14,5 | 18.8 | N.-& |
| CaO | 1.5 | 5.3 | M.-% |
| MgO | 2.1 | 3.5 | M.-% |
| Fe ₂ O ₃ | 3.7 | 6.1 | M.-% |
| TiO ₂ | 0.4 | 1.0 | M.-% |

In terms of clay mineral composition, there is no significant difference between the clay raw materials in the "Loickenzin" and "Altentreptow, east" mining fields.

The following mineral composition is characteristic:
(see Appendix 8)

| | | | |
|--|--|----|------|
| Quartz: | 25 | 30 | M.-% |
| Muscovite-montmorillonite- mixed-1-layer-mineral: | 35 | 40 | M.-% |
| Kaolinite/chlorite: | 15 | 20 | M.-% |
| Muscovite: | B | 15 | M.-% |
| Traces (# < 10 %): | Calcite, dolomite, siderite, feldspar, pyrite, occasionally clinoptilolite | | |

With increasing depth, the clay mineral content increases and the quartz content decreases.

B: Altentreptow mining field, east

The grain size distribution is shown in Appendix 7.

The following average chemical composition is characteristic:

| | |
|--------------------------------|-------------|
| SiO ₂ | 59.0 wt% |
| Al ₂ O ₃ | 15.0 wt% |
| CaO | 2.5 wt% |
| MgO | 2.4 wt% |
| K ₂ O | 2.7 mol% |
| Na ₂ O | ff 1.0 wt% |
| Fe ₂ O ₃ | 6.1 M.-Ä |
| TiO ₂ | < z, 0 M.-Ä |
| SO ₃ | 0.26 wt% |
| Loss on ignition | 9.3 wt% |

X-ray diffraction analysis revealed that the calcite content (B 6 %) in the Altentreptow clay is higher than that in the Loickenzin clay (< 5 %).

The specific processing characteristics of the predominant swellable three-layer silicate in the clays of both mining fields can be characterised as follows:

- Sensitivity of the raw material to drying,
- rapid heating capability within the temperature range between 300 and 850°C;
- early onset of sintering (already above 850°C) with a relatively narrow sintering range (approx. 30-60°C);
- development of a strong and homogeneous red firing colour in the body;
- Tendency to bubble ('black cores', secondary porosity) above 1050°C.

The firing temperatures required to achieve sufficiently low water absorption, frost resistance and adequate flexural strength should therefore lie between 1020°C and 1050°C.

The modern moulding, drying and firing equipment available today, together with suitable mortar mixes (e.g. containing approx. 70% clay from the BWE sites at Loickenzin and Altentreptow), enable high product quality (see photographic documentation in Appendix 9), as demonstrated by laboratory and small-scale trials.

6, Technical Infrastructure

6.1. Transport links and road

transport

Both mining fields are located in the immediate vicinity of the B 96 between Neubrandenburg and Jarmen and thus offer good integration into the wider transport networks. This ensures rapid access to major economic centres and customers. The distance to Berlin is approx. 140 km, approx. 60 km to the Rostock-Berlin motorway and approx. 240 km to Hamburg via the motorway. In future, the planned new east-west A20 motorway will provide a convenient link approximately 20 km away, particularly to Poland (Pomellen border crossing approx. 130 km away). The link to the Baltic Sea port of Stralsund (80 km) is also economically viable.

Rail transport

The planned extension of the Stralsund-Neubrandenburg-Berlin line (inclusion in the Inter-Regio network) creates favourable conditions for the Altentreptow site, which is situated directly on this route.

Shipping

There are no inland waterways in the immediate vicinity of the future roof tile factory. The ports of Stralsund, Sassnitz, Wolgast and Anklam are suitable for trade with Eastern European and Scandinavian countries, although in each case intermediate transport by road would be required.

6. 2. Site selection criteria for the Establishment of the Zindustrial-plant in Arnobmens

Both sites, 'Loickenzin' and 'Altentreptow, east', are situated directly on the outskirts of Altentreptow.

The land-use plan for the district of Altentreptow designates one commercial development area to the west and one to the east of Altentreptow.

These development areas will be equipped with all the necessary utilities (20 kV overhead line and 20 kV underground cable; 2 bar natural gas pressure pipeline, water supply, sewerage, communications network) required for the operation of a ceramics plant.

The development of the open-cast mine in the Loickenzin sub-area will be the most complex of all the sub-areas due to the terrain, the presence of the Torneybach stream, and the need to construct some of the paved access routes from the open-cast mine to the brickworks.

7. Environmental aspects

The Tollense lowlands stretch from north to south through the town of Altentreptow towards Neubrandenburg. The 'Loickenzin' and 'Altentreptow, east' mining fields do not encroach upon this landscape conservation area. According to the 1st Regional Planning Programme of the State of Mecklenburg-Western Pomerania dated 30 July 1993, both mining fields are designated as reserve areas for raw material extraction.

A: Loickenzin deposit

1. Teilfeld Loickenzin

The Torneybach stream and its immediate surroundings, which cross the Loickenzin sub-field, are worthy of protection from a landscape and nature conservation perspective. From a water management perspective, the stream serves as a receiving watercourse. Should this sub-field be developed, the Torneybach would need to be diverted to ensure the minimum water supply for the new roof tile factory.

The State Office for the Environment and Nature in Neubrandenburg has given its approval for this, provided the following conditions are met:

- once mining begins in this sub-field, the Torneybach stream must be maintained in its current form for as long as possible,
- the implementation of compensatory measures for nature and the landscape must also commence upon the start of mining,
- As part of the preparation of a framework operational plan, the mitigation measures must be documented in the landscape management support plan;
- The mitigation measures must be agreed with the Neubrandenburg District Office.

The drainage function of the stream is to be taken over by the resulting quarry lake when the stream is diverted.

2. Teilfelder Klatzow/Thalberg

According to a written statement from STAUN Neubrandenburg, there is no potential for conflict relating to nature conservation or landscape protection for either of the two sub-sites.

B: Altentreptow deposit, east

At this deposit, the potential for conflict is limited to the proximity to residential development (compliance with the Technical Instructions on Noise and Air Quality).

When excavation work commences in this clay pit, it should start at the point furthest from the residential area; furthermore, a protective barrier should be erected between the residential area and the excavation site to minimise noise and dust nuisance.

No contaminated sites are known to exist above either of the BWE fields.

8. Environmental aspects

Particularly in the new federal states, attempts are being made to meet market demand by creating new capacity.

It is worth noting that two new roof tile factories have been established or are currently under construction in the state of Thuringia, and three in the state of Saxony. The capacity of these factories is estimated at approximately 90 million ceramic roof tiles per annum.

In relation to the development of production volumes in West Germany in recent years:

| | | |
|------|-----------------|---------|
| 1989 | 465 | million |
| | | units |
| 1990 | 493 | million |
| | | units |
| 1991 | 553 | million |
| | | units |
| 1992 | appr 600 | million |
| | ox. | units |

Taking into account the population shares in East and West Germany and the particularly strong renovation and new-build activity in the new federal states, an increase in production capacity is relevant to the market and sales.

Furthermore, the reduced transport costs associated with deliveries from the Altentreptow site compared with traditional suppliers in the Berlin, Hamburg and Schleswig-Holstein markets were expected to stimulate competition.

The federal states of Saxony-Anhalt, Brandenburg and Mecklenburg-Western Pomerania have not previously had their own ceramic roof tile production.

9. Pöerderlnstr The State Ministry of Economic Affairs

Following consultation with the Ministry of Economic Affairs in Schwerin and the relevant regional economic development agency, the following funding instruments have been identified:

1. The district of Altentreptow, where the clay deposits are located, is part of the Neubrandenburg employment office district, which has an above-average unemployment rate, and is classified as Funding Area III with the maximum funding of 35% investment grants on all eligible investments.
The extraction of clay and related investments are excluded from funding. Funding is available for the purchase or manufacture of assets forming part of the investment project (see tax law definition).

However, the following are not eligible for funding:

the purchase of land

- low-value assets (current limit: DM 800)

cars, LKYf, estate cars

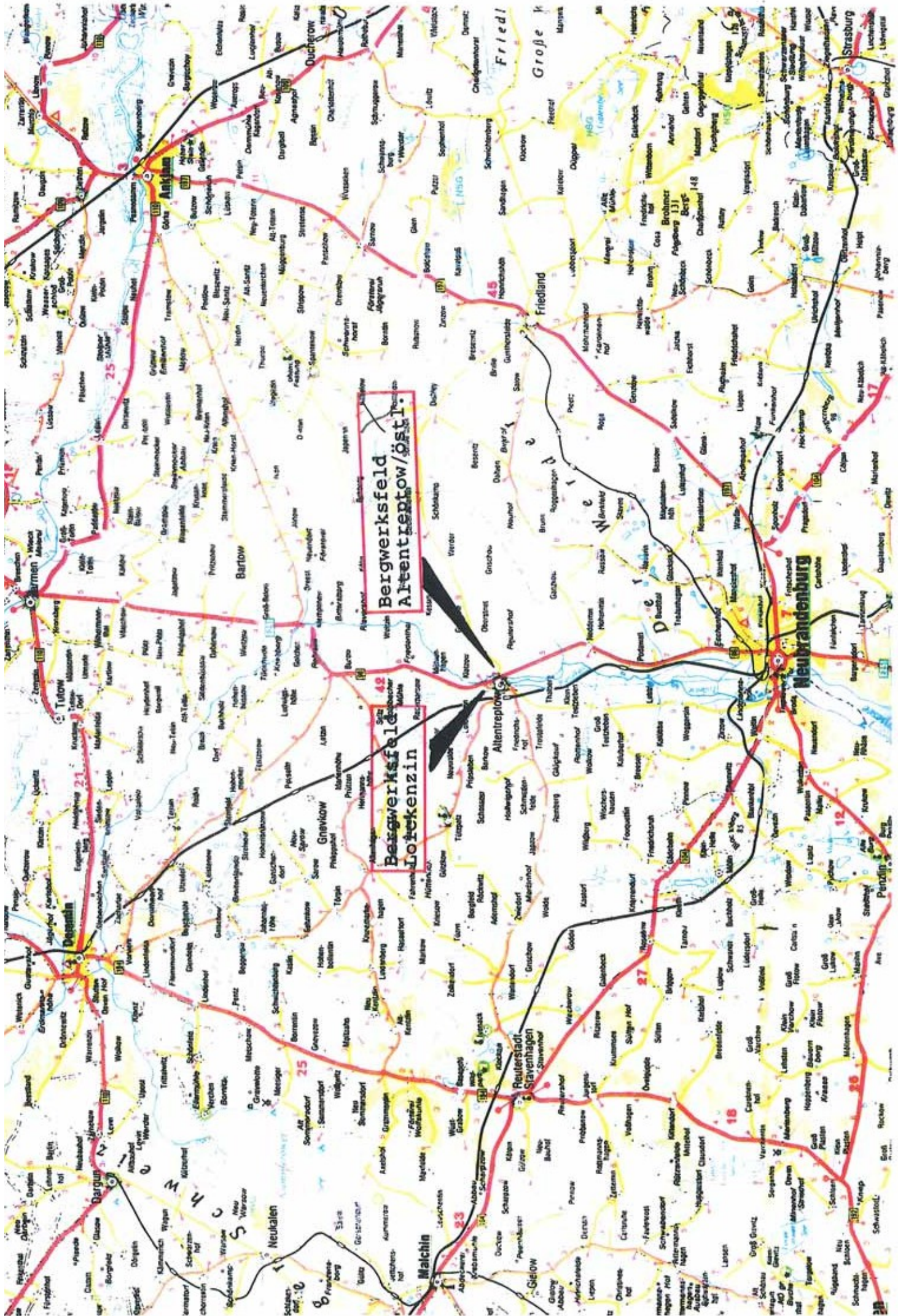
2. In addition to this funding from the joint programme •Improvement of the regional economic structure•: tax incentives may be utilised in the new federal states. These include the investment allowance, which is calculated on the basis of the total acquisition or production costs of the eligible movable assets delivered or manufactured during the financial year. For eligible investments, it amounts to 8% of the acquisition or production costs, provided that, for the assets referred to in Article 13 - Amendment to the Investment Allowance Act 1991 - the investment commenced after 31 December 1992 and before 1 July 1994, and was completed before 1 January 1997.
3. State authorities and local authorities shall ensure the accelerated processing of approval procedures (mining law, regional planning, building planning and application procedures under the Federal Immission Control Act).

Appendix 1

Location of the Loickenzin and
Altentreptow BWE fields, east

Overview map, scale

1:250,000

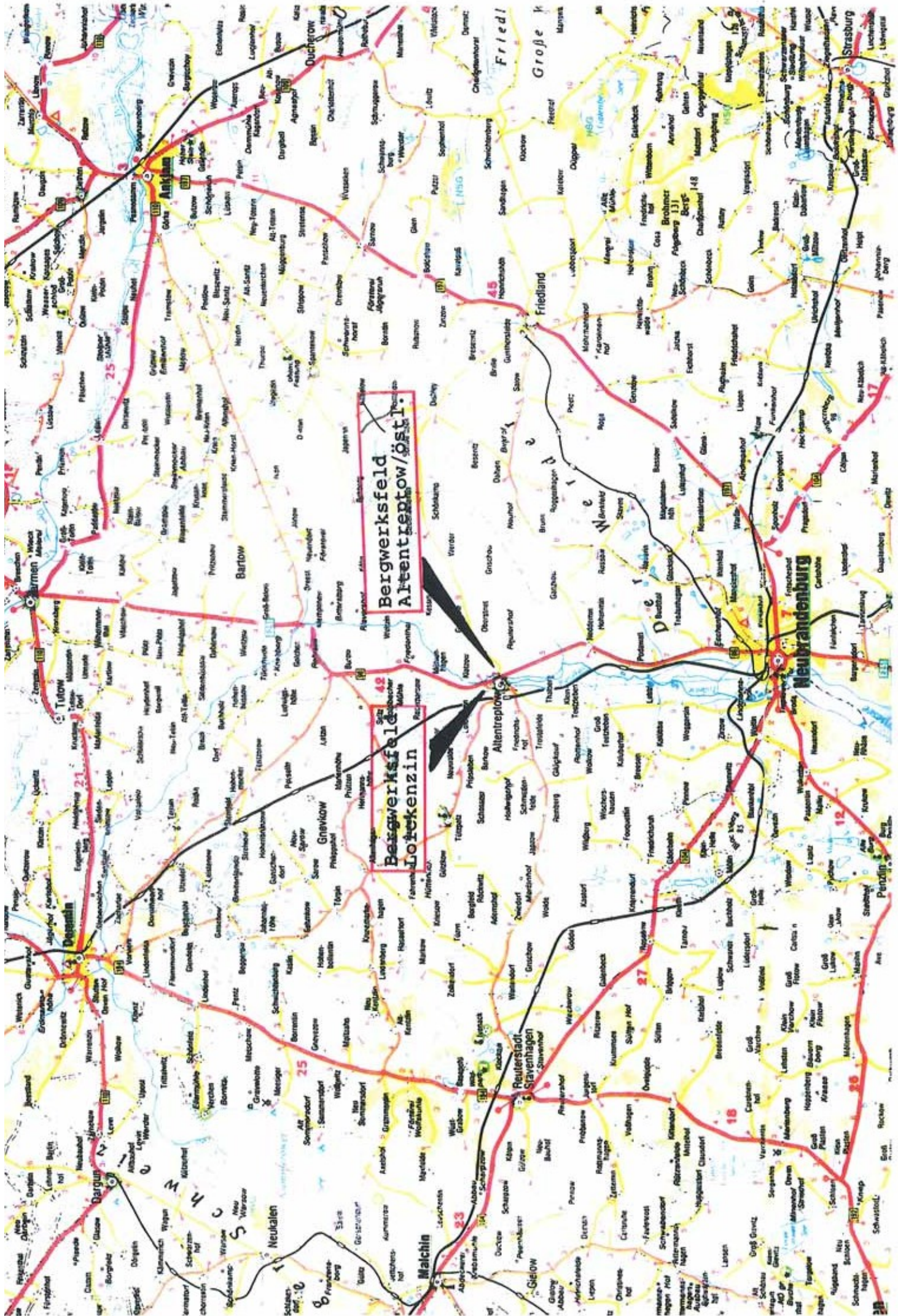


Appendix 2

Soil investigation works in the
Altentreptow area

Location map

Scale 1:25,000

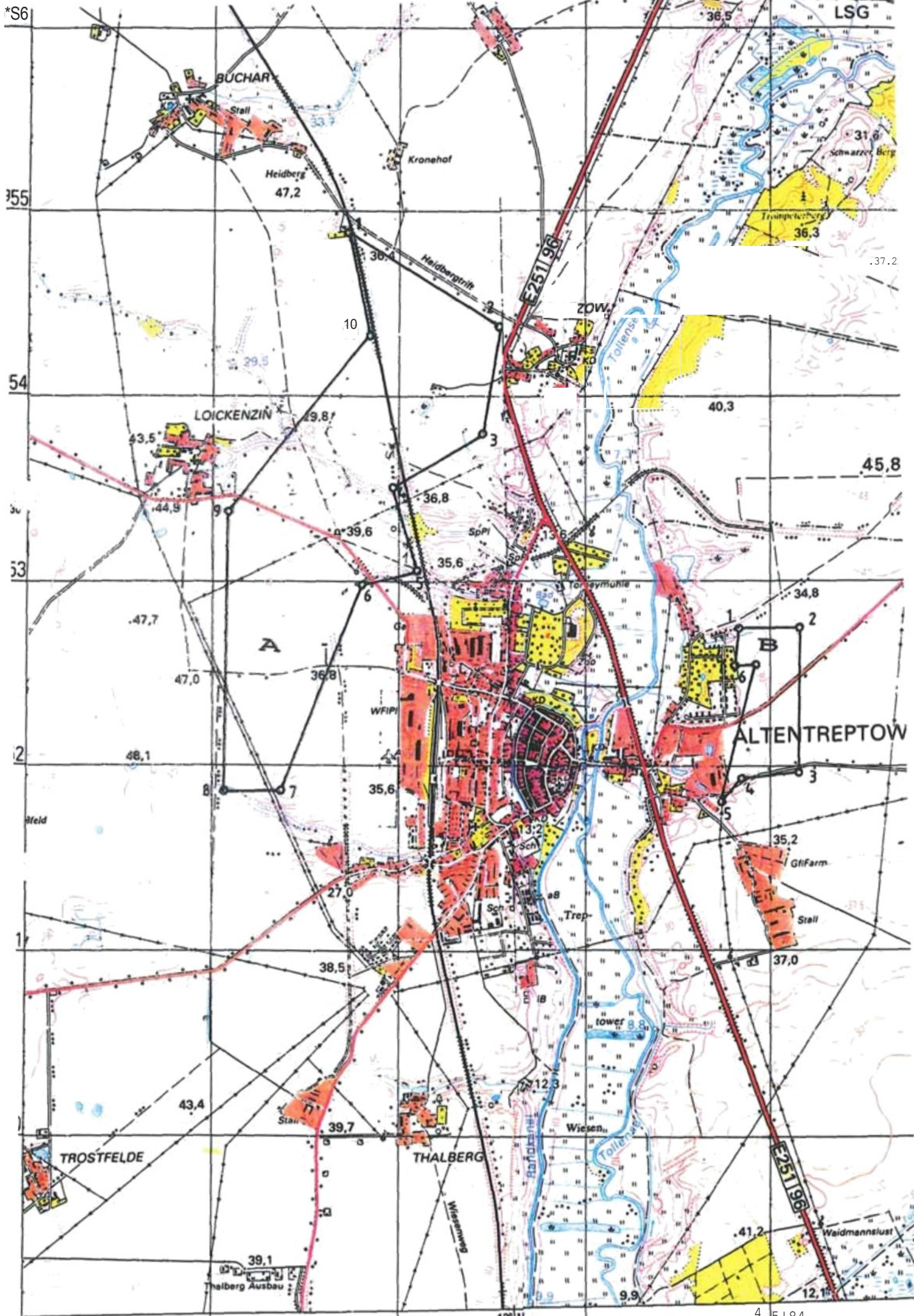


Appendix 3

Location of the mining fields
(A) Loickenzin and (B) Altentreptow, east

Scale: 1:25,000

*S6



80

45 81

45 82

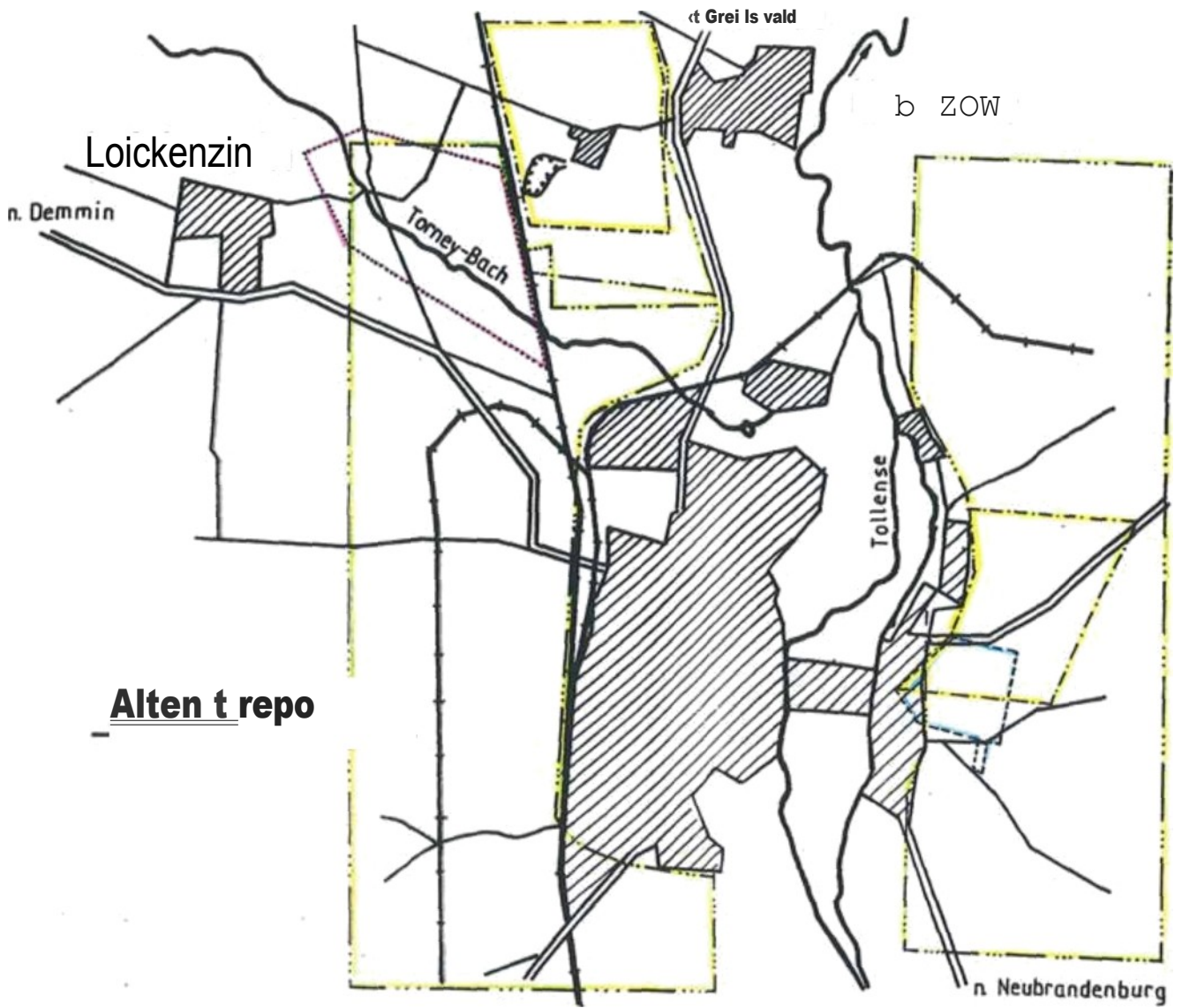
4983

4 15 | 84

Appendix 4

Rupelton Teilfeld Loickenzin

- Geologischer Vorrat -



Alten t repo

magepian

y: 1 : 25,000

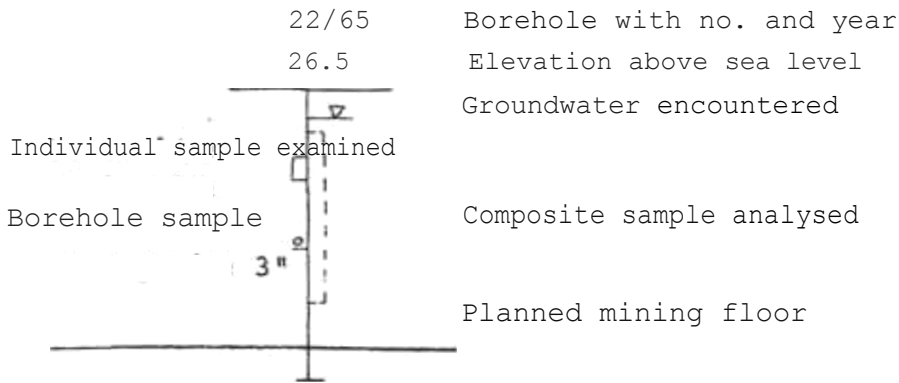
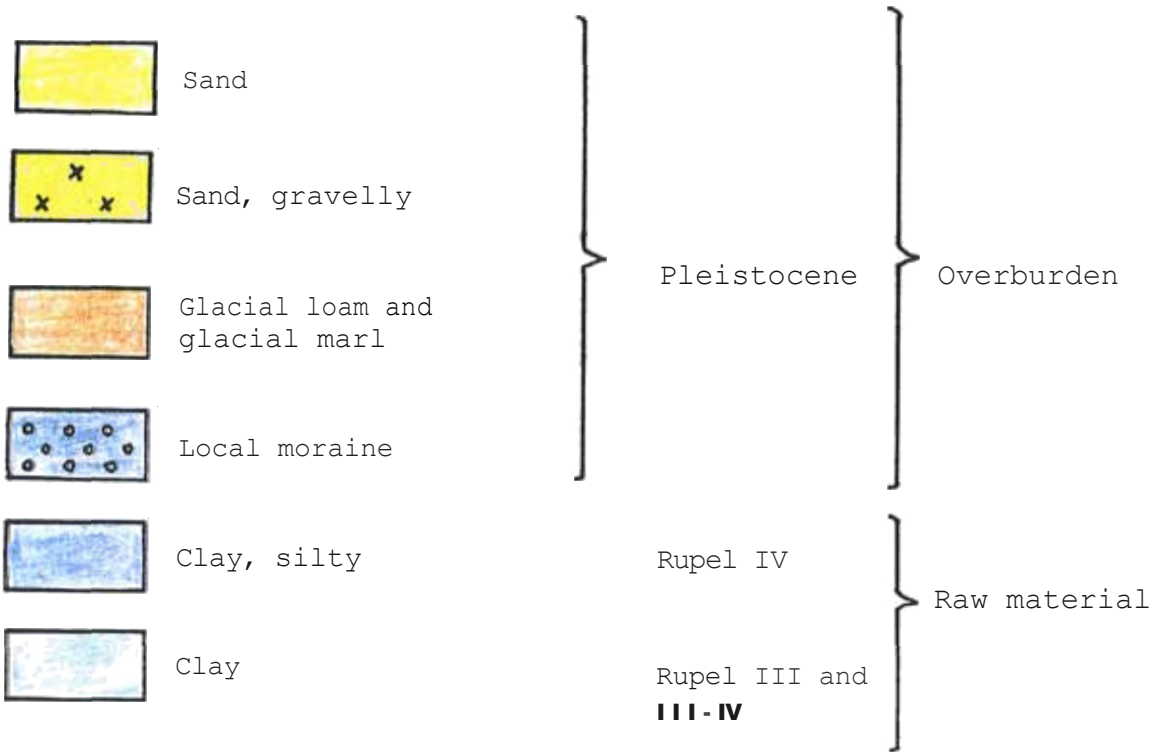
LAGRNDR:

- Survey map , 1953
- Exploration area 1963 Exploration areas 196
S and 1967
- Geophysical New area , 1963

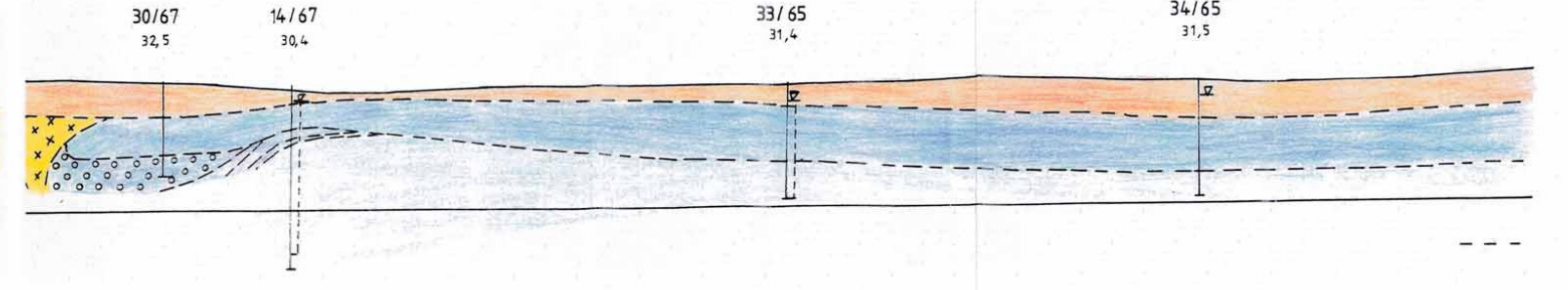
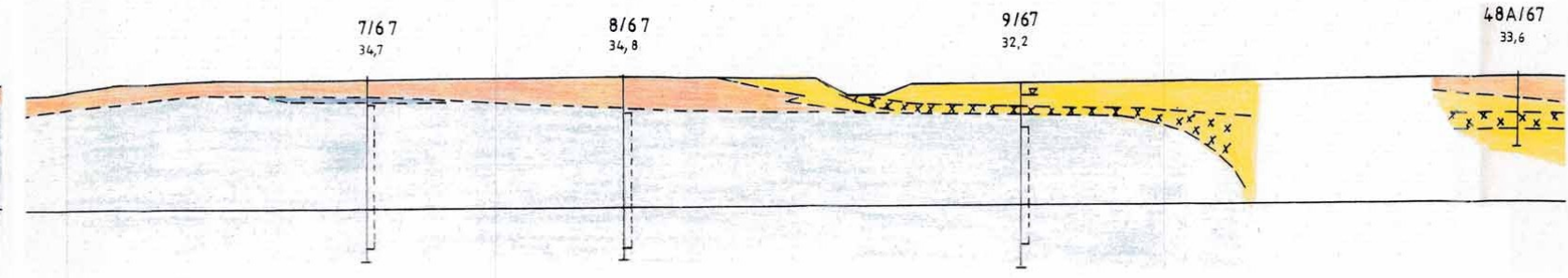
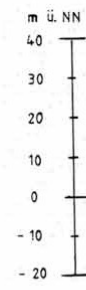
Appendix 4.1

Loickenzin sub-area

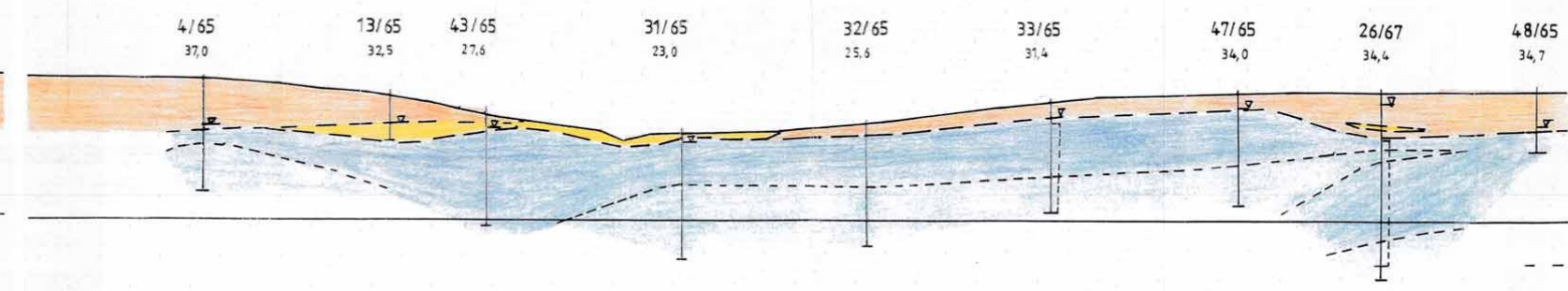
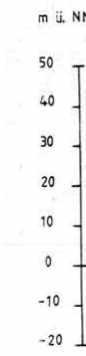
f3CMiCÖCezzaCi zz1t be 22 øzd 9 from
the 1967 survey



9



22

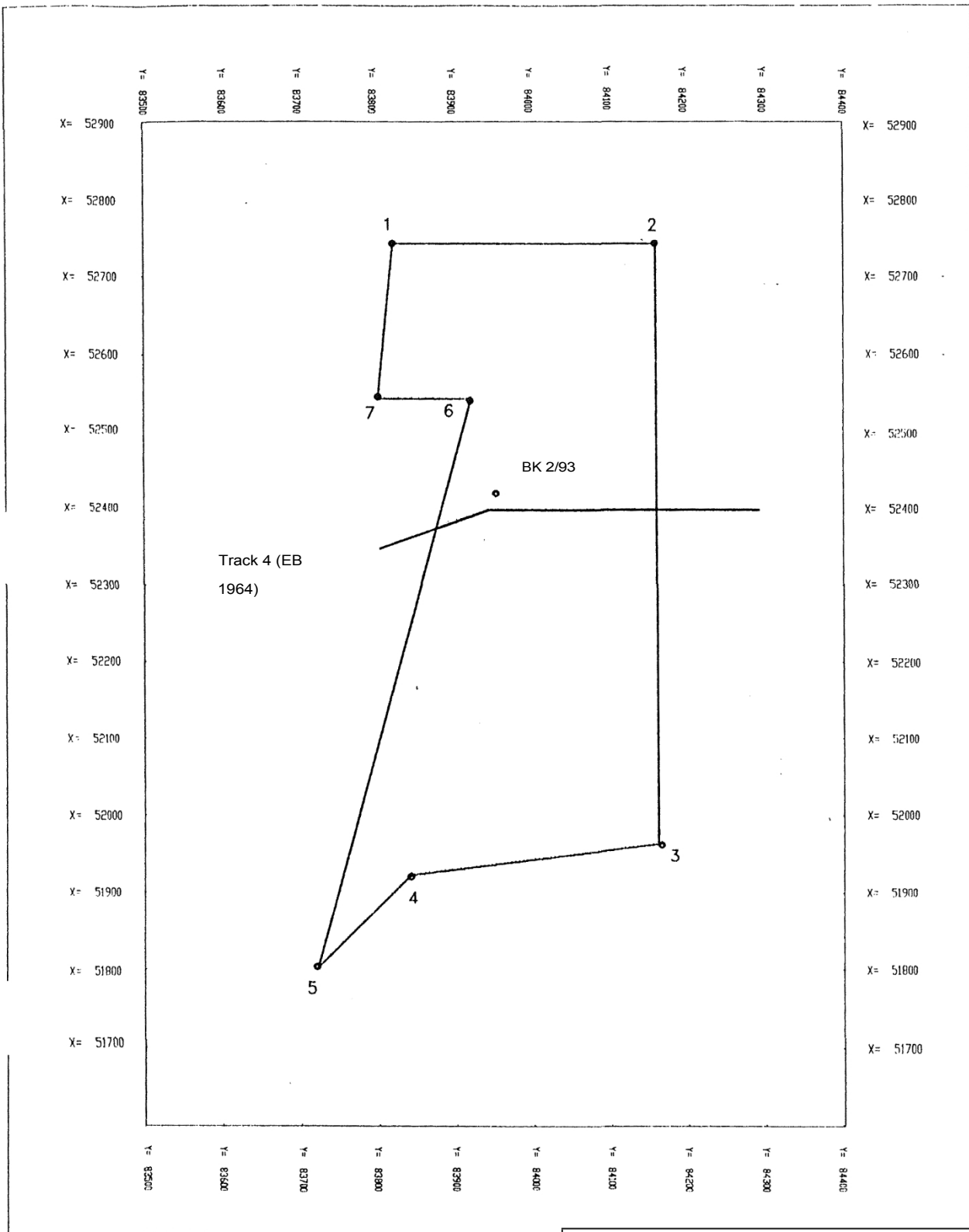


Sicherheitspfeiler

Objekt :
Ton Altentreptow
Teilfeld Loickenzin

Schnittspuren 9 u. 22 | Erkundung 1967 | Bearbeiter :
Dipl. Ing. Chudziak

Datum : 21.10.93 M = 1:1000 Bl. Nr.



Oh dear! * To n Alt e n t r e p t o w

Altenrepto w mining field, ösJlic h

Author: Dip. Ing. P. Cudzicli

Do lum:)Ü.1 0.93

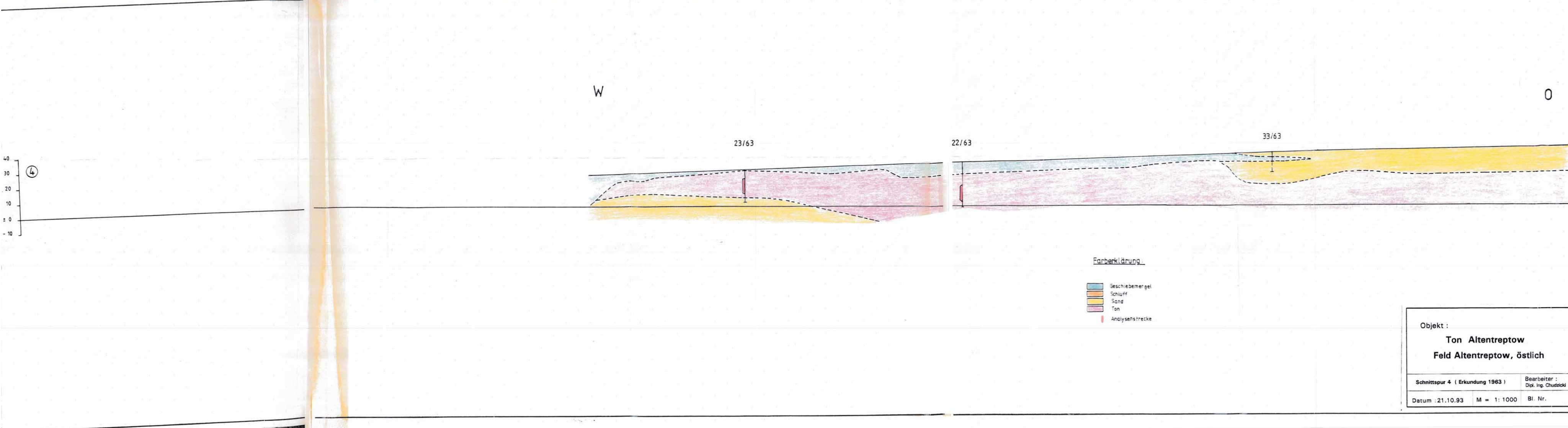
= 1 '60,000

Bl. N.H.

Appendix 5.1

Altentreptow mining field, east

Stratigraphic section 4 from the
1963 exploration



Farberklärung

- Geschiebemergel
- Schluff
- Sand
- Ton
- | Analysenstrecke

| | | |
|-----------------------------------|---------------------|---------|
| Objekt : | | |
| Ton Altentreptow | | |
| Feld Altentreptow, östlich | | |
| Schnittspur 4 (Erkundung 1963) | Bearbeiter : | |
| | Dipl.-Ing. Chudicki | |
| Datum : 21.10.93 | M = 1:1000 | Bl. Nr. |

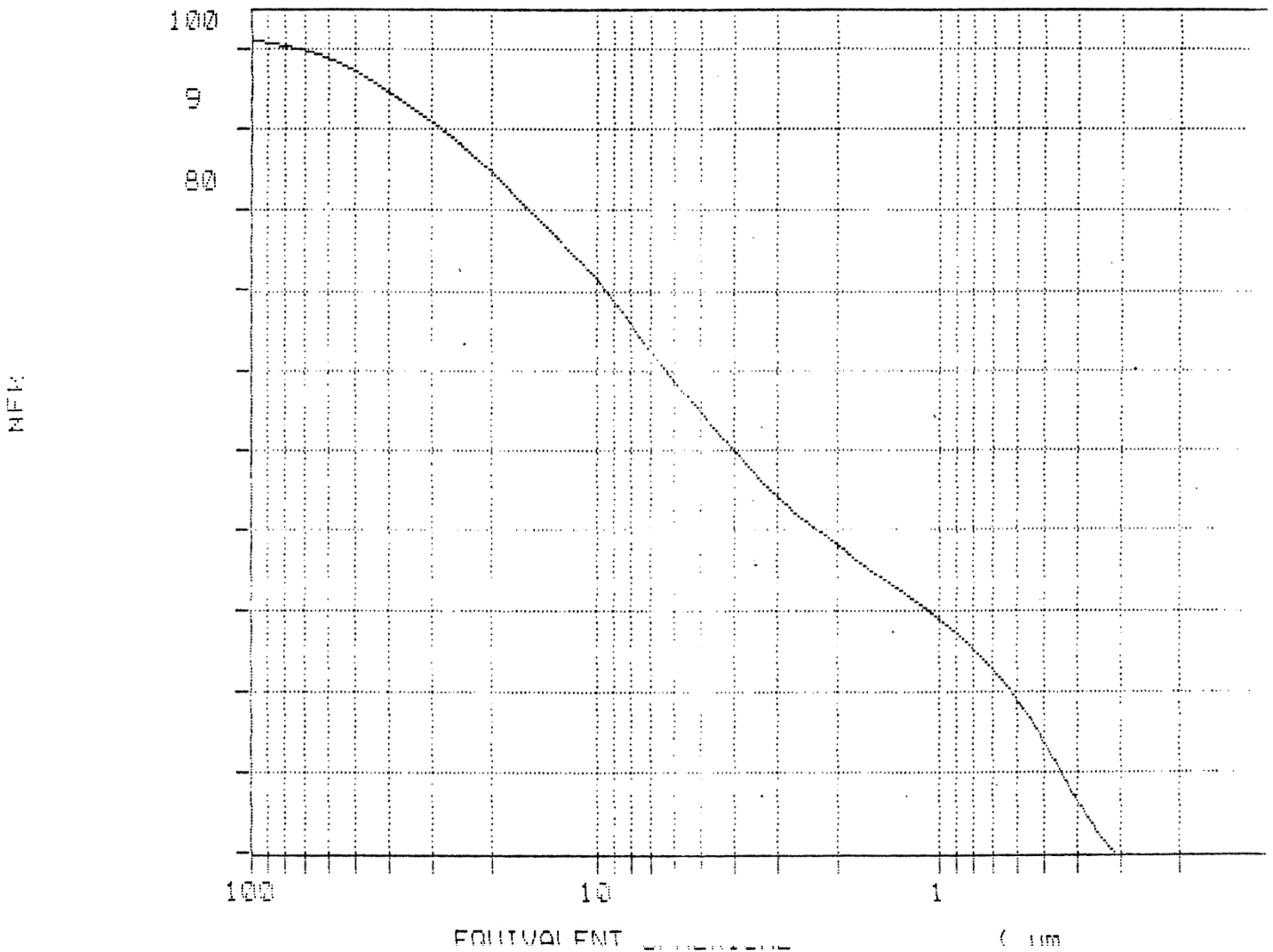
Appendix 6

Grain size distribution of composite sample BK
1B/93
In the Loickenzin sub-field

FILE DIRECTORY/NUMBER: DATA1 /8
SAMPLE ID: BK 1E/93 Sample
SUBSCRIBER:
OPERATOR:
SAMPLE TYPE:
LIQUID TYPE: Water
ANALYSIS TEMP: 35.1°C
BASELINE/FULL SCALE: 142/ 108 counts/sec

UNIT NUMBER: 1
START 13:56:25 21/09/93
REPT 14 : 54 : 31 21/09/93
TOT RUN TIME 0:12:02
SARIDENS: 2,600 g/cc
LIQ DENS: 0.9941 g/cc
LIQ VISC: 0.7217 ep
RUN TYPE: "High Speed"

CUMULATIVE MASS PERCENT FINER VS. DIAMETER

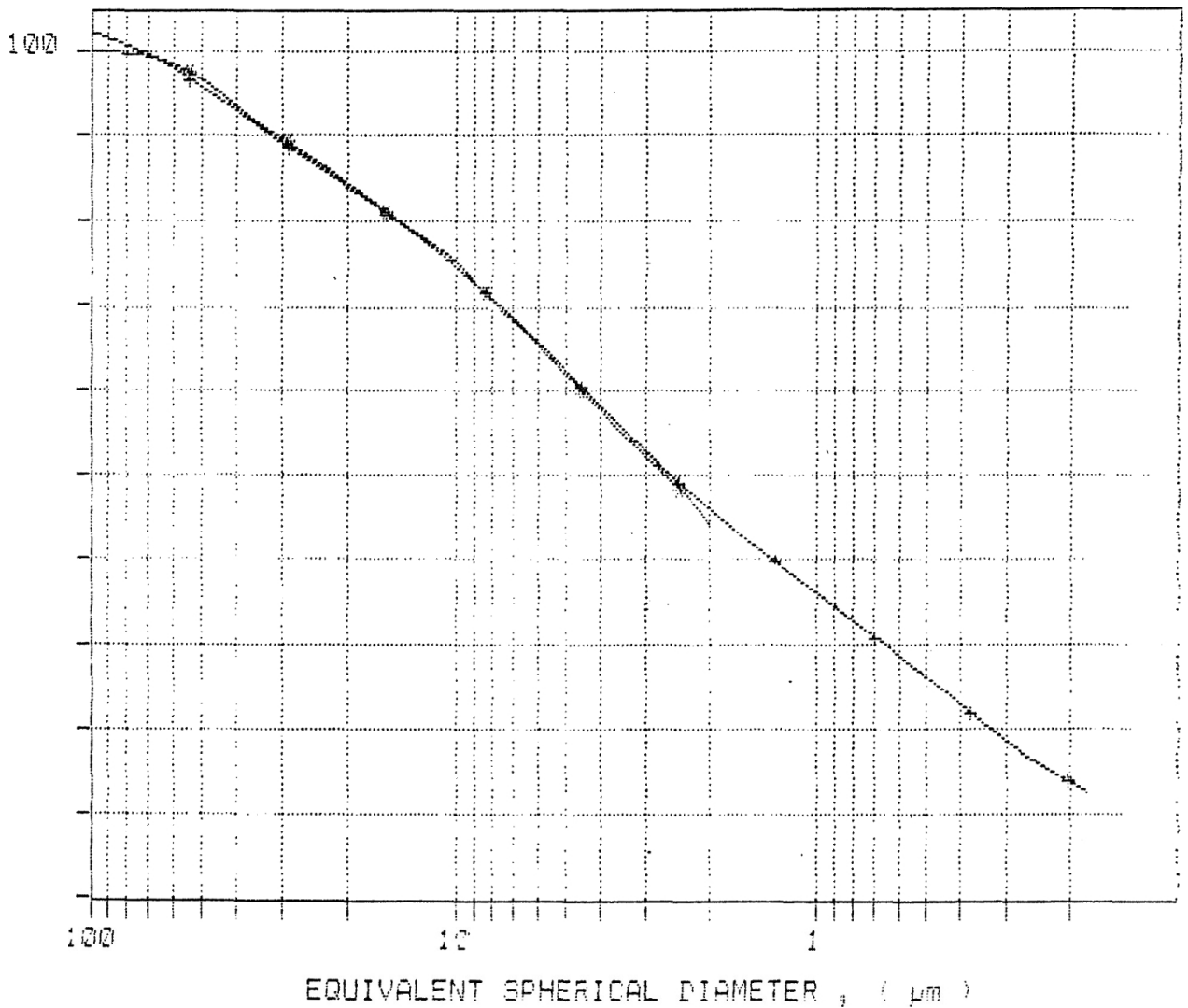


Grain size distribution of mixed sample BK
2/93 from the Altentreptow mining field, east

SAMPLE DIRECTORY/NUMBER: DATA1 /7
SAMPLE I D: Recovery 6
SUBHEADING:
OPERATOR:
SAMPLE TYPE:
LIQUID TYPE: Slater
ANALYSIS POINT: 35.0 deg c
BASELINE/FULL SCALE: 142/ 95 ki counts/sec

UNIT NUMBER: 1
5'TAR'1 1-3: 03: 09 ,21/09/93
REPR T 14:12:15 21/09/93
TOT RbN THE 0:35:39
SAJ4 DENS: 2,600 g/cc
LIQ DENS: 0.9941 g/cc
LIQ VISC: 0.7220 cp
RUN TYPE: High Speed

CUMULATIVE MASS PERCENT FINER VS. DIAMETER
7 Wiederholung 6
A BK ... Mischprobe



Appendix 8

Radiographic overview images by Tone Loickenzin
and Altentreptow, east

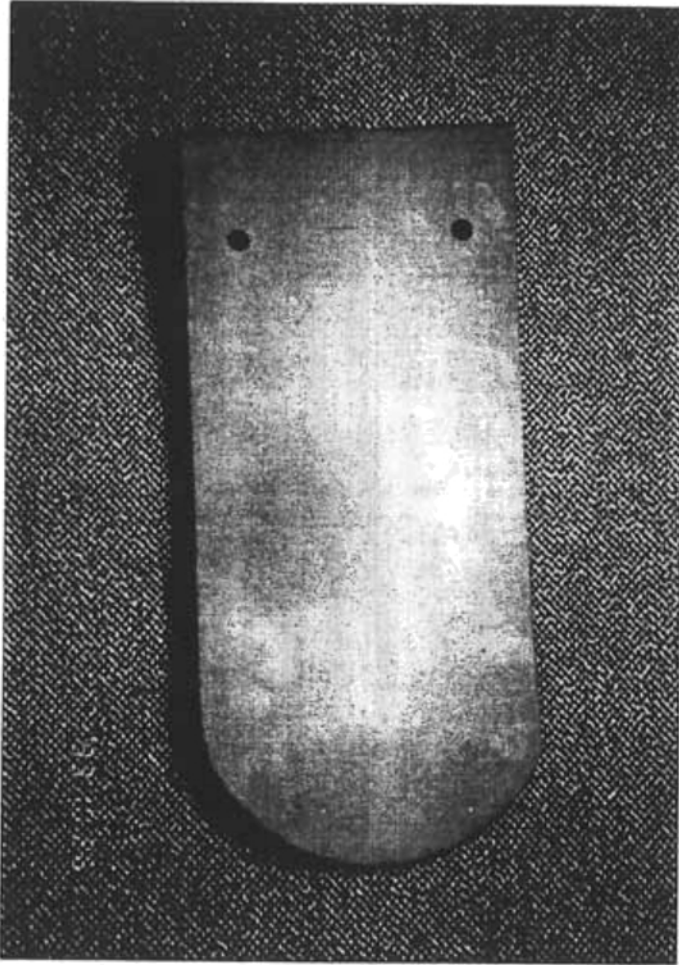
Appendix 9

Photographic documentation of test specimens
from the small-scale technical trial

1. Blank

2. Roof tile

1. Raw tile



2. Roof tile



APPENDIX 3

Clay deposits Altentreptow / Loickenzin
- a data collection -
DURTEC, 2009

DURTEC

Engineering, Consultancy and Laboratory Services Ltd



Clay deposits Altentreptow / Loickenzin

- a da& collection

Clay deposits Altentreptow / Loickenzin

- a data collection

.....
Dr
.....
Dr J. Schomburg
.....

Neubrandenburg, 23 November 2009

CONTENT

1. General
2. Description of the mining situation
 - 2.1 General
 - 2.2 Geological situation
3. Known potential uses of the deposits
4. Description of infrastructure
5. Potential applications
6. Literature/Sources

Annex

- Annex 1: Location of clay deposits "Altentreptow östl." and "Loickenzin" (punctiform)
Location of clay deposits "Altentreptow östl." and "Loickenzin" (area)
- Annex 2: Clay deposit "Altentreptow östl." No. 245/90/643 — location
plan with coordinates
- Annex 3: Clay deposit "Loickenzin" No. 169/90/634, 640, 644 — location
plan with coordinates
- Annex 4: Map of regional policy
- Annex 5:

1. General

The documentation contains geographical, geological and infrastructure-related information, as well as data from application tests and regarding ownership rights.

2. Description of mining situation

2.1 General

The clay deposits "Altentreptow östl." and "Loickenzin" are classified as so-called "bergfreie Bodenschätze", which means that the holder of the mining rights is not automatically the owner of the land above the mineral deposit. The land above the deposit acquires the status of so-called "begünstigter Grund und Boden". Pursuant to Sections 17 and 77–81 of the so-called "Bundesberggesetz", the holder of the mining rights may initiate a procedure known as a "Grundabtretungsverfahren" with the relevant mining authority to acquire the land above the mineral deposit from the former landowner.

This could be a major advantage for commencing mining operations at a mineral deposit purchased from the so-called "Treuhandanstalt". As a result of this situation, as enshrined in law, many regional policy programmes designate such mineral deposits as so-called "Rohstoffvorranggebiet".

In accordance with Sections 52 and 57 of the so-called "Bundesberggesetz", a mining document ("Betriebspläne") must be drawn up and approved before mining operations can commence.

In accordance with Section 23 of the so-called "Bundesberggesetz", the competent mining authority must approve the sale of mineral deposits classified as "bergfreie Bodenschätze/Bergwerkseigentum".

More detailed figures (mining area) can be found in Annexes 1–4.

2.2 Geological situation

A compilation of relevant data and figures for the clay deposits “Altentreptow östl.” and “Loickenzin” can be found in Table 1.

| Pos. | Criteria / Parameter | clay deposit "Altentreptow east" | clay deposit "Loickenzin" (comprising 3 parts: "Thalberg", "Loickenzin", "Klatzow") |
|------|--|---|---|
| A | General | | |
| A.1 | protected area (BWE — field) | approx. 27 ha | approx. 208 ha |
| A.2 | reserves | - estimated 12 million tonnes, - no mining activity to date, | - estimated 36 million tonnes (total for 3 sections), - proved 10 million tonnes, - not open, |
| A.3 | (average thickness of overburden | » 9 m (up to max. 20 m) | IZ 6 m (from 2 to 10 m) |
| A.4 | average thickness of clay (m) | 20 m | 35 m |
| A.5 | detected clay types | 2 varieties | 3 varieties |
| A.6 | boreholes (total metres drilled per year) (to investigate the clay deposit) | 427 m (1953) total: 467 m 40 m (1993) | 904 m (1963) total: 4560 m 1,464 m (1965) 2,152 m (1967) 40 m (1993) |
| A.7 | principle geological profile | overburden 0 9 m usable clay layer 20 m | overburden 2–10 m usable clay layer 30–40 m |
| A.8 | type of overburden | | hu loam, glacial till, sand (alternating) |
| A.9 | characteristic of clay sheet | Type 1: dark grey, higher content of sand and particles larger than 20 µm, Type 2: green-grey, higher content of clay fraction <2 mm, - in places more than 30 m thick, | Type 1: dark brown, with a higher content of particles >20 µm, free of carbonates and pyrite Type 2: grey, free of carbonates, traces of pyrite Type 3: grey-green, higher clay content, free of carbonates, - in places more than 50 m thick, |
| A.10 | groundwater level | between 1 and 7 m (Pleistocene layers) | - groundwater and surface water flowing towards Torney Brook, - groundwater flows in an easterly direction, - even the overburden is permeated by groundwater, - no water seepage. |

| B | | Clay characteristics | | | | |
|-----|---|--|--|---|--|--|
| B.1 | chemical composition (mass %) | SiO ₂ 57.8 wt% Al ₂ O ₃ 16.0 wt% Fe ₂ O ₃ 6.2 wt% CaO+MgO 5.6 wt% K ₂ O+Na ₂ O 3.5 wt% S 3 0.3 wt% GV 9.4% C org. 1.7 mol% | | SiO ₂ 58.7 wt% Al ₂ O ₃ 15.1 wt% Fe ₂ O ₃ 6.1 wt% CaO+MgO 4.9 wt% K ₂ O + Na ₂ O 3.4 wt% S 3 0.3 wt% GV 9.3% C org. 1.8 wt% | | |
| B.2 | mineralogical composition (mass-%) | Quartz 25–30 % Muscovite-montmorillonite mixed-layer — mineral 35–40% Kaolinite/chlorite 15–20 % Muscovite up to 15% Calcite, dolomite, siderite < 3% Feldspar < 3% Pyrite < 1 % | | | | |
| | | | | | | - as depth increases, the quartz content decreases and the clay mineral content increases, |
| B.3 | grain size distribution (mass %) (average) | » 63 <i>km</i> 1.3 — 8.7 63–20 <i>pm</i> 15.6 20–2 <i>pm</i> 51.4 < 2 <i>pm</i> 33.0 | | » 63 <i>pm</i> 0.4 — 5.5 > 20 <i>km</i> 0.6–22.1 20 <i>pm</i> 28.7 — 54.6 < 2 <i>pm</i> 32.6 — 69.2 type 1: approx. 35 < 2 <i>pm</i> Type 2: approx. 50 < 2 <i>pm</i> Type 3: approx. 70 < 2 <i>pm</i> | | |
| B.4 | further parameters | - CEC (Cation Exchange Capacity): approx. 50 mval/100g, - permeability: « 1 x 10 ⁻¹⁰ m/sec., | | - CEC: approx. 50 mval/100 g, - permeability: < 1x 10 ⁻¹⁰ m/sec. | | |

Table 1: Compilation of clay deposit characteristics

3. Known potential uses of the deposits

Environmental protection

This is based on the legal requirements for mineral sealing compounds (clay seals) used to seal the base, sides and surfaces of waste disposal sites in Germany, as described in the Technical Instructions on Waste (TA Abfall) and the Technical Instructions on Municipal Waste (TA Siedlungsabfall), Part E. In particular, the content of clay minerals, carbonates and organic substances, as well as the maximum size of aggregates, are important parameters. Table 2 shows the relevant values for the Altentreptow östl. and Loickenzin clay deposits in comparison with the required data from the regulations.

| Parameter | Mineral | | Clay from | |
|--|--|---|-------------------------|-------------------------|
| | Seal of Base Technical Instructions on Waste (TA Abfall) Part I, Supplement E and Technical Instructions Municipal Waste (TA Siedlungsabfall) | Seal of Surface Technical Instruction on Waste (TA Abfall), Part I, Supplement E and Technical Instruction on Municipal Waste (TA Municipal Waste) | Altentreptow | Loickenzin |
| Key Parameters | | | | |
| Clay mineral content | * 10 % with high AC | » 10%/ with high AC | * 60% with high AC | » 65% with high AC |
| Carbonate content | « 15% | < 15% | < 3% | < 3% |
| Content of organic substances | < 5 % | < 5 % | 1.7% | 1.8% |
| Maximum size of aggregates | < 32 mm | < 32 mm | ++ | + |
| Particle size distribution | » 20 % « 2 µm | » 20% « 2 µm | > 35 « 2 µm | gl 50% < 2 µm |
| Built-in parameters | | | | |
| Coefficient of Water Permeability (k-value) | < 5 * 10 ⁻¹¹ | « 5 * 10 ⁻¹¹ « 5 * 10 ⁻¹¹ Disp.-Class I and II | « 5 * 10 ⁻¹¹ | « 5 * 10 ⁻¹¹ |
| Proctor Density (De.) | » 95 % | > 95 % | + | |
| Max. air pore content | « 5 % | < 5 % | + | |
| Layer thickness | < 25 cm | 25 cm | + | |
| Total thickness | * 150 cm for SWD, 75 cm for Disp.-Cl.II, 50 cm for Disp.-Cl.I | * 50 cm | + | |
| Homogeneity | Good, uniform built-in water content, > De, production using the mixed-in-plant method | good, uniform moisture content, ^ Dpr, production using the mixed-in-plant method | + | |

AC – Adsorption Capacity;

> m-1 — high content of muscovite-montmorillonite mixed-layer mineral (> 30 %)

+ - guaranteed

Table 2: Substantial and built-in requirements for the base and surface seal of disposal sites
 in comparison with the properties of the clays from Altentreptow East and Loickenzin

Ceramic behaviour

In 1993, DURTEC collected several hundred kilograms of representative clay material from the clay deposits via two boreholes.

The clay materials were analysed, yielding the following results:

| Parameter | Loickenzin BK 1E/93 B | Altentreptow BK 2193 |
|--|--|---------------------------------|
| Water content | 30.2 (at depths greater than 30 m, water content increases to 35.0 %) | IB 31.4 |
| Chemical and mineralogical composition | see Table 1 see Table 1 | see Table 1 |
| <u>Grain-size distribution</u> | | see Table 1 |
| dry shrinkage (%) at 105 °C for mixtures of | | |
| - 75 ° / of clay material and 25 % sand from Küssow | 8.0% | 8.0% |
| - 0 / of clay material and 35 % sand from Küssow | 7.0% | 8.0% |
| - 100% clay material | 10% | 9 % |

| firing behaviour | Loickenzin | | | | Altentreptow | | | |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | BK 1E/93 | | | | BK 2/93 | | | |
| | 1000 °C | | 1050 °C | | 1000 °C | | 1050 °C | |
| | ts ¹ (%) | wa ² (%) | ts ¹ (%) | wa ² (%) | ts ¹ (%) | wa ² (%) | ts ¹ (%) | wa ² (%) |
| - 75% of clay material and 25 % of sand | 10.0 | 9.7 | 12.0 | 7.0 | 10.0 | 11.6 | 11.0 | 6.1 |
| - 65% clay material and 25% sand | 9.0 | 11.3 | 10.0 | 8.7 | 8.0 | 11.1 | 10.0 | 7.0 |
| - 100% clay material | 10.0 | 10.4 | 11.0 | 9.0 | 10.0 | 9.0 | 10.0 | 8.1 |

¹ ! total shrinkage of fired body

²) water adsorption of fired body

The firing colour of the prepared bodies depends solely on the firing temperature (1000 °C: red, 1050 °C: reddish-brown).

Based on these laboratory test results, a pilot-scale test was carried out at the Mayer-Holsen roofing tile plant in Hüllhorst, using a mixture of 70% clay and 30% sand. Using a press from Keller (model PVA 35), a dryer (10 hours at 90 °C) and a hydrocasing furnace (maximum temperature 1030 °C for 3 hours), several hundred roofing tiles of the so-called 'Biberschwanz' type were produced.

They were characterised by the following parameters:

- dry shrinkage: 6.8 ‰
- firing shrinkage: 2.4 %
- water adsorption: 10 %
- firing colour: red to reddish-brown

4. Infrastructure description

Information on the administrative structure and land register can be found in Table 3.

A compilation of relevant infrastructure data, environmental protection information and regional policy planning is presented in Table 4

5. Potential applications

Ceramics

Based on approx. 300 million tonnes of geological reserves of Tertiary marine clays in north-eastern Germany exists a long history of ceramic use of clays from type

“Altentreptow/Loickenzin”. These clays are characterised by the dominant muscovite mixed-layer mineral. Specific ceramic properties of this clay type are:

- a high content of expandable mixed-layer minerals,
- kaolinite content < 15 %
- high sensitivity during drying
- low sintering point, expansion preference > 1100 °C
- narrow sintering range
- homogeneous red firing colour, because > 5 % Fe₂O₃ is fixed in the octahedral position of the three-layer silicates
- limited use with wet forming techniques
(dry pressing of clay powders (should be preferred))

| Item | criteria / parameters | clay deposit "Altentreptow East" | clay deposit "Loickenzin" (comprising 3 parts: "Thalberg", "Loickenzin", "Klatzow") |
|----------|-----------------------------------|---|--|
| A | <u>authority structure</u> | | |
| A.1 | federal state | Mecklenburg-Western Pomerania | |
| A.2 | district | Demmin | |
| A.3 | office | Treptow-Tollensewinkel | |
| A.4 | municipality | town of Altentreptow | |
| A.5 | associated villages | Buchar, Friedrichshof, Klatzow, Loickenzin, Rosemarsow, Thalberg, Trostfelde, | The village of Loickenzin is part of the town of Altentreptow |
| | | | |
| B | <u>Land register</u> | | |
| B.1 | open fields | Altentreptow: open field No. 4 | Loickenzin: open field No. 1 Thalberg: open field No. 2 Klatzow: open field No. 1 and 3 |
| B.2 | open fields parts | Total no: 11 (owners: 45% of total area — private individuals, 55% of total area — BVVG) | Total no: 75 (owners: 80% of total area — private individuals, 16% of total area — BVVG, 4% of total area — municipality / church) |

Table 3: Compilation of authority structure and land register with respect to the clay deposits "Altentreptow östlich" and "Loickenzin"

| Pos. | criteria / parameters | clay deposit "Altentreptow östlich" | Clay deposit "Loickenzin" (comprising 3 parts: "Thalberg", "Loickenzin", "Klatzow") |
|-------------|-------------------------------|---|---|
| A | <u>Infrastructure</u> | | |
| A.1 | geographical position | -attheEast—outskiroftown Altentreptow, | - at the north-western outskirts of the town of Altentreptow, |
| A.2 | distance to cities | - Berlin (140 km, S), Neubrandenburg (25 km, S), Greifswald (50 km, N), Rostock (140 km, NW), Polish border (130 km, E), | |
| A.3 | motorway / roads | - 6 km to the A20 motorway, - 1 km to the B96, | - 10 km to the A20 motorway, - 5 km to federal road B96, |
| A.4 | railway | - Altentreptow railway station (Stralsund–Berlin line), | |
| A.5 | navigation / shipping | - inland ports: Demmin (32 km, NW), Jarmen (30 km, N), Anklam (40 km, NE), - federal waterway to the Baltic Sea, | |
| A.6 | airports / flight connections | - Neubrandenburg Airport (20 km, S), - Rostock-Laage Airport (120 km, NW), | |
| A.7 | energy | - electricity (20 kV – cable connection, underground and overhead), | |
| A.8 | water / wastewater | - centralised wastewater treatment in the town of Altentreptow, - water supply via the Teetzleben water treatment plant; | |
| A.9 | Gas | - main gas supply line (10 km north-east of the town of Altentreptow; connection DN 200, pressure 25 bar), | |
| A.10 | Communication network | - existing, currently installing DSL connection, | |
| | | | |

| Item | criteria / parameters | “Altentreptow East” clay deposit | clay deposit “Loickenzin” (comprising 3 parts: “Thalberg”, “Loickenzin”, “Klatzow”) |
|------|-----------------------|--|---|
| B | conflicting uses | | |
| B.1 | Regional policy | <ul style="list-style-type: none"> - area with top priority for mining activity (so-called “Rohstoffvorrang-gebiet”) to date, - planning for 2009: downgrading of priority status (so-called “Rohstoffvorbehaltsg-gebiet”), - The mining plan will be assessed on a case-by-case basis, | <ul style="list-style-type: none"> - area with second priority for mining activity (so-called “Rohstoffvorsorgegebiet”), - planning for 2009: reduction of priority status (so-called “reserve area”), - mining plan will be assessed on a case-by-case basis, |
| B.2 | settlement structure | <ul style="list-style-type: none"> - the protected mining area (BWE) is near the town of Altentreptow; some safety distances may be required, | <ul style="list-style-type: none"> - no adverse impact is known, |
| B.3 | conservation | <ul style="list-style-type: none"> - there are no direct interactions with protected nature reserves or protected biotopes, | <ul style="list-style-type: none"> - “Thalberg” section: no interactions, - “Loickenzin” section: cross-section of Torney Brook; difficulties in obtaining mining permission are likely, - “Klatzow” section: biotopes should be checked; agreement with the conservation authority is required, |
| B.4 | water reserves | <ul style="list-style-type: none"> - no interactions, | <ul style="list-style-type: none"> - Torney Brook acts as a tributary, |

Table 4: Compilation of relevant infrastructure, regional policy and environmental information regarding clay deposits “Altentreptow East” and “Loickenzin”

With reference to various R&D activities described by SCHOMBURG & ZWAHR (1999), ZWAHR & SCHOMBURG (1998), HOFMANN (1997) and CHUDZICKI & SCHOMBURG (1994), SCHOMBURG et al. (1990), the main applications of ceramics can be summarised (Table 5).

| Ceramic products | Characteristics of the application |
|--|--|
| 1. Clay component for standard brick mixes | Proportion in batches up to approximately 15 %, Improved firing colour, green flexural strength and compressive strength of products, reduced water absorption. |
| 2. Clay component in batches for clinker bricks and roof tiles | Incorporation in batches of up to approximately 30%, intensification of the colour of the red firing, improvement in compressive and flexural strength. Reduction in water absorption and increase in frost resistance of the products, lowering of the maximum firing temperature and reduction of firing time. |
| 3. Clay component in batches for wall and vitrified clay (stoneware) floor tiles | Proportion in batches depending on the firing colour of bodies 2–15%. Improvement in green flexural strength, dry flexural strength and bending splitting strength. Reduction in water absorption, shortening of kiln firing cycles and reduction in the maximum permissible firing temperature. |
| 4. Monobatch for unglazed, frost-resistant floor covering elements | Dust or dry pressing method (depending on the water content of batches; dry pressing at 0 to 5% water content and dust pressing when water content ranges from 5 to 10%). Special drying and firing technology. Production using rapid firing is possible (120 minutes). |
| 5. Ceramic engobes for roofing Tiles | Dry grinding and preparation of powders (< 100 µm), Preparation of engobes partly using colouring metal oxides |
| 6. Production of expanded clays | Spherical grains produced by granulation (2–8 mm) are expanded in a rotary kiln (expansion temperature approx. 1150 °C), depending on size and bulk density, as insulating materials, substrates for plants (such as Seramis) or for the production of hydraulically bonded construction materials |

Table 5: Ceramic applications of tertiary marine clay from north-eastern Germany

Environmental protection

In addition to their use as a component of engineered waste deposit barrier systems (bottom or top liners consisting of clay material), dried clay powders were applied as mineral fillers in geosynthetic liner material. It has been shown that clays rich in muscovite-montmorillonite mixed-layer minerals (MMML) are more resistant to attack by harmful organic substances or acidic leachates from waste bodies than bentonites/pure montmorillonites and meet all the necessary parameters stipulated by German legislation for waste disposal. (SCHOMBURG & ZWAHR, 1999; PUSCH & SCHOMBURG, 1999)

Further applications based on the specific properties of MMML-rich clays could include:

- improvement of water quality in lakes and rivers
- treatment of waste water from industrial plants (paper, leather, food production)
- treatment of sewage
- component of engineered building systems for coast protection and dams/levees

Further details of these applications were described by SCHOMBURG & WIESNER (2000). The clay materials used are granules or clay powders (dried and milled).

Various

It is also known from the market that granulate products prepared from MMML-rich clays could be used

- as filling material for voids in boreholes
- to protect cables in wind energy equipment
- for filling groundwater-vulnerable areas of structures (e.g. underground tunnels) cat litter (cat litter tray)

6. Literature/Sources

SCHOMBURG, J., F. Linde & M. STICKEL:

Quality-Improved Bricks through Clay Mineral Bodies Rich in Smectite.—TBI §
(1990), No. 3, 27–28

CHUDZICKI, P. & J. SCHOMBURG: North-East German clay mineral raw materials — the basis for
the manufacture of modern building ceramics.-
Brick Industry International 6 (1994), No. 3, 175–182

HOFMANN, G.: Clay as a Raw Material and the Brick Industry in the New Federal States.-
Brick Journal 2 (1997), No. 3, 37–40

ZWAHR, H. & J. SCHOMBURG: Ceramic applications of muscovite-montmorillonite mixed-layer
— mineral clays.
Ziegel-Zeitschrift 3 (1998), No. 4, 225–230

SCHOMBURG, J. & H. ZWAHR: Characteristics and applications of muscovite-
montmorillonite mixed-layer mineral clays.
Cfi/Ber. DKG 76 (1999) No. 6, pp. 18–21

PUSCH, R. & J. SCHOMBURG: Impact of microstructure on the hydraulic conductivity
of undisturbed and artificially prepared smectitic clay. – Engin. Geology 54
(1999), No. 1/2, 167–172

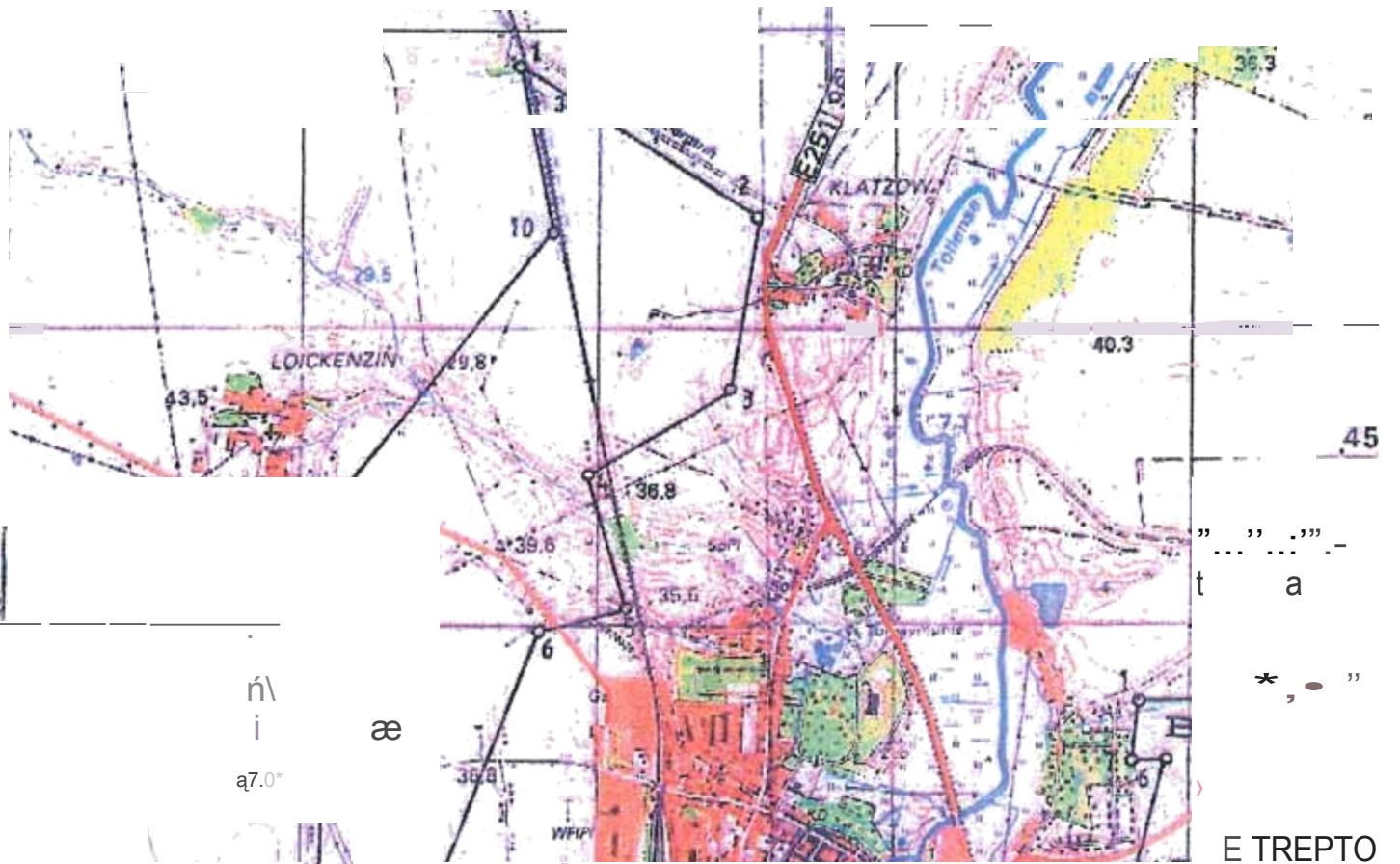
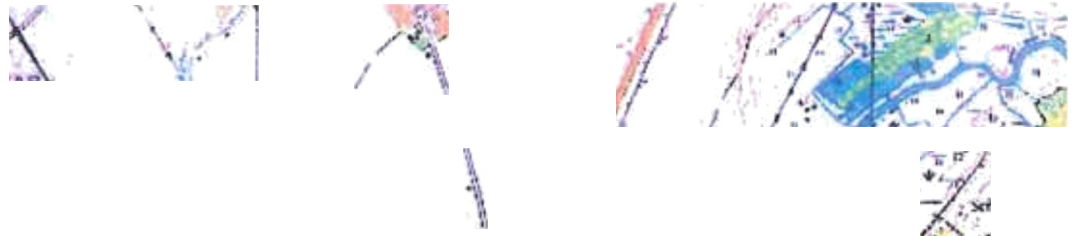
SCHOMBURG, J. & C. WIESNER: Clay minerals for improving water quality and for dyke and
coastal protection structures.
Cfi/Ber. DKG 77 (2000), D 16–17

- /1/ REICHE: Survey report on Altentreptow, 1953 BAUSS:
- /2/ Survey report on Loickenzin, 1964
- /3/ LAWRENZ: Exploration Report Altentreptow West 1966 LAWRENZ: Exploration
Report Altentreptow dated 21 January 1969
- /4/ Study on the sale of the Treuhandanstalt's mining property in Altentreptow / East,
No. 245/90/643 (clay deposit).
DURTEC GmbH, dated 30 March 1993
- /5/ Study on the sale of: Mining property of the Treuhandanstalt Loickenzin, No.
169/90/634, 640, 644 (clay deposit).-
DURTEC GmbH, dated 30 March 1993
- /6/ Report on the extraction and laboratory analysis of representative raw material
samples in the Loickenzin and Altentreptow mining fields, east.-
DURTEC GmbH, dated 22 October 1993
- /7/ Documentation: 'Supporting project documentation for the acquisition and use of the BWE
clay deposits at the Altentreptow site'.
DURTEC GmbH, dated 11 February 1994
- /8/ Project proposal: 'Use of the BWE – Loickenzin deposit (Nos. 169/90/634,
640, 644) and
the BWE — Altentreptow deposit, east (No. 245/90/643) for the establishment of a roof tile
factory."
DURTEC GmbH, dated 11 February 1994
- /9/ Main operational plan for exploration in the Altentreptow mining field, east.-DURTEC
GmbH, dated 30 June 1994
- /10/

- /11/ Application for acquisition by Ostmecklenburgisch-Vorpommersche Verwertungs- und Deponie GmbH for the BWE deposit 'Loickenzin' (No. 169/90/634, 640, 644) for the extraction of sealing clay. – DURTEC GmbH, 1995

Annex 1

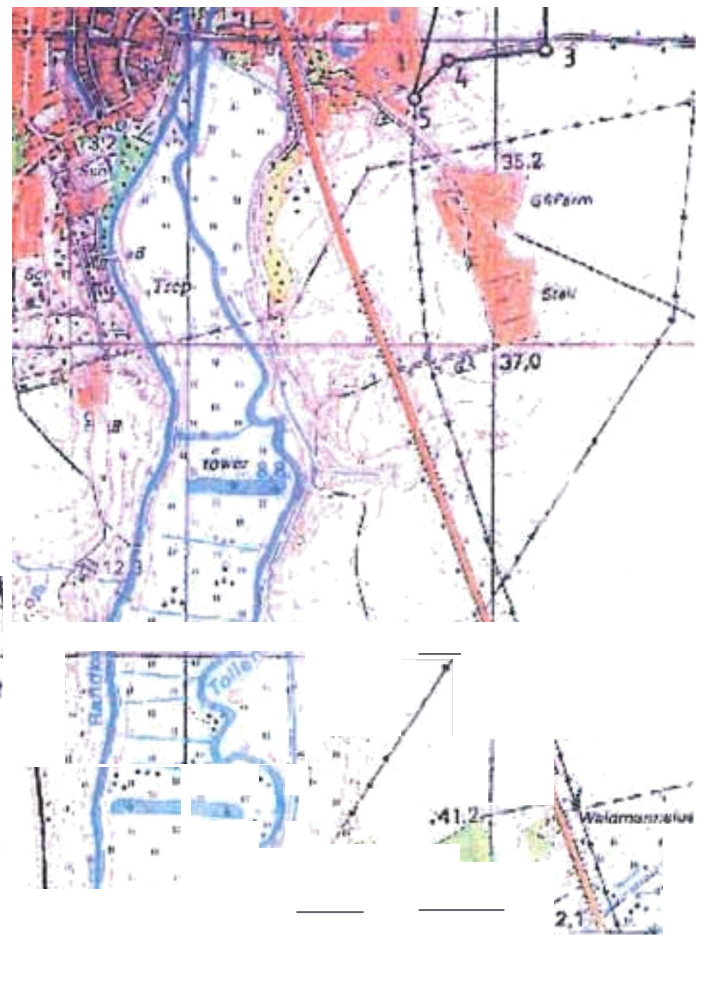
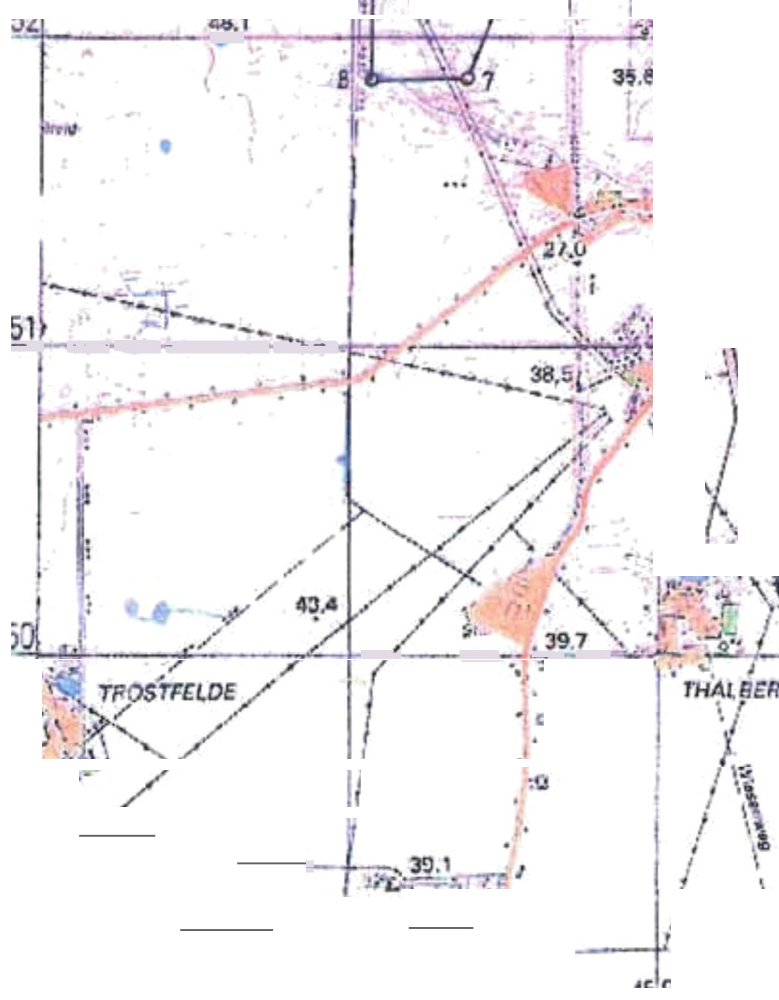
Location of the “Altentreptow östl.” and “Loickenzin” clay deposits
(punctiform)



ñ
i
æ
a7.0*

” ” ” ”
t a
* , • ”

E TREPTO



Annex 2

Location of the 'Altentreptow east' and 'Loickenzin' clay deposits (area)

für das Bergwerksfeld: Altentreptow/östlich
 Bodenschatz/Bodenschätze:
 tonige Gesteine zur Herstellung von Bläh-
 produkten

Land:

Bezirk/Regierungsbezirk: Neubrandenburg

| Eckpunkte | Koordinaten der Feldesckpunkte | |
|-----------|--------------------------------|----------|
| | R | N |
| 1 | 45 83820 | 59 52740 |
| 2 | 45 84160 | 59 52740 |
| 3 | 45 84160 | 59 51960 |
| 4 | 45 83840 | 59 51920 |
| 5 | 45 83720 | 59 51800 |
| 6 | 45 83920 | 59 52540 |
| 7 | 45 83800 | 59 52540 |

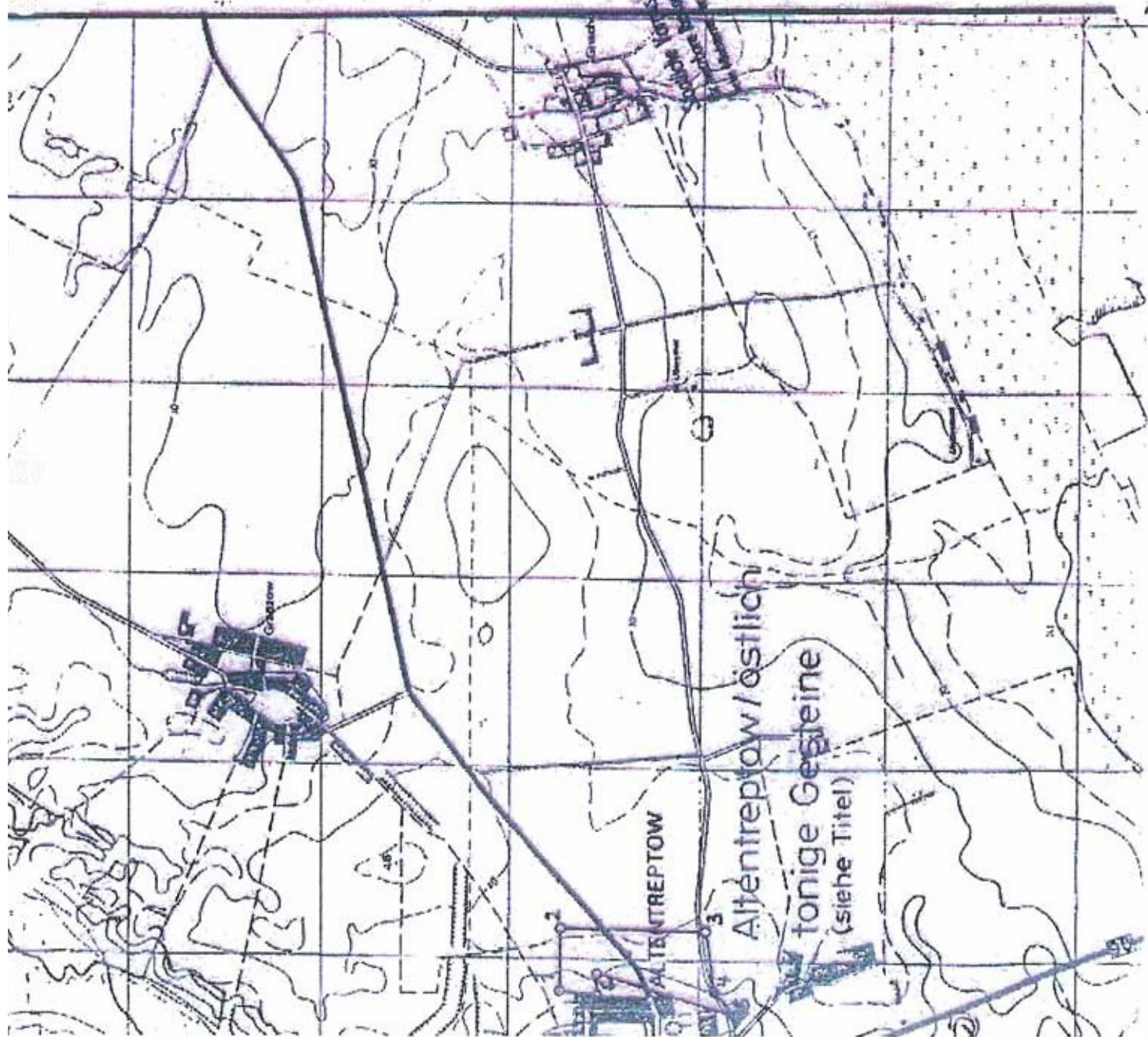
Flächeninhalt des Feldes: 269 553 m²

Maßstab: 1 : 25 000

Angefertigt: Berlin, September 1990

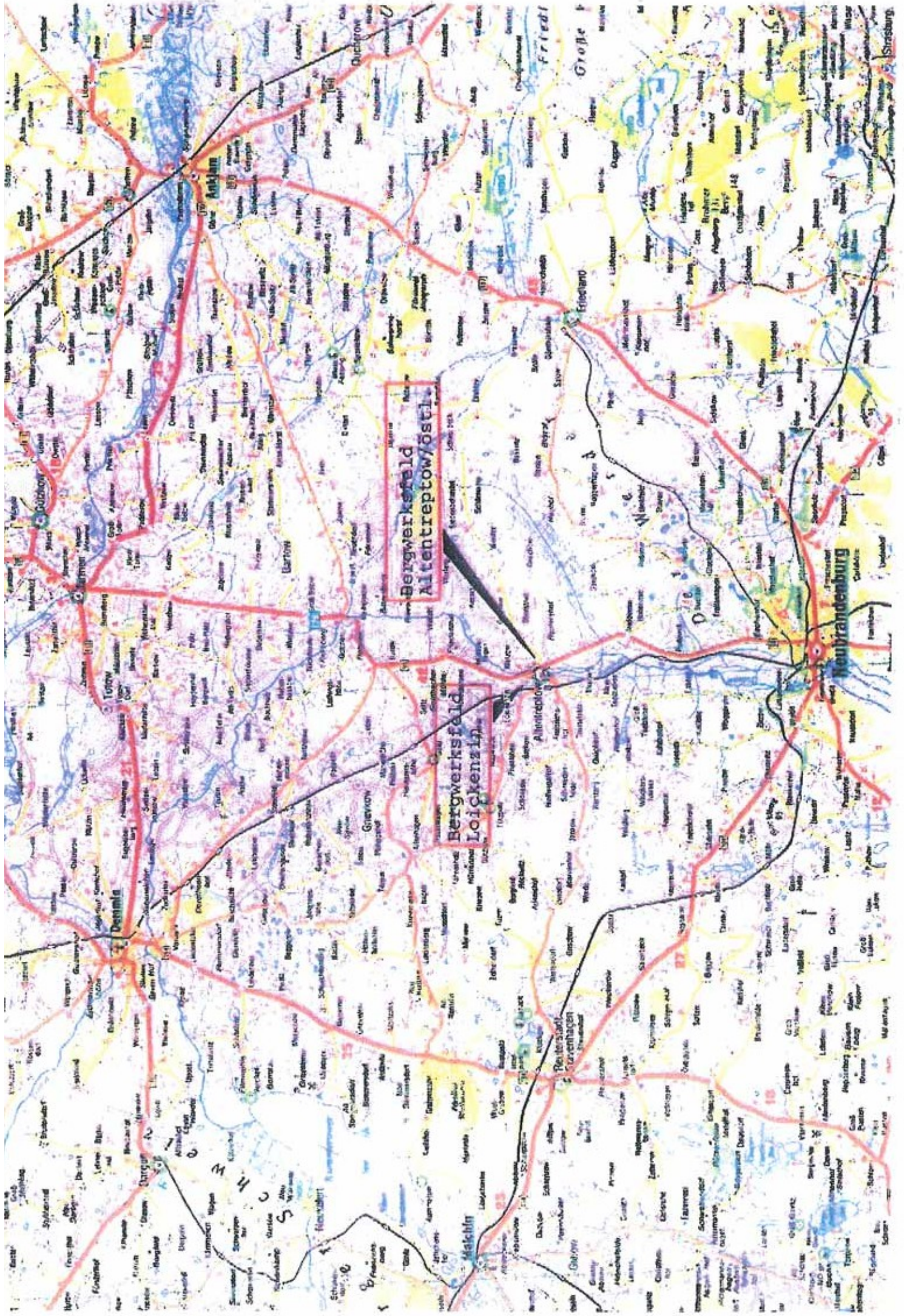
durch:

W. W. W.
 von der Staatlichen Vermessungsämtern
 bedauerlicher Vermessungsingenieur



Annex 3

Clay deposit "Altentreptow östl." No. 245/90/643 -
Location plan with coordinates



Annex 4

Clay deposit “Loickenzin” No. 169/90/634, 640, 644 – Location plan
with coordinates

für das Bergwerksfeld: Loickenzin

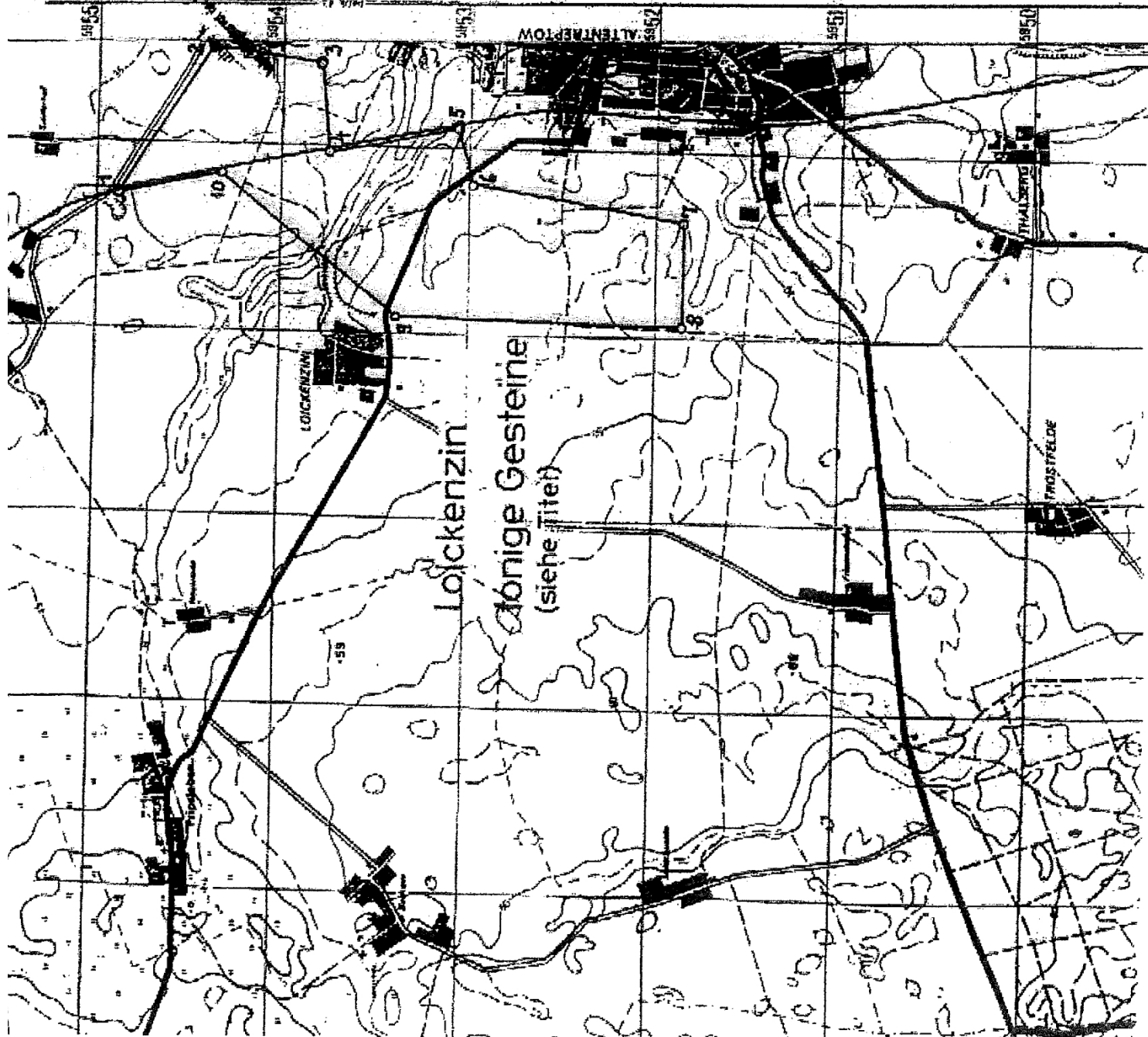
Bodenschatz/Bodenschätze:

tonige Gesteine zur Herstellung
von Bitumenprodukten

Land:

Neubrandenburg

Bezirk/Regierungsbezirk:



| Eckpunkte | Koordinaten der Feldeseckenpunkte | |
|-----------|-----------------------------------|----------|
| | R | H |
| 1 | 45 81720 | 59 54880 |
| 2 | 45 82520 | 59 54380 |
| 3 | 45 82440 | 59 53800 |
| 4 | 45 81950 | 59 53750 |
| 5 | 45 82100 | 59 53050 |
| 6 | 45 81800 | 59 52980 |
| 7 | 45 81620 | 59 51860 |
| 8 | 45 81060 | 59 51860 |
| 9 | 45 81080 | 59 53380 |
| 10 | 45 81840 | 59 54320 |

Flächeninhalt des Feldes: 2 082 658 m²

Maßstab: 1 : 25 000

Angefertigt: Berlin, September 1990

durch:

M. Henschel

von der Staatlichen Amtskommission
bestimmter Vermessungsingenieur

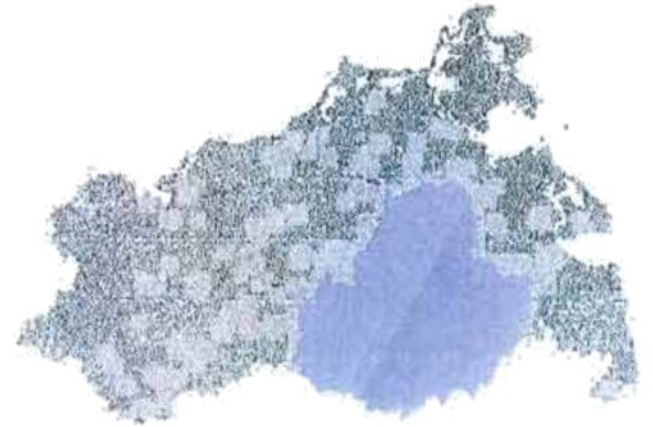
Belegexemplar d. Nr. 169/90/63463

Annex 5

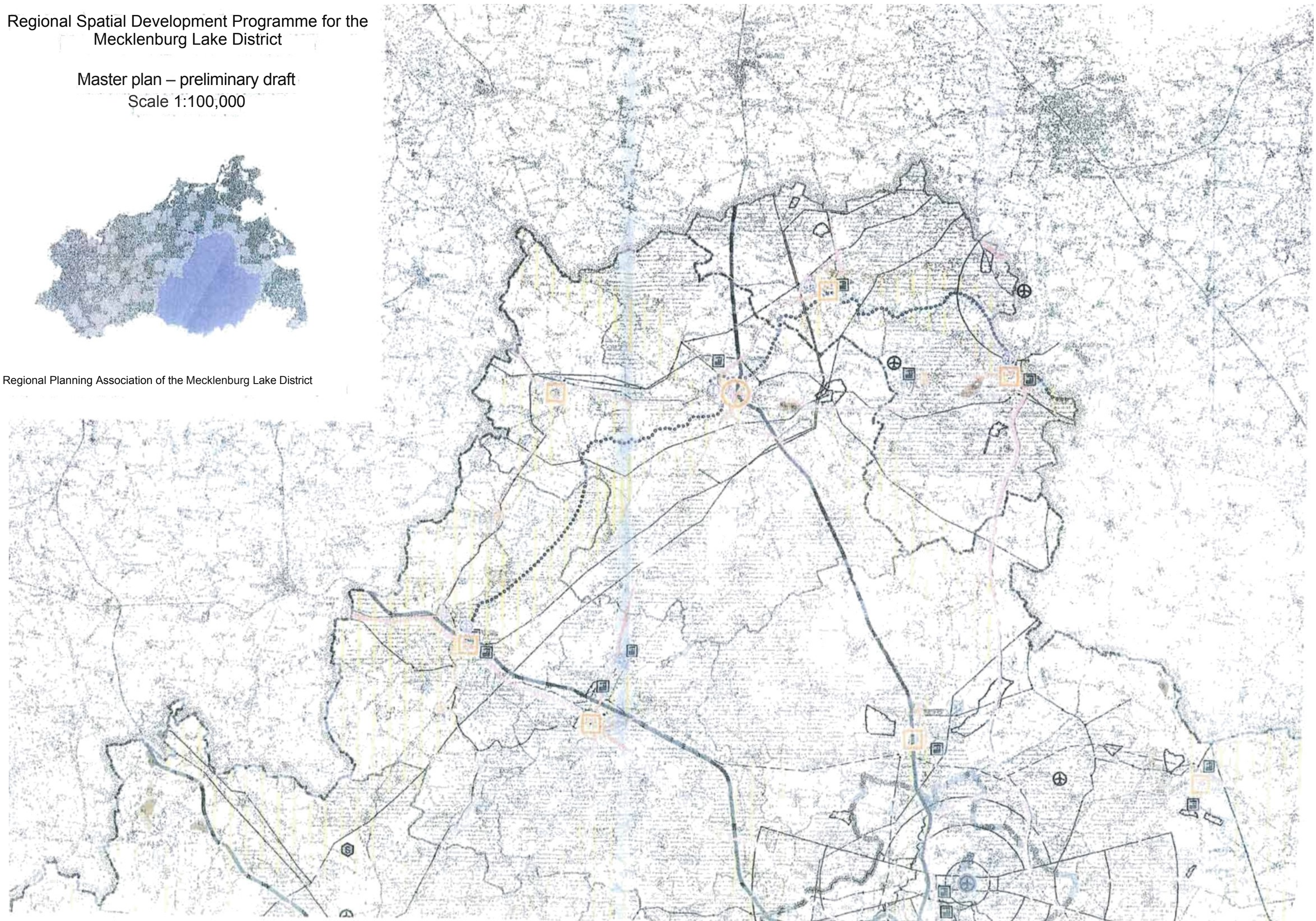
Map of regional policy

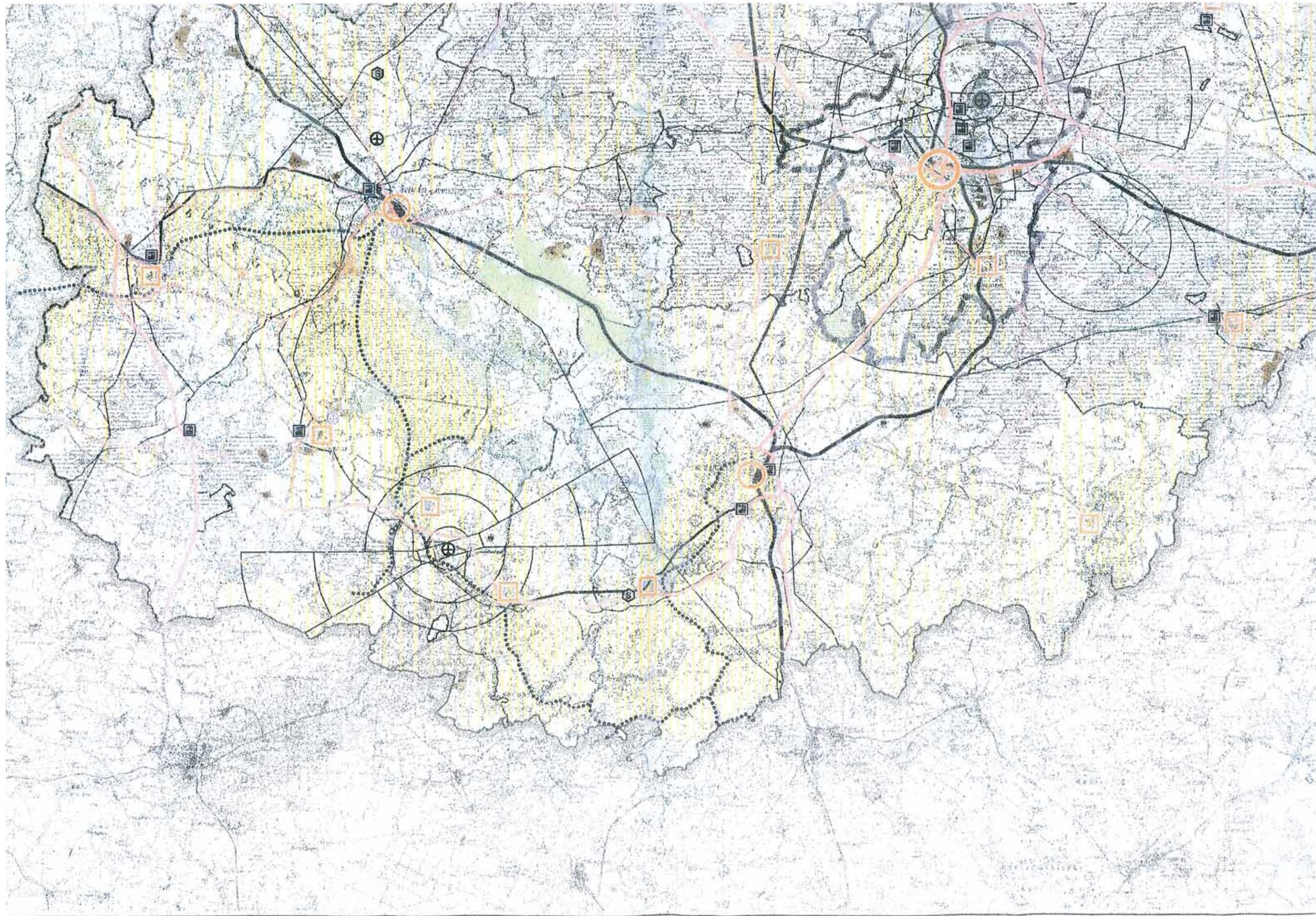
Regional Spatial Development Programme for the
Mecklenburg Lake District

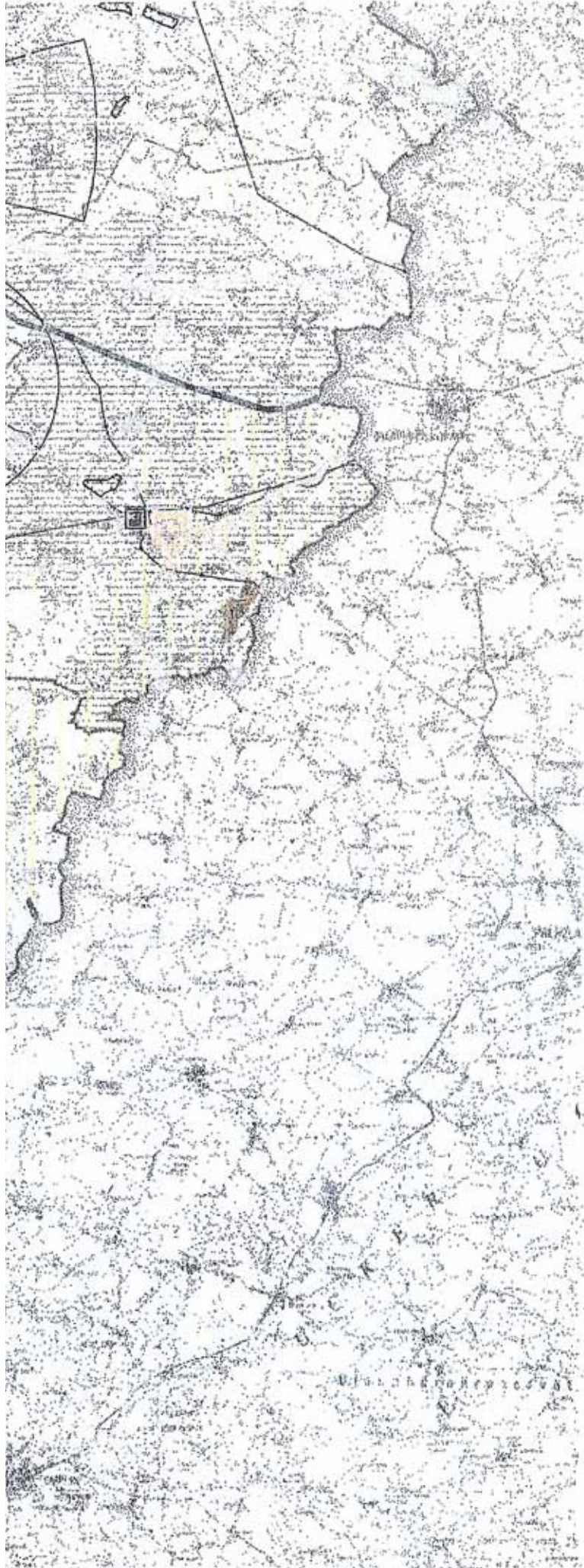
Master plan – preliminary draft
Scale 1:100,000



Regional Planning Association of the Mecklenburg Lake District







Regionale Infrastruktur

- Grossräumiges Strassennetz
- Grossräumiges Strassennetz/geplant
- Autobahnanschlussstelle
- Überregionales Strassennetz
- Überregionales Strassennetz/geplant
- Regionales Strassennetz
- Bedeutsames, flächenerschließendes Strassennetz
- Regional bedeutsames Radwegenetz
- Regional bedeutsames Radwegenetz/geplant
- Grossräumiges Schienennetz
- Überregionales Schienennetz
- Haltepunkt IC
- Regional bedeutsamer Hafen (Wirtschafts- und/oder Sportboothafen)
- Wichtige Binnenwasserstrasse
- Sonstige Binnenwasserstrasse

Nachrichtliche Übernahme

- Hochspannungsleitung
- Hochspannungsleitung/geplant
- Ferngasleitung
- Regionalflughafen mit Bauschutzbereich
- Regionaler Flugplatz
- Sonstiger Flugplatz
- Untersgründspeicher

Grenzen

- Grenze der Planungsregion
- Kreisgrenze

Kartengrundlage:
 Rasterdaten der Mikroskizze D100-1, 100 000 Mecklenburg-Vorpommern, LVermA-MV
 © LVermA-MV
 Nr. 0002010

Vervielfältigung nur mit Erlaubnis des Herstellers. Als Vervielfältigung, auch von Teilen, gelten z.B. Nachdruck, Fotokopie, Mikroverfilmung, Digitalisieren, Scannen sowie Speicherung auf Datenrechner.

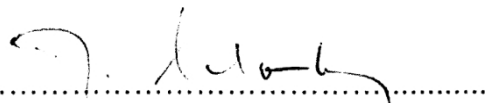
Bearbeitung/
 Kartographie: Amt für Raumordnung und Landesplanung Mecklenburgische Seenplatte
 Herausgeber: Regionaler Planungsverband Mecklenburgische Seenplatte
 Stand: Januar 2009

APPENDIX 4

Data documentation Dr J.
Schomburg DURTEC,
2011

DATA DOCUMENTATION

Clay deposit "Loickenzin /
Klatzow"
Mecklenburg-Western Pomerania, Germany

A handwritten signature in black ink, appearing to read 'J. Schomburg', is written over a horizontal dotted line.

Dr J. Schomburg, Habil.

Neubrandenburg, 25 May 2011

CONTENTS

1. General
2. Geological data
3. Infrastructure
4. Bibliography and list of sources

Appendices

- Appendix 1: Geographical overview map
(not to scale)
- Appendix 2: Plan of the BWE field "Loickenzin" with the BWE sub-fields "Klatzow" and "Thalberg"
(with coordinates)
- Appendix 3: Overview of clay exploration in the Altentreptow area
(scale: 1:25,000)
- Appendix 4: Regional classification of clay deposits in the Altentreptow area
(Extract from RREP MS, February 2011)
- Appendix 5: Land classification of clay deposits in the Altentreptow area according to KOR 50
(Extract from KOR 50)

1. General

On 13 May 2011, Bergwerk Klatzow GmbH commissioned an update of geological and spatial planning data and conditions as at 30 April 2011 for the BWE sub-field "Loickenzin/Klatzow".

The clay deposits in the Altentreptow area had been the subject of various studies for some time, as can be seen from the bibliography and list of sources.

Tables 1 and 2, as well as Appendices 1 to 5, were compiled on the basis of these documents.

2. Geological data

The general geological and deposit-related data for the BWE sub-field "Loickenzin/Klatzow" are presented in tabular form in Table 1.

3. Infrastructure

The relevant spatial planning criteria relating to the BWE sub-field "Loickenzin/Klatzow" are shown in Table 2.

| Item | Criterion / Parameter | "Loickenzin/Klatzow" clay deposit | | |
|------------------------------|----------------------------------|---|----------------|----------------|
| 01 | BWE area size | approx. 113 ha (total area of the 'Loickenzin' deposit approx. 208 ha) | | |
| 01.1 | Coordinates of the BWE subfield | Coordinates of the field corner points | | |
| | | Corner point no. | R | H |
| | | 1 | 4581720 | 5954880 |
| | | 2 | 4582520 | 5954380 |
| | | 3 | 4582440 | 5953800 |
| | | 4 | 4581960 | 5953760 |
| | | 5 | 4582100 | 5963060 |
| | | 6 | 4581800 | 5953000 |
| | | 7 | 4581630 | 5953230 |
| | | 8 | 4581140 | 5953450 |
| 10 | 4581840 | 5954320 | | |
| Area of the BWE sub-field a | | 1 132 150m² | | |
| "Loickenzin/Klatzow": | | | | |
| 01.2 | Exploration field size | - The BWE sub-field "Loickenzin/Klatzow" is divided into 2 exploration fields: - 'Klatzow' exploration area (approx. 35 ha, overgrown, former mining site) + "Loickenzin" exploration field | | |
| 02 | Reserves | - based on classification as <u>a reserve for raw material security according to RREP MS 2011</u> (see Table 2, point D.1) + "Klatzow" exploration field approx. 14 million tonnes (according to BAUSS, 1964) + "Loickenzin" exploration field approx. 5 million tonnes | | |
| 03 | B - Overburden thickness | O 10.00 m | | |
| 04 | O - Thickness of clay | B 35.00 m | | |
| 05 | Clay varieties | Rupel clay with 3 varieties | | |
| 06 | Drilling metres from exploration | - Total drilling metres in the BWE 'Loickenzin' field: 4,560 m, - of which in the BWE sub-field "Loickenzin/Klatzow" 21 boreholes totalling 620 metres (1963), | | |
| 07 | General geological profile | Overburden: 2.00–10.00 m Usable: B 20.00–35.00 m (up to 43.00 m in places) | | |
| 08 | Overburden | Humus-rich soil, gravelly marl, alternating with sand, | | |
| 09 | Classification of usable soil | Clay type 1: dark brown rupel clay; free from carbonates and pyrite, clay type 2: grey rupel clay; carbonate-free, traces of pyrite, clay type 3: green rupel clay, carbonate-free, higher clay content, | | |
| 10 | Groundwater table | between 1.00 — 8.00 m below ground level (Pleistocene strata, drainage into the Tomey stream) | | |

Table 1: Geological and deposit-related data for the BWE sub-field 'Loickenzin/Klatzow'

| Item | Criterion / Parameter | “Loickenzin/Klatzow” clay deposit |
|----------|--|--|
| A | Local administrative structure | r |
| A.1 | Federal state | Mecklenburg-Western Pomerania |
| A.2 | District | Demmin |
| A.3 | District | Treptow-Tollensewinkel |
| A.4 | Municipality | Town of Altentreptow |
| A.5 | Localities belonging to the municipality | Buchar, Friedrichshof, Klatzow, Loickenzin, Rosemarsow, Thalberg, Trostfelde |
| | | |
| B | <u>Cadastral</u> | |
| B.1 | Parish / Field | Loickenzin / Field 1 Klatzow / Fields 1 and 3 |
| B.2 | Parcel numbers | - a total of 75 parcels relating to the BWE field “Loickenzin” (owned by private individuals 80%, trust 16%, church 2.7%, local authority 1.3%) |
| | | |
| C | <u>Infrastructure</u> | |
| C.1 | Geographical location | - north-west of the town of Altentreptow; village of Loickenzin, - Towns in relation to Altentreptow: + Berlin — to the south, approx. 140 km, + Neubrandenburg – to the south, approx. 25 km, + Greifswald — to the north, approx. 50 km, + Stralsund – to the north, approx. 90 km, + Rostock – to the north-west, approx. 140 km, + Polish border — to the east, approx. 130 km, |
| G.2 | Roads | - near the A20 (approx. 10 km), - not far from the L35 (formerly the B96), - the BWE section ‘Loickenzin/Klatzow’ is bordered to the south by the L27 (Altentreptow–Demmin), |
| C.3 | Rail | - direct connection of Altentreptow to the rail network, |
| C4 | Waterway | - Inland waterway transport possible on the Peene (federal waterway), - connection to the Baltic Sea (Baltic region) and the River Oder via the federal waterway, - Ports for freight handling nearby: + Demmin – to the north-west, approx. 32 km, + Jarmen — to the north, approx. 30 km, + Anklam — to the north-east, approx. 40 km, |
| C.5 | Airport | - Trollenhagen Airport near Neubrandenburg (approx. 20 km, to the south), - Rostock-Laage Airport (approx. 120 km, to the north-west) |
| | | |

| Pos. | Criterion / Parameter | Clay deposit “Loickenzin/Klatzow” |
|----------|---|---|
| C.6 | Energy | <ul style="list-style-type: none"> - 20 kV overhead line SW of Altentreptow, passing Altentreptow in a NW direction, - Branch of the 20 kV overhead line above Altentreptow heading north-east, - 20 kV underground cable SW of Altentreptow along the western city boundary, |
| C.7 | Water and wastewater | <ul style="list-style-type: none"> - Altentreptow is supplied via the water catchments in the Teetzleben area, - Altentreptow has a central sewage treatment plant; connection options available, |
| C.8 | Gas | <ul style="list-style-type: none"> - The main gas pipeline runs eastwards along Altentreptow into Heading north (distance approx. 10 km), - Branch / high-pressure connection pipeline (DN200, gas pressure 25 bar) from the main gas pipeline runs north of Altentreptow, crossing the B96 between Altentreptow and Klatzow , connection point south-west of Altentreptow, |
| C.9 | Crude oil | <ul style="list-style-type: none"> - in planning, planned route of the crude oil pipeline north-east of Altentreptow, |
| C.10 | Communications network | <ul style="list-style-type: none"> - Communications network in place, - expansion of broadband coverage (DSL) is currently being planned, |
| | | |
| D | Competing uses | |
| D.1 | Spatial planning (Reference: securing raw materials) | <ul style="list-style-type: none"> - According to the current RREP MS, within the BWE sub-field ‘Loickenzin/Klatzow’, the exploration field “Klatzow” and, to a limited extent, the exploration field “Loickenzin” (above the Tomey Stream) has been designated as a reserve area for the long-term safeguarding of near-surface raw materials; when weighing this against competing uses, <u>particular weight</u> is given to the interests of raw material security (no priority); - The review of the extraction project in accordance with the required approval procedures remains unaffected by the regional planning classification, |
| D.2 | Settlement structure | <ul style="list-style-type: none"> - to the east of the BWE lies the town of Altentreptow, which serves as the primary centre for the region; |
| D.3 | Agriculture | <ul style="list-style-type: none"> - Arable land above and adjacent to the BWE sub-area, agriculture being the dominant activity in the surrounding area, |
| D.4 | Nature conservation | <ul style="list-style-type: none"> - The BWE sub-area is crossed by the Tomey Brook; - Tomey Brook and its surrounding areas are considered a biotope worthy of protection; consequently, no consent to the mining permit; - The BWE sub-area does not affect any protected areas; any wetland habitats that may be present require a site inspection and assessment by the nature conservation authority; the granting of a mining permit is subject to the assessment of the nature conservation authority; |
| D.5 | Drinking water protection areas | <ul style="list-style-type: none"> - Tomey Brook acts as a receiving watercourse, |

Table 2: Infrastructure in the vicinity of the BWE sub-site ‘Loickenzin/Klatzow’

4. Bibliography and list of sources

- REICHE: Report on the geological and economic exploration of the clay deposits near Altentreptow in 1953.
State Geological Commission, AS Schwerin, 24 April 1954
- FRANKE: Report on the results of the geoelectric survey at Altentreptow –
Report by VEB Geophysik Leipzig, 1964
- BAUSS, R.: Report on 'Exploratory drilling for clay at the Altentreptow prospecting site, 1963' –
VEB Geolog. Erkundung Nord, Schwerin (16 June 1964)
- ROSENBERGER, H.: Report on the analysis of clay samples from Altentreptow taken during the 1963 drilling programme by VEB Geologische Forschung Nord, dated 18 December 1965
- ROSENBERGER, H.: Report on investigations of 24 clay samples from Altentreptow taken during the 1965 drilling programme by VEB Geologische Erkundung Nord regarding their suitability as expanded clay (porous sinter), dated 22 August 1966
- LAWRENZ, B.: Results report "Altentreptow clay exploration work 1965" – VEB Geologische Erkundung Nord, Schwerin (29 August 1966)
- RIETSCH, G.: Final report on the implementation and evaluation of small-scale technical tests on the Altentreptow clay deposit – Institute for Applied Mineralogy 1967
- WALTER: Report on the hydrogeological exploration work in the Altentreptow area 1965/66.-
Report on the Results of the VEB Geologische Erkundung Nord, Schwerin 1967
- LAWRENZ, B.: Report on the results of geological exploration work to identify expanded clay in Altentreptow.
VEB Geologische Forschung und Erkundung Halle, BT Schwerin dated 21 January 1964
- DURTEC GMBH: Study/documentation "Study on the sale of: Mining property of the Treuhandanstalt Altentreptow/east, No. 245/90/643 (clay deposit)" – Neubrandenburg, 30 March 1993

4. Bibliography and list of sources

- REICHE: Report on the geological and economic exploration of the brick clay deposits in 1953 near Altentreptow.
State Geological Commission, AS Schwerin, 24 April 1954
- FRANKE: Report on the results of the geoelectric survey of Altentreptow –
Report by VEB Geophysik Leipzig, 1964
- BAUSS, R.: Report on 'Exploratory drilling into clay at the Altentreptow
prospecting site, 1963' –
VEB Geolog. Erkundung Nord, Schwerin (16 June 1964)
- ROSENBERGER, H.: Report on the analysis of clay samples from Altentreptow taken during the
1963 drilling programme by VEB Geologische Forschung Nord, dated 18
December 1965
- ROSENBERGER, H.: Report on the investigation of 24 clay samples from Altentreptow, taken from
the 1965 boreholes of VEB Geologische Erkundung Nord, regarding their
suitability as expanded clay (porous sinter) dated 22 August 1966
- LAWRENZ, B.: Results report "Altentreptow clay exploration work 1965" – VEB
Geologische Erkundung Nord, Schwerin (29 August 1966)
- RIETSCH, G.: Final report on the conduct and evaluation of small-scale technical
tests at the Ton Altentreptow site – Institute for Applied
Mineralogy, 1967
- WALTER: Report on the results of hydrogeological exploration work in the Altentreptow
area 1965/66.
Final report, VEB Geologische Erkundung Nord, Schwerin 1967
- LAWRENZ, B.: Report on the results of geological exploration work to identify expanded clay in
Altentreptow.
VEB Geological Research and Exploration Halle, BT Schwerin dated 21 January
1964
- DURTEC GMBH: Study/documentation 'Study on the sale of: Mining property of the
Treuhandanstalt Altentreptow/east, No. 245/90/643 (clay deposit)'
Neubrandenburg, 30 March 1993

DURTEC GMBH: Study/documentation "Study on the sale of the Treuhandanstalt's mining property in Loickenzin, Nos. 169/90/634, 640, 644 (clay deposit)" .-
Neubrandenburg, 30 March 1993

DURTEC GMBH: Report on the extraction and laboratory analysis of representative raw material samples in the Loickenzin and Altentreptow/east mining fields –
Neubrandenburg, dated 22 October 1993

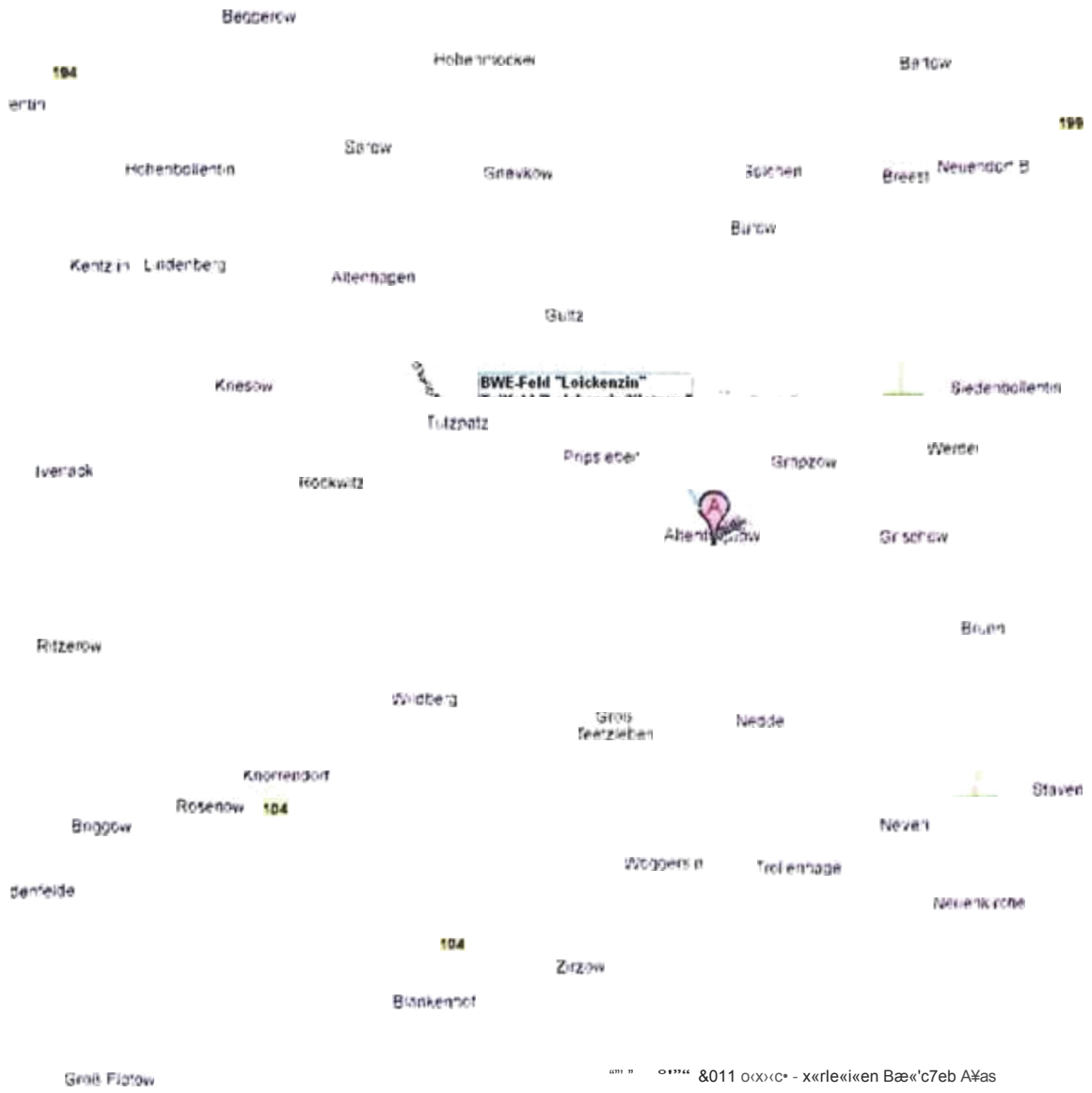
DURTEC GMBH: Main operational plan for exploration in the Altentreptow/east mining field –
Neubrandenburg, dated 30 June 1994

DURTEC GMBH: Project proposal – Utilisation of the Loickenzin and Altentreptow/east BWE deposits for the establishment of a roof tile factory – Neubrandenburg 1994

APPENDIX 1

Geographical overview map

(not to scale)



"" "" &011 oxxc - x«lex«en Bæ«c7eb A¶as

APPENDIX 2

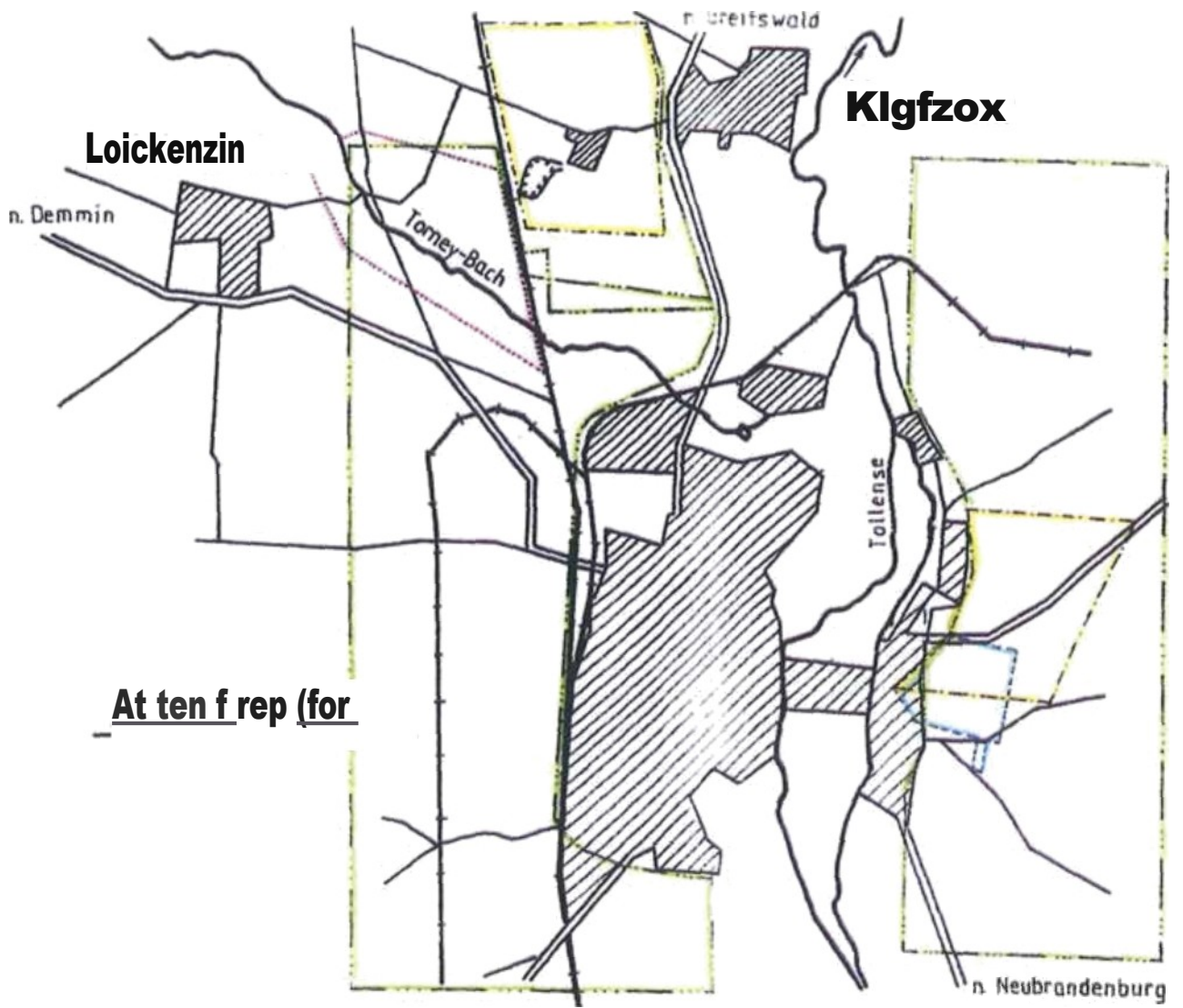
Map of the BWE field "Loickenzin" with the BWE sub-fields "Klatzow" and "Thalberg"

(with coordinates)

APPENDIX 3

Overview of soil investigations in the Altentreptow area

(Scale: 1:25,000)



At ten f rep (for

uacæpian

Scale: 1 : 25,000

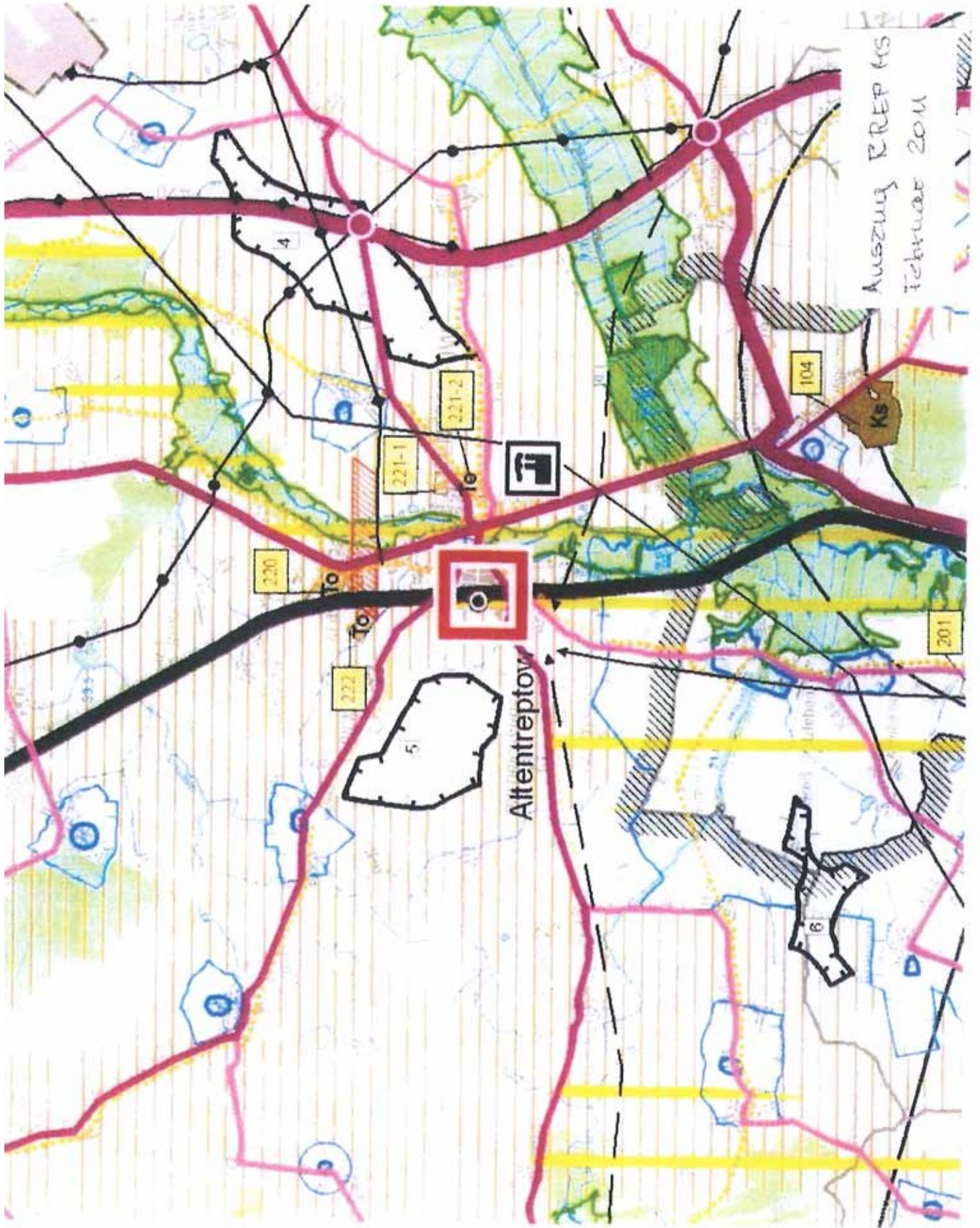
KEY:

- Reconnaissance map 1953
- -- Exploration area 1963 Exploration area 1965 and 1367
- ceophys. Neßqebie fl 196 3












APPENDIX 4

Regional planning classification of clay deposits in the Altentreptow area





















(Extract from RREP MS, February 2011)



Regional settlement structure




| | |
|---|---|
|  | Oberzentrum |
|  | Mittelzentrum |
|  | Mittelzentrum mit Teilfunktionen |
|  | Untzentrum |
|  | Ländlicher Zentralort |
|  | Mittelbereich |
|  | Nahbereich |
|  | Ordnungsraum |
|  | Grünzäsur |
|  | Allgemeine Siedlungsfläche |
|  | Überwiegend gewerblich genutzte Siedlungsfläche |













Regionale Infrastruktur

| | |
|--|--|
|  | Autobahn / Autobahnanschlussstelle / geplant |
|  | Sonstige großräumige Straßenverbindung / geplant |
|  | Überregionale Straßenverbindung / geplant |
|  | Straße für den regionalen Verkehr |
|  | Straße für den bedeutsamen flächenschleppenden Verkehr / geplant |
|  | Schielenpersonen- Fernverkehrsstrecke / Haltepunkt |
|  | Schielenpersonen- Nahverkehrsstrecke / Haltepunkt |
|  | Sonstige Eisenbahnstrecke |
|  | Elektrifizierte Strecke |
|  | Regionalfugplatz mit Bauschutzbereich |
|  | Sonstiger Flugplatz mit Bauschutzbereich |
|  | Wichtiger Schifffahrtsweg |
|  | Sonstiger Schifffahrtsweg |
|  | Richtfunkstrecke |
|  | H / g0\$dad (1 < okv. 22okv. 36okv) |
|  | Umspannwerk / geplant |
|  | Ferngas-Hochdruckleitung |
|  | Übergabestation Ferngas |
|  | Öl- oder Produkteneileitung / geplant |
|  | Regforus significant Abfo ertfs<x·pasgso\$opa |

Regionale Infrastruktur

Borders

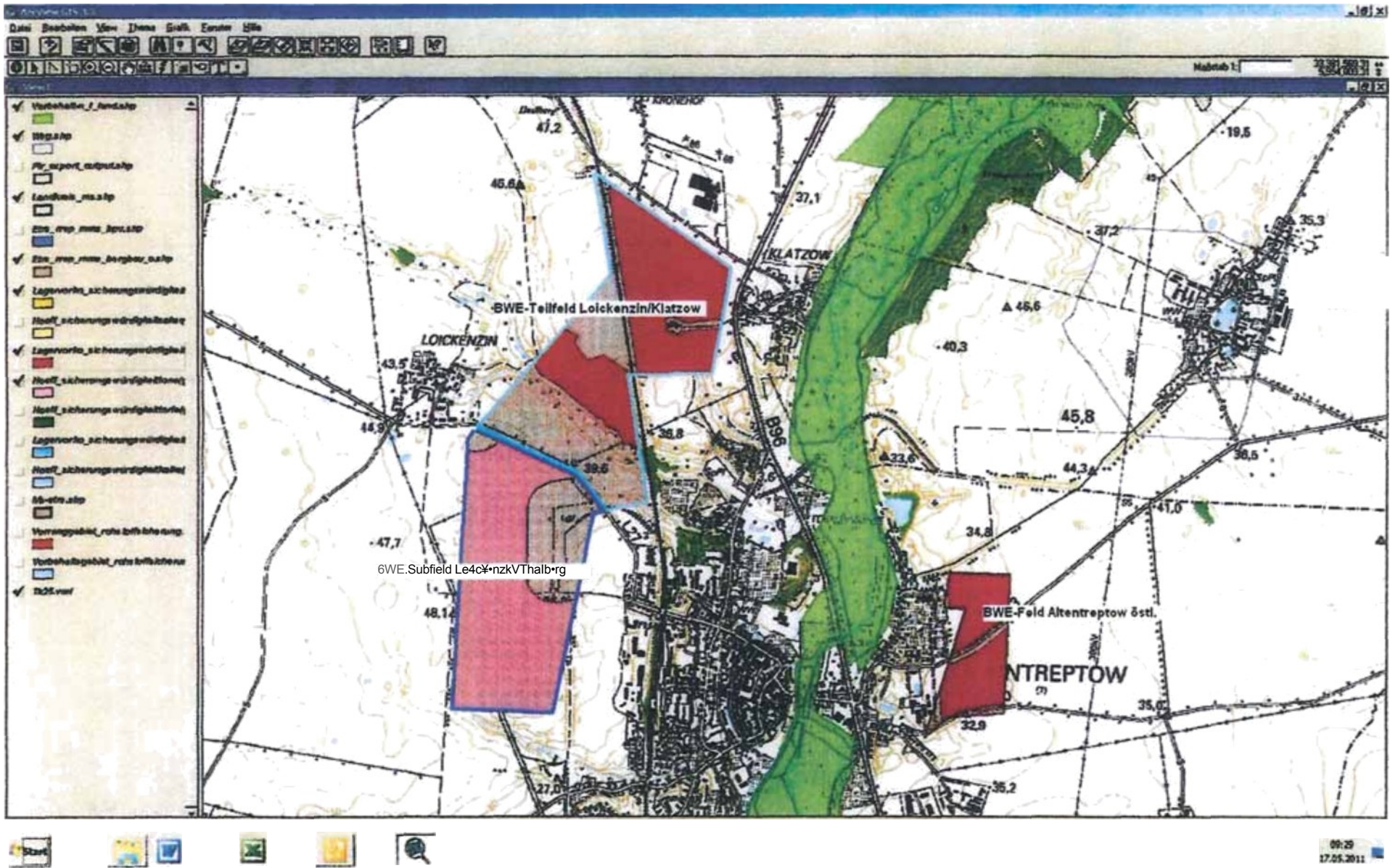
| | |
|---|----------------|
|  | Regionsgrenze |
|  | Kreisgrenze |
|  | Gemeindegrenze |

| | |
|---|---|
|  | Vorranggebiet Naturschutz und Landschaftspflege |
|  | Vorsorgeaum Naturschutz und Landschaftspflege |
|  | Nationalpark (NLP) Naturschutzgebiet (NSG) Naturpark (NP) Landschutzschutzgebiet (LSG) |
|  | Tourismusschwerpunktum |
|  | Tourismusentwicklungsraum |
|  | Vorranggebiet Trinkwassersicherung |
|  | Vorsorgeaum Trinkwassersicherung |
|  | Vorranggebiet Rohstofficherung (Klössand KS; Sand S Ton T; Quarzsand Qs) |
|  | Vorsorgegebiet Rohstoffischer (Klössand KS; Sand S |
|  | Raum mit besonderer natürlicher Eignung für die Landwirtschaft |
|  | Eignungsraum für Windenergieanlagen |
|  | Verteidigungsrichtung |

APPENDIX 5

Area classification of clay deposits in the Altentreptow according to KOR 50

(Extract from KOR 50)



Extract of clay deposits according to KOR 50 and VB NuL in accordance with RREP MS (non-scaled)

APPENDIX 6

Local parameters and potential uses of the clay in the BWE sub- field 'Loickenzin/Klatzow'

Known potential uses

Environmental protection

The basis is the lawful use of mineral sealing materials (clay liners) for base linings, side and surface linings of landfill sites in Germany, as described in the technical guidelines of the TA Abfall Teil (Part I, Annex E) and TA Siedlungsabfall, which specify requirements for the most important parameters, such as the content of clay minerals, carbonates, organic substances and the maximum grain size.

Table 3 shows the relevant parameters relating to the clay in the BWE site "Loickenzin/Klatzow" in comparison with the required legal specifications.

| Parameter | Mineral | | BWE sub-area "Loickenzin/Klatzow" |
|---|--|---|--------------------------------------|
| | Base sealing Technical Instructions on Waste, Part I, Annex E and TA Municipal Waste | Surface sealing TA Waste, Part I, Annex E and TA Municipal Waste | |
| Key parameters | | | |
| Clay content | » 10 % with high AC | > 10% with high AC | > 65% ^{'''} with high AC |
| carbonate content | < 15 % | < 15 % | < 3% |
| organic matter content | < 5 % | < 5 % | 1.8% |
| Max. particle size | < 32 mm | « 32 mm | + |
| Particle size distribution | > 20% < 2 µm | > 20% < 2 µm | > 50% < 2 µm |
| Installation parameters | | | |
| Water permeability coefficient (k-value) | « 5 x 10 ⁻¹⁰ | < 5 x 10 ⁻¹¹ « 5 x 10 ⁻¹¹ Diso. Class I and II | < 5 x 10 ⁻¹⁰ |
| Proctor density (De.) | > 95% | > 95% | |
| Max. air void content | < 5 % | < 5 % | |
| Layer thickness | « 25 cm | < 25 cm | |
| Total thickness | ¿ 150 cm for SWD > 75 cm for Disp.-Kl. II > 50 cm for Disp.-Kl. I | 50 cm | |
| Homogeneity | Good, grout with constant composition, ^ Dpr, grouting using the mixed-in-plant method, | Good, installation water with constant content, > Dpr, installation using the mixed-in-plant method. | |

AC — adsorption capacity; + - guaranteed

(1) » m⁻¹ — high content of muscovite-montmorillonite mixed-layer mineral (> 30%)

Table 3: Substantial and installation requirements for base and surface linings compared with the properties of the clay from the BWE sub-field 'Loickenzin/Klatzow'

Ceramic behaviour

Ceramic behaviour

In 1993, DURTEC GmbH extracted a total of approximately 100 kg of representative clay material from the clay deposit around Altentreptow via two core drillings (BK 2/93 in the eastern part of the BWE Altentreptow field, BK 1E/93 in the Loickenzin/Klatzow sub-field of the BWE) and prepared it for a firing test.

The material and ceramic-technical parameters analysed for this purpose are shown in Table 4.

The firing colour of the prepared test specimens depends on the firing temperature (1000 °C — red, 1050 °C — reddish-brown).

The laboratory results are based on the pilot firing test carried out at the Mayer-Holsen roof tile factory in Hüllhorst, using a mixture of 70% clay material and 30% sand.

Using a Keller PVA 35 press, a dryer (10 hours at 90 °C) and a hydrocasing kiln (maximum temperature 1030 °C for 3 hours), approximately 100 'Biberschwanz' roof tiles were produced.

They are characterised by the following parameters:

| | |
|--------------------|----------------------|
| - Drying shrinkage | 6.8% |
| - Firing shrinkage | 2.4 %/o |
| - Water absorption | 10 % |
| - Firing colour | red — reddish brown. |

| Parameter | BWE sub-field 'Loickenzin/Klatzow' | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-----------------------------|---|--------------------|-------------|---------|--|---------|--|------|------|------|------|-----|-----|-----|-----|-------------------|------|-----|------|-----|-------------------|-----|------|------|-----|-----------|------|------|------|-----|--------------------------------------|--|--|--|--|---------------------------------------|--|--|--|--|
| Water content | G 30.2% (at depths > 30 m, water content increases to 35%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chemical composition (mass %) | SiO ₂ | 58.7 | Al ₂ O ₃ | 15.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Fe O | 6.1 | CaO+MgO | 4.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | K ₂ O+Na ₂ O | 3.4 | SO ₃ | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | GV | 9.3 | Organic C | 1.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mineralogical composition (mass %) | Quartz | B 25 | Muscovite-montmorillonite-mixed-layer mineral | 35-60 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Kaolinite / chlorite | 20 | Muscovite | < 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Calcite, dolomite, siderite | < 3 | Feldspar | < 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pyrite | < 1 | - with increasing depth, the clay mineral content increases and the quartz content decreases, | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| e grain size distribution (AB, mass %) | > 63 µm | 0.4 – 5.5 | > 20 µm | 0.6 – 22.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 20 µm | 28.7 – 54.6 | < 2 µm | 32.6 – 69.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Type 1: | approx. 35% < 2 µm | Type 2 | approx. 50% < 2 µm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Type 3 | approx. 70% < 2 µm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other parameters | - CEC (cation exchange g exchange capacity) | approx. 50 mval/100 g | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - Permeability | < 1 × 10 ⁻¹⁰ m/s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drying shrinkage at 105 °C (%) (clay material from BK 1E/93) | - 75% clay + 25% sand (Küssow) | 8.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - 65% clay + 35% sand (Küssow) | 7.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | - 100% clay | 10.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Firing behaviour (clay material from BK 1E/93) | <table border="1"> <thead> <tr> <th rowspan="3">Composition</th> <th colspan="2">1000 °C</th> <th colspan="2">1050 °C</th> </tr> <tr> <th>ts**</th> <th>wa**</th> <th>ts**</th> <th>wa**</th> </tr> <tr> <th>(%)</th> <th>(%)</th> <th>(%)</th> <th>(%)</th> </tr> </thead> <tbody> <tr> <td>75%/25% clay/sand</td> <td>10.0</td> <td>9.7</td> <td>12.0</td> <td>7.0</td> </tr> <tr> <td>65% clay/35% sand</td> <td>9.0</td> <td>11.3</td> <td>10.0</td> <td>8.7</td> </tr> <tr> <td>100% clay</td> <td>10.0</td> <td>10.4</td> <td>11.0</td> <td>9.0</td> </tr> <tr> <td colspan="5">** total shrinkage of the fired body</td> </tr> <tr> <td colspan="5">** Water adsorption of the fired body</td> </tr> </tbody> </table> | | | | Composition | 1000 °C | | 1050 °C | | ts** | wa** | ts** | wa** | (%) | (%) | (%) | (%) | 75%/25% clay/sand | 10.0 | 9.7 | 12.0 | 7.0 | 65% clay/35% sand | 9.0 | 11.3 | 10.0 | 8.7 | 100% clay | 10.0 | 10.4 | 11.0 | 9.0 | ** total shrinkage of the fired body | | | | | ** Water adsorption of the fired body | | | | |
| Composition | 1000 °C | | 1050 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ts** | wa** | ts** | wa** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (%) | (%) | (%) | (%) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 75%/25% clay/sand | 10.0 | 9.7 | 12.0 | 7.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65% clay/35% sand | 9.0 | 11.3 | 10.0 | 8.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100% clay | 10.0 | 10.4 | 11.0 | 9.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ** total shrinkage of the fired body | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ** Water adsorption of the fired body | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

^aDue to the muscovite-montmorillonite mixed-layer mineral, which determines its properties, the use of this clay is comparable to that of Friedland clay,

Table 4: Material and ceramic-technical parameters of the clay in the BWE field
"Loickenzin/Klatzow"

APPENDIX 5

Quotation from FIM GmbH incl. data sheet
2011



FIM Friedland Industrial Minerals GmbH - Am Kupfergraben 8 a - 10117 Berlin

GEOTEKT GbR
 Mr Dipl.-Min. Dr Gerald Dehne Nerseburger Straße
 14
 37441 Bad Sachsa

Sitz / Verwaltung
 Am Kupfergraben 6 a D-
 10117 Berlin
 Tel. +49 (0)30-28 04 29 90
 Fax +49 (0)30-28 04 29 99

Werk Friedland
 Schwarzer Weg
 D-17098 Friedland

Tel +49 (0)39601-333 0
 Fax +49 (0)39601-333 77

Internet www.friedland.de
 Email info@friedland.de

By fax to: Oss23/2828

9 June 2011

Quotation Afim 110609

Subject: Surface sealing of old landfill sites

Dear Mr Dehne,

Thank you very much for your enquiry today regarding our Friedland bentonite. We are pleased to offer you the following, subject to our general terms and conditions:

Friedland raw clay – swellable raw clay, not stone-free, naturally formed and sourced directly from the Salow deposit, consisting of 100% original Friedland bentonite as per the attached data sheet.

1 offer EXW

| Material | Delivery | EXW price LaBerstätte Salow near Friedland |
|---------------------|----------------|---|
| Friedland Bentonite | «». 1,000.00 t | 17.00 C/t:* |

* incl. loading by F-IND Friedland Industrial Minerals GmbH

2. Transport und Logistik

Loading takes place onto a lorry provided by the customer with a flat loading area. All standard lorries can be loaded from the loading bay at the warehouse in 17099 Salow.

Account no. Dresdner
 Bank Berlin Branch,
 Pariser Platz 8
 CO 40 M6 08 00
 Sort code 20 800 00

Dipl.-Kom. Rainer Dajllwig
 Am Criadonenbug
 HRBOJB24

Tax No. 37/242/20 741



3. Angebots-, Liefer- und Zahlungsbedingungen

Prices exclude applicable VAT, currently 19%

This offer is valid until 31 December 2011 and is subject, in particular, to normal, largely unchanged transport conditions, a final destination that can be reached under such conditions, and the continued application of current freight rates, tariffs and conditions.

Delivery terms: Delivery commences 3–5 days after full commercial clarification. Payment terms: 14 days net; flat-rate reminder fee of €50 per reminder stage, supplier credit 8.50% p.a. from the 31st day; offer subject to change, errors excepted.

4. Installation, confirmation of order, warranty

Please note that the production of clay-mineral-modified earth-based materials for mixed-grain mineral sealing and the use of water-swelling clays in civil engineering place special demands on preliminary engineering work and require particular engineering care during installation. As a material supplier, we guarantee the conformity of our delivered products with our product data; however, any warranty for the structure, regardless of the legal basis, is excluded.

We hope we have presented you with an attractive offer and look forward to a pleasant collaboration should a pleasant collaboration.

Kind regards

FEN Friedland **Industrial** Minerals GmbH

A handwritten signature in black ink, appearing to read 'I.A. Nanja Semann'. The signature is written over a faint, light-colored background that looks like a watermark or a very light stamp.

I.A. Nanja Semann

Order Centre

Buikvurbindur J Draadner
Bank BarIn Fillala Pariser
Platz 8

RTO 40 846 508 00
Sort code 120 800 00

Gc» 1 iiii» lühier
R8iner Dallwig, BSc (Bus Admin)

AG Charlottenburg HRB
91824

Tax No. 37/242/20 741



Friedländer Clay Raw clay

Formation: Friedländer Clay is a high-quality Eocene clay of marine origin.
 Chemical/mineralogical characterisation: Predominantly irregular dioctahedral muscovite–montmorillonite interlayered mineral with 60–70% montmorillonite content, alongside kaolinite, muscovite, quartz and feldspar

| Chemical Analysis in % | |
|--------------------------------|--------|
| SiO ₂ | 58,98 |
| TiO ₂ | 0.66 |
| Al ₂ O ₃ | 19,47 |
| Fe ₂ O ₃ | 6.89 |
| MnO | 0.023 |
| MgO | 2.05 |
| CaO | 0.49 |
| Na ₂ O | 0.89 |
| K ₂ O | 3.07 |
| F | < 0.01 |

| Material and physical data | |
|-----------------------------|------------------------|
| Dioxin (NATO/CCMS) | 0.20 ng/kg |
| H ₂ O absorption | 150–170°/Enslin |
| Bergfeuchte | Ca. 27% |
| Density (T=20°C) | 2.7 t/m ³ |
| pH-Wert | 8.3 |
| Specific surface area | 170 m ² / g |
| Kationen Austauschkapazität | 50 – 60 mval/100g |

Guarantee of origin

Lagerstätte Friedland Siedlungsscholle



**Friedländer Clay
Unfired clay**

Raw material extraction: Friedland open-cast mine, selective extraction using a bucket excavator.
 Origin guarantee: The raw material is extracted exclusively from the Friedland settlement deposit (bentonite deposit under mining law) and marketed exclusively by FIN GmbH.
 Packaging and form of delivery: Bulk

| Grain size distribution Slurry analysis DIN 18123 | |
|---|--------------------------|
| Parameter | Mittel value [mass-%] |
| < 2,0 µm | 62 - 74 |
| 2.0-6.3 | 10-15 |
| 6.3 - 20 | 8 - 12 |
| 20-63 | 4 - 8 |
| < 63 | 2 - 5 |

| Mineral composition | |
|------------------------------|----------------------|
| Mineral | Mittelwert [Masse-%] |
| Wechsellagerung ¹ | 44 |
| Muscovite | 12 |
| Kaolin/Chlorit | 11 |
| Glaucanite | 1 |
| Quarz | 24 |
| Feldspar | 5 |
| Karbonate | 2 |
| Pyrit | 1 |

| Water permeability DIN 18139 / k-value |
|---|
| ~ 1,0 - 1,6 x 10 ⁻¹¹ |

| |
|--|
| ¹ Characteristic mineral: muscovite-montmorillonite mixed-layer mineral |
| Tonminerale gesamt: 73 - 78% |

\$: FIM BIOTECH

Geotechnical parameters for the Friedland site

| Parameter | Unit | Measured values |
|---|-------------------|--|
| 1. Particle size distribution (DIN 18126) | % | Sand fraction (> 63 mm): 3–4 Silt fraction (2–63 µm): 20–25 Clay fraction (< 2 µm): > 70 |
| 2. Cation exchange capacity | mval/100g | 50–60 |
| 3. pH value | | 8.3 |
| 4. natural water content | % | 27–30 |
| 5. Optimal water content | % | 23–24 |
| 6. Water absorption capacity | % | 150–170 |
| 7. Mixing water requirement | % | 33–45 |
| 8. Density | g/cm ³ | 2.71 |
| 9. Water permeability (DIN 18130) | m/s | 1–7 × 10 ⁻¹¹ |
| 10. Yield strength (DIN 18122) | | 0.30 |
| 11. Yield strength (DIN 1822) | | 0.29–0.34 |
| 12. Plasticity index | | 0.55–0.60 |
| 13. Consistency index | | 0.80–0.90 |
| 14. Activity according to SKEMPTON | | 0.83 |
| 15. Effective friction coefficient | Degrees | 4 |
| 16. Effective cohesion | kNm ⁻¹ | 0 |
| 17. apparent cohesion | kN/m ² | 80 |
| 18. organic matter | % | 0.0084 |
| 19. Dioxin content I-TE (NATO/CGMS) | ng/kg/TS | ≤ 0,17 |
| 20. Yield | m ³ /t | 7–8 |

FIM Biotech GmbH

Info@fimbio.de
www.fimbio.deVKwaamgundGb
n''
O-10711 BernFon + 49-30-28 04 29 90
Fax + 49-30-28 04 29 99Friedland plant
Schwarzer Weg
D- 7096 FriedlandFon + 49-39601-333-0
Fax +49-39601-331 77Contact details:
Qr,,dn,r Bank Terms and
ConditionsKTQd051dd2t00
BL2 120 800 00Geschäftsführer:
Dipl.-Kfm. Rainer Dallwig
Aa chariottenourg PRO t07 963

FA Championships (BeNln)

ANNEX 6

Regional Spatial Development Programme for
the Mecklenburg Lake District 2011, Regional
Planning Association for the Mecklenburg Lake
District
(Excerpt)

230-1-14

State Ordinance on the Regional Spatial Development Programme
Mecklenburg Lake District
(RREP MS-LVO M-V)

Dated 15 June 2011

Reference: GVOBl. M-V 2011, p. 362

Pursuant to Section 9(5) of the State Planning Act, as published on 5 May 1998 (GVOBl. M-V pp. 503, 613), last amended by Article 8 of the Act of 12 July 2010 (GVOBl. M-V p. 366), the State Government hereby orders:

Section 1

(1) The Regional Spatial Development Programme for the Mecklenburg Lake District is hereby adopted. It shall be published in the Official Gazette for Mecklenburg-Western Pomerania.

(2) The binding effect of the programme extends to the objectives, principles and other requirements of spatial planning and to the spatial planning provisions set out on the 1:100,000 scale map. Explanatory notes and illustrative maps are not subject to this binding effect.

(3) The objective set out in programme clause 6.2.2 (2) is to be supplemented with the following footnote: "The objective is subject to the provisions of the Education Act."

(4) Pursuant to section 5(3), first sentence, of the State Planning Act, a breach of procedural or formal requirements is irrelevant unless it is raised in writing with the highest state planning authority within one year of this Regulation coming into force, setting out the facts on which the alleged breach is based.

Section 2

This Regulation shall enter into force on the day following its promulgation. Schwerin,

15 June 2011

The Minister-President

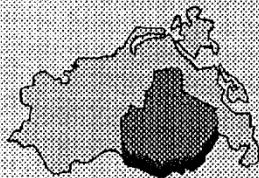
Erwin Sellering

**The Minister for Transport,
Construction and Regional
Development**

Volker Schlotmann

Regionales Raumentwicklungsprogramm Mecklenburgische Seenplatte

- Entwurf -



Regionaler Planungsverband
Mecklenburgische Seenplatte



Imprint

Publisher:

Mecklenburg Lake District Regional Planning Association

Editor:

Office for Regional and Spatial Planning, Mecklenburg Lake District

Title page:

LOGO Media, Neubrandenburg

Contact:

Mecklenburg Lake District Regional Planning Association – Office: Helmut-Just-Straße
2–4, 17036 Neubrandenburg

Tel.: 0395 777551-100

Fax: 0395 777551-101

Email: poststelle@afrlms.mv-regierung.de

Website: www.region-seenplatte.de

Neubrandenburg, 22 February 2011

In order to maintain the ecological balance, prohibitions and restrictions on use have been established for the drinking water protection zones; these can be found in the relevant protection regulations.

Re 5.5(2):

The drinking water reserve areas are defined on the general map (scale 1:100,000) based on the criteria shown in Figure 29. For their representation, relevant documents from the lower water authorities have been incorporated for information purposes.

Figure 29:
Criteria for defining drinking water reserve areas

- Trinkwasserschutzzone III (weitere Schutzzone) der jeweiligen festgesetzten Wasserfassung
- Trinkwasserschutzzonen III A und III B bzw. IV (weitere Schutzzonen) der jeweiligen festgesetzten Wasserfassung

In drinking water protection zones, any activities that could lead to a deterioration in water quality must be avoided.

The groundwater resources currently being exploited in the planning region meet the requirements and legal provisions in terms of both quality and quantity. Based on the current state of knowledge regarding the exploration of groundwater resources, it is foreseeable that the supply of drinking water from regional, as yet untapped reserves can be secured in the future, even as demand rises.

Re 5.5(3) and (4):

The principles set out above are already laid down as binding provisions in the Mecklenburg-Western Pomerania State Spatial Development Programme, in programme clauses 5.5(3) and (4), and are reproduced here for information purposes. They are justified as follows: *"In order to meet the requirements of water protection, comprehensive and proper wastewater disposal is essential. In addition to protecting groundwater, this also serves to improve water quality and infrastructure to promote the economic development of the state. The possibilities for decentralised solutions (small-scale sewage treatment plants) are subject to natural and legal conditions."*¹⁶ *

5.6 Securing raw materials

5.6.1 Securing raw materials

(1) The near-surface mineral resources in the planning region that are suitable for extraction shall be secured for the long-term regional and supra-regional supply of raw materials and extracted in a spatially organised manner. The extraction of mineral resources shall be directed in particular towards the priority and reserved areas for raw material security specified in the general map (scale 1:100,000).

Long-term
raw
materials
supply

(2) In den Vorranggebieten Rohstoffsicherung¹⁶³ hat die Sicherung und Gewinn-
surface: "Raw materials: Priority... or others": clear

Priority areas for securing
raw materials

¹⁶³ Quote: Mecklenburg-Western Pomerania Regional Development Programme, Explanatory Notes to Chapter 5.5.
^{1 3} determined on the basis of the criteria shown in Figure 30

"Mining rights. Mining-related uses are restricted to these areas

auszuschließen. (Z)

(3) The 'reserve areas for securing raw materials' ⁶⁴serve to ensure the long-term supply of near-surface raw materials. When weighing up competing land-use options that would preclude or significantly impair raw material extraction, particular weight is given to the interests of securing raw materials.

Reserve areas for raw material security

(4) In all planning, care must be taken to ensure that the exploitation of underground raw material deposits – even if they are not currently being used – is not blocked in the long term. Options for the continued use of geothermal energy and brine, as well as for underground storage, should be kept open.

*Subsurface raw materials and underground storage
see also LEP 5.6(4)*

Reason

Re 5.6.1(1):

The planning region contains extensive deposits and occurrences of quartz sand, gravel, sand and clay suitable for extraction. To extract and safeguard these mineral resources as a raw material base for the economy, priority and reserved areas for raw material security have been designated on the general map (scale 1:1,000,000) in accordance with the 'Mecklenburg-Western Pomerania State Spatial Development Programme'⁵. The technical basis is the 'Map of Near-Surface Raw Materials M-V' (KOR 50) at a scale of 1:50,000, published in 2005 by the State Office for the Environment, Nature Conservation and Geology of Mecklenburg-Western Pomerania. It contains extensive information in digital form on the geological distribution of near-surface raw materials. Differentiated by deposits, occurrences and areas of potential, the suitability for construction and the need for protection, including the situation under mining law, are assessed and presented. Following the recommendation of the Geological Survey, areas in protection classes 1 to 3 were considered for their suitability for designation as raw material security areas in regional planning.

Following a process of weighing up competing land-use claims, deposits and occurrences of quartz sand, gravel, sand, clay and peat classified in security classes 1 to 3 have been included in the master map (scale 1:1,000,000) as priority and reserved areas for raw material security. Furthermore, existing extraction rights granted via approved operating plans for areas not designated as priority or reserved areas for raw material security on the master map (scale 1:1,000,000) remain unaffected.

The areas of potential in the planning region are classified as security classes 2 and 3 in accordance with KOR 50. These have not been designated as raw material security areas, as long-term security of supply is already guaranteed by existing deposits and reserves. Furthermore, the areas of potential are predominantly located in sub-regions of the planning region that are of high natural value and significant for tourism.

The priority and reserve areas shown on the general map (scale 1:100,000) cover a total area of 27 km² (= 0.5% of the region's area). As industrial "Technically recoverable reserves of near-surface raw materials"¹ are thus safeguarded in terms of spatial planning:

⁶⁴ defined on the basis of the criteria set out in Figure 31

⁽¹⁾ See: Mecklenburg-Western Pomerania State Spatial Development Programme, 5.6(1) and 5.6(2).

¹ "Data according to KOR 50 M-V (2005)

Sand and gravel

- as priority areas for raw material security (quartz sand, gravel sand and sand) approx. 350 million tonnes (23 areas)
- as reserve areas for raw material security (quartz sand, gravel sand and sand) approx. 250 million tonnes (19 areas)

Clay

- as priority areas for raw material security (clay) approx. 30.4 million tonnes (2 areas)
- as reserve areas for raw material security (clay) approx. 180 million tonnes (8 areas)

Peat

- designated as a priority area for securing raw materials (peat): approx. 0.8 million tonnes (1 area)

More than 90% of commercial extraction of near-surface raw materials in the planning region is concentrated on gravel and sand. The demand analysis carried out by the Ministry of Economic Affairs of Mecklenburg-Western Pomerania in 1999 forecasts an average demand for the planning region of 4.8 million tonnes (1999) falling to 4.57 million tonnes in 2010. Actual annual extraction is below this figure. Figures from the annual statistical reports of the Stralsund Mining Authority show a stagnating trend since 2002, averaging 3.5 million tonnes per year.

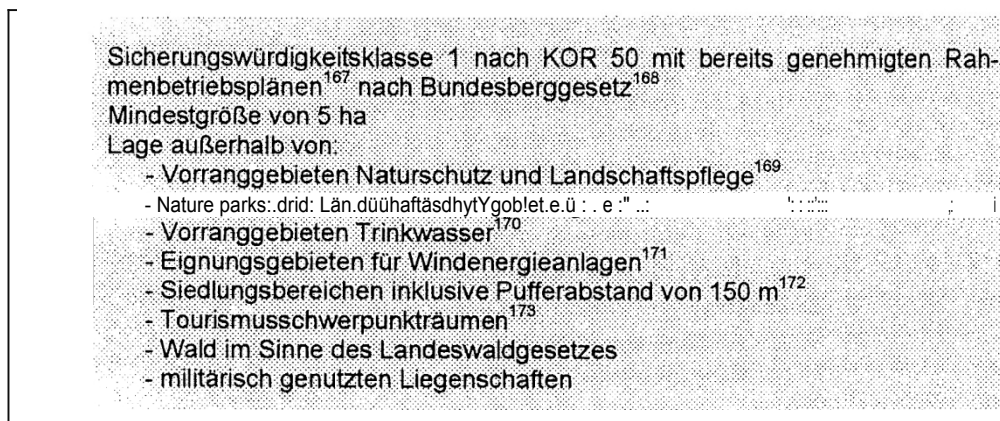
Assuming that the average extraction volume of gravel and sand will essentially remain stable in the coming years, the long-term security of near-surface raw materials is guaranteed by the priority and reserve areas for raw material security defined in the master map (scale 1:1,000,000).

Re 5.6.1(2):

The priority areas for raw material security serve to safeguard regionally significant deposits and the extraction of near-surface raw materials such as quartz sand, gravel sand, sand, clay and peat. They are designated on the master map (scale 1:100,000) based on the criteria shown in Figure 30 and comprise the deposits listed in Table 7.

Abbildung 30:

Kriterien zur Festlegung von Vorranggebieten Rohstoffsicherung



¹⁶⁷ as of December 2009

¹⁶⁸ See: **Federal Mining Act**, Section 52(2).

¹⁶⁹ See: Programme clause 5.1(4)

¹⁷⁰ See: Programme clause 5.5(1)

¹⁷¹ See: Programme clause 6.5(5)

¹⁷² See: KOR 50, Base Map A.

¹⁷³ See: Programme clause 3.1.3(2)

Table 7:
Priority areas for securing raw materials

| No. ^{1,4} | Designation in accordance with KOR 50 | RohstoP | Mining status (08/2010) | District 02/2010 |
|--------------------|--|---------|----------------------------|------------------|
| 101 | Demmin Siebeneichen | Ks | BWE | DM |
| 102 | Müssentin | Ks | BWE, B/B, gG | DM |
| 103 | Sanzkow East 1 | Ks | B/B | DM |
| 104 | Hohenmin | Ks | BWE, B/B | MST |
| 105 | Kreuzbruchhof | Ks | BWE, gG | MST |
| 106 | Sophienhof North 1 | Ks | B/B, gG | MST |
| 107 | Woggersin Tannenbergl 1 | Ks | B/B | MST |
| 108 | Hallait NO | Ks | BWE | MÜR |
| 109 | Hohen Wangelin/Liepen TF1 | Ks | BWE, B/B, gG | MÜR |
| 110 | JabelNo | Ks | B/B | MÜR |
| 111 | Kargow Lower Village TF2 | Ks | gG | MÜR |
| 112 | Klocksln-Blücherhof TF1 | Ks | BWE, B/B | MÜR |
| 113 | Langhagen Feld1 | Ks | BWE | MÜR |
| 114 | MalchowNorthwest TF1 | Ks | B/B | MÜR |
| 115 | Rethwisch Möllenhagen | Ks | BWE, gG | MÜR |
| 11d | Black West 1 | Ks | B/B | MÜR |
| 117 | Wackstow | Ks | B&B, gG | MÜR |
| 118 | Neubrandenburg-Hinterste Mühle TF1 | Ks | BWE | NB |
| 119 | Neubrandenburg- Spargelberg | Ks | BWE | NB |
| 120 | Sponholz | Qs | B/B, gG | MST |
| 121-1 121-2 | Neubrandenburg- Fritscheshof | Qs | BWE | NB |
| 122 | Neubrandenburg- Steepenweg | Sat | BWE | NB |
| 123 | Ramelow | Sat | B/B, gG | MST |
| 124 | Friedland North-East | Tf | BWE | MST |
| 125 | Friedland Salow 1 | To | BWE | MST |
| 126 | Woldegk 1 | To | BWE | MST |

Re 5.6.1(3):

The reserved areas for raw material security serve to safeguard regionally significant deposits of near-surface raw materials such as quartz sand, gravel, sand and clay. They are defined on the general map (scale 1:100,000) on the basis of the criteria set out in Figure 31 and comprise the deposits listed in Table 8.

¹ ^ corresponding to the numbering on the general map (scale 1:100,000)

Figure 31.
Criteria for the designation of reserved areas for raw material security

| |
|--|
| <p>Sicherungswürdigkeitsklasse 1 bis 3 nach KOR 50 mit Bergbauberechtigung</p> <ul style="list-style-type: none"> - Mindestgröße von 5 ha Lage außerhalb von: <ul style="list-style-type: none"> - Vorranggebieten Naturschutz und Landschaftspflege¹⁷⁵ - Naturparks und Landschaftsschutzgebieten - Vorranggebieten Trinkwasser¹⁷⁶ - Eignungsgebieten für Windenergieanlagen¹⁷⁷ - Siedlungsbereichen inklusive Pufferabstand von 150 m¹⁷⁸ - Tourismusschwerpunkträumen¹⁷⁹ |
|--|

Table 8
Reserve areas for raw material security

| No. ¹⁰⁰ | Designation in accordance with KOR 50 | Raw material | Mining Status (08/2010) | District 02/2010 |
|--------------------|--|-----------------|----------------------------|---------------------|
| 201 | Lebbin West | Ks | B/B, gG | DM |
| 202 | Neustrelitz Steinwalde | Ks | BWE | MST |
| 203 | Sandhagen | Ks | BWE | MST |
| 204 | Sanzkow East 2 | Ks | B/B | DM |
| 205 | Steinwalde East | Ks | B/B | MST |
| 206 | Thurow-Rödlin | Ks | B/A | MST |
| 207 | Groß Dratow | Ks | B/B | MÜR |
| 208-1 | Hallalit South | Ks | BWE | MÜR |
| 208-2 | | | | |
| 209 | Kotzow | Ks | B/B | MÜR |
| 210 | Black West2 | Ks | B/B | MÜR |
| 211 | Waren-Schwenzin 1 | Ks | BWE | MÜR |
| 212 | Wildkuhl North | Ks | B/B | MÜR |
| 213 | Woggersin Tannenberg 2 | Ks | B/B | MST |
| 214 | Neubrandenburg- Fritscheshof | Qs | BWE | NB |
| 215 | Neubrandenburg-Küssow | Qs | BWE | NB |
| 216-1 | Treuen | Sat | B/B | DM |
| 216-2 | | | | |
| 217 | Neustrelitz Kiefernheide | Sat | BWE | MST |
| 218 | Warlin South | Sat | B/B | MST |
| 219 | Adamshoffnung TF2 | Sat | BWE | MÜR |
| 220 | Altentreptow Klatzow | To | BWE | DM |
| 221-1 | Altentreptow East | To | BWE | DM |
| 221-2 | | | | |
| 222 | Loickenzin | To | BWE | DM |
| 223 | Friedland Salow 1 | To | BWE | MST |
| 224 | Friedland Salow 2 | To | BWE | MST |
| 225 | Hildebrandshagen | To | BWE | MST |
| 226 | Wolfshagen | To | BWE | MST |
| 227 | Möllenhagen East | To | BWE | MÜR |

¹⁷ * See: Programme clause 5.1(4) ¹⁷ *

See: Programme clause 5.5(1)

¹⁷ * See: Programme clause 6.5(5)

¹⁷ * See: KOR 50, Base Map A.

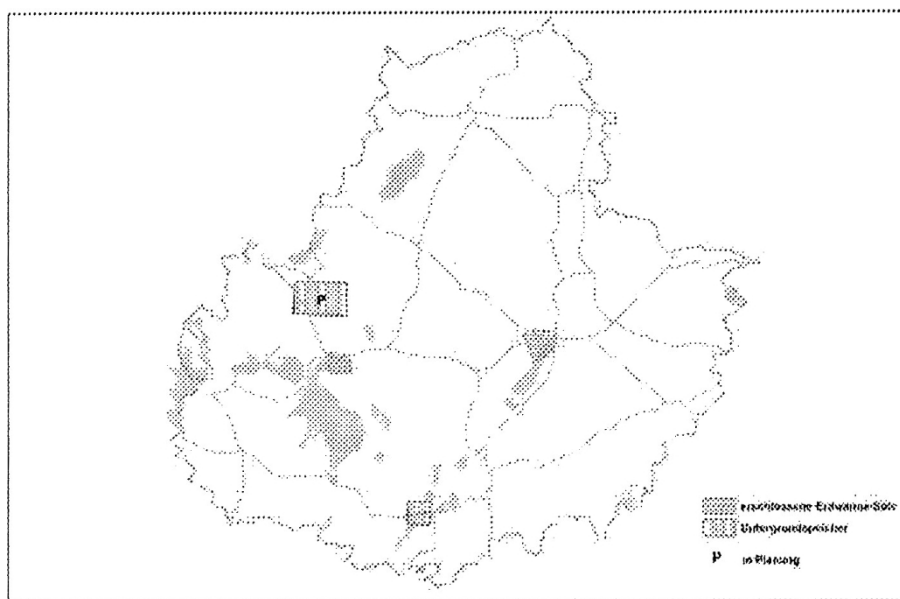
¹⁷ * See: Programme Note 3.1.3(2)

¹⁸⁰ in accordance with the numbering on the general map (scale 1:100,000)

Re 5.6.1(4)

The extraction and use of underground raw materials generally takes up very little space. Significant spatial impacts may arise from the necessary integration of extraction sites into the infrastructure and from transport links. Geothermal and brine deposits are located near Neubrandenburg and Waren (Müritz) have already been developed. Reservoirs are planned near Wesenberg and are planned near Hinrichshagen.⁸¹ On the general map (scale 1:100,000), the Wesenberg underground storage facility and the planned Hinrichshagen underground storage facility are shown for information purposes.

Figure 32:
Underground storage facilities and developed geothermal/brine resources¹⁸²



5.6.2 Raw material extraction

(1) Raw material extraction shall be carried out in such a way that the associated environmental impact and the adverse effects on nature and the landscape are kept to a minimum.

Extraction of raw materials
see also LEP 5.6(3)

Extraction and the removal of raw materials should be carried out in such a way that orderly settlement development and quality of life are not impaired.

(2) Deposits that have already been explored should be mined in preference to new discoveries, provided that this does not conflict with other land-use requirements. Efforts should be made to ensure the complete exploitation of the deposit, taking into account technical considerations, in particular those relating to mining law and water management.

Complete extraction of accessible deposits

(3) Outside the priority and reserve areas for raw material security, the extraction of near-surface mineral resources in the priority areas for nature

Exclusion of mining projects

¹ ¹¹ See: Figure 32

¹ ^{**} Source: Stralsund Mining Authority

conservation and landscape management, in priority areas for drinking water and in key tourism areas.

(4) In nature conservation and landscape management reserve areas and in tourism development areas, the extraction of near-surface mineral resources should be avoided where possible or aligned with the functions of these areas.

Avoiding mining projects

(5) In areas with large-scale raw material deposits, particularly around Hohen Wangelin-Hallait, Möllenhagen and Neubrandenburg, a concentration of active opencast mines should be excluded. By staggering the timing of exposure, extraction and renaturation or recultivation in neighbouring opencast mines, significant negative impacts on the environment should be avoided.

Avoiding the reclassification of mining projects

Reason

Regarding 5.6.2(1) and (2):

Mining operations generally involve significant disruption to the natural environment and impacts on other land uses, not only during the extraction phase but often for a considerable period after mining has ceased. During open-cast mining operations, extraction, processing and transport can give rise to negative effects such as soil loss, groundwater contamination, pollutant emissions and noise. By fully exploiting deposits that have already been opened up, staggering operations over time and carrying out ongoing renaturation or recultivation, negative impacts are to be limited to the extent that is absolutely necessary.

Re 5.6.2(3):

Outside the priority and reserved areas for raw material security, the extraction of raw materials is possible; however, from a regional planning perspective, extraction does not carry particular significance when weighed against other land-use claims.

The extraction of mineral resources is generally prohibited in priority areas for nature conservation and landscape management, as nature conservation and landscape management take precedence over all other land-use requirements – including extraction projects – in these areas, and extraction projects are incompatible with the conservation objectives underlying these areas.¹⁰³

In priority areas for drinking water, the extraction of mineral resources is not permitted, as this is incompatible with the protection objective of safeguarding the aquifer from contamination or other adverse effects in the public interest, in particular in the interests of public health and the preservation of groundwater as a component of the natural balance.^{8 °}

“Key tourism areas” represent the most scenic parts of the planning region, where the interests of tourism take precedence over those of other economic sectors. The extraction of near-surface mineral resources in these sub-areas would hinder the development of the tourism industry, diminish their suitability as attractive tourist destinations and jeopardise the particular economic significance of these sub-areas for tourism.

^{1 3} See: 5.1(4)

^{1 ^} See: 5.5(1)

¹⁵ See: 3.1.3(2)

Re 5.6.2(4):

Reserved areas for nature conservation and landscape management¹⁸⁶ are of particular importance for nature conservation and landscape management. Accordingly, the interests of nature conservation and landscape management must be given special consideration when weighing up and coordinating with extraction projects, and the extraction project must be assessed for compatibility with the respective conservation objective. The nature conservation and landscape management reserve areas designated on the general map (scale 1:1, 000,000) are, for the most part, designated as nature parks or landscape conservation areas. The permissibility or prohibition of excavation in these areas is regulated in detail by regulations and, where applicable, by management and development plans. Where possible, the extraction of near-surface mineral resources should only be carried out outside the tourism development areas¹⁸⁷ so as not to jeopardise the intended and existing tourism development.

Re 5.6.2(5):

A concentration of active opencast mines exacerbates the adverse effects associated with raw material extraction. The duration of the intervention is prolonged and the timing of compensation or the completion of renaturation or recultivation is delayed. Even two opencast mines situated next to each other, though not necessarily adjacent, can constitute such a concentration. Staggering the timing of extraction contributes significantly to minimising the adverse effects. If further deposits are to be developed in close proximity to existing opencast mines, measures must be put in place, where necessary, to keep the impact on the population from noise and dust, as well as the effects on sensitive natural habitats and landscape potential, to a minimum.

5.6.3 Renaturation and recultivation

(1) It must be ensured that the renaturation and/or recultivation of opencast mining sites begins as early as possible and continues on an ongoing basis. In doing so, account must be taken of the natural and spatial characteristics of the adjacent areas, existing land uses in the surrounding area, and the conservation and development objectives for the surrounding sub-region. Where possible, the mining areas should be restored to their original use.

*adapted follow-up
use*

(2) Joint post-mining utilisation concepts shall be developed for spatially adjacent individual projects.

*Post-mining
utilisation
concepts*

Reason

Re 5.6.3(1) and (2):

The earliest possible commencement and the gradual continuation of renaturation or recultivation measures on already mined sections of opencast mines make a significant contribution to compliance with the principles and objectives of spatial planning in accordance with programme provisions 5.1, 5.1.2 and 5.1.4, as well as to compliance with the impact regulations under nature conservation law.

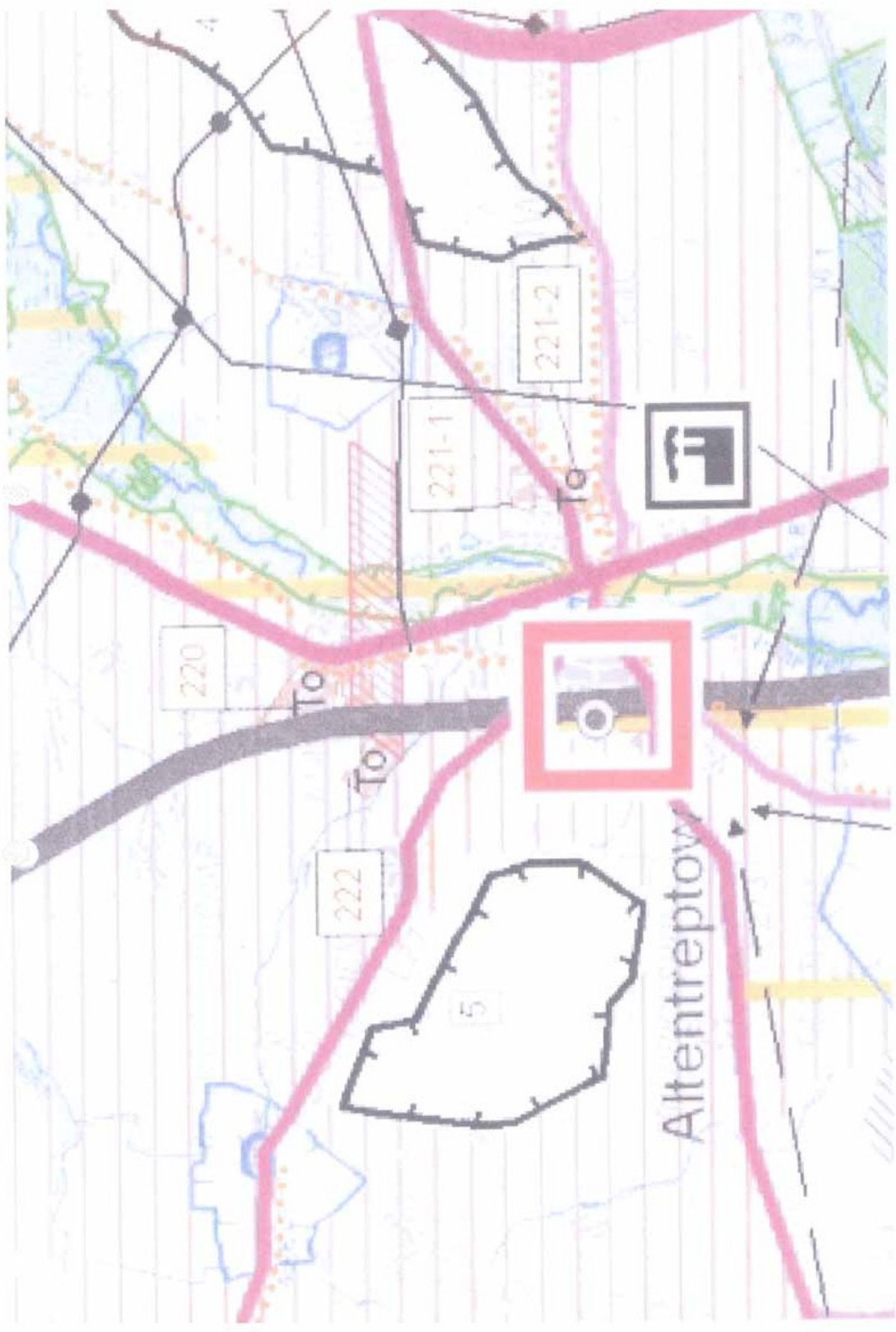
The type of renaturation or recultivation is determined in particular by the following criteria, which are suitable for limiting conflicts arising from subsequent use and for contributing to spatial development and landscape design:

¹⁸⁶ See: 5.1(5)

¹⁸⁷ See: 3.1.3(3)

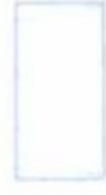
- natural conditions at the mining site, such as groundwater levels, terrain, etc.,
existing land uses, such as agricultural, forestry or commercial uses in the vicinity of the mining area, as well as the spatial location, particularly within or in relation to areas of conservation and suitability (e.g. priority and reserved areas for nature conservation and landscape management, key tourism areas and tourism development areas).

Due to geological conditions, mining activities may become spatially concentrated, thereby exacerbating the adverse effects resulting from opencast mining operations. By developing coordinated post-mining utilisation concepts (e.g. inter-municipal landscape plans), the adverse effects of any kind arising from opencast mining can be reduced and orderly spatial development ensured.





Vorranggebiet Trinkwasser



Vorbehaltsgebiet Trinkwasser



Vorranggebiet Rohstoffsicherung

Kiessand Ks; Quarzsand Qs; Sand Sa; Ton To; Torf Tf
Nummerierung entsprechend Tab. 7



Vorbehaltsgebiet Rohstoffsicherung

Kiessand Ks; Quarzsand Qs; Sand Sa; Ton To
Nummerierung entsprechend Tab. 8



Eignungsgebiet für Windenergieanlagen

Nummerierung entsprechend Tab. 11



Großräumiges Straßennetz

Regionale Infrastruktur

APPENDIX 7

Photographic
documentation July 2011



Klatzow, Nordostgrenze mit Blick nach Südwesten

Klatzow, Nordostgrenze mit Blick nach Südwesten





Klatzow, railway line

Loickenzin, north-west corner with a view towards the south-east





Loickenzin, Nordwestgrenze mit Blick auf Altabbau