Project Task – Outline

Does the Late Pleistocene Sava River terrace surface in the Krško Basin really not exhibit post-depositional tectonic deformation?

Outline submitted to

GEN energija d.o.o.

Vrbina 17, Krško

(after discussion on June 16th 2015[1])

Prepared by:

dr. Tomaž Verbič, consulting geologist

Arhej d.o.o.

Drožanjska cesta 23, Sevnica

mag. Matjaž Novšak, director

Ljubljana, June 30th 2015

[1] Participants: mr. Jože Špiler, dr. Jurij Kurnik, dr. Tomaž Verbič

Background

Seismic hazard assessment related to the objects with possible destructive effects on the society and the environment must be based on the information as complete as possible. It is well known that the information about the eventual younger deformations are far more important in such an assessment as of the older ones.

In the Krško Basin this fact refers mainly on the Sava River deposits/terraces of different ages.

The question

This proposal comes from the key question[2] with different, even opposite answers:

Late Pleistocene Sava River terrace in the Krško Basin. Deformed or not?

Answer 1

Recently, the statement of RIZZO (2013 p6) is very clear[3]:

[2] The Late Pleistocene Sava River terrace is the youngest geological unit in the Krško Basin that was recognized by different experts as tectonically deformed (GeoZS 2003; Verbič 2003, 2005, 2008; USA Earth Science team seismic source characterization for PSHA 2004). This is the reason why we address it as the key question. Furthermore, the recognized deformations of the Late Pleistocene terrace west of the Krško NPP could be connected with the deformations on its eastern side (USA Earth Science team seismic source characterization for PSHA 2004; Verbič, 2005, 2008).

[3] The report (RIZZO 2013) further on p6: *"Geodetic observations do suggest that folding may be ongoing; however, these results are within the systematic error of the measurements."* Since the authors mention *"systematic error"*, it is understood they are speaking here about the geodetic leveling and/or GPS observations of some fixed benchmarks. We are aware of large problems rising from tectonic interpretation of that kind of the data. Our question isn't based on them.
We will show later that the addressed question is rising from the other kind of geodetic measurements, combined with the sedimentary analysis.

The Late Pleistocene and Holocene surfaces do not exhibit post-depositional tilt.

It should be noted, that RIZZO (2013) do not offer any evidence or reference for this statement. It seems that such a strong statement about one of the key issues in the process of characterizing capable faults within 5 km should not be put forward without any background. Particularly, there are opposite answers based on measurements and analysis (see Answer 2 to Answer 4).

Answer 2

Early in the year 2004 the "Revised PSHA for NPP Krško site (Revision 1)" report was made. There the American team with B. Swan, K. Hanson and R. Youngs (USA Earth Science team seismic source characterization for PSHA, 2004) pointed out

"… and there is about 1.5-m of vertical separation in the Würm[4] terrace (16 +- 3 ka) that is coincident with the surface projection of the Artiče fault …" (p6)

Their observations regarding the Late Pleistocene terrace (which match up with the Middle Pleistocene[5] terrace deformations at the same location[6]) also could be seen from figures (in original report Figures 3.2-1 and 3.2-5; here Fig. 1 and Fig. 2).

Late in the year 2003, GeoZS (GeoZS 2003) performed paleoseismological investigations near Drnovo village; additionally, GPS topographic lines were also measured (GEOID 2003; here App. 1) in order to check eventual topographic

[4] Würm: morphostratigraphic term considered to be Late Pleistocene.

[5] »Middle Pleistocene« Sava River sediments and terrace(s) remnants should be placed in chronostratigraphy more precisely, which is one of the intermediate targets of the Project Task. We still have in our archives original reports of IRSL and TL analysis (from S. Mahan, USGS) of two samples from Dolenja vas (Verbič, 2004). See Project Task – Outline below.

[6] Late Pleistocene (≈ 1,5 m vertical separation in last ≈ 16.000 years).
Middle Pleistocene (≈ 18 m vertical separation in last ≈ 150.000 years).

anomalies on the Late Pleistocene terrace surface[7].

There are two interpretations of those measurements, one by GeoZS and one by Tomaž Verbič, consulting geologist.

Answer 3

The concluding statement of GeoZS about GPS measurements sounds clear:

> ***“Performed investigations, i.e. the relief analysis by detail geodetic measurements have shown, with relatively high degree of probability, that the Quaternary relief (Late Pleistocene terrace) of the Krško basin has been structurally deformed.”*** **(GeoSZ 2003, p19)**

Those deformed structures were not an issue of any further investigations that were performed in the following years. Furthermore, the structures that could clearly play a major role in characterizing capable faults within 5 km are not even mentioned in the proposal of the ongoing investigations in the Krško Basin (RIZZO & GeoZS 2015).

Answer 4

Verbič (2003, here App. 2) put his interpretation on GEOID’s (2003, here App. 1) GPS topographic profiles measurements. He divided profiles into segments and recognized backtilting[8] segments on all five profiles. The segments fit well with the sedimentary slope 1,6 +- 0,3 m/km in other profiles, except two segments on longer profiles where the tilt is around triple value (≈ 5 m/km) of the sedimentary slope. Detailed GPS measurements confirmed a 2,4 m vertical displacement of the Late Pleistocene terrace surface on the northern limb of the Krško syncline, and 0,7 – 1,4 m on the southern one (App. 2).

Verbič further explained his interpretation in the years 2005 and 2008. He demonstrated that the backtilting segment of the Late Pleistocene terrace surface between Brege and Jelše villages could not be of erosional origin (Verbič 2005; Fig. 11A,B; here Fig. 3A,B). He also showed that the backtilting structure at the surface fits very well with the sense of the Bouguer anomalies contours (Verbič, 2008, Fig. 27; here Fig. 4). Similarly, the segment with

---

[7] GPS measurements were preformed with differential GPS, rover receiver mounted on sledge or carried and placed by hand from point to point.

[8] »backtilting« means here a tilt towards N, opposite to the original sedimentary slope towards S.

triple value of the sedimentary slope on the N limb of the Krško syncline, fits well with the deep structure based on gravity data (Verbič, 2008 Fig. 16A,B; Fig. 27; here Fig. 5A,B and Fig. 4). Furthermore, these observations/interpretations are consistent with the tilted Middle Pleistocene Sava River conglomerate terrace between Leskovec village and the center of the Krško syncline[9] (Verbič 2003; here App. 2; USA Earth Science team seismic source characterization for PSHA, 2004 Fig. 3.2-5; here Fig. 2).

Both of the above described deformations of the Late Pleistocene terrace, on the S as well as on the N limb of the Krško syncline, could be connected with the Brežice and Artiče faults separately, eastwards of the Krško NPP (USA Earth Science team seismic source characterization for PSHA, 2004 Fig. 3.2-3; here Fig. 6; Verbič, 2008 Fig. 27; here Fig. 4). This supposed connection should be rigorously tested through detailed investigations.

> Referring to the above data we propose detailed investigations to answer more than a decade old open questions[10].

Project Task – Outline

May it be noted that this is only a rough draft following the goal to answer the above-mentioned open question. It is not a basis to evaluate the expenses, time and crew[11].

1. New GPS measurements across both topographic anomalies. Profile routes should be determined to avoid anthropogenic surfaces as much as possible; paths and roads are not such a problem, while landfills and excavations of soils are. It should be noted

[9] Revealing elements here are also boreholes data from near the center of the Krško syncline (Kenk 2003) where conglomerate - probably of Middle Pleistocene age - was drilled at a depth of 30 – 40 m (here Fig. 7).

[10] In the GeoZS (2003) document is a concluding remark: »*Thus, in order to reconstruct possible recent deformations of the Krško basin as a whole, systematic interdisciplinary research should be performed over the entire Krško basin, especially of the part that is covered by Late Quaternary sediments.*«

[11] There are at least two reasons why this is only a rough outline: firstly, time constraints and secondly, unavailability of some data and reports (e.g. seismic reflection profiles).

that large areas on the investigated area have been urbanized since first measurements taken in 2003. Before starting, all the routes should be carefully examined by walking. Needed amount about 50 km.

Expected result: more precise geometry of both structures on the Late Pleistocene terrace surface.

2. High-resolution seismic reflection profiles (HRS). One proposed HRS profile (Mrtvi potok) is already proposed on that area (RIZZO & GeoZS 2015), although within the Orlica fault as the target. It should be elongated further to the south across the highway. Other profile routes cannot be determined without careful examination of already acquired data[12]; our opinion is that at least 10 km of HRS profiles will be necessary. One long profile should more or less follow part of the route of the regional KK-02-99. Target reflectors: inside Miocene, top of Miocene, top of Pl/Q, possible reflectors inside PlQ and Q. Target depth range 20 - 300 m.

   Regarding the regional seismic reflection profiles taken in the year 1999, we emphasize that the quality of the data from the Mesozoic basement is not good enough. Both of the potential faults (Artiče and Brežice) might be deep blind thrusts with faulted basement and folded Tertiary and Quaternary (e.g. Santa Fe Springs Segment of the PHT), so distinct basement reflectors are very important for the interpretation. It should be considered about acquiring whole vertical profiles, from at least 1 km of the basement towards surface.

   Expected result: reflectors (stratigraphy) and their deformations. Also connected with borehole stratigraphy (see below).

3. Drilling. Several boreholes needed, completely cored, for different purposes.

   a. To determine the depth of (Middle Pleistocene) gravel/conglomerate along the old seismic line KK-02-99 (Verbič, 1999; USA Earth Science team seismic source characterization for PSHA, 2004 Fig. 3.2-5; here Fig. 2). At least 5 boreholes where the seismic line crosses deformed segments of the topographic profiles (d-d' and d-e), to reach the bottom of the Middle Pleistocene gravel/conglomerate and at least 2 m in the basement, expected depth ≈ 20 m (and more as we are moving towards S). Samples for age dating.

      Expected result: tilting geometry other deformations of the Middle Pleistocene conglomerate/gravel and its age.

[12] We have no access to any of the already acquired reflection profiles.

b. Near the overpass over the highway near Drnovo in the center of the Krško syncline, several boreholes were drilled for geomechanical purposes up to a depth of 40 m (Kenk 2003; e.g. V4-3/7, here Fig. 7). Conglomerate was drilled here approximately between 30 -38 m deep. Stratigraphy and samples for age dating are the main target here. To drill deep enough to reach the basement of PlQ, probably the Pontian. (It should be proved with ostracod fauna). No reliable data as to how deep, probably more than 80 m, at least 10 m down in the Miocene sediments. Two boreholes.

   Expected result: age of sediments below and above the Middle Pleistocene conglomerate/gravel and also its own age. Geometry of the subsidence/tilting (combined with results from above mentioned cores).

4. Age dating was already mentioned. Conventional luminescence dating (up to ≈ 200.000 years) as well as Cosmogenic Radionuclide Dating (CRN). $^{40}Ar/^{39}Ar$, U-Pb, perhaps ^{14}C (if organic material is found). Our estimation is that at least 20 analyses (mostly luminescence) are needed only from several Middle Pleistocene Sava River terrace(s) remnants; some of them will probably be unrealistic for various reasons, as occurred during the Libna project (RIZZO 2013).

5. GPR and other high resolution geophysical methods. Would come into play depending on previous mentioned results and field circumstances.

6. Paleoseismological investigations would come into play depending on previous mentioned results and field circumstances.

References

GEOID, 2003: Technical report on geodetic measurements. In: GeoZS, 2003: Paleoseismic investigations on Krško Basin, Volume 3.

GeoZS, 2003: Paleoseismic investigations on Krško Basin, Volume 1: Main Report. Prepared for NEK, 20 pp.

Kenk, M., (ed.) 2003: AC Smednik – Krška vas. – Geoinženiring. Ljubljana. (Neobjavljeno poročilo).

RIZZO, 2013: Characterization of the Libna fault and tectonic framework of the Krško Basin, Krško, Slovenia. Revision 0. http://www.ursjv.gov.si/fileadmin/ujv.gov.si/pageuploads/si/medijsko-sredisce/dopisGen/FinalReport.pdf

RIZZO & GeoZS 2015: GEN energija Seismic Hazard Analysis Project for Krško 2. Presentation to Slovenian Nuclear Safety Administration on 27 January 2015. http://www.ursjv.gov.si/fileadmin/ujv.gov.si/pageuploads/si/medijsko-sredisce/dopisGen/Rizzo.pdf

USA Earth Science team seismic source characterization for PSHA (Swan, Hanson and Youngs) 2004: Revised PSHA for NPP Krško site, PSR – NEK – 2.7.2, Revision 1, Chapter 3.2., 19 pp.

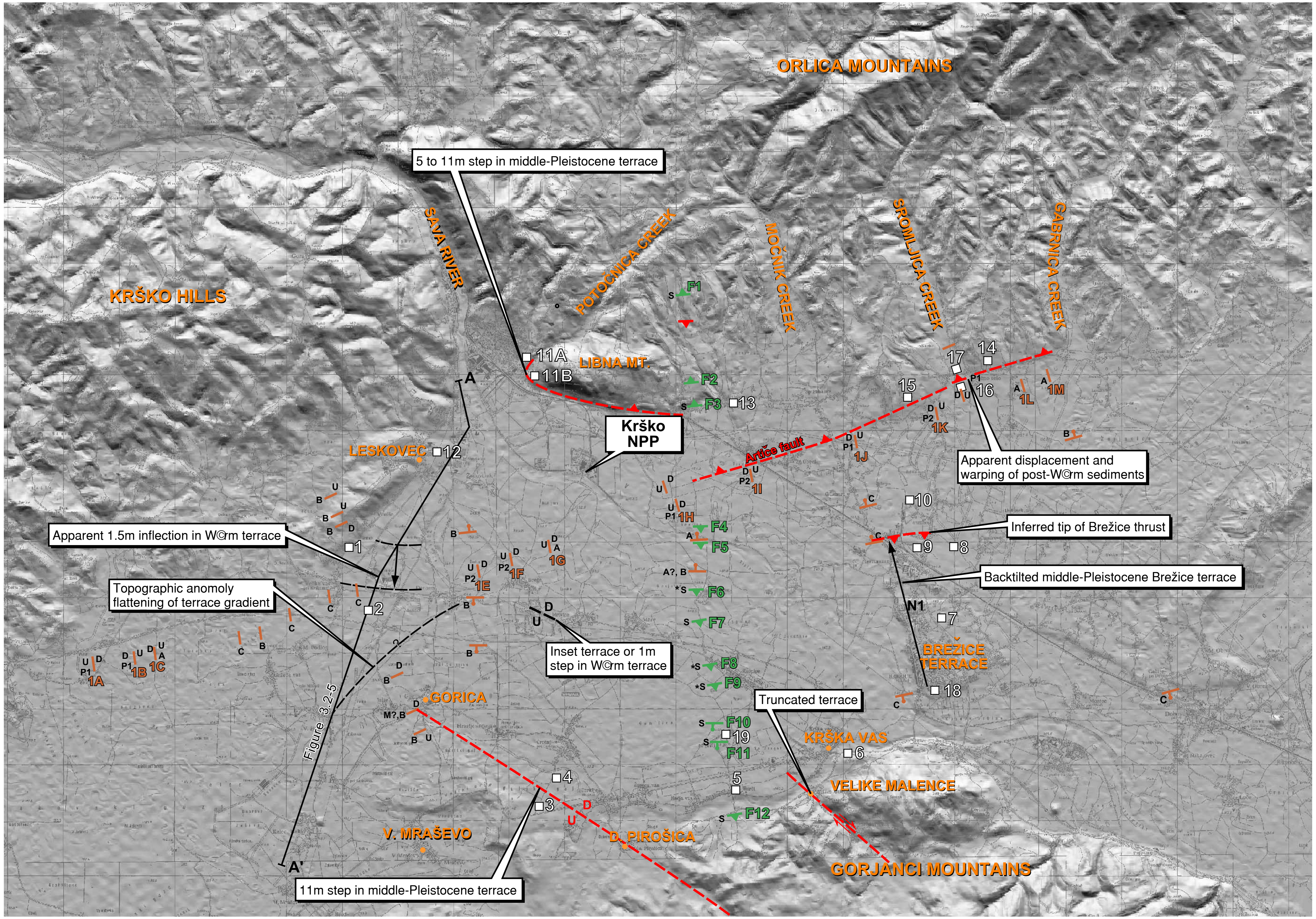
Verbič, T., 1999, Poročilo o raziskavah kvartarnih sedimentov vzdolž refleksijskih seizmičnih profilov na Krškem polju in pripravljalna dela za postavitev seizmičnih opazovalnic. Upublished report, Uprava RS za jedrsko varnost. 16 p.

Verbič, T. 2003: Geological interpretation of the geodetically (GPS) measured topographic profiles in the Krško basin. In: GeoZS, 2003: Paleoseismic investigations on Krško Basin, Volume 2.

Verbič, T. 2004: Quaternary stratigraphy and neotectonics of the Eastern Krško Basin. Part 1: Stratigraphy. Razprave IV. Razreda SAZU 45, 171-225. (In Slovene with English abstract).

Verbič, T. 2005: Quaternary stratigraphy and neotectonics of the Eastern Krško Basin. Part 2: Neotectonics. Razprave IV. Razreda SAZU 46, 171-216. (In Slovene with English abstract).

Verbič, T. 2008: Kvartarni sedimenti, stratigrafija in neotektonika vzhodnega dela Krške Kotline. Diseracija, NTF, Univerza v Ljubljani.



NOTES

1. Top of carbonate-cemented gravel (correlated to the 150 ka middle Pleistocene terrace) was encountered at an elevation of 154 m in auger holes along Line KK-02-99 between stations 262 and 285 (Verbič, 1999a).
2. Top of older gravel encountered at elevation of 148-149 m in auger holes along Line KK-02-99 between stations 325 and 365 (Verbič, 1999a).
3. Top of gravel (correlated to the 150 ka middle Pleistocene terrace) was observed at an elevation of 162m in test pit RV 2/97 (Verbič, 1997).
4. Top of gravel (correlated to the 150 ka middle Pleistocene terrace) was observed at an elevation of 151m in test pit RV 1/97 (Verbič, 1997).
5. Surface of Middle Pleistocene terrace is at an elevation of 154-156 m.
6. The surface elevation of a remnant of an older terrace (possibly the 150 ka middle Pleistocene terrace) is at an elevation of 171 m. Gravel deposits in an abandoned paleo-channel of the Krka River that lies south of the terrace remnant are at an elevation of 163m (Verbič, 1995).
7. Test pit at Crnc exposed 115 cm of fine-grained sediment (pseudogley) overlying sandy gravel (top of gravel at an elevation of 158 m). Based on soil profile development these sediments are correlated to the 150 ka middle Pleistocene terrace (T. Verbič, 2002).
8. Test pit RV 5/97 exposed 170 cm of fine-grained sediment (pseudogley) overlying mostly carbonate sandy gravel (top of gravel at an elevation of 147 m). Based on soil profile development these sediments are correlated to the 150 ka middle Pleistocene terrace (Verbič and Rižnar, 1997).
9. Test pit RV 6/97 exposed 210 cm of fine-grained sediment (pseudogley) overlying carbonate sandy gravel (top of gravel at an elevation of 150 m) Based on soil profile development these sediments are correlated to the 150 ka middle Pleistocene terrace (Verbič and Rižnar, 1997).
10. A buried soil (A/C profile) developed in gravel was encountered at depth of 8 m (elevation of 144 m) in Boring KK-4 (Verbič, 1995). The age of this gravel is uncertain.
11. Terrace remnants at the western end of Libna Mountain in Krško are mapped at elevations of 177 m (11A) and 188 m (11B). (Verbič, 1995; Živanovič, et al., 1998). Based on soil profile development, the terrace remnant at 11A is correlated to the 150 ka middle Pleistocene terrace.
12. A remnant of the middle Pleistocene terrace (~150 ka) is mapped at Leskovec at an elevation of approximately 173m.
13. Thermoluminescence (TL) dating yielded ages of 139.5 ± 11.84 ka and 151.71± 14.8 ka for sample KNN1-02 from sand lens within fluvial outwash gravel mapped as the Middle Pleistocene and 96.92 ± 5.27 ka and 139.96 ± 9.45 ka for sample KNN3-02 from the overlying fine-grained terrace cover (see Figure 4-1 in Geomatrix 2002).
14. Cumulative vertical separation of the unconformity at the base of the P/Q across the Artiče fault is 240 m (Poljak, 1999) (see Figure 4-17 in Geomatrix 2002).
15. Cumulative vertical separation of the unconformity at the base of the P/Q across the Artiče fault is 125 m (Plate 4b in Poljak, 1999).
16. Steepening in gradient of modern channel is coincident with 4m apparent vertical separation of gravel of probable post-Würm age (see Figure 4-18 in Geomatrix 2002).
17. Apparent ~ 2m displacement of young near-surface sand layer (see Figure 4-18 in Geomatrix 2002).
18. The southernmost highest part of the Brežice terrace is at an elevation of 165 m (Živanovič and others, 1998).
19. Pri gomili gravel pit. Thermoluminescence (TL) dating yielded ages of 19.4 ± 0.1 ka (Pg11) and 16.07 ± 0.32 ka (Pg12) for sand lenses within Würm terrace deposits (see Figure 4-1 in Geomatrix 2002).

Note: (N1) apparent east-west lineament is an artifact within digital elevation model (DEM).

0 1 km

EXPLANATION

Fault picks on seismic profiles

- Reverse/thrust fault; barb on upthrown block
- Normal fault; bar and ball on downthrown block
- U/D Steeply dipping fault; apparent vertical separation indicated by U = Up D = Down
- Possible locations of post middle-Pleistocene faulting

1A Source: Persoglia (2000) (Table 4-8)
Youngest unit shown to be displaced:
- P1 = Quartz sand
- P2 = Marl
- A = Within Pliocene sequence (Pontian Formation) near the separation of layers with prevalently sands from marls
- M = Near Pliocene-Miocene (Pannonian marls) transition
- B = Near top of Badenian (Lithotamnian limestone)
- C = Near top of Mesozoic (Cretaceous)

F1 Source: Prelogovič (1996)

(∗) Asterick designates more limited set of faults shown on interpretation of migrated profiles P-4/95 and P-3-5/95

S = Fault interpreted to top of seismic data

SHADED RELIEF MAP SHOWING LOCATIONS OF FAULT PICKS AND QUATERNARY OBSERVATIONS RELATED TO THE EVALUATION OF RECENT DEFORMATION

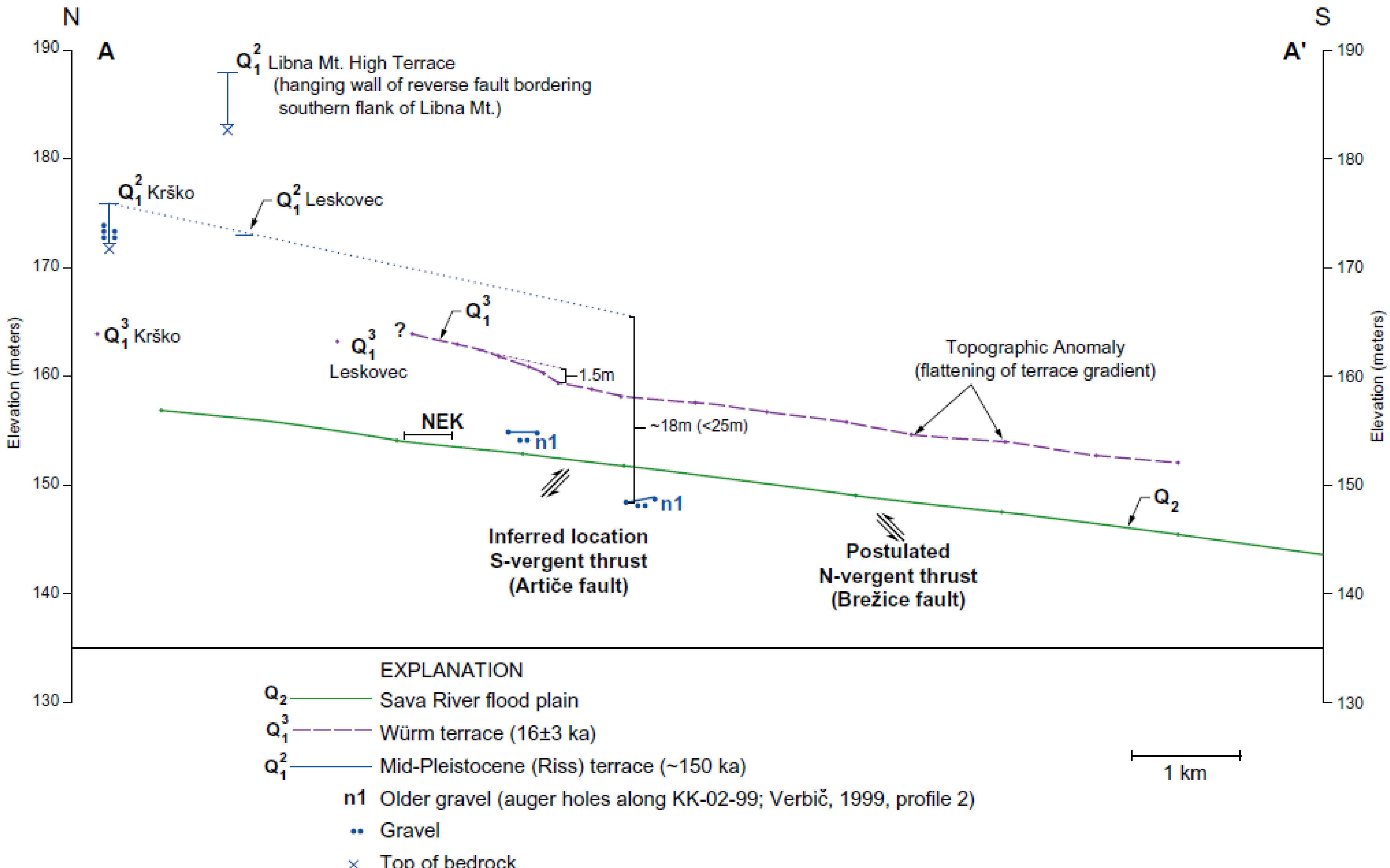
Revised PSHA Krško NPP

PSR-NEK-2.7.2 (Rev. 0)

GEOMATRIX	Project No.	Figure
	7823	3.2-1

S:\7800s\7823\task_01102_1021_fr_fig_03.2-01.ai

S:\7800s\7823\task_01\02_1021_fr_fig_03.2-05.ai



Note: Location of profile shown on Figure 3.2-1.

GEOMATRIX

TOPOGRAPHIC PROFILE OF SAVA RIVER TERRACES
Revised PSHA Krško NPP
PSR-NEK-2.7.2 (Rev. 0)

Project No. 7823

Figure **3.2-5**

Figure 3A, B

from Verbič, 2005 Fig. 11A, B

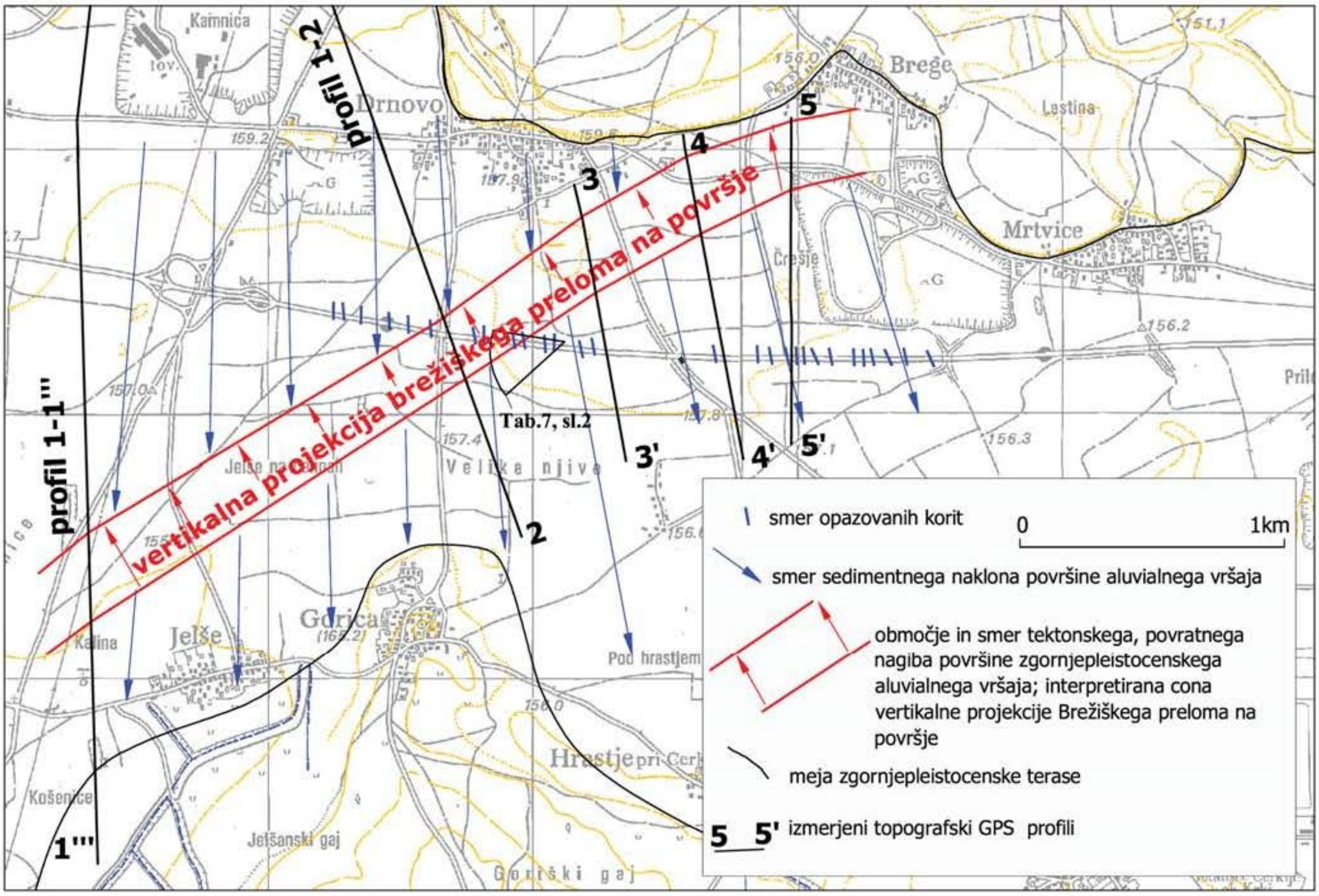


Figure 4

from Verbič 2008, Fig. 27

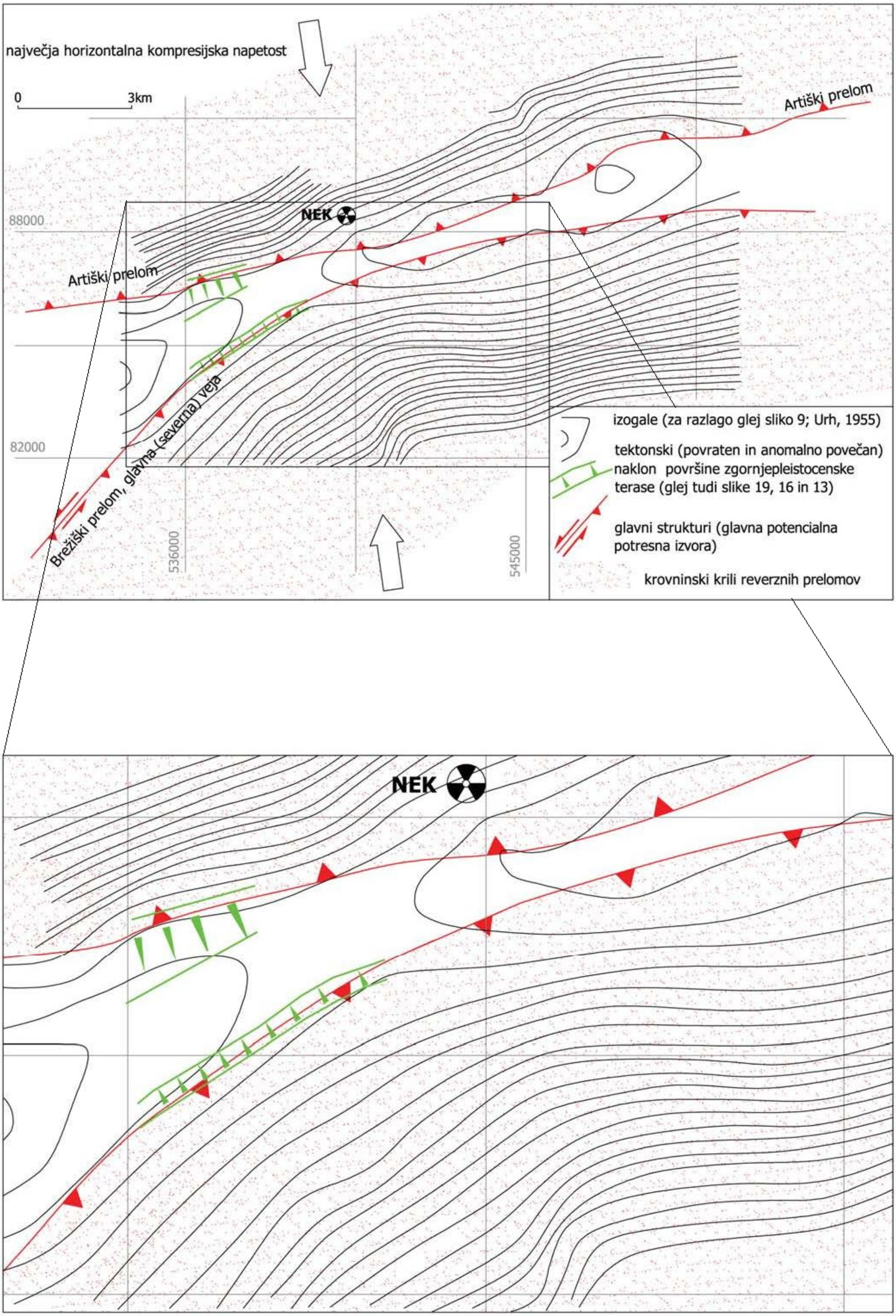
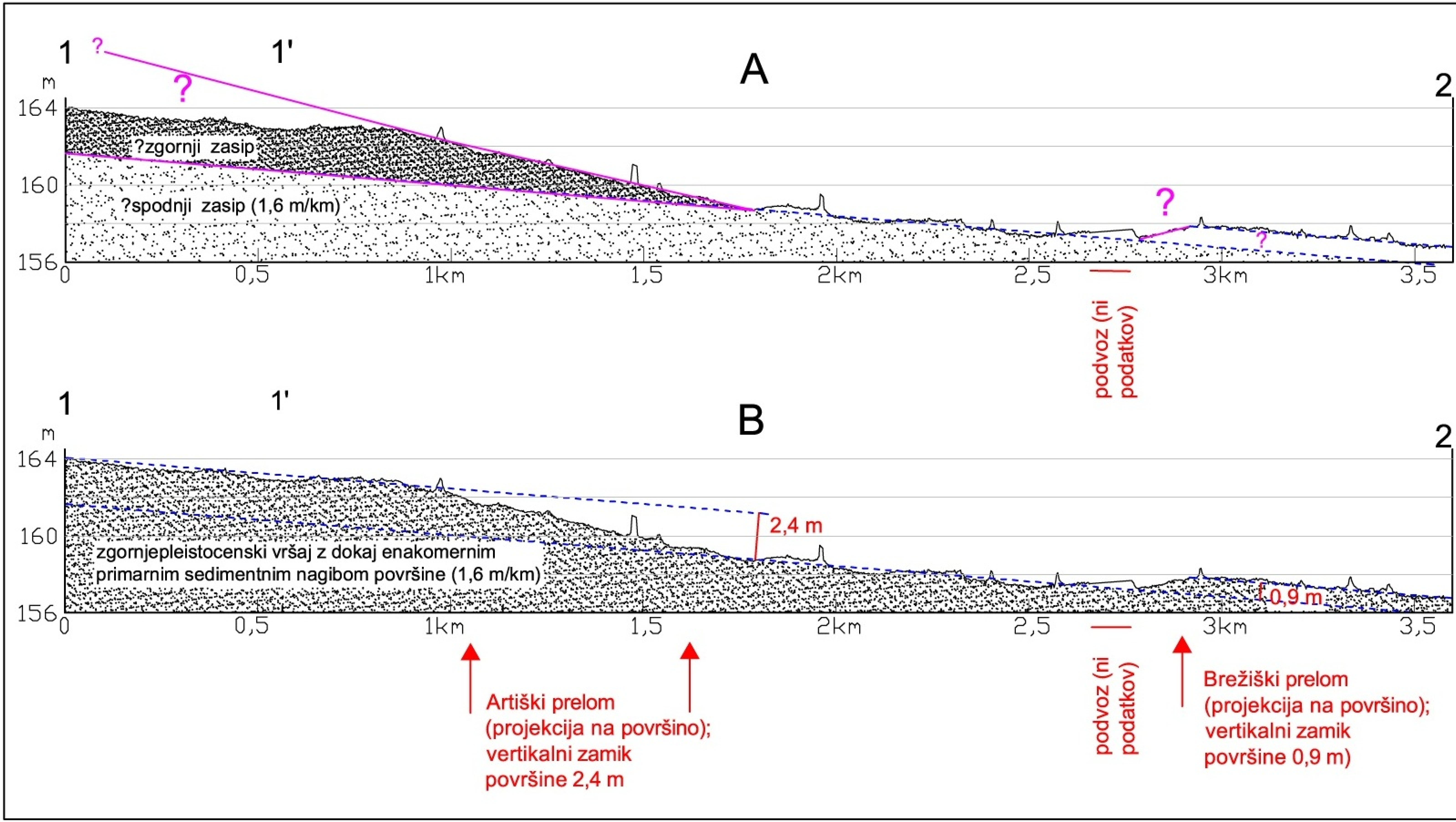
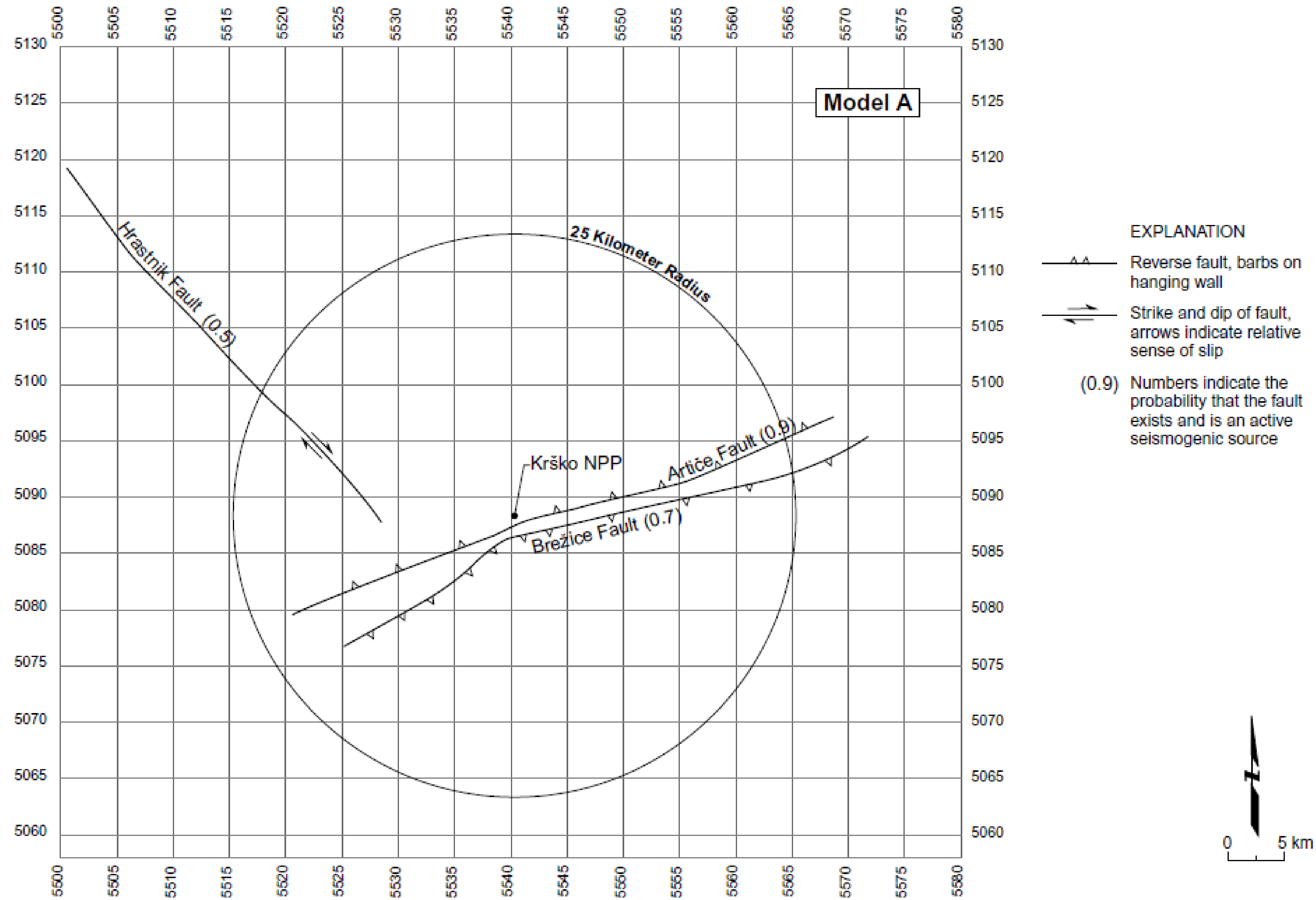


Figure 5A, B

from Verbič 2008, Fig. 16A, B



S:\7800s\7823\task_01\02_1021_fr\ _fig_03.2-03.ai



GEOMATRIX

USA EARTH SCIENCE TEAM
GENERALIZED FAULT SOURCES MODEL A
Revised PSHA Krško NPP
PSR-NEK-2.7.2 (Rev. 0)

Project No. 7823

Figure 3.2-3

Figure 7
(from Kenk 2003)

DR NOVO

GZL Geoinženiring d.o.o.		Naročnik: DARS d.d
Sonda: V4-3/7 Globina: 40 m Vrsta: sondažno vrtanje Namen: geomehanske preiskave Kota vrha: 0 m Datum vrtanja: 4.3.03 Vodja: Popovič	DN: 20-728/02 Karta: List: x: y: z: 0 Merilo: 1 : 50	Objekt: AC Smednik-Krska vas V4-3/7

NAČIN	GLOBINA	KLASIFIKACIJA: GEOLOŠKI PROFIL	KLASIFIKACIJA: AC	STAROST	LITOLOŠKI OPIS	VZOREC	TERENSKE IN LAB. RAZISKAVE: N/P	RP [kN/m²]	τ [kN/m²]	OPOMBE
rotacijsko na suho	11,6		GM		zameljen prod,vlažno jedro,prodniki do 3 cm,sivo rjava barva					
	12,6		GM-GC		zameljen do zaglinjen prod,vezano jedro,prodniki do 3 cm,samice proda do 7 cm,svetlo rjava barva		41			
	14,7		GM		zameljen prod,vlažno jedro,prodniki do 3 cm,sivo rjava barva					
	17,8		CH		mastna glina,sg.-tg.kons.,siva barva,prepereli org.ostanki (črne pege) in vložki zelo stisljive org.gline		15	125 100 150 175 150 150 100 100 100 125 125 75 75 75 25 75 125		
			Pt		šota z vložki zelo stisljive organske gline do nekaj cm in kosi lesa do 5 cm,črna barva		71			

Nivo podtalnice:	Datum:				Obdelal:	Pregledal:	Št. lista: 2
	Nivo:						Priloga:

2.5.G.3.16

GZL Geoinženiring d.o.o.

Naročnik: DARS d.d

Sonda: V4-3/7
Globina: 40 m
Vrsta: sondažno vrtanje
Namen: geomehanske preiskave
Kota vrha: 0 m
Datum vrtanja: 4.3.03
Vodja: Popovič

DN: 20-728/02
Karta:
List:
x:
y:
z: 0
Merilo: 1 : 50

Objekt: AC Smednik-Krska vas V4-3/7

NAČIN	GLOBINA	KLASIFIKACIJA: GEOLOŠKI PROFIL	KLASIFIKACIJA: AC	STAROST	LITOLOŠKI OPIS	VZOREC	N/P	RP [kN/m²]	τ [kN/m²]	OPOMBE
rotacijsko na suho	24,2		Pt		šota z vložki zelo stisljive organske gline do nekaj cm in kosi lesa do 5 cm,črna barva		52			
	24,8		Cl-Ol		pusta do organska glina,vložki preperelega proda,siva barva					
	25,3		GC		zaglinjen prod,prepereli prodniki z glinastim vezivom,tg.kons.,siva barva					
	26,5		Ol		organska glina s posam. prep.prodniki,temna sivo rjava barva					
	27		GC		zaglinjen prod,zelo zbit,vezan preperel prod,siva barva		25			
	27,5		CH		mastna glina,sg.kons.(Qu=50-75),siva barva					
	28		GC		zaglinjen preperel prod,vezivo mastna glina,posam.org.primesi,siva barva					< pojav vode
	28,5		CL-SC		meljna glina do zaglinjen pesek,siva barva					
	29,3		Ol		organska glina,z vložki šote,temno rjava barva					
	30		CH		mastna glina,tg.kons.(Qu=150),drobci prep.prodnikov,tanki vložki zelo stisljive org.gline,siva barva					
			GC		zaglinjen prod do mastna glina s prodom,prodniki do 3 cm,lepo zaobljeni,vezivo pretežno mastna glina,le na posam.mestih prehaja v vezivo puste in meljne					

Nivo podtalnice:	Datum:				Obdelal:	Pregledal:	Št. lista: 3
	Nivo:						Priloga:

GZL Geoinženiring d.o.o.

Naročnik: DARS d.d

Sonda: V4-3/7
Globina: 40 m
Vrsta: sondažno vrtanje
Namen: geomehanske preiskave
Kota vrha: 0 m
Datum vrtanja: 4.3.03
Vodja: Popovič

DN: 20-728/02
Karta:
List:
x:
y:
z: 0
Merilo: 1 : 50

Objekt: AC Smednik-Krska vas V4-3/7

NAČIN	GLOBINA	KLASIFIKACIJA: GEOLOŠKI PROFIL	KLASIFIKACIJA: AC	STAROST	LITOLOŠKI OPIS	VZOREC	N/P	RP [kN/m²]	τ	OPOMBE
rotacijsko na suho	32,4		GC		zaglinjen prod do mastna glina s prodom,prodniki do 3 cm,lepo zaobljeni,vezivo pretežno mastna glina,le na posam.mestih prehaja v vezivo puste in meljne gline,lg.-sg.kons.,siva barva s črnimi pegami (prep.org.ostanki)					
	33,7		CH-OH		mastna do zelo stisljiva org.glina,drobci in posam.prodnički temno sive barve,mestoma org.vložki šote,tg.kons.			150 175 150 200 225 175		
	35,2		CH		mastna glina,tg.kons.,s prodom,prodniki pretežno do 1 cm,posamezni večji,siva do sivo zelena barva		22	150 150 150 175 200		
	37,3		GM		zameljen zbit prod vezan v konglomerat,prodniki raznobarvni do 2 cm,tudi delno prepereli					
	38,4		GM		zameljen prod,prodniki do 2 cm,,lepo zaobljeni,nevezano jedro,siva barva					
	38,9		CL		meljna glina z vložki puste do mastne gline,tg.kons.(Qu=150),sivo zelena barva					
	39,5		ML-MI		peščeni do glinasti melj,siva barva					
	40		OH		zelo stisljiva org.glina z vložki mastne gline in šote,ptd.kons.(Qu=200),rjavo črna barva		21			

Nivo podtalnice:	Datum:	Obdelal:	Pregledal:	Št. lista: 4
	Nivo:			Priloga:

2.5.G.3.18