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Division: Construction and Ecology
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EKOLOGICAL AUDIT

Name of project: Industrial Zone Vlcovice
Client: Koprivnice Municipality

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1. Introduction

The ecological audit provides an assessment of the condition of different environmental components (atmosphere, water, soil) in the site approved for the construction of "Industrial zone Vlcovice". These assessment was supported by available surveying and measurements done in the utility space. In addition, the chemical analyses of soil and water samples taken in the area of the industrial zone and adjacent streams were performed in July 2000.

The environmental condition has been assessed considering current Czech law and standards.

2. Description of the urban utility space

2.1 Natural conditions

The industrial zone Vlcovice is situated at the eastern limit of Koprivnice, in the direction to the village Vlcovice, between the Tatra, a.s. complex and the state road I/58 Pribor – Koprivnice. The road I/58 provides good transport availability of Pribor, Ostrava, Novy Jicin, Frydek – Mistek and Frenstat pod Radhostem.

It is a flat area moderately sloped to the north to Lubina river. The average altitude ranges from 322 a.s.l. (northern part) to 340 a.s.l. (southern part).

From the climatic point of view the site is classified with the MT 10 type of area characterized by moderately warm spring, long moderately dry summer, moderately warm autumn and dry winter with short snow melting.

2.2 Current site utilization

The lands considered for the industrial zone are registered as agricultural lands (arable) and currently utilized for the agricultural purposes.

2.3 Development

The industrial zone area follows the production complex of Tatra, a.s. Koprivnice on the west boundary.

Family houses are exceptional in the utility area. Only 3 family houses near the road I/58 on the north-eastern side and 7 buildings 150 – 300 m to the north from the industrial zone are located there. Family houses are built also along the Sykorecek brook approximately 800 m north-west and along the road I/58 to Pribor. Approximately 400 m to the south-east houses of the village Vlcovice are located. Residential family houses are mostly single-floor or two-floor buildings with gardens and outbuildings situated within the area.

2.4 Utility services

The existing utility services run along the road I/58 and an access road leading to the loading gatehouse Tatra, a.s. They cover Telecom cabling, drinking water pipes DN 400 and gas pipes VTL (high-pressure) 200.

The area approved for the industrial zone is mostly vacant, only on the east side gas pipes VTL 200 run.

2.5 Vegetation

As mentioned above the area of the future industrial zone consists of lands without any permanent vegetative cover and used for the agricultural production as arable soil.

Grown vegetation occurs along the road I/58, along Sykorecek brook and along a nameless left-bank tributary of Sykorecek brook, which makes a south-east limit of the industrial zone area.

The vegetative cover along Sykorecek brook consists of willows, alders, ashes, maples, oaks, birches which are completed with new plants in the upper part of the stream.

In the east where a nameless brook flows there is a vegetative cover 15 – 20 m wide with common domestic kinds of trees and bushes (willows, alder, maple, ash, European elder, black-thorn, red dogwood etc.).

Along the road I/58 fruit trees, ashes, maples and birches can be found. In the south in the distance of about 600 m there is a complex of forest lands, which is part of the natural park called Podbeskydi.

VKP, ÚSES (significant landscape elements, territorial systems of ecological stability)

The Sykorecek brook and a nameless left-bank tributary to Babincův brook are significant landscape elements (VKP) in accordance with Law no. 114/92 of Code on Nature and Landscape Preservation § 4 par. 2 a 6.

Any territorial systems of ecological stability (ÚSES) does not occur in the site of the future industrial zone. The closest biocorridor occurs over the state road I/58 on the east side as the proposed local biocentre

The southern part of the industrial zone touches the protective zone of the natural park Podbeskydi.

According to available information nor plants nor animals protected in accordance with Law no. 114/92 on Nature and Landscape Preservation live in the industrial zone and close vicinity

2.6 Hydrography of the site

The main stream of a wide area is Lubina river flowing from the south to the north in the distance of about 450 – 800 m.

The other important stream in the utility space is Koprivnicka river flowing though the town and creating a left tributary of the Lubina, pouring into it in front of Pribor.

In the southern half of the area of the industrial zone Sykorecek brook springs, then flows around the complex of Tatra, a.s. and empties into Koprivnicka river.

Another important stream in the utility space is Babincův brook flowing between the road I/58 and Lubina river, the left-bank tributary of which is a south-eastern limit of the industrial zone.

3. Atmosphere

3.1 Polluted air

3.1.1 Measurement of air quality in the utility space

The air pollution in the area of Koprivnicka has been monitored by an automatic monitoring station running by the Czech hydrometeorological Institute, branch office Ostrava – Poruba within the scope of the national automatic pollution monitoring system (AIMS) since 1994. The station is located near the state road approximately 900 m far from the Industrial zone Vlcovice. The station monitors concentrations of SO_2, NO_X and from 22 October 1995 as well fractions PM 10 of powder aerosol.

In the North-Moravion Region air quality is currently measured by 23 automatic monitoring stations (AMS) and 15 manual monitoring stations (MMS).

Map no. 1

Map no. 2

3.1.2 Survey of air pollution in the utility space

The following tables show values of air pollution: SO_2, NO_X and powder aerosol (PM 10) in μ/m^3 per last 5 years of monitoring (1995 – 1999) by the Lubina station.

Table no. 1 - Average annual concentration μ/m^3

Year	SO_2	NO_X	Powder aerosol (PM 10)
1995	24	29	-
1996	33	35	41
1997	19	29	31
1998	13	22	24
1999	9	20	21

Table no. 2 – Average monthly concentrations μ/m³

Year	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
SO_2												
1995	46	20	24	16	13	8	11	13	12	21	32	68
1996	93	-	52	29	12	9	8	11	10	18	15	57
1997	89	16	16	12	4	5	4	7	-	14	27	25
1998	30	21	14	8	6	6	4	7	9	8	26	21
1999	17	17	11	9	6	6	4	4	6	7	17	9
NO_X												
1995	37	23	31	25	26	17	18	21	19	39	39	57
1996	63	-	52	37	19	14	12	21	19	34	32	60
1997	70	27	31	21	14	15	14	23	-	29	-	34
1998	26	32	21	14	12	10	11	16	19	20	42	38
1999	25	21	21	18	13	14	14	14	22	21	34	23
Powder aerosol PM 10												
1995	-	-	-	-	-	-	-	-	-	-	47	81
1996	78	-	63	49	26	22	-	22	23	36	26	56
1997	82	24	41	26	19	21	13	25	-	-	-	29
1998	32	28	26	21	18	15	15	20	22	17	39	32
1999	31	25	30	25	18	18	16	14	20	15	33	16

Table no. 3 – Maximum daily concentrations in μ/m³

Year	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
SO_2												
1995	134	49	53	43	30	19	29	40	22	61	81	187
1996	198	174	110	64	34	32	16	23	19	37	38	169
1997	309	42	51	29	11	18	12	19	27	45	75	77
1998	129	63	56	16	14	14	10	17	23	26	121	58
1999	38	63	27	28	16	15	15	17	14	17	45	23
NO_X												
1995	123	58	76	44	53	28	32	41	37	104	149	155
1996	150	161	105	71	46	34	20	35	40	70	76	175
1997	212	50	64	48	37	28	22	36	42	80	134	110
1998	94	101	49	30	24	26	19	28	40	115	128	111
1999	89	78	55	63	24	27	25	27	39	63	102	94
Powder aerosol (PM 10)												
1995	-	-	-	-	-	-	-	-	-	132	218	257
1996	208	157	116	101	56	43	28	36	54	70	80	202
1997	246	52	115	63	36	34	29	38	37	52	94	96
1998	132	64	56	51	37	41	31	40	63	54	139	78
1999	59	62	81	58	32	32	43	33	53	56	114	60

Notes:
- the average monthly value is stated if at least 16 daily averages are available in a month and the continuous drop-out in daily averages is not longer than 5 days
- fraction PM 10 of powder aerosol has been measured by AMS since 22 October 1995

3.1.3 Current pollutant limits

In the CR the limits for selected polluting agents set in the Amendment of the Federal Environmental Committee of 1 October 1991 to Law no. 309 of 9 July 1991 on Air Protection against Polluting Agents are valid.

Table no. 4 – Pollutant limits for polluting agents

Pollutant	Expressed as	Pollutant limits (μg/m^3)				
		IH_r	IH_d	IH_{8h}	IH_k	General requirement
Fly dust		**60**	**150**		**500**	**Concentration of IH_d and IH_k must be exceeded in no more that in 5 % of cases in the year**
Suplhur dioxide	**SO_2**	**60**	**150**		**500**	**Concentration of IH_d and IH_k must be exceeded in no more that in 5 % of cases in the year**
Sulphur dioxide and flue dust	SO_2 – p.p.		250*			
Nitrogen dioxide	**NO_2**	**80**	**100**		**200**	**Concentration of IH_d and IH_k must be exceeded in no more that in 5 % of cases in the year**
Carbon dioxide	CO		5000		10000	**Concentration of IH_d and IH_k must be exceeded in no more that in 5 % of cases in the year**
Ozone	O_3			160		
Lead in flue dust	Pb	0,5				
Cadmium in flue dust		0,01				
Malodorous substances		Concentrations must not trouble inhabitants				

Notes

IH_r - Average yearly concentrations of a pollutant. The average concentration means a mean value of concentration found out in a selected point within one year as an arithmetic average of average 24-hour concentrations.

IH_d - Average yearly concentration of a pollutant. The average daily concentration means a mean value of concentration found out in a selected point within one year as an arithmetic average of average 24-hour concentrations. The average daily concentration means also a value of at least uniformly

distributed measurements of average half-hour concentrations within 24-hours (arithmetic average).

IH_{8h} - Average eight-hour concentration of pollutant. The average eight-hour concentration means a mean value of concentration found out in a selected point within 8 hours.

IH_k - Average half-hour concentration of pollutant. The average half-hour concentration means a mean value of concentration found out in a selected point within 30 minutes.

3.1.4 Evaluation of air pollution in the utility space

The evaluation of air pollution was performed by the branch office of CHMÚ in Ostrava – Poruba in July 2000 supported by measurements done in the Lubina station (see Table no. 5).

Table no. 5 – Air pollution in AMS CHMÚ Lubina in 1995 – 1999

Year	PRM	% IH_k	% IH_d	PRM	% IH_k	% IH_d	PRM	% IH_k	% IH_d
	Sulphur dioxide (SO_2)			Nitrogen dioxides (NO_X)			Powder aerosol (PM 10)		
1995	24	0,0	0,6	29	0,4	2,8	-	-	-
1996	33	0,0	2,8	35	0,6	3,3	41	-	**5,6**
1997	19	0,0	0,9	29	0,7	2,7	31	-	**11,9**
1998	13	0,0	0,0	22	0,1	1,6	24	-	2,3
1999	9	0,0	0,0	20	0,1	0,3	21	-	0,6

Current pollutant limits [1)]

Pollutant	IH_r [$\mu g/m^3$]	IH_k [$\mu g/m^3$]	Exceeded [2)] [%]	IH_d [$\mu g/m^3$]	Exceeded [2)] [%]
SO_2	60	500	5	150	5
NO_X	80	200	5	150	5
PA [3)]	60	500	5	150	5

Notes

- fraction PM 10 of powder aerosol has been measured by AMS since 22 October 1995

PRM: average yearly concentration

% IH_d: relative no. of days with the daily concentration higher than the daily pollutant limit

% IH_k: relative no. of half-hours with 30-minute concentration higher that the short-term pollutant limit; AMS takes three-hour powder aerosol samples and that´s why % of IHk of this pollutant cannot be evaluated

1) current pollutant limit acc. to provision of EM of 1 January 1991 to Law 309/91 of Code (part 84/94 and 84/92)

2) allowed number of limit exceeding per year

3) existing pollutant limits are generally adopted for powder aerosol (applied for total powder TSP even for fraction PM 10)

From the above evaluation it accrues

a) Average yearly pollutant limits IH_r were not nearly exceeded (SO_2, NO_X, powder aerosol) in the utility space in 1995 – 1999.
b) The relative number of half-hours, in which the 30-minute concentration was higher than the short-time pollutant limit ($IH_{k,}$) was not exceeded in more than 5% of monitored pollutants (SO_2, NO_X) in the utility space in 1995 – 1999. Samples of powder aerosol were taken by AMS Lubina by three hours therefore the percentage of IH_k exceeding was not evaluated.
c) The relative number of days when the daily concentration was higher than the daily pollutant IH_d limit of the powder aerosol allowed limit was exceeded in more than 5 % cases in the years 1996 a (5,6 %) and 1997 (11,9 %). The 5 % limit of SO_2 and NO_X was not exceeded in 1995 – 1999.

3.1.5 Direction of dominant winds

The direction of dominant winds was defined by the Czech Hydrometerological Institute, Branch Office Ostrava – Poruba in January 2000. It is based on measurements performed at the nearest monitoring station for last 10 years:

N	NE	E	SE	S	SW	W	NW	Calm	Sum
11,7	6,2	2,0	3,9	8,4	28,2	6,2	3,9	29,5	100

3.1.6 Main air polluting agents

The main polluting agents in Koprivnice are:
- Tatra, a.s., registered office Koprivnice, Stefanikova 1163
- Tatra Novy Jicin, a.s. – boiler house, Senov u Nového Jicina, Dukelska 109

In the south-west direction towards dominant winds there are:
- Kotouc Stramberk, spol. s r. o. – cement manufacturing, premises in Stramberk (app. 5 km)
- Frenstat pod Radhostem roughly 6,5 km far
  - SUPERIOR – boiler house, premises in Frenstat pod Radhostem, Mistecka 963
  - L. A. BERNKOP, spol. s r. o. – boiler house, premises Frenstat pod Radhostem, Maskova 929
  - SIEMENS ELEKTRMOTORY, s.r.o., Mohelnice, Nadrazni 25
- In Pribor roughly 4,5 km far
  - Tatra Pribor, a.s., Pribor, Mistecka 1111
  - LONKA Pribor, a.s., Pribor, ul. 9. kvetna 1162
  - TEDOM ENERGO, s.r.o. – boiler house (earlier Priborska tepelna spolecnost), sidlem Trebic, Vycapy 195

3.1.7 The utilization of the area in the direction of dominant winds

The dominant wind direction is from SW (28,2 %) and north (11,7 %). The area in the direction of winds in the north-east is mostly used for farming. Roughly 1,1 km far there is a

southern limit of Vetrkovice with a dispersed development of family houses and outbuildings. 1,5 km far from there the water basin Vetrkovice is situated which is a raw water source for Tatra, a.s. Koprivnice. In this direction roughly 15 km far there is the district town Frydek – Mistek having 65 000 inhabitants.

In the south direction, in which 11,7 % of winds flow, the Beskydy region can be found with a significant town Roznov pod Radhostem distanced 16 km.

It may be stated that in the direction of dominant winds in the closest area no health institutions, schools, railway stations, churches or other cultural monuments are located which can be impacted by possible emissions from the industrial zone.

Neither the town of Koprivnice located west from the industrial zone should be affected by possible emissions significantly. The flow of winds from the east to the west is about 2 % per year.

3.2 Temperature

The nearest station of the Czech Hydrometeorological Institute measuring regularly air temperature is in Frenstat pod Radhostem.

The results of measurements in respective months in 1991 – 1999 are shown in the Table no. 7.

Table no. 7 – Average monthly air temperatures Tm °C measured by the station in Frenstat pod Radhostem 1991 - 1999

Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
1991	-0,8	-4,9	5,5	6,6	9,1	14,8	18,6	16,8	14,2	7,1	4	-3,2	7,3
1992	-0,3	0,6	3,3	7,7	12,1	17,1	19,3	22,2	13,3	6,5	4,2	-2,3	8,6
1993	0,1	-1,6	1,1	8,3	14,6	15,3	17	16,8	12,8	9,1	-1,1	1,9	7,8
1994	2,2	-1,5	5,3	7,5	12,3	15,7	20,3	18,2	15,1	7,1	4,5	1,1	9
1995	-2,8	3,2	1,7	7,2	11,2	15,1	19,9	16,4	11,8	9,9	0,2	-3,4	7,5
1996	-5,5	-4,9	-2,6	7	13,3	16,7	16,4	16,7	9,3	9,4	6,1	-6,2	6,3
1997	-5,7	1,8	2,4	4,3	13,7	16,9	16,4	17,5	12,8	5,9	3,4	1,2	7,6
1998	0,2	3	1,7	10,3	13	17,1	17,9	17,3	13,5	8,8	-0,8	-1,7	8,4
1999	0,9	-1,2	4,3	9,1	13,3	15,9	18,8	16,7	15,9	8,9	2,2	0	8,7

3.3 Precipitation

Precipitation is measured by the station CHMÚ in Frenstat pod Radhostem. This station is the closest one to the industrial zone.

The precipitation quantity in 1991 – 1999 in respective months is shown in the Table no. 8.

Table no. 8 – Precipitation quantity SRAm (mm) measured by the station Frenstat pod Radhostem in 1991 - 1999

Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
1991	13,8	27,7	24	52,8	146,1	120,4	142,3	148,3	41,1	16,8	76,6	85,5	895,4
1992	41,1	66,2	100,2	69,8	41,2	73,9	80,4	11,1	72,6	108	14,7	107,5	786,7
1993	36	48,9	92,2	33,3	56,3	74,4	96,4	56,5	67,8	59,6	38,2	85,9	745,5
1994	53,2	13,4	71,2	156,2	111,3	68,2	41,4	109,2	117,7	76,7	38,6	59,8	916,9
1995	78,7	37,1	76,3	96,4	129,2	159,3	40,5	121,1	89,7	5,2	93,4	48,8	975,7
1996	29,9	44,2	50,3	105	151,9	129,9	51,4	130,8	251	61,7	92,1	24,5	1122,7
1997	20,7	35,9	38,5	64,1	160,4	117,1	623,5	85,7	67,6	65,3	119,2	54,6	1452,6
1998	54,4	33,6	52,7	87	45,2	205	114,1	66,1	187,1	117,6	44,4	27,6	1034,8
1999	43,9	72,4	48	113,4	46,3	213,8	130,5	65,5	66,9	78,7	120,6	51,8	105

4. Underground water

4.1 Hydrological conditions

As far as hydrogeology is concerned this area is included in the region 321 Flysh sediments in the basin of the river Odra. Irrigation (water content) in given rocks of the subsoil is connected with the rocks fissures and lithological alternation of claystones and sandstones (see the enclosure No. 2). Good fissures can be awaited in layers of sandstones, conglomerates creating suitable collector with fissure permeability. Substantially weathered layers of sandstones, conglomerates on the transition between the overlying sheet and rock subsoil are characterized with the porously-fissure permeability. In the opposite, the malrstones and claystones are characterized by a limited permeability and thanks to it they belong to the insulators. The circulation of underground water itself is strongly limited by flysh character of strata because the more permeable layers (benches) of sandstones alternate with practically impermeable layers of claystones on which the vertical communication ends.

The intensity of water content in the rock environs is in the direct dependence on the rainfall activity and size of the background of underground water natural reserves. The size of the background is given by hydrological river basin corresponding to the terrain morphology and hydrological river basins given by the interconnection of fissure systems in the rock environs. The limited infiltration of rainfalls into rock environs adjoins to it in the dependence on the permeability of the overlying sheet and vertical communication between the layers.

4.2 Direction of water flow

The main aquifer of underground water flow in the locality is dirty gravel of terrace benches of the Lubina river. It is an aquifer with pore permeability and level under pressure, the direction of underground water flow is generally to the north to the Lubina river which drains the utility space. The less important aquifers are positions of weathered clay of the upper parts of Frydek layers and clay complex of strata with pore permeability.

4.3 Underground water level depth

Based on the engineering-geological surveying of January 2000 performed by Geova, s.r.o. in the utility space in the western half of the area watered gravel were found in the depth of 3,2 – 4,3 m while in the eastern half-part water bearing was not found to the depth of 6,0 m.

Test hole S1
underground water level: not found

Test hole S2
underground water level: not found

Test hole S3
underground water level: met – 3,3 m p.p.t.
steady – 1,3 m p.p.t.

Test hole S4
underground water level: met – 4,6 m p.p.t.
steady – 3,69 m p.p.t.

Test hole S5
underground water: met – 4,6 m p.p.t.

4.4 Surveying

As mentioned above only that engineering-geological surveying was performed in January 2000 (Geova, s.r.o.). Any detailed hydrogeological surveying was not performed in the locality. Only past test holes made within the study for the Vlcovice dams in the area west of the Vlcovice village can be mentioned. These test holes are distanced about 1 200 m from the industrial zone and have an informative significance only.

4.4.1 Results of the performed surveying

During the engineering-geological surveying in 02/2000 only 1 sample of underground water was taken, namely from the test hole S4 for the purpose of a physical-chemical analysis.

The analysis aimed at defining aggressivity against concrete and steel structures. The analysis proved the aggressivity of underground water caused by a carbonate component, the concentration of which exceeds allowed limits set by the standard. It is water slightly aggressive against concrete and medium up to more aggressive against steel. The sample was not analysed from the pollution viewpoint.

Table no. 9 - Physical and chemical water analysis – test hole S4

Colour of non-filtered water		light yellow
Colour of filtered water		light yellow
Turbidity of non-filtered water		opalescent
Turbidity of filtered water		clear, colour-free
Odour at: 20°C 70°C		-
Hydrogen sulphide mg/l		-
Filtrability		good
All substances mg/l		-
Loss of annealing mg/l		-
Evaporation residue dried mg/l		450
Evaporation residue annealed mg/l		-
Loss of annealing mg/l		-
Index of stability		- 1,14
Index of saturation		- 1,68
Riddeck corrosion index		-
Oxidability mg O_2/l		2,20
Oxidability mg $KMnO_4$/l		8,50
Humin substances st.		-
pH		6,60
Acidity total nmo/l		0,20
Acidity apparent nmol/l		0,00
Total hardness ^oN		12,0
Carbonate hardness ^oN		9,00
Non-carbonate hardness ^oN		3,00
Calcareous hardness ^oN		8,50
Magnesium hardness oN		3,50
Sodium+Potassium Na^+, K^+ mg/l		-
Calcium Ca^{2+} mg/l		60,0
Magnesium Mg^{2+} mg/l		15,0
Iron Fe^{3+} mg/l		-
Manganese Mn^{2+} mg/l		-
Ammonium ions mg/l		<0,05
Chlorides Cl^- mg/l		33,0
Sulphates SO_4^{2-} mg/l		77,0
Nitrites NO_2^- mg/l		<0,01
Nitrates NO_3^- mg/l		<0,50
Phosphates PO_4^{3-}		<0,05
Hydrogen-carbonates HCO^- mg/l		98,0
Carbonates CO_3^{2-} mg/l		-
Silicates SiO_2 mg/l		-
Conductivity mS/m		33,0
Carbon dioxide CO_2 free mg/l		8,80
Inflow CO_2 to Fe mg/l		2,00
Inflow CO_2 to CaO mg/l	calculation	6,90
	marble t.	6,90

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4.5 Information on the underground water utilization in the utility space

Under available information and performed field investigation only 2 residential buildings near the state road I/58 use underground water, namely house no. 99 Mr. Kahanek Zdenek and house no. 100 Ing. Fialova Marie. These houses have wells built in their plots and use water for drinking.

Other buildings in the vicinity are supplied with drinking water from the Ostrava Region Water Piping managed by SmVaK.

4.6 Possible underground water pollution sources

Since the direction of underground water flow is generally to the north a potential pollution source seems to be the complex of Tatra Koprivnice on the north-eastern limit of the industrial zone.

In the direction against underground water flow there is neither any manufacturing plant nor agricultural plant which could pollute water. The area is mostly covered with forest.

5. Surface water

From the hydrographic point of view the utility area belongs to the region of surface water III-A-4-d, ie to the region medium-watered with the most watered month - March, heavy fluctuating grade of runoff and very little retention ability.

The area is generally drained by the Lubina river. Other importance streams are:

- Koprivnicka river
- Sykorecek brook
- Babincův brook

Important right-bank tributaries of the Lubina river are:

- Tichavka,
- Lubinka
- Sveceny potok

5.1 Lubina river

The Lubina flows along the north-east side of the industrial zone from the south to the north. Its closest channel is in the distance of roughly 480 m.

5.1.1 Hydrological stream data

No. of hydrological order : 2-01-01-139
Profile : mouth of Koprivnicky to Lubina in km 17,25
Basin area : 130,7 km^2

N-year flows ($m^3.s^{-1}$)

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	35	55	86	114	146	194	234	II

Level height at flow Q20 = 284,40 m a.s.l.
Q100 = 285,30 m a.s.l.

Hydrological arrangement no. : 2-01-01-137
Profile : below grade TATRA in Lubina km 20,45
Basin area : 114,3 km^2

N-year flows

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	31	48	77	102	130	173	209	II

Level height at flow Q20 = 303,00 m n. m.
Q100 = 303,60 m a.s.l.

5.1.2 Water quality

According to regular monitoring performed by Povodi Odry water quality in the Lubina – profile Vlcovice is as follows: (it is ∅ of value for 1999 – 05/2000)

Table no. 10

dissolved O_2	- 11,0
BSK_5	-2,1 mg/l
$CHSK_{Cr}$	-11,6 mg/l
$CHSK_{Mn}$	- 3,2 mg/l
RAS	- 168 mg/l
NL	- 13 mg/l
Fe	- 0,28 mg/l
Mn	- 0,03 mg/l
Cl	- 19 mg/l
SO_4	- 30 mg/l
Ca	- 37 mg/l
Mg	- 5,8 mg/l
$N\text{-}NH_4$	- 0,4 mg/l
$N\text{-}NO_3$	- 2,3 mg/l
$N\text{-}NO_2$	- 0,05 mg/l
pH	- 8,0
collif. bact.	- 51,6 KTJ/ml

5.2 Sykorecek brook

The Sykorecek brook springs in the centre of the industrial zone and flows to the north along Tatry, a.s. and empties into the Koprivnicky river. The length of the river is 4710 m.

5.2.1 Hydrological data of the stream

No. of hydrological arrangement : 21-01-01-138
Profile : ústi do Koprivnicky km 0,0000
Basin area : 4,3 km^2

N-year flows

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	3	6	10	14	18	23,5	28	IV

No. of hydrological arrangement : 2-01-01-138
Profile : km 1,430
Basin area : 3,4 km^2

N-year flows

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	3	5	9	12	15	20	24	IV

No. of hydrological arrangement : 2-01-01-138
Profile : km 3,360
Basin area : 0,23 km^2

N-year flow

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	0,3	0,5	0,9	1,2	1,6	2	2,5	IV

5.2.2 Water quality

The quality of water in Sykorecek brook is not monitored regularly. In July 2000 four water samples were taken for the preparation of this audit by Laborator Morava, s.r.o. and a chemical analysis was performed. The samples was indicated as no. 3 (1582), no. 4 (1583), no. 5 (1584) and no. 6 (1585).

Sampling points are indicated in the layout 1:10 000 (Annex no. 3).

The sample no. 3 (1582) was taken at the outlet of rain water drainage from the complex of Tatra, a.s. in front of emptying into the Sykorecek brook.

The sample no. 4 (1583) was taken about 50 m behind the confluence with rain water drainage from Tatra, a.s.
Sample no. 5 (1584) was taken from the outlet of the channel of WTP Tatra, a.s. in front of mouth to Sykorecek brook.

Sample no. 6 (1585) was taken about 10 m behind the confluence of the brook and outflow behind the WTP.

Table no. 11 - Results of sample analyses

Indicator	no. 1582	no. 1583	no. 1584	no. 1585	Units	Method	Uncertainty %
dissolved oxygen	9,15	10,78	9,05	8,53	mg/l	SOP 42 **N**	10
BSK5	4,35	3,28	2,68	2,88	mg/l	SOP 06	15
CHSK-Mn	9,70	8,89	7,27	6,46	mg/l	CSN EN 8467	10
RAS	400	320	336	308	mg/l	CSN 75 7346	12
non-dissolved substances	6	74	12	18	mg/l	CSN EN 872	10
Fe	0,22	0,25	0,19	0,16	mg/l	SOP 04	10
Mn	<0,05	0,05	0,05	<0,05	mg/l	SOP 04	10
Hg	<0,0005	<0,0005	<0,0005	<0,0005	mg/l	SOP 03	9
Cd	<0,001	<0,001	<0,001	<0,001	mg/l	SOP 02	10
chlorides	3,12	4,31	14,25	14,60	mg/l	CSN ISO 9297	5
sulphates	58	60	55	41	mg/l	SOP 01	10
Ca	60,2	64,8	61,2	58,1	mg/l	SOP 04	8
Mg	3,12	4,31	2,06	2,01	mg/l	SOP 04	7
ammonia nitrogen	0,35	0,18	0,78	0,23	mg/l	SOP 09	8
nitrate nitrogen	9,66	2,99	3,91	6,44	mg/l	SOP 07	11
nitrite nitrogen	0,09	0,03	0,04	0,04	mg/l	SOP 11	6
organic nitrogen	<0,3	<0,3	<0,3	<0,3	mg/l	SOP 41 **N**	20
pH	7,43	7,53	7,72	7,83		CSN ISO 10523	5
NEL	<0,05	<0,05	0,06	<0,05	mg/l	SOP 33	25

SOP – standard operating procedure

The non-accredited tests are in the column "Method" indicated by the letter **N** and relevant SOP.

Uncertainty – qualified or calculated estimate of uncertainty of measurement in %

5.3 Koprivnicka river

The Koprivnicka river flows across the town in its western half in the distance of roughly 1,8 km from the western boundary of the industrial zone. Between the river and industrial zone there is the production complex of Tatry, a.s. The length of the stream is 7,1 km. Koprivnicka river empties to the Lubina in front of Pribor.

5.3.1 Hydrological data of the river

No. of hydrological arrangement : 2-01-01-138
Profile : mouth to Lubiny km 0,000
Basin area : 13,5 km^2

N-year flows

N	1	2	5	10	20	50	100	Class
$m^3.s^{-1}$	7	14	23	31	40	53	63	III

5.3.2 Water quality

The quality of water in the Koprivnicka is not monitored regularly.

For the assessment of the pollution state one sample was taken from the river about 110 m below the outlet from WTP in 1995. The chemical analysis was performed by Povodi Odry, a.s. The result of analysis is as follows:

Table no. 12

Indicators	Units	Sample 5170
NL – all	mg/l	12
NL – annealed	mg/l	5
NL – loss of annealing	mg/l	7
RL – all	mg/l	341
RL – annealed	mg/l	252
RL – loss of annealing	mg/l	89
pH		7,19
CHSK – Cr (h)	mg/l	82
BSK – 5 I.	mg/l	25,0
Nitrates	mg/l	5,6
Nitrites	mg/l	0,443
Ammonia	mg/l	34,74

5.4 Babincův brook

Babincův brook is a stream of a local importance. It flows between Lubina river and the state road I/58 about 250 m from the northern boundary of the industrial zone Vlcovice. From the spring it flows to the west through Vlcovice and empties into Lubiny river. From the viewpoint of the location of the industrial zone its right-bank nameless tributary is important flowing along the eastern boundary of the industrial zone. This tributary has a small content of water and in the event of insufficient precipitation it dries off.

5.4.1 Hydrological data of the brook

No. of hydrological arrangement : 2-01-01-138

N-year flows – not monitored

5.4.2 Water quality

The quality of water in Babincův brook is not monitored too. Within the preparation of this audit two samples of water were taken by Laborator Morava, s.r.o. from the right-bank nameless tributary and a chemical analysis was performed.

The sample indicated no. 1 (1580) was taken near the state road I/58

The sample no. 2 (1581) was taken in the upper part of the brook in fields.
Sampling points are indicated in the layout 1:10 000 (Annex no. 3).

Table no. 13 – Chemical analysis of water samples

Indicator	no. 1580	no. 1581	Units	Method	Uncertainty %
dissolved oxygen	8,75	8,55	mg/l	SOP 42 **N**	10
BSK5	3,62	9,42	mg/l	SOP 06	15
CHSK-Mn	8,57	10,02	mg/l	CSN EN 8467	10
RAS	308	336	mg/l	CSN 75 7346	12
non-dissolved substances	2	2	mg/l	CSN EN 872	10
Fe	0,14	0,10	mg/l	SOP 04	10
Mn	0,06	0,05	mg/l	SOP 04	10
Hg	0,0007	<0,0005	mg/l	SOP 03	9
Cd	<0,001	<0,001	mg/l	SOP 02	10
chlorides	5,56	2,09	mg/l	CSN ISO 9297	5
sulphates	69	75	mg/l	SOP 01	10
Ca	77,2	80,9	mg/l	SOP 04	8
Mg	3,61	2,09	mg/l	SOP 04	7
ammonia nitrogen	0,18	0,08	mg/l	SOP 09	8
nitrate nitrogen	3,91	4,37	mg/l	SOP 07	11
nitrite nitrogen	0,03	0,03	mg/l	SOP 11	6
organic nitrogen	<0,3	<0,3	mg/l	SOP 41 **N**	20
pH	8,04	7,79		CSN ISO 10523	5
NEL	<0,05	<0,05	mg/l	SOP 33	25

SOP – standard operating procedure

The non-accredited tests are in the column "Method" indicated by the letter **N** and relevant SOP.

Uncertainty – qualified or calculated estimate of uncertainty of measurement in %

5.5 Other water streams and basins

Other tributaries of the Lubina river in the wide vicinity such as Lubinka, Sveceny potok and Tichavka create right-bank tributaries and do not affect the industrial zone and also the industrial zone will not affect them. Similarly, the water basin Vetrkovice distanced 1,5 km north-eastwards.

5.6 Limits of admissible surface water pollution

In accordance with the Decree of the Government no. 82/1999 of Code the indicators and values of the admissible grade of surface water pollution are as follows:

Table no. 14

Indicator	Symbol	Unit
1. Dissolved oxygen	O_2	mg/l
2. Biochemical consumption of oxygen	BSK_5	mg/l
3. Chemical consumption of oxygen by permanganate	$CHSK_Mn$	mg/l
4. Chemical consumption of oxygen by dichromate	$CHSK_{Cr}$	mg/l
5. Total organic carbon	TOC	mg/l
6. Sulphides, sulphates	S^{2-}, H_2S	mg/l
7. Water reaction	pH	-
8. Temperature	t	°C
9. Dissolved substances dried	RL105	mg/l
10. Dissolved substances annealed	RL550	mg/l
11. Total iron	Fe	mg/l
12. Total manganese	Mn	mg/l
13. Free ammonia	NH_3	mg/l
14. Ammonia nitrogen	$N\text{-}NH_4^+$	mg/l
15. Nitrite nitrogen	$N\text{-}NO_2$	mg/l
16. Nitrate nitrogen	$N\text{-}NO_3$	mg/l
17. Organic nitrogen	N_{org}	mg/l
18. Total phosphor	P_C	mg/l
19. Chlorides	Cl^-	mg/l
20. Sulphates	SO_4^{2-}	mg/l
21. Calcium	Ca^{2+}	mg/l
22. Magnesium	Mg^{2+}	mg/l
23. Fluorides	F^-	mg/l
24. Monohydric phenols	FN 1	mg/l
25. Anion tensides	PAL-A	mg/l
26. Non-polar exareaed substances	NEL	mg/l
27. All cyanides	CN^-	mg/l
28. Active chlorine	Cl_2	mg/l
29. Boron	B	mg/l
30. Mercury	Hg	mg/l
31. Cadmium	Cd	mg/l
32. Lead	Pb	mg/l
33. Arsenic	As	mg/l
34. Copper	Cu	mg/l
35. Total chrome	Cr	mg/l
36. Chrome (VI)	Cr^{VI}	mg/l
37. Cobalt	Co	mg/l
38. Nickel	Ni	mg/l
39. Zinc	Zn	mg/l
40. Aluminium	Al	mg/l

Note
The values of indicators express the pollution of surface water at 355-day flow or at minimum guaranteed water flow and after mixing with waste or special water or the value of an indicator with the probability of non-exceeding of 90 % (oxygen exceeded).

5.7 Surface water quality in the utility space

Table no. 15 - Water quality of taken samples

Indicator	no.1580	no.1581	no.1582	no.1583	no.1584	no.1585	Lubina	Units	Values of surface water pollution acc. to Govern. Decree 82/1999 Code
dissolved oxygen	**8,75**	**8,55**	**9,15**	**10,78**	**9,05**	**8,53**	**11**	mg/l	5
BSK5	3,62	**9,42**	4,35	3,28	2,68	2,88	2,1	mg/l	8
CHSK-Mn	8,57	10,02	9,70	8,89	7,27	6,46	3,2	mg/l	20
RAS	308	336	400	320	336	308	168	mg/l	-
non-dissolved substances	2	2	6	74	12	18	13	mg/l	-
Fe	0,14	0,10	0,22	0,25	0,19	0,16	0,28	mg/l	2,0
Mn	**0,06**	0,05	<0,05	0,05	0,05	<0,05	0,03	mg/l	0,5
Hg	0,0007	<0,0005	<0,0005	<0,0005	<0,0005	<0,0005		mg/l	0,001
Cd	<0,001	<0,001	<0,001	<0,001	<0,001	<0,001		mg/l	0,005
chlorides	5,56	2,09	3,12	4,31	14,25	14,60	19	mg/l	350
sulphates	69	75	58	60	55	41	30	mg/l	300
Ca	77,2	80,9	60,2	64,8	61,2	58,1	37	mg/l	300
Mg	3,61	2,09	3,12	4,31	2,06	2,01	5,8	mg/l	200
ammonia nitrogen	0,18	0,08	0,35	0,18	0,78	0,23	0,4	mg/l	2,5
nitrate nitrogen	3,91	4,37	9,66	2,99	3,91	6,44	2,3	mg/l	11
nitrite nitrogen	0,03	0,03	**0,09**	0,03	0,04	0,04	0,05	mg/l	0,05
organic nitrogen	<0,3	<0,3	<0,3	<0,3	<0,3	<0,3	-	mg/l	3,0
pH	8,04	7,79	7,43	7,53	7,72	7,83	8,0		6-9
NEL	<0,05	<0,05	<0,05	<0,05	0,06	<0,05	-	mg/l	0,2

From the water samples it was found that surface water in the utility space are less polluted. In all taken samples dissolved oxygen was exceeded 1,7 – 2,2 x.

In the sample no. 1582 (rain water drainage from Tatra) the nitrite nitrogen content was exceeded 1,8 x. After mixing with water from Sykorecek brook the admissible limits of this indicator were not exceeded.

It is necessary to note that excepting the Lubina river water quality in the streams is not monitored regularly.

5.8 Possible surface water pollution sources

Sykorecek brook
Into the brook waste of different quality from septic tanks from the housing, treated water from the WTP of Tatra, a.s. Koprivnice are emptied in 2.66 km. Substantial inflow and potential pollution source may be caused by the outlet of the rain water drainage of the car park of Tatra, a.s. Koprivnice in 3.350 km and the outlet of rain water drainage in 3.010 km.

Babincův brook
Water in Babincův brook may be polluted by harmful matters from the farms around the site (plant protective spraying, gasoline and oil from agricultural machines and tractors). Into the brook as well sewage effluent from the houses of Vlcovice are emptied.

Lubina river
A possible source of water pollution of the Lubina within the utility space is a dump of industrial waste located on the left bank of the river about 400 m to the north from the site

Koprivnicka river
Water in Koprivnicka river may be polluted above all upon the breakdown the municipal water treatment plant emptying into it. Into to the river rain water drainage from different plants in the town are emptied.

5.9 Flood areas

The area of the industrial zone with the lowest altitude of 322 m a.s.l. is lying out of the flood area of the Lubina river. The level Q100 in the Lubina reaches in 20,45 km, ie below the level of Tatra in the village Lubina northward opposite the industrial zone, the height of 303,60 m a.s.l.

The level of flood discharge of Sykorecek brook is affected by the levels of n-year water or the Lubina river only at the mouth where the stream floods adjacent lands.

In the upper part of the brook water from the brook may flood not only the lands but also the housing. In the areas of the industrial zone the channel of the Sykorecek brook has a sufficient capacity and therefore there is no danger of flood.

6. Soil

6.1 Geological conditions

From the geomorphologic point of view the area belongs to the external West Carpathians, West Slopes of Beskydy Mountains, subsystem of Podbeskydska Hills, Stramberk Hills near the Natural Park “Cerveny kamen“ sloping to the Lubina river valley. Geomorphology of the original ground is hidden by intensive farming within the utility space.

The utility space is composed of two main stratigraphic units - rocks of the Mezosoic and quaternary periods. The prequaternary subsoil of the site are created by the rocks of Frydek

strata of the “Podslezska unit” represented by grey powder lime claystone weathered in upper locations.

The terrain of interest is composed of two main stratigraphic units – rocks of Mesozoic era (Mesozoicum) and Quaternary era (Quater). The Pre-Quarter subsoil of the territory is created by the rocks of Frydek strata of the Under-Silesian unit, represented by grey powder-like calcareous claystones, in the upper positions by the partially weathered ones.

In the geological structure of Quaternary covering formations of the territory of interest in the upper parts of the territory in the south locality part of declination there take share the deluvial argillaceous sediments of the holocene up to pleistocene age (bore hole S5) creating the dejection cone (bore hole S1) in a part of the locality, getting on to rocks of the Frydek strata.

In the plain part of the locality the covering of Mesozoic formations is created by argillaceous fluvial gravel of the upper accumulation of the main terrace of the river Lubina, on the loess (Eolic) clays of Würm Age (flooded) get on with the addition of the deluvial component (bore holes S2, S3). In the vicinity of local water flows and the river Lubina the covering formations are represented by fluvial sediments, in case of the river Lubina the valley terraces, represented by the flooding clays and argillaceous gravel (bore holes S4 and S6).

The youngest sediments in the territory investigated are the anthropogene made-up grounds reached by the bore hole S5, of the character of aggregate and cinders in the local road body.

6.2 Geological survey

In January 2000 Geova, s.r.o. did in the area of the industrial zone six engineering-geological test holes to the depth of 3,0 – 6,0 m. The holes were indicated S1 – S6 and are drawn in the layout 1:10 000 (Annex no. 2)

6.3 Results of surveying works

On the basis of drilling works carried out the following basic types of soil and materials were identified in the terrain of interest according to the situating of single bore holes:

- topsoil, made up grounds
- loess, flooding, deluvial clays
- argillaceous gravel, water-bearing argillaceous gravel
- partially weathered claystones, claystones

According to the customer‘s requirement three failed samples of earth were taken off for the carrying out of laboratory analyses and classification according to the CSN 731001, and namely from the bore hole S3 in metrage (footage) 0,8-1,5 m, 3,2-4,5 m, and the bore hole S6 0,2-1,0 m.

6.3.1 Topsoil

The topsoil creates the most upper position in prevailing part of the interest terrain. The topsoil is represented by the humus clay, darkly brown, of solid consistence. According to the CSN 731001 we include this earth into the group of special earths – organic earths with the identification CLO. For foundations of constructions this position is not considered.

6.3.2 Made-up grounds

In the space of interest the made-up grounds were reached only by the bore hole S5 in the line of local reinforced road. These earths are generally considered as unsuitable for foundations.

6.3.3 Argillaceous clays (clay loams)

In the subsoil of the upper position of topsoil the upper Quarter covering is mainly created by argillaceous clays (clay loams), according to the macroscopic description belonging in single locality parts to deluvial, loess and flooding argillaceous clays (clay loams). According to the CSN 731001 we include the argillaceous clays (clay loams) in the group of fine-grained earths, class F6 – symbol CL (clay with low plasticity), in the vicinity of the Lubina flow into the class F4 – symbol CS (arenaceous /sandy/ clay). Directive standard characteristics of physically-mechanical properties are given in the following table:

Table no. 16

Indicator	Symbol/unit		F6 (CSN 731001)	F4 (CSN 731001)
Volume weight	γ	kN/m^3	21,0	18,5
Deformation module	E_{def}	Mpa	4	4
Total angle of internal friction	φ_u	^{o}	0	0
Total coherence	c_u	kPa	50	50
Effective angle of internal friction	φ_{ef}	^{o}	18	22
Effective coherence	c_{ef}	kPa	11	14
Poisson‘s number	ν	-	0,4	0,35

6.3.4 Clay gravel

In the subsoil of argillaceous clays (clay loams), in the plain part of the locality, the clay gravels were reached, in the vicinity of the Lubina flow the clayey gravels, medium-compacted and compacted ones, dry and water bearing ones with the boulders 5 – 30 cm. According to the CSN 731001 we include these sediments in the group of gravel earths, class G5 – symbol GC (clay gravel), in the vicinity of the Lubina flow into the class G4 – symbol GM (argillaceous gravel). Directive standard characteristics of physically-mechanical properties are given in the following table:

Table no. 17

Indicator	Symbol/unit	G5 (CSN 731001)	G4 (CSN 731001)
Volume weight	γ kN/m^3	19,5	19
Deformation module	E_{def} Mpa	40	60
Effective angle of internal friction	φ_{ef} ^{o}	28	30
Effective coherence	c_{ef} kPa	4	3
Poisson‘s number	ν -	0,3	0,3

6.3.5 Weathered claystones, claystones

In the subsoil of clay loams (argillaceous clays), in the sloping part of the locality, the claystones were reached, mainly to the final depth of bore holes the partially weathered ones. According to the CSN 731001 we include these rocks into the group of rock rocks, in the sense of article 63 the rocks were classified according to the compression strength, determined by an evaluation. The classification of rocks of single classes according to the strength of rock material is given in the Table no. 18.

Table no. 18

Class	Strength (Mpa)	Strength	Characteristics
R6	0,5-1,5	Extremely low	The rock can be scraped by a nail
R5	1,5-5	Very low	The rock can be crushed down by a hand
R3	15-50	Medium	The rock can be easily crushed down by a hammer

With the drilling prospecting works the below given geological profile was reached with giving the classification according to the CSN 731001. The classification, in case of earth samples taken off, was carried out by the laboratory of the firm Unigeo a.s., in other cases the classification was carried out on the basis of macroscopic description. The values of table counted bearing capacity (power) R_{dt} (kPa) were determined with the respect of the CSN 731001 on the basis of the macroscopic description.

Bore hole S 1

0,0 - 0,1 humus loam (clay) – top soil, darkly brown, solid consistence, CLO
0,1 - 1,25 rusty brown loam (clay) (argillaceous clay), deluvial, powder-like, solid, F6 – CL,
R_{dt} = 100 kPa
1,25 - 2,4 gray-brown clay loam (argillaceous clay), deluvial, powder-like with the addition of angular fragments of claystone, solid, F6 – CL, R_{dt} = 120 kPa
2,4 - 2,95 gray-brown decomposing weathered claystones with the claystone fragments (eluvium), R6, R_{dt} = 150 kPa

2,95 - 4,5 gray partially weathered claystones with the claystone fragments, R5, R_{dt} = 200 kPa

The underground water level: not reached

Bore hole S 2
0,0 - 0,2 humus loam (clay) – top soil, darkly brown, solid consistence, CLO
0,2 - 1,8 rusty brown loess argillaceous clay (clay loam), with gray ghost lines, solid, F6 – CL, R_{dt} = 100 kPa
1,8 - 3,1 rusty (fluvial) argillaceous clay, with the addition of organics and small boulders of gravel, solid, F6 – CL, R_{dt} = 120 kPa
3,1 - 4,2 gray-brown clay gravel with boulders up to 5 cm, medium-compacted, G5 – GC, R_{dt} = 200 kPa
4,2 - 4,5 gray clay gravel coarse with the boulders up to 20 cm, compacted, wet, G5 – GC, R_{dt} = 250 kPa

The underground water level: not reached

Bore hole S 3
0,0 - 0,4 humus loam (clay) – top soil, darkly brown, solid consistence, CLO
0,4 - 1,9 rusty gray clay loam, solid, F6 – CL, R_{dt} = 100 kPa
1,9 - 2,8 rusty brown clay gravel, with small boulders of sandstone up to 5 cm, medium-compacted, G5 – GC, R_{dt} = 200 kPa
2,8 - 3,2 rusty gray clay gravel with the boulders up to 20 cm, compacted, wet, G5 – GC, R_{dt} = 220 kPa
3,2 - 4,5 gray clay gravel coarse with the boulders up to 25 cm, compacted, water bearing beds, G5-GC, R_{dt} = 250 kPa

Underground water level:
Bumped into : 3,3 m p.p.t.
Stabilized: 1,3 m p.p.t.

Bore hole S 4
0,0 - 0,3 humus loam (clay) – top soil, darkly brown, solid consistence, CLO
0,3 - 0,7 brown-black rusty stained clay loam, solid, F6 - CL
0,7 - 1,0 gray clay loam with rusty ghost lines, solid, F6 – CL, R_{dt} = 100 kPa
1,0 - 2,5 rusty gray clay loam, solid, F6 – CL, R_{dt} = 100 kPa
2,5 - 2,8 rusty clay gravel with boulders up to 5 cm, medium-compacted, G5 – GC,
R_{dt} = 200 kPa
2,8 - 4,3 rusty brown clay loam, solid, F6 – CL, R_{dt} = 120 kPa
4,3 - 5,5 rusty clay gravel with boulders up to 15 cm, water bearing beds, G5 – GC,
R_{dt} = 250 kPa

Underground water level:
Bumped into: 4,6 m p.p.t.
Stabilized: 3,69 m p.p.t.

Bore hole S 5
0,0 - 1,0 the made up grounds of the aggregate and cinders character
1,0 - 2,3 yellow-brown argillaceous clays, at the basis with the claystone fragments, solid, F6 – CL, R_{dt} = 100 kPa
2,3 - 2,95 gray clays powder-like (eluvium), solid, F6 – CL, R_{dt} = 100 kPa
2,95 - 4,5 brown decomposing weathered argillaceous slates with the addition of vein quartz, R6, R_{dt} = 150 kPa
4,5 - 5,1 brown decomposing weathered argillaceous slates, wet, R6, R_{dt} = 120 kPa
5,1 – 5,3 brown decomposing partially weathered argillaceous slates, dry, R6, R_{dt} = 150 kPa
5,3 - 6,0 gray claystones,R3, R_{dt} = 400 kPa

Underground water level:
Bumped into : 4,6 m p.p.t.

Bore hole S 6
0,0 - 0,15 humus loam (clay) – top soil, darkly brown, solid consistence, CLO
0,15 - 1,0 brown-gray fluvial clay-sand loam (argillaceous-sand clay) with the small boulders of gravel, solid, F4 – CS, R_{dt} = 150 kPa
1,0 - 3,0 darkly brown argillaceous gravel with boulders of glauconitic sandstone, boulders up to 30 cm, wet, medium-compacted, G4 – GM, R_{dt} = 400 kPa

Underground water level: not reached

In the interest locality the foundations conditions can be characterized as simple ones, under the underground water level as complicated ones. For the case of foundation, for current objects, the value of bearing power 100 – 120 kPa can be recommended, in the depth highest than 2,5 m the value of 150 kPa. In case of foundation of high constructions it is necessary to make the foundation conditions more accurate by detailed prospecting in the place of construction , and in case of using of higher values than standardized ones the taking over of footing bottom by responsible geo-technician is necessary.

6.4 Soil conditions

Soil in the utility area has the character of medium-heavy loam-clay and heavy clay-loam, clay-sand and clay soil with sand. Typologically, soil may be classified as brown slightly gleization soil. The soil has mostly a deep profile without skeleton solely with admixture or medium-stony. According to the results of laboratory analyses the chemism of the soil is satisfactory only that of arable layer.

The chemism of subsoil layers is quite satisfactory, the content of Fe_2O_3 shows a significant settlement of subsoil layers and worsened permeability caused by that. The soil is in lower layers quite delimed.

Main soil units occurring in the site are as follows:

- Gleization soil on slope loam, medium-heavy to medium-skeleton or slightly stony, inclining to temporary waterlogging.
- Brown gleization soil, gleization redzins and gleization soil on different slates, on shale and silt, lighter to medium-heavy, to medium-gravel or stony, inclining to temporary waterlogging.
- brown gleization soil and gleization "redzins" on slate and settlements of Carpatian "flysh", heavy to very heavy, without gravel to slightly gravel, inclining to temporary waterlogging.

6.5 Soil investigation

In July 2000 Laborator Morava, s.r.o., Studénka, took four samples of soil for the identification of foreign matters of inorganic nature under Decree of the Ministry of Ecology CR no. 13/94 of Code. For sampling the methods of ÚKZÚZ – methodological procedure for agrochemical testing of soil - were applied. Samples were taken from by probes made over the all area. Pits were made to the depth of roughly 30 cm, one sample consists of about 50 pits of the whole area.

In 1996 The Central and Testing Agricultural Institute Brno, department of soil agrochemistry and plant aliment, took one sample in the territory of the industrial zone and two samples in the close vicinity.

Taken samples are indicated as no. 1 (1586E), no. 2 (1587E), no. 4 (1589E), no. 5 (1590E), 1119, 1142 and 0131. Sampling points are drawn in the layout 1:10 000 (Annex no. 2).

6.6 Results of investigating works

The content of risk elements in the samples was determined in 07/2000 by the decomposition method using aqua regia, in 1996 by exarea 2M HNO_3 (relation of soil to exarea 1:10). All inorganic elements have been measured, see Annex no. 1 Decree no. 13/94 of Code.

Table no. 19 – Results of sample analysis (total content in aqua regia)

Indicator	no. 1586	no. 1587	no. 1589	no. 1590	Unit	Method**	Uncertainty %
arsenic	7,75	9,50	8,80	7,00	mg/kg	**SA*** ÚKZÚZ	20
beryllium	0,75	1,00	1,25	0,75	mg/kg	**SA*** ÚKZÚZ	20
cadmium	0,32	0,46	0,34	0,42	mg/kg	**N** ÚKZÚZ	10
cobalt	9,75	10,0	9,75	8,25	mg/kg	**N** ÚKZÚZ	10
chrome	31,0	31,8	34,8	19,8	mg/kg	**N** ÚKZÚZ	10
mercury	0,115	0,094	0,099	0,089	mg/kg	**N** ÚKZÚZ	10
copper	13,8	18,5	18,3	15,5	mg/kg	**N** ÚKZÚZ	10
molybde-num	1,53	1,68	<1,00	1,00	mg/kg	**N** ÚKZÚZ	10
nickel	18,0	20,0	23,0	16,3	mg/kg	**N** ÚKZÚZ	10
lead	22,8	72,8	24,8	21,0	mg/kg	**N** ÚKZÚZ	20
vanadium	35,6	38,5	46,8	26,0	mg/kg	**N** ÚKZÚZ	10
zinc	68,5	76,0	81,8	61,3	mg/kg	**N** ÚKZÚZ	20

Method** - acc. to current methods of ÚKZÚZ (mineralizate in "aqua regia" measured by the method AAS, ETA – As, Cd, Mo, V a Hg – AMA 254)

Non-accredited tests are indicated by the letter N in the column "Method".
Subconareas accredited **SA**, non-accredited **SN**.

Uncertainty - qualified or calculated estimate of measurement uncertainty in %

Limits of the risk element content in soil (mg.kg^{-1}) under Decree no. 13/1994 of Code

Table no. 20 - Total content (Decomposition by aqua regia)

Elements	Maximum admissible values	
	light soil	other soil
As	30,0	30,0
Be	7,0	7,0
Cd	0,4	1,0
Co	25,0	50,0
Cr	100,0	200,0
Cu	60,0	100,0
Hg	0,6	0,8
Mo	5,0	5,0
Ni	60,0	80,0
Pb	100,0	140,0
V	150,0	220,0
Zn	130,0	200,0

Notes:
1. Data on risk element content are not valid for organic soil.
2. Light soil is sand and loam-sand soil acc. to the analytic method of prof Novak (Entire Methodology of plant aliment no. 1/1990, published by the Institute of Scientific and Technical Information in Prague).
3. The content of risk elements in soil (mg.kg-1): Data stated are valid for mixed samples taken from the upper layer of tested mineral soil in the thickness of 0,25 m, air-dried to constant mass.

Table no. 21 - Results of sample analyses in exarea 2M HNO_3

Elements	In exarea 2 M HNO_3 in mg.kg^{-1}									Tot. content
	Cd	Cr	Pb	Cu	Zn	Co	Ni	V	Be	Hg
1119	0,44	6,14	21,9	8,3	25,7	5,61	5,24	9,17	0,46	0,101
1142	0,42	4,58	20,8	6,5	19,6	4,23	2,69	11,9	0,41	0,274
0131	0,35	3,20	20,6	9,7	17,4	5,00	3,90	nest.	nest.	0,088

Limits of the risk element content in soil (mg.kg-1) under Decree no. 13/1994 of Code

Table no. 22 - Extract 2 M HNO_3 (extract by solution 2 M HNO_3 ration of soil to extract agent 1:10)

Elements	Maximally admissible values	
	light soil	other soil
As	4,5	4,5
Be	2,0	2,0
Cd	0,4	1,0
Co	10,0	25,0
Cr	40,0	40,0
Cu	30,0	50,0
Hg	-	-
Mo	5,0	5,0
Ni	15,0	25,0
Pb	50,0	70,0
V	20,0	50,0
Zn	50,0	100,0

Notes:
1. Data on risk element content are not valid for organic soil.
2. Light soil is sand and loam-sand soil acc. to the analytic method of prof Novak (Entire Methodology of plant aliment no. 1/1990, published by the Institute of Scientific and Technical Information in Prague).
3. The content of risk elements in soil (mg.kg-1): Data stated are valid for mixed samples taken from the upper layer of tested mineral soil in the thickness of 0,25 m, air-dried to constant mass.

6.6.1 Soil pollution assessment

The limit of risk elements admissible as a maximum in all soil samples as mentioned in Amendment no. 1 to Decree no. 13/1194 of Code was not exceeded. The content of risk elements in concentrations is several times lower than allowed values.

In the CR there is no other standard or law which set any admissible content of pollutants in soil.

6.7 Current utilization of lands

The lands for the construction of the industrial zone are at present without any vegetative cover and used for farming as arable land.

6.8 Possible pollution by the sources round

The area in the close vicinity towards the road I/58 or the access road leading to the rear gatehouse of Tatra, a.s. may be theoretically polluted by the escape of oil or other harmful substances in the event of possible crash of vehicles driving on the roads. The type of such a crash is generally possible.

The soil pollution may be caused as well by agricultural production, ie by tractors, combines or other agricultural machines used for farming.

If such soil pollution happens, it will be local pollution only, which can be recovered by the stripping of polluted soil.

Soil may be polluted by the escape of chemical matters used for the spraying of agricultural plants. For fertilizing dung is used mostly, synthetic fertilizers are used to a limited extent. Neither the Tatra, a.s., operation would affect the soil quality. The industrial zone is out of the area with dominant winds and the drainage of Tatra, a.s. is built out of the assessed area.

7. Radon

7.1 Site investigation

Within the ecological audit the company Radkontrol – Ing. Ivan Dolezal took in July 2000 samples of soil air for the determination of the risk of radon penetration from the subsoil for the planned construction of occupied buildings.

Regarding the fact that in the time of measurements the number of future buildings and their detail layout were not known, the investigation was aimed at finding out radon risk for different types of quaternary covers in the area. For measurement purposes three sub-units were selected indicated as „Area 1“ (north-east limit of the complex) – representing the loess loam cover, „Area 2“ (south-east limit of the complex) – representing the loess loam cover a „Area 3“ (south-west limit of the complex) – representing sloped sediments. The layout of respective areas are shown in Annex no. 4.

7.2 Sampling points

Soil air probes were spaced in the above mentioned areas in distances of about 20 m (paced). Not to damage existing crop plants, the sampling was situated at the margins of the area - along roads in particular. The frequency of sampling followed the methodology requirements of radon survey : **15 soil air samples were collected** (sucked) **on each of the areas - total 45 samples were collected**. Minimum evaluable data sets are of concern - which agree with the tentative character of the survey (to evaluate the whole of area - sampling in 20 x 20 m sampling grid should be done - which represents more than 2000 samples). To evaluate the permeability of soil air sampling layer, **4 permeability measurements (in situ) were done** in each area. No sampling of soil were done (to determine the soil permeability) because the geological survey had been done (Geova s.r.o. company had performed it). Locations of sampling sites and permeability measuring points are depicted on schemes attached to this report (see Spatial distribution schemes - Annex 4).

7.3 Applied investigation methods

Soil pore air samples were collected by means of a hollow steel probe (tube), by „lost spike“ method from a depth of 0,8 m below ground. To measure the soil air radon concentration (volume activity of radon), scintillation detection of alpha particles of radon (Rn-222 nuclide) and its daughter products was used. The LUK-4a radon detector and Lucas chambers of 145 ml volume were employed. Uncertainty of the method is about 15%. Volume quantification was provided by Janett syringe.

7.4 Subbase permeability

The footing bottom level of prospective buildings was not known at time of this report elaboration; slab-on-ground structures can be expected in particular. The direct subsoil will be formed by clayey loams (F6 soil class).

On the basis of the grain size (fine fraction prevails), the layer formed by clayey loams (F6 soils) can be regarded as a very low permeable environment. The river terrace gravels (G5 soils) can be regarded as a medium permeable layer (basic on the grain size).

To verify the sampling layer soil permeability (0,8 m depth), measurements were performed by means of RADON-JOK permeability meter. The following permeability coefficients of sampling layer were found (placement of permeability measurement sites - see Annex 3):

Sampling site no.	permeability coefficient (m^2)	soil permeability category
P1	$<1.E^{-16}$	low
P2	$<1.E^{-16}$	low
P3	$<1.E^{-16}$	low
P4	$<1.E^{-16}$	low
P5	$<1.E^{-16}$	low
P6	$2.E^{-13}$	boundary: medium - low
P7	$7.E^{-14}$	low
P8	$<1.E^{-16}$	low
P9	$<1.E^{-16}$	low
P10	$<1.E^{-16}$	low
P11	$2.E^{-14}$	low
P12	$<1.E^{-16}$	low

Only a small variation of sampling layer permeability in horizontal profile is evident. Very low permeabilities prevail; even lower than the low determination limit of given method is ($<1.E^{-16}$). The increased permeability (P6 site - Area 2) relates to higher gravel fraction of sampling layer at this site (probe penetration was worse in this site - maybe the consequence of anthropogennous material ocurrence at sampling level). With respect to the sporadic occurence of the increased permeability, it was not considered in the summary classification.

On the basis of the permeabilities founded in both horizontal and vertical profile, **the resulting low permeability category** follows for all the areas measured.

7.5 Results of radon volume activity measurement

AREA No. 1

VOLUME ACTIVITY OF SOIL GAS RADON (Rn 222)	
Mean value	**52.1 kBq/m^3**
Standard deviation	**22.2 kBq/m^3**
RESULTING VALUE (QIII):	**57.1 kBq/m^3**

SUBSOIL	
Soil classification(acc.toCSN731001standard):	**F6 (clay)**
PERMEABILITY OF SOIL:	**low**

RESULTING RADON RISK CATEGORY:	**MEDIUM**

Number of soil gas samples: 15 **No. of soil samples: 0**

AREA No. 2

VOLUME ACTIVITY OF SOIL GAS RADON (Rn 222)	
Mean value	**36.7 kBq/m^3**
Standard deviation	**10.7 kBq/m^3**
RESULTING VALUE (QIII):	**40.2 kBq/m^3**

SUBSOIL	
Soil classification(acc.toCSN731001standard):	**F6 (clay)**
PERMEABILITY OF SOIL:	**low**

RESULTING RADON RISK CATEGORY:	**MEDIUM**

Number of soil gas samples: 15 **No. of soil samples: 0**

AREA No. 3:

VOLUME ACTIVITY OF SOIL GAS RADON (Rn 222)	
Mean value	**36.5 kBq/m^3**
Standard deviation	**10.7 kBq/m^3**
RESULTING VALUE (QIII):	**39.9 kBq/m^3**
SUBSOIL	
Soil classification(acc.toCSN731001standard):	**F6 (clay)**
PERMEABILITY OF SOIL:	**low**
RESULTING RADON RISK CATEGORY:	**MEDIUM**

Number of soil gas samples: 15 **No. of soil samples:** 0

More distinct excess of low risk high limit in the Area 1 is of concern, while the classification of both Area 2 and Area 3 approaches the „medium risk-low risk" boundary.

The occurrence of maximum radon volume activity values goes along with high moisture saturation of sampling layer level on each of the area measured (water suction was observed at that sampling sites) - the consequence of limited radon diffusion and convection up to the surface atmosphere (the 3rd - 5th days before the measurement were rainy).

The summary classification according to the valid methodology (issued by Czech Geological Survey, 1994) which is based on the 3. quartile value of radon data set (Area 1: 57,1 kBq.m^{-3}; Area 2: 40,2 kBq.m^{-3} ; Area 3: 39,9 kBq.m^{-3}) related to subsoil permeability corresponds the medium radon risk category - for all the areas measured. Concerning the Area 2 and Area 3, the classification approaches the boundary of medium risk and low risk category (the high limit of low radon risk category of about 35 kBq/m3 for the third quartile corresponds the lowest subsoil permeabilites).

7.6 Assessment of radon risk in the utility space

The measured areas of the Vlcovice Business Area were **classified into the medium radon risk category** on the base of the measured values of radon volume activity in soil air and on the base of the subsoil permeability. Due to limited sampling frequency, the measured results should be regarded as a primary and tentative information of the area observed. The above mentioned classification represents just peripheral parts of the area. The classsification has been done with respect to the conservative (stricter) approach of classification not to underestimate the resulting radon risk. Due to a higher moisture content of surface soil (interval before sampling had been rainy; substantial part of surface soil were „bare" - grassless), the measured values can be regarded as annual maxima.

The survey results can be summarized as follows:

- **it can be stated unambiguously that there are no high radon risk areas in the whole of Vlcovice Business Area,**
- **the medium radon risk- and the low radon risk values have occured in the area of concern; the substantial part of the observed area has been characterized by „soft“ values of medium radon risk category** (near the „medium risk-low risk“ boundary),
- **if no additional** (detailized) **radon survey is carried out, structures designed within the area shall be protected against radon penetration - corresponding the medium radon risk category; possible detailed survey** (at time of structures layout design**) could specify the risk category** (whether medium risk or low risk**) of individual building sites.**

According to Decree no. 184/97 Coll. on requirements for radiation protection assurance (and according to correlate provisions of Building Law and Atomic Law) - builidngs constructed in area other than with a low radon risk **must be protected against radon penetration.**

7.7 Recommendations for construction

The measured areas has been classified into the medium radon risk category - according to Decree no. 184/97 Coll. on requirements for radiation protection assurance (and according to correlate provisions of Building Law and Atomic Law) - buildings constructed in the medium radon risk area **must be protected against radon penetration.**

The CSN 73 0601 standard (Protection of buildings against radon from the soil) deals with the protection against radon. General principles of the protection against radon according to the standard are described below; the specific precautions should be designed by a competent designer with respect to both the construction and ventilation of buildings.

7.8 Protection of the buildings with occupied rooms (work-rooms) contacted contact

The above mentioned standard requires the following preventive measures corresponding the measured values of radon volume activity and the subsoil permeability:

All the constructions of designed building being in contact with soil must be carried out in the first class of tightness (i.e. a design significantly limiting air convection and decreasing radon diffusion), thus with a radonproof insulation. Utility entrances must be sealed.

If all the rooms on contact floor (in contact with soil) **are mechanically ventilated** (air conditioned), **the radonproof insulation can be replaced by a damp**(water)**-proof one** (designed according to CSN 73 0600 standard) - i.e. the radonproof insulation is not necessary.

It can be generally recommended the constructions in contact with soil to provide with a radonproof insulation (i.e. the insulation shall be a material of a high diffusion resistance - the best characteristics are reached by polypropylene based foils, "over average" characteristics are reached by high density polyethylene foils, softened PVC foils, and asphalt boards with Al foil, and worse characteristics are reached by "classic" asphalt boards). The radonproof insulation shall be carried out along with a thorough bed plate (to prevent a crack occurence at the „bed plate-peripheral walls“ connection) and a sealing of both wiring and piping outlets led from below floors.

The following **minimum radonproof insulation thicknesses** have been calculated according to the CSN 73 0601 standard (for the measured radon risk and for the standard ventilation conditions: room volume air exchange of $0.3.h^{-1}$ in prospective buildings); "typical" dimensions of dwelling room (2,5 m high, of a volume of 50 m^3) were used to calculate thicknesses of different insulation sorts (to compare insulations of different quality) - see the table:

Table no. 24

INSULATION	MATERIAL	MINIMUM INSULATION THICKNESS (mm) - TRACT 1	MINIMUM INSULATION THICKNESS (mm) - TRACT 2	MINIMUM INSULATION THICKNESS (mm) - TRACT 2
OLDROYD	polypropylene	0.01	0.01	0.01
FATRAFOL 803	softened PVC	0.52	0.36	0.36
BITAGIT(SRS35)	asphlat board	1.49	1.05	1.05
SKLOBIT	asphalt board	0.89	0.63	0.63

8. Noise

8.1 Main noise sources

The main noise source within the utility space impacting upon the housing is the traffic noise on the road I/58 Pribor – Frenstat pod Radhostem. According to the information of the road databank in Ostrava 3,163 cars and 588 trucks per 24 hours drove on the road I/58 in 1995. In 1995 – 1999 the traffic density of the I class roads increased by about 28 %, trucks traffic by 35 % and car traffic 27 %, it means that at present 4,107 cars and 974 trucks drive on this road.

The housing in the utility space is situated more than 600 m from the complex of Tatra, a.s., The impact upon is caused by the above mentioned traffic is not substantial at present.

8.2 Noise impacts upon the existing buildings

Noise impacts of the existing residential buildings located close to the road I/58 were assessed based on the computer programme Noise + version 4 created by the company Jp Soft Praha and is 70,8 dB.

The highest admissible outdoor noise values are according to hygienic regulations 37/1977 Code 80 dB by day (50 dB basic level + 10 dB correction of mixed zone + 20 dB area around the roads of I and II class) and 40 dB at night.

9. Conclusion

The assessment of different environmental components was performed based on available measurements done by the Czech Hydrometeorological Institute in Ostrava-Poruba (air quality), Povodi Odry (water quality in Lubina river), surveying within the preparation of the construction of the Industrial Zone, investigations for the needs of the submitted audit and field investigation of the company supplying the audit in July. For the assessment current Czech environmental law, decrees, regulations and standards were used.

It can be stated that different environmental components in the region considered for the implementation of the „Industrial Zone Vlcovice“ are not polluted above the acceptable limit and reach mostly allowed values under the current Czech law.

10. Survey of the most important regulations, laws, decrees and standards related to environmental protection

10.1 Environment - general provisions

- Law no. 17/1992 Sb. (Sb. = Code) of Code on environment
- Law CNR no. 282/1991 of Code on Czech environmental inspection
- Law CNR no. 244/1992 of Code on environmental impact assessment
- Law CNR no. 114/1992 of Code on nature and landscape protection (amended by legal Provision of the Board of CNR no. 347/1992 of code), Law no.289/1995 of Code, Findings of the Constitutional Court of CR no. 3/1997 of Code, Law no. 16/1997 of Code and Law no. 123/1998 of Code
- Decree of Ministry of Ecology CR no. 395/1992 of Code enforcing some provisions of the Law CNR no. 114//1992 of Code on nature and landscape protection amended by Decree of ME no. 105/1997 of Code

10.2 Air protection

- Law no. 309/1991 of Code on air protection against pollutants (Air Law), amended by the Law no. 218/1992 of Code and Law no. 158/1994 of Code., (full version no. 211/1994 Sb.)
- Law CNR no. 389/1991 on state management of air protection and air pollution penalties, amended by later regulations (full version no. 212/1994 Sb), no. 86/1995 Sb.
- Law no. 86/1995 Sb. on ozone layer of the Earth
- Decree of ME CR no. 117/1997 Sb., setting emission limits and other conditions for stationary pollution sources operation and air protection
- Decree of ME CR no. 41/1992 Sb., defining regions needing a special air protection and setting principles for the creation and operation of control systems and some other air protection measures amended by the Decree no. 279/1993 Sb.
- Decree of ME CR no. 316/1997 Sb., setting the amount of matters harmful to ozone layer of the Earth ensuring the basic needs in 1998 a 1999
- Regulation of the Federal Environmental Committee of 1 October amending Law no. 309 of 9 July 1991 on air protection against pollutants amended by the Regulation of the Federal Environmental Committee of 23 July 1992 published in Article 84/1992 Sb., amended by Regulation no. 122/1995 and Regulation no. 117/1997 Sb.

- Methodological instruction of the Department of Air Protection of EM CR on small source pollution penalties (acc. to § 8 sec. 1 with consideration to § 6 sec. 1 and 4 and § 7 sec. 2 of Law CNR no. 389/1991 Sb., on state management of air protection and pollution penalties published in the Bulletin of ME CR no. 4/1992)
- Methodological instruction of the Department of Air Protection of EM CR on the preparation of operating rules of smog warning and control systems for the control of

other air pollution sources listed in the Decree no. 41/1992 Sb., published in Bulleting ME CR no. 4/1992
- Methodological guideline of the Air Protection Department of ME CR on the calculation of pollutant characteristics for the air quality assessment ref. no. 520/2203/93, published in Bulletin of ME CR no. 2/1994
- Methodological instruction no.4 of the Air Protection Department of ME on the calculation of air pollution from point and mobile sources ”SYMOS 97”, published in Bulleting of ME no. 3/1998

- CSN (Czech Standard) 83 4501 Air Protection. Measurement of emissions from air pollution sources. Basic terms, terminology, division.
- CSN 83 4511 Air Protection. Classification of emissions from air pollution sources
- CSN 83 4611 Air Protection. Measurement of solid emissions from air pollution sources.

10.3 Water systems

- Law no.138/1973 Sb.on water (Water Law) amended by Law CNR no. 425/1990 Sb., Law no.114/1995 Sb., Law no.14/1998 Sb. and Law no. 58/1998 Sb.
- Law CNR no.130/1974 Sb. on state management of water systems amended by Law. 49/1982 Sb., Law CNR no. 425/1990 Sb. and Law CNR no.23/1992 Sb. (full version of Law CNR no. 458/1992 Sb.),amended by Law no.114/1995 Sb.
- Law no. 58/1998 Sb. on charges for discharge of waste water to surface water
- Decree of Government no. 35/1979 Sb. on water payments (amended by Decree of Government no. 91/1988 Sb., full version of DG no. 2/1989 Sb.), amended by Law CNR no.281/1992 Sb.) and Law no. 58/1998 Sb.
- Decree of Government CR no. 82/1999 Sb., setting the indicators for admissible level of water pollution amended by Decree of Government no. 185/1996 Sb.
- Decree of Government CSR no. 27/1975 on flood protection

- CSN 73 6510 Water systems. Principal water system terminology
- CSN 73 6512 Water systems. Hydrotechnical terminology. Water streams.
- CSN 73 6521 Water systems. Water works terminology
  Changes: a/ Bulletin FÚNM no. 1/88, to be replaced with CSN 75 0150
- CSN 73 6561 Hydrological underground water data
- ON 73 6808 Handling rules for waterworks on water streams
- CSN 75 3102 Water source protection. Indication of protective zones of mass drinking water supply sources
- CSN 75 3415 Water protection against oil matters. Oil matter treatment structures and storage
- CSN 75 3418 Surface and underground water protection against pollution upon oil and oil matters transport by road vehicles
- CSN 75 6101 Sewerage and sewers. To be replaced with CSN 73 6701.
- CSN 75 6402 Small water treatment plants
- CSN ISO 5667-1 (75 7051) Water quality. Sampling. Instructions for draft sampling plan
- CSN 83 0531 Mikrobiological surface water analysis
- CSN 83 0532 Surface water biological analysis

- CSN 83 0901 Surface water protection against pollution. General requirements
- CSN 83 0905 Water protection against dump pollution
- CSN 83 0916 Water protection against oil matters. Oil matter piping. Revision: a/ by publishing
- CSN 83 0917 Water protection against oil matters. Sewerage and oil water treatment + Comments
- CSN 75 1111 Drinking water
- CSN 75 7221 Water quality, surface water quality classification
- CSN 75 7220 Water quality, surface water quality control

10.4 Rock protection

- Law no. 44/1988 on protection and utilization of mineral deposits (Mining Law), (amended by Law CNR no. 541/1991 Sb.) (ú.z.pod. c. 439/1992 Sb. effective in CR) and changes accruing from Law CNR no. 10/1993 Sb. and Law no. 168/1993 Sb.
- Law CNR no. 62/1988 Sb. on geological works and Czech Geological Institute, (amended by Law no. 543/1991 Sb.)
- Decree no. 172/1992 Sb. of Czech Mining Office on mining spaces
- Decree no. 175/1992 Sb. CMO on conditions for extraction of non-selected mineral deposits
- Decree no. 364/1992 Sb. ME CR on protected deposit areas

10.5 Protection of agricultural and forest lands

- Law no. 334/1992 Sb. on agricultural land protection (accruing from changes and amendments to Law no. 10/1993 Sb.)
- Decree of ME CR no. 13/1994 Sb., giving details on agricultural land protection
- Law no. 289/1995 Sb. on forests and change and amendments to certain laws (Forest Law)
- Decree no. 77/1996 Sb. of Ministry of Agriculture on applications for withdrawal or limitation and details on forest land protection
- Decree no. 81/1996 Ministry of Agriculture on the calculation of the amount of injury or damage caused upon forest productive functions
- Methodological instruction of ME CSR ref. no. 40-917/1982-413 of 1 June 1982 on establishment and treatment of temporary topsoil dumps
- Methodological instruction of the Forest and Land Protection Department of ME CR of 1 October1996 ref. no. OOLP/1067/96 on the withdrawal of lands from agricultural land fund acc. to Law CNR no. 334/1992 Sb., on agricultural land protection amended by CNR no. 10/1993 Sb., published in Bulleting of ME CR no. 4/1996

10.6 Waste

- Law no. 125/1997 Sb. on waste amended by Law no. 167/1998 Sb.
- Decree ME no. 337/1997 Sb., containing Waste Register and setting other waste registers (Waste Register)
- Decree of ME no. 338/1997 Sb. on waste disposal details

- Decree of ME no. 339/1997 Sb. on dangerous waste assessment
- Methodological instruction no. 7 of Waste Department of ME of 29. 4. 1998 ref. no. OODP/1473/98 on waste classification procedures according to Waste Register (Decree of ME no. 337/1997 Sb., issuing Waste Register and deciding upon other waste registers) published in Bulletin of ME no. 3/1998
- Information no. 15 of Waste Department of ME MŽP CR on the issue of the Methodological Instruction for the waste health risks published in Bulletin of ME CR no. 5 – 6/1993
- Information no. 2 of Waste Department of ME CR on accreditation of State Testing Institute published in Bulleting of ME CR no. 2/1994
- Information no. 8 of Waste Department of ME and Hygiene and Empidemiology Department of Ministry of Health on special competence of persons commissioned for the assessment of dangerous waste according to § 4, sec. 5 Law no. 125/1997 Sb. on waste published in Bulletin of ME no. 3/1998

10.7 Others

- Decree no.. 13/1977 on health protection against unfavourable effects of noise and vibration
- Law no. 20/1966 Sb. on human health and care
- Regulation of MH no. 408/1990 on health protection against unfavourable effects of electromagnetic radiation
- Regulation of MH no. 76/1991 on limitation of radon and other natural radionuclide radiation

Annexes:

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