

CONSORTIUM DICON – ACCIONA ING.



ENVIRONMENTAL IMPACT ASSESSMENT REPORT

for Investment Proposal:

BUILDING A NEW NUCLEAR UNIT OF THE LATEST GENERATION AT THE KOZLODUY NPP SITE

CHAPTER 3: DESCRIPTION AND ANALYSIS OF COMPONENTS AND FACTORS OF THE ENVIRONMENT AND CULTURAL HERITAGE THAT SHALL BE LARGELY AFFECTED BY THE INVESTMENT PROPOSAL AND THE INTERACTION BETWEEN THEM

- **3.5.** LANDSCAPE
- **3.6. BIODIVERSITY**
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3 DESCRIPTION AND ANALYSIS OF COMPONENTS AND FACTORS OF THE ENVIRONMENT AND CULTURAL HERITAGE THAT SHALL BE LARGELY AFFECTED BY THE INVESTMENT PROPOSAL AND THE INTERACTION BETWEEN THEM

3.5 LANDSCAPE

According to the **European Landscape Map LANMAP2**¹, the territory of Kozloduy NPP, in which the four sites and the 30-km surveillance zone around the Plant are located, fall under the following landscape categories (**Figure 3.5-1**)

Continental hilly landscape on sedimentary rocks with arable lands on the territory of Bulgaria and Romania.

 Continental lowland landscape on sedimentary rocks with arable lands on the territory of Romania.



Legend: 1 – Settlement; 2 – Kozloduy NPP

FIGURE 3.5-1: EUROPEAN LANDSCAPE MAP LANMAP2 – 30-KM ZONE AROUND KOZLODUY NPP

¹ LandscapeEurope. 2002. Landscapes of Europe. LANMAP2. Alterra. Wageningen UR.

3.5.1 LANDSCAPE CLASSIFICATION SYSTEM

Two Landscape Classification Systems are developed for the country:

- ✓ regional landscape zoning map of Bulgaria² and
- typological classification system of landscapes in Bulgaria³.

According to the map with **regional landscape zoning** of Bulgaria, the territory of Kozloduy NPP is located in the:

A. North Bulgarian landscape zonal district:

→ I. North Danubian-plain landscape sub-district:

4. Zlatiyski landscape region;

5. Dolnoiskarski landscape region.

→ **II.** South Danubian plain landscape sub-district:

13. Lyutensko-Borovanski landscape *region*.

Specified structures within the 30-km zone round the Kozloduy NPP EAD are presented

within the range of:

- → Kozloduy Municipality and the eastern part of Lom Municipality covering part of the Zlatiyski landscape region (4);
- → Valchedram, Hayredin, Krivodol and Mizia municipalities in Zlatyiski (4) and Lyutensko-Borovanski (13) landscape regions;
- → Oryahovo Municipality in Dolnoiskarski landscape region (5);
- → areas entering the 30-km zone of the Kozloduy NPP in Byala Slatina, Borovan and Boychinovtsi municipalities in Lyutensko-Borovanski landscape region (13).

Typological classification system of landscapes in Bulgaria characterizes the status and landscapes functioning as open geosystems with specific internal structure⁴.

Various processes are running within this structure under the influence of external, natural and anthropogenic factors. Factors largely depend on the internal structure of geosystems and their sustainability. The landscape sustainability degree towards external impacts is determined by the most stable component – morpho-lithogenic foundation. It is accepted to be the main criteria for determining the landscape class.

Landscape *type* is defined on the basis of zonal hydro-climate indicators.

² Landscape zonning of Bulgaria. Geography of Bulgaria. Monography. BAS 1997.

³ Landscape classification system of Bulgaria. Geography of Bulgaria. BAS. Sofia. 1997.

⁴ Landscape zonning of Bulgaria. Geography of Bulgaria. Monography. BAS 1997.

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Landscape *subtype* is defined on the basis of the same zonal indicators as for the landscape types, but with variables that vary within the limits of the respective type.

Landscape *group* is defined on the basis of mesomorphic and lithogenic indicators such as type and properties of rock substrate, characteristics of new deposits, etc.

Territory of the 30 km zone around the Plant enters the landscape structure that is characterized by 8 groups, 5 sub-groups and 2 landscape types of the Plain Landscapes Class

1. Class	Plain landscapes
1.1 Туре	Landscapes of moderate continental meadow-steppe and forest lowlands
1.1.1. Sub-type	Landscapes of meadow-steppe lowlands
1.1.1.1. Group	Landscapes of meadow-steppe alluvial lowlands with medium degree of agricultural reclamation
1.1.2. Sub-type	Landscapes of meadow-marsh lowlands.
1.1.2.2. Group	Landscapes of meadow-marsh alluvium lowlands with comparatively low degree of agricultural reclamation
1.1.3. Sub-type	Landscapes of forest lowlands
1.1.3.3. Group	Landscapes of forest lowlands on river islands
1.1.3.4. Group	Landscapes of forest lowlands over the flood terrace hills with comparatively low degree of agricultural reclamation
1.2. Туре	Landscapes of moderate-continental steppe, meadow-steppe and forest-steppe plains
1.2.5. Sub-type	Landscapes of chernozem meadow-steppe plains
1.2.5.7. Group	Landscapes of chernozem meadow-steppe plains on loess rocks with high degree of agricultural reclamation
1.2.5.8. Group	Landscapes of chernozem meadow-steppe plains on carbonate rocks with medium degree of agricultural reclamation
1.2.6. Sub-type	Landscapes of forest-steppe plains
1.2.6.9. Group	Landscapes of forest-steppe plains on loess rocks with high degree of agricultural reclamation
1.2.6.10. Group	Landscapes of forest-steppe plains on calcareous rocks with medium degree of agricultural reclamation

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Numerical indices of landscape taxonometric ranks are part of the Landscape Map of the country and identify hierarchic landscape classification whereto the territory of the Investment Proposal belongs.

Figure 3.5-2 shows that the site of Kozloduy NPP falls within landscape *group 1.1.2.2. Landscapes of meadow-marsh alluvium lowlands with comparatively low degree of agricultural reclamation.* Accuracy when determining the belonging of certain landscape of the above scheme does not comply entirely with the objectives of the territory of the Investment Proposal. For detailed characterization of landscapes of small-sized territories, such as the site of Kozloduy NPP, a more detailed system for landscape classification according to leading/physiognomic component is applied ⁵.



Legend: 1 – Kozloduy NPP; 2 – 30-km zone around the Plant; 3 – Border of landscape group level FIGURE 3.5-2: DIAGRAM OF THE TYPOLOGICAL LANDSCAPE STRUCTURE OF THE 30-KM ZONE AROUND THE PLANT

3.5.2 LANDSCAPES ON THE TERRITORY OF KOZLODUY NPP

Anthropogenic landscape. The Kozloduy NPP site is part of the anthropogenic landscape.

⁵ Petrov, P. 1990. Landscape Science. University edition – SU Kliment Ohridski.

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The following subtypes thereof occur at the site:

- → Landscape "anthropogenic industrial": formed by the buildings of Units 1, 2, 3, 4,
 5 and 6 of the Kozloduy NPP, administration buildings, electric and other equipment and parking lots;
- → Landscape "anthropogenic communication" in the structure whereof enter road communications on the territory of the Kozloduy NPP and existing routes of overhead transmission line HV.

Furthermore, on the territory of Kozloduy NPP also occur:

Forest landscape. Tree vegetation is the physiognomic component of this landscape. The territory of the landscape is broken by communication lines, buildings, open spaces, etc. Landscape forest is created to arrange green spaces and development of environment. The component structure includes various tree and shrub species. Landscape forest possesses stability and capacity for self-organization and self-regulation.

Aquatic landscape. Surface water is the leading and physiognomic component. The component is represented by the Cold (intake) Channel and the Hot (outlet) Channel to the Plant. It covers comparatively large area and shall be distinguished as a separate landscape. The latter is unstable in time. Its existence depends entirely on the anthropogenic activities.

3.5.2.1 LANDSCAPES ON THE TERRITORY OF SITE 1

The following landscape structures can be defined according to the leading landscapeforming component on the territory of that site:

Agrarian landscape. The structure of agrarian landscapes includes pastures and arable areas on the land of Harlets village.



FIGURE 3.5-3: PART OF "INDUSTRIAL AND COMMUNICATION" LANDSCAPE (*PRESENTED BY KOZLODUY NPP – New capacities EAD*)

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Anthropogenic landscape. On the territory of Site 1 is distinguished the variety of anthropogenic communication landscape wherein the anthropogenic effect is expressed in construction of various drainage channels and roads (**Figure 3.5-3**).

3.5.2.2 LANDSCAPES ON THE TERRITORY OF SITE 2

The following landscape structures can be distinguished on the territory of that site:

Agrarian landscape. The appearance thereof is formed by arable areas as part of the lands of Harlets village (**Figure 3.5-4**).



FIGURE 3.5-4: PART OF "AGRARIAN" LANDSCAPE (PRESENTED BY KOZLODUY NPP - NEW CAPACITIES EAD)

Arable lands are formed under the effect of purposeful anthropogenic activity resulting in landscape changes aimed to meet specific demands. Existence of such landscapes depends on anthropogenic activities – man may continuously maintain them in a particular state.

Anthropogenic landscape. The structure includes abandoned buildings and facilities of a former farm yard on the territory of Kozloduy NPP.

Forest landscape. The structure includes tree-shrub massifs on the Kozloduy NPP territory cultivated for greening purposes of the Plant territory.

3.5.2.3 LANDSCAPES ON THE TERRITORY OF SITE 3

Agrarian landscape. The greater part of this site territory is occupied by arable areas within the lands of Harlets village and the town of Kozloduy. Represented by the "agrarian crop rotation" landscape.

Anthropogenic landscape. The anthropogenic landscape structure includes open irrigation channels, field roads and the existing routes of overhead transmission lines HV.

3.5.2.4 LANDSCAPES ON THE TERRITORY OF SITE 4

The Site territory is part of the "anthropogenic" landscape on the Kozloduy NPP territory. The following varieties thereof occur:

- → "Anthropogenic industrial" landscape established by the built service departments (Figure 3.5-5) – "Equipment Office", "Car-Repair Shop" and "Assembly Shop".
- → "Anthropogenic communication" landscape the structure thereof includes all road communications.



FIGURE 3.5-5: PART OF "ANTHROPOGENIC INDUSTRIAL" LANDSCAPE (PRESENTED BY KOZLODUY NPP – NEW BUILD EAD)

3.5.2.5 LANDSCAPES WITHIN THE 30-KM ZONE OF KOZLODUY NPP

Depending on leading and/or physiognomic landscape-forming component (**Figure 3.5-6**), landscapes on the territory of the 30-km zone around the Kozloduy NPP are classified as follows:





Legend: 1 – Anthropogenic landscape; 2 – Forest landscape; 3 – Aquatic landscape; 4 – Grassland landscape; 5 – Agrarian landscape.

FIGURE 3.5-6: MAP OF LANDSCAPE TYPES WITHIN THE 30-KM ZONE AROUND KOZLODUY NPP

Forest landscape. Leading and physiognomic component in this landscape is tree vegetation. These are natural territorial complexes of the forest stock of Kozloduy Municipality, the eastern part of Lom Municipality, Valchedram, Hayredin, Mizia, Oryahovo municipalities and parts entering the 30-km zone of Kozloduy NPP in the Byala Slatina, Borovan, Krivodol and Boychinovtsi municipalities.

The landscape horizontal structure is characterized by partitioning of the territory. It covers river bank territories and hilly slopes. The structure thereof includes tree species forming also the visual appearance of the landscape. Various species of willows and poplars, Downy oak, Turkish oak and Hungarian oak, Field elm, Lime-trees, etc. Furthermore, Common Acacia cultures occur as well as pure and mixed cultures of Black Pine. Belts of poplar cultures are grown alongside the Danube River and cover the main part of the islands. Most common among shrub species are the amorpha species. Forest landscape is characterized by high resistivity because of the available capacities for self-regulation and self-renewal.

Grassland landscape. This landscape occupies considerable areas in the valleys around the territory of the Investment Proposal. Out of the varieties thereof the "meadow marsh"

landscape is presented in micro-depressions of flood river terraces and in isolated plots around marshes within the region.

Agrarian landscape. Agrarian landscapes present natural-territorial complexes of lands in the municipalities surrounding the territory of Kozloduy NPP. The landscape appearance is characterized by arable lands and pastures formed under the effect of purposeful anthropogenic activities aimed to meet specific demands. Existence of such landscapes depends entirely on the anthropogenic activities – man may maintain them permanently in a particular state.

Aquatic landscape. Leading and physiognomic component in this landscape is surface water represented by landscape " river aquatic". The structure of river landscapes includes the Danube, Skat, Ogosta and Tsibritsa rivers and tributaries in the catchment areas thereof.

Anthropogenic landscape. Anthropogenic landscapes on the territory of the 30-km zone around the NPP are represented generally by the following varieties – "anthropogenic settlement", " anthropogenic communication" and " anthropogenic industrial".

3.6 BIODIVERSITY

The subject of assessment in the report of EIA is the impact of the new unit on one of the four alternative sites provided for erection thereof. Analysis and assessment of the impact on the biodiversity (protected vegetation and animal species) are conducted for the 30-km zone around the Kozloduy NPP.

3.6.1 FLORA

According to the geobotanical zoning of Bulgaria, the territory within the 30-km around the Kozloduy NPP refers to the Eurasian steppe and forest-steppe region, Lower Danube Province, Danube River District, Zlatiyski Region. This area is predominantly forestless and occupied mainly by agricultural cereals and vineyards. There are sparse remains of forests including Turkish Oak (Quercus cerris L.), Virgilian Oak (Quercus virgilliana Ten.) and Downy Oak (*Quercus pubescens* Willd). In some places secondary forest associations grow with prevalence of Oriental Hornbeam (Carpinus orientalis Mill.), South European Flowering Ash (Fraxinus ornus L.), etc. Man-made plantations of Acacia (Robinia *pseudoacacia* L.) are also reported. During the degradation of forests they are replaced by bushy associations including the Smoke Tree (Cotinus coggygria). In forestless plots secondary grass formations are formed with the prevalence of Scented Grass (Chrysopogon gryllus (L.) Trin.), Yellow Bluestem (Dichanthium ischaemum (L.) Roberty), Bulbous Bluegrass (Poa bulbosa (L.), etc. series of steppe elements play a part along with the Montpellierian Camphor-fume (Camphorosma monspeliaca L.), Danubian Clustered Broom (Chamaecytisus danubialis (Vel.) Rothm.), (Potentilla pirotensis (Borbas) Markova), etc. In places of excessive moisture along the Danube River, forest associations occur with prevailing White Willow (Salix alba L.), White Poplar (Populus alba L.) and Black Poplar (Populus nigra L.). On isolated plots there are cultures of hybrid poplars (Populus X

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euroamericana). Associations are also formed also of marshy and boggy grass vegetation with prevailing Reed (*Phragmites australis* (Cav.) Trin ex Stend.), Narrowleaf Cattail (*Typha angustifolia* L.), Lakeshore Bulrush (*Schoenoplectus lacustris* L.), etc.

Data from the last publication of the Red Book for the Republic of Bulgaria, Volume 1, Plants and Fungi (Peev, D. et al. (ed.).on-line)[#] and the Biological Diversity Act show that within the 30-km range of the study area the following protected plants under the Biological Diversity Act are presented: Water Soldiers (*Stratiotes aloides*), critically endangered species; Rumelian Corn-flower (*Centaurea rumelica*), endangered, Balkan endemic species; Yellow Waterlily (*Nuphar lutea*), endangered species; (*Astragalus dasyanthus*), critically endangered species, included in the 1997 IUCN Red List of Threatened Plants under the category "rare"; Giant Snowdrop (*Galanthus elwesii*), endangered species; Floating Fern (*Salvinia natans*); Sea Spray (*Goniolimon collinum*). There are data on two other species that are have been met within the 30-km zone around Kozloduy NPP, but their associations are not encountered by decades and are marked as missing for this region in the "Red Book of Plants and Fungi": Military Orchid (*Orchis militaris*), endangered species and Fringed Water-lily (*Nymphoides peltata*), endangered species.

Within the 30-km range of the study area are found 55 species of medicinal plants (**Table 3.6-1**), whose collection, bying and sustainable use is regulated by the Medicinal Plants Act (State Gazette, no. 29 / 7.04.2000, as amended in SG no. 23 / 1.03.2002, SG no. 91 / 25.09.2002, in force as of 1.01.2003, SG no. 30 /11.04.2006, in force as of 12.07.2006, SG no. 65 / 11.08.2006, in force as of 11.08.2006). All medicinal plant species are largely distributed except for 2 of them (*Nuphar lutea* and *Galanthus elwesii*).

English name	Latin name	Family
Saffron Thistle	Carthamus lanatus L.	Asteraceae
	Xeranthemum annuum L.	Asteraceae
Purple Loosestrife	Lythrum salicaria L.	Lythraceae
Marsh Marigold	Caltha palustris L.	Ranunculaceae
Common Ivy	Hedera helix L.	Araliaceae
Yellow Water-lily	Nuphar lutea (L.) S. et S.	Nymphaeaceae
Danewort	Sambucus ebulus L.	Caprifoliaceae
European Black Elderberry	Sambucus nigra L.	Caprifoliaceae
European Speedwell	Veronica beccabunga L.	Scrophulariaceae
Heath Speedwell	Veronica officinalis L.	Scrophulariaceae
Corn Speedwell	Veronica arvensis L.	Scrophulariaceae
Field Eryngo	Eryngium campestre L.	Apiaceae
White Willow	Salix alba L. Salicaceae	
Purple Willow	Salix purpurea L. Salicaceae	
Common Vervain	Verbena officinalis L.	Verbenaceae
Common Hawthorn	Crataegus monogyna Jacq.	Rosaceae
Common Dandelion	Taraxacum officinale Web.	Asteraceae

TABLE 3.6-1: MEDICINAL PLANTS

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English name	Latin name Family		
Haresfoot Clover	Trifolium arvense L.	Fabaceae	
White Clover	Trifolium repens L.	Fabaceae	
Salad Burnet	Sanguisorba minor Scop.	Rosaceae	
Ribwort Plantain	Plantago lanceolata L.	Plantaginaceae	
Hoary Plantain	Plantago media L.	Plantaginaceae	
Lesser Celandine	Ranunculus ficaria L.	Ranunculaceae	
Bird's-foot Trefoil	Lotus corniculatus L.	Fabaceae	
St John's Wort	Hypericum perforatum L.	Hypericaceae	
Rough Cocklebur	Xanthium strumarium L.	Asteraceae	
Common Agrimony	Agrimonia eupatoria L.	Rosaceae	
Camphorfume	Camphorosma monspeliaca L.	Chenopodiaceae	
Sorrel	Rumex acetosa L.	Polygonaceae	
Sheep's Sorrel	Rumex acetosella L.	Polygonaceae	
Giant Snowdrop	Galanthus elwesii Hook. (G. maximus Vel.)	Amaryllidaceae	
White Sweet Clover	Melilotus alba Med.	Fabaceae	
Yellow Sweet Clover	Melilotus officinalis (L.) Pal.	Fabaceae	
European Dewberry	Rubus caesius L.	Rosaceae	
Fuller's Teasel	Dipsacus fullonum L. (D. sylvestris Huds.)	Dipsacaceae	
Cursed Buttercup	Ranunculus scleratus L.	Ranunculaceae	
Water Mint	Mentha aquatica L.	Lamiaceae	
Horse Mint	Mentha longifolia (L.) Huds.	Lamiaceae	
Yellow Star-thistle	Centaurea solstitialis L.	Asteraceae	
Mouse-ear Hawkweed	Hieracium pilosella L.	Asteraceae	
Shepherd's-purse	Capsella bursa-pastoris (L.)Medic.	Brassicaceae	
Wood Avens	Geum urbanum L.	Rosaceae	
Lesser Bulrush	Typha angustifolia L.	Typhaceae	
Mugwort	Artemisia vulgaris L.	Asteraceae	
Old Man's Beard	Clematis vitalba L.	Ranunculaceae	
Coltsfoot	Tussilago farfara L.	Asteraceae	
Wall Germander	Teucrium chamaedrys L.	Lamiaceae	
Yarrow	Achillea millefolium gr.	Asteraceae	
Common Chicory	Cichorium intybus L.	Asteraceae	
Eurasian Smoketree	Cotinus coggygria Scop. Anacardiaceae		
Blackthorn	Prunus spinosa L. Rosaceae		
Viper's Bugloss	Echium vulgare L.	Boraginaceae	
Redstem Filaree	Erodium cicutarium (L.) L'Her.	Geraniaceae	
Raywood Ash	Fraxinus oxycarpa Willd.	Oleaceae	

Assessment of flora and vegetation shall include expected impact on the protected plant species during the civil works and operation of the new unit, as per the Biological Diversity Act, growing in the area of the investment proposal (IP) – the four alternative sites and those included in the range of impact within the 30-km perimeter.

3.6.2 FAUNA

According to the zoo-geographic zoning of Bulgaria, the 30-km zone around the Kozloduy NPP is located in the Danubian zoo-geographic region, in the belt of plain-hilly and hilly-foothill belt of oak forests. Euro-Siberian and European species prevail with the addition of a significant number of Mediterranean species. The avifauna also features Euro-Siberian, European and Mediterranean species. On the one hand, strong anthropogenization of lands in the region (drying up of the Kozloduy swamp, bunding of the Danube River and Ogosta River, Ogosta riverbed regulation, cutting off natural vegetation on the Danube islands, excessive chemical content of the soils in the Zlatiyata, etc.) has drastically affected fauna and recent complex formation. The fauna may be subdivided in three categories in terms of stability thereof to the degree of anthropogenic loading: synanthropic, eusynanthropic and ecologically plastic species. The species composition of animal associations has markedly changed due to significant anthropogenic impact.

Regional characteristics of the mammalian fauna belongs to the North Bulgarian sub-region with well-developed loess cover of the interfluvial areas. Natural zonal vegetation has been destroyed to a great extend and its place has been taken by secondary vegetation, manmade plantations of poplar plantations, herbaceous vegetation on wetter soils, represented by meadows. Secondary vegetation is characterized by the tendency of xerophytisation, leading to penetration of steppe species in these communities. The largest area among secondary vegetation is occupied by agricultural crops. Although natural habitats are destroyed at huge areas in this sub-region, it is characterized by the significant diversity of mammal species.

Directive Country	Birds Directive (SPA)	Habitats Directive (SCI)	Total	Ramsar Convention
Bulgaria	BG0002007 BG0002008 BG0002009 BG0002104	BG0000199 BG0000508 BG0000527 BG0000533 BG0000614 BG0000336	10	Maintained Ibisha reserve
Romania	ROSPA0010 ROSPA0023	ROSCI0045 ROSPA0135	4	
Total	6	8	14	1

TABLE 3.6-2: PROTECTED AREAS OF THE NATURA 2000 NETWORK AND AFTER THE RAMSAR CONVENTIONIN REPUBLIC OF BULGARIA AND REPUBLIC OF ROMANIA ON THE TERRITORY OF THE 30-KM MONITORINGZONE

On the other hand, the factors justifying the species richness in the region is the availability of a large ecological corridor (the Danube River), relative proximity of the Danube Delta, migration stream of birds over the territory, including the low altitude. The Kozloduy NPP

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is located in the middle of an ecological complex of large swamps, part of which already dried up or transformed into fish-breeding ponds (Bistretsko, Tsibarsko and Kozloduysko Ostrovsko⁶, inter-continental dunes (at Bistrets and Duboleni), the Danube islands (Tsibar, Tsibritsa, Svraka, Kozloduy, Kopanitsa), river mouths (Zhiu, Ogosta, Skat), flooded island forests, large sand strips (between Dolni and Gorni Tsibar). A large part thereof is included in the protected areas of the NATURA 2000 network and the Ramsar Convention – **Table 3.6-2**.

During various seasons of the year, seven species of the Globally Threatened Bird Species occur in that ecological complex: Dalmatian Pelican (*Pelecanus crispus*), Lesser Whitefronted Goose (*Anser erythropus*), Red-breasted Goose (*Branta ruficollis*), Ferruginous Duck (*Aythya nyroca*), White-tailed Eagle (*Haliaetus albicilla*), Red-footed Falcon (*Falco vespertinus*) and Corn Crake (*Crex crex*).

The greater, larger-scale range of the studied territory (with a radius of 30 km) and the greater time interval of tens of years are of significant importance to the studies related to biodiversity and conservation. References since the end of the 19th century to date shall be used for description of some elements of ecosystems in the region. The UTM coordinate network is applied with the help of modern atlases that have been compiled for distribution of plants and animals in Europe, on the Balkan Peninsula and in Bulgaria.

3.6.2.1 INVERTEBRATES

So far in Bulgaria have been reported more than 29 000 species of invertebrates (of about 29 850 animal species), the vast majority of which is constituted by insects represented by more than 20 500 species. The West Danubian Plain is one of the least studied areas of the country, in the region of Kozloduy NPP (30-km surveillance zone for new nuclear unit) there are almost no data on the observation of invertebrates. There are single data on dragonflies, Coleoptera (beetles), etc., which give an idea of the region's biodiversity. As objects for the assessment of biodiversity of invertebrates, within the area potentially affected by the future investment proposal, are selected the most representative group in terms of biomass in the food chain, attractiveness to the public and participation in the international and regional conventions and laws for the protection of biodiversity - species butterflies (Lepidopteraof the family of Ground Beetles (Coleoptera, Carabidae), *Rhopalocera/Lepidoptera-dias*), ants (Hymenoptera-Formicidae), grasshoppers (Orthoptera), dragonflies (Odonata) and molluscs (Mollusca).

The species composition of terrestrial invertebrates is determined by the existing unpublished data and data from the project "Selection of a contractor for mapping and determination of the conservation status of habitats and species according to an approved

⁶ Michev, T., M. Stoyneva (eds). 2007. Inventory of Bulgarian Wetlands and their Biodiversity. Publ. House Elsi-M, Sofia, 364 pp.

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list and minimizing the risks to birds" for habitats of species of national level. According to the latest sources within the 30-km zone of the impact of the Investment Proposal are situated the habitats of the species (Figure 3.6-1): Ornate Bluet (Coenagrion ornatum), Green Snaketail (Ophiogomphus cecilia), species of the earth-boring dung beetle family (Bolbelasmus unicornis), Great Capricorn Beetle (Cerambyx cerdo), Saproxylic Beetle (Cucujus cinnaberinus), Stag Beetle (Lucanus cervus), (Morimus asper funereus), Hermit Beetle (Osmoderma eremita) (also included in the Bern Convention - Annex II, IUCN and the Red Book of Bulgaria as endangered), Jersey Tiger (*Euplagia quadripunctaria*), Large Copper (*Lycaena dispar*), included in Annex II of the Habitats Directive. Rosalia Longicorn (Rosalia alpina) was previously reported for the region based on indirect data, but new data do not confirm its occurrence in the 30-km surveillance zone (Figure 3.6-1). In Table 3.6-3 is presented a list of other terrestrial invertebrates inhabiting the West Danubian Plain that are found in the 30-km area around the IP. Species of the mayfly genus (Brachycercus harrisella), included in the Red Book of the Republic of Bulgaria in the category Critically Endangered (Golemanski (ed.) 2011)⁷, has been reported for the Danube River at Kozloduy in the period 1955-1964. The species shall be considered both terrestrial and aquatic, because the larvae develop at the bottom of large rivers, and the imago flies on land.

On **Figure 3.6-1** are shown in dark green optimal habitats for the species, while the light green shows the semi-suitable habitat types within the 30-kilometer zone around the IP.



⁷ Golemanski (ed.) 2011. Red Book of Bulgaria.



In **Table 3.6-3** is given species composition of terrestrial invertebrates of the mollusk group, dragonflies, orthoptera, ground beetles, ants, butterflies that are inhabiting the 30-km zone around the IP and their conservation status: HABDIR II – Annex II of the Habitats Directive; BERN II – Appendix II of the Bern Convention; CORINE – CORINE habitat RB – Red Book of the Republic of Bulgaria, VU – vulnerable.

TABLE 3.6-3: Species composition of terrestrial invertebrates

Group / Species		Status
Ν	Iollusca	
Carychium minimum		
Carychium tridentatum		
Cochlicopa lubrica		
Vertigo pygmaea		
Truncatellina cylindrica		
Pupilla muscorum		
Argna macrodonta		
Sphyradium doliolum		
Vallonia costata		
Vallonia pulchella		
Acanthinula aculeata		

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Group / Species		Status
Merdigera obscura		
Zebrina detrita		
Chondrula tridens		
Chondrula microtragus		
Cochlodina laminate		
Laciniaria plicata		
Succinea oblonga		
Oxychilus glaber		
Daudebardia rufa		
Tandonia kusceri		
Punctum pygmaeum		
Limax maximus		
Cepaea vindobonensis		
Helix lucorum		
Helix pomatia		
Bradybaena fruticum		
	Odonata	
Calopteryx virgo		
Calpteryx splendens		
Sympecma fusca		
Lestes barbarus		
Lestes virens		
Platycnemis pennipes		
Coenagrion puella		
Coenagrion ornatum		HABDIR II
Ischnura pumilio		
Ischnura elegans		
Aeshna affinis		
Anax imperator		
Gomphus flavipes		
Gomphus vulgatissimus		
Ophiogomphus cecilia		HABDIR II, RED BOOK-VU
Onychogomphus forcipatus		
Libellula depressa		
Orthetrum albistylum		
Orthetrum brunneum		
	Orthoptera	
Decticus verrucivorus		
Platycleis (Platycleis) affinis		
Platycleis (Platycleis) albopunctata grisea		
Platycleis (Tessellana) veyseli		
Metrioptera (Metrioptera) roeselii roeselii		
Pholidoptera griseoaptera		
Pholidoptera fallax		
Pholidoptera littoralis		
Pachytrachis gracilis		
Rhacocleis germanica		
Gampsocleis glabra		
Tettigonia caudata		

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Group / Species	Status
Tettigonia viridissima	
Ephippiger ephippiger	
Ruspolia nitidula	
Conocephalus dorsalis	
Conocephalus discolor	
Conocephalus hastatus	
Phaneroptera nana	
Tylopsis lilifolia	
Leptophyes albovittata	
Isophya rectipennis	
Isophya speciosa	
Poecilimon thoracicus	
Gryllus campestris	
Melanogryllus desertus	
Modicogryllus truncatus	
Pteronemobius heydenii heydenii	
Oecanthus pellucens pellucens	
Gryllotalpa stepposa	
Xya pfaendleri	
Tetrix tenuicornis	
Tetrix subulata	
Tetrix bolivari	
Tetrix depressa	
Calliptamus italicus	
Odontopodisma decipiens	
Pezotettix giornae	
Acrida ungarica	
Locusta migratoria cinerascens	
Oedaleus decorus	
Oedipoda caerulescens	
Acrotylus insubricus	
Aiolopus strepens	
Aiolopus thalassinus	
Stethophyma grossum	
Dociostaurus maroccanus	
Dociostaurus brevicollis	
Stenobothrus fischeri fischeri	
Stenobothrus lineatus lineatus	
Omocestus minutus	
Omocestus rufipes	
Euchorthippus declivus	
Chorthippus parallelus	
Chorthippus oschei	
Chorthippus brunneus brunneus	
Chorthippus mollis	
Coleoptera-Carabidae	
Cicindela (Cicindela) hybrida hybrida	
Cicinaeia (Cicinaeia) campestris campestris	

Cicindela (Cylindera) germanica

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Group / Species	Group) / Sp	ecies
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Group / Species	Status
Cicindela (Lophidia) littoralis nemoralis	
Omophron limbatum	
Calosoma (Acalosoma) inquisitor	
Calosoma (Calosoma) sycophanta	
Calosoma (Campalia) auropunctatum	
Carabus (Oreocarabus) hortensis	
Carabus (Tomocarabus) convexus gracicolor	
Carabus (Megodontus) violaceus azurescens	
Nebria (Nebria) brevicollis	
Notiophilus palustris	
Notiophilus rufipes	
Elaphrus (Elaphrus) riparius	
Elaphrus (Elaphropterus) aureus	
Elaphrus (Neoelaphrus) uliginosus	
Scarites (Parallelomorphus) terricola	
Clivina fossor	
Clivina collaris	
Dyschirius (Dyschiriodes) aeneus	
Dyschirius (Dyschiriodes) nitidus	
Trechus quadristriatus	
Tachys (Paratachys) bistriatus	
Tachys (Paratachys) micros	
Elaphropus (Tachyura) diabrachys bisbimaculatus	
Asaphidion flavipes	
Bembidion (Odontium) striatum	
Bembidion (Bracteon) litorale	
Bembidion (Eurytrachelus) laticole	
Bembidion (Chlorodium) splendidum	
Bembidion (Metallina) lampros	
Bembidion (Metallina) properans	
Bembidion (Princidium) punctulatum	
Bembidion (Philochtus) lunulatum	
Bembidion (Bembidion) quadripustulatum	
Bembidion (Bembidion) quadrimaculatum	
Bembidion (Leja) articulatum	
Bembidion (Leja) octomaculatum	
Bembidion (Notaphus) varium	
Bembidion (Notaphus) semipunctatum	
Bembidion (Emphanes) tenellum	
Bembidion (Emphanes) azurescens	
Bembidion (Nepha) tetragrammum illigeri	
Bembidion (Bembidionetolitzkya) varicolor	
Bembidion (Peryphanes) dalmatinum	
Bembidion (Peryphus) andreae bualei	
Bembidion (Peryphus) testaceus	
Bembidion (Ocydromus) decorum decorum	
Myas chalybaeus	
Poecilus (Poecilus) lepidus	
Poecilus (Poecilus) striatopunctatus	

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Group / Species

Status

Poecilus (Poecilus) subcoeruleus	
Pterostichus (Melanius) anthracinus	
Pterostichus (Platysma) niger	
Pterostichus (Omaseus) aterrinus	
Abax (Abax) carinatus	
Agonum (Anchomenus) dorsalis	
Agonum (Oxypselaphus) obscurum	
Agonum (Agonum) marginatum	
Agonum (Agonum) lugens	
Agonum (Europhilus) thoreyi	
Synuchus vivalis	
Dolichus halensis	
Calathus (Calathus) fuscipes	
Calathus (Neocalathus) melanocephalus	
Calathus (Neocalathus) erratus	
Calathus (Neocalathus) ambiguous	
Laemostenus (Pristonychus) terricola punctatus	
Amara (Amara) similata	
Amara (Amara) ovata	
Amara (Amara) convexior	
Amara (Amara) littorea	
Amara (Amara) lunicollis	
Amara (Amara) aenea	
Amara (Amara) eurynota	
Amara (Amara) familiaris	
Amara (Amara) lucida	
Amara (Calia) collicita	
Amara (Cena) sonicita Zahrus (Zahrus) tenehrioides	
Zabrus (Pelor) sninines	
Anisodactylus (Anisodactylus) sianatus	
Diachromus aermanus	
Acupalpus (Acupalpus) meridianus	
Acupalpus (Ancylostria) interstitialis	
Ophonus (Cephalophonus) cephalotes	
Ophonus (Ophonus) sabulicola ponticus	
Ophonus (Ophonus) azureus	
Ophonus (Ophonus) cribricollis	
Pseudophonus (Pseudophonus) rufipes	
Pseudophonus (Pseudophonus) griseus	
Pseudophonus (Platus) calceatus	
Harpalus (Harpalus) affinis	
Harpalus (Harpalus) distinguendus	
Harpalus (Harpalus) smaragdinus	
Harpalus (Harpalus) dimidiatus	
Harpalus (Harpalus) tardus	
Harpalus (Harpalus) serripes	
Harpalus (Harpalus) flavicornis	
Harpalus (Harpalus) atratus	

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Group / Species	Status
Harpalus (Harpalus) tenebrosus	
Harpalus (Harpalus) pygmaeus	
Dixus obscurus	
Chlaenius (Chlaenites) spoliatus	
Chlaenius (Chlaeniellus) vestitus	
Licinus (Licinus) cassideus	
Lebia (Lamprias) cyanocephala	
Lebia (Lebia) scapularis	
Syntomus obscuroguttatus	
Polystichus connexus,	
Hymenoptera-Formicidae	
Myrmica rubra	
Messor structor	
Messor caducus	
Tetramorium caespitum	
Diplorhoptrum fugax	
Liometopum microcephalum	
Campontus (Camponotus) vagus	
Camponotus (Myrmentoma) fallax	
Lassius (Lasius) niger	
Formica (Serviformica) fusca	
Formica (Serviformica) cinerea	
Formica (Serviformica) rufibarbis	
Formica (Serviformica) cincularia	
Formica (Formica) pratensis	
Cataglyphis nodus	
Polyergus rufescens	
(Lepidoptera-Rhopalocera / Lepidoptera	-dias)
Thymelicus sylvestris	
Papilio machaon	
Iphiclides podalirius	
Zerynthia polyxena	BERN II, CORINE
Gonepteryx rhamni	
Colias crocea	
Colias alfacariensis	
Aporia crataegi	
Pieris brassicae	
Pieris rapae	
Pieris napi	
Anthocharis cardamines	
Pontia edusa	
Leptidea sinapis	
Callophrys rubi	
Lycaena phlaeas	
Lycaena dispar	HABDIR II, BERN II, CORINE
Lycaena tityrus	
Aricia agestis	
Cyaniris semiargus	
Polyommatus icarus	

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Group / Species	Status
Pseudophilotes vicrama	
Plebejus argus	
Apatura ilia	CORINE
Polygonia c-album	
Cynthia cardui	
Vanessa atalanta	
Inachis io	
Aglais urticae	
Nymphalis polychloros	
Nymphalis antiopa	
Issoria lathonia	
Brenthis daphne	
Melitaea cinxia	
Melitaea phoebe	
Pararge aegeria	
Lasiommata maera	
Erebia medusa	
Melanargia galathea	
Maniola jurtina	
Coenonympha pamphilus	

3.6.2.2 AQUATIC INVERTEBRATES

Four endangered aquatic invertebrates are identified in the water basins within the 30-km zone of the NPP – Danube River, lower course and mouths of Tsibritsa and Ogosta rivers, Asparuhov val Dam.

Striped Nerite (Theodoxus transversalis)

The species was dominant in the Bulgarian section of the Danube River in the past (96 specimens/m² and 26 g/m²) and Danube tributaries, but now it is rare (Angelov, 2000)⁸. The species was encountered within the 30-km zone of the Kozloduy NPP at Dolni Tsibar (km718) (05.09.2012, – 1 specimen; 01.11.2012 – 10 specimens) (**Figure 3.6-2**).

⁸ Angelov, A. 2000. Mollusca (Gastropoda et Bivalvia) aquae dulcis. Catalogus faunae bulgaricae, 4. Sofia-Leiden, Pensoft & Backhuys Publishers BV, 57 pp.



FIGURE 3.6-2: HABITATS OF STRIPED NERITE (THEODOXUS TRANSVERSALIS)

Thick Shelled River Mussel (Unio crassus)

The species was common in the Danube River in the past, with an average numbers of 1-3 specimens/m², reaching 80-90 speciments/m² in some areas (Angelov, 2000). Currently, according to our data, the species is found in the river, but much less frequently than the other two species of the *Unio* genus. Live specimens were found within the 30-km zone of the Kozloduy NPP. In the Danube River at Kozloduy Islands (05.09.2011) were established 23 live specimens and 131 shells (0.5 specimens/m²) in three areas: in the front part against the island, against the wider part and next to the ferry on the beach from the side of the town of Kozloduy (data of M. Todorov) and in the Danube River at Dolni Tsibar (km718) (05.09.2012) with numbers below 1 specimen/m² (own data). During field studies shells of *U. crassus* are encountered (19.02.2013) in the area between Mizia and Oryahovo (**Figure 3.6-3**).



FIGURE 3.6-3: HABITATS OF THICK SHELLED RIVER MUSSEL (UNIO CRASSUS)

Depressed River Mussel (Pseudanodonta complanata)

The species encountered in the Danube River is relatively low in numbers (Angelov, 2000). Live specimens have been found within the 30-km zone of the Kozloduy NPP. At Dolni Tsibar (km718, 05.09.2012) with numbers below 1 specimen/m² (own data). During field studies shells of the species are found at the Asparouhov val Pumping Station (05.09.2012). (**Figure 3.6-4**).



FIGURE 3.6-4: HABITATS OF DEPRESSED RIVER MUSSEL (PSEUDANODONTA COMPLANATA)

Narrow-Clawed Crayfish (Astacus leptodactylus)

The species is relatively common throughout the Danube River in the past (Bulgurkov 1961)⁹ and currently (own data). Live specimens within the 30-km zone have been encountered at the Asparouhov val Pumping Station (05.09.2012) and at the Asparouhov val Dam (01.10.2011, own data). It was also found during both field studies – in the Danube River at Radetzky Port (above Kozloduy, 19.02.2013) and of the Kozloduy Islands (06.03.2013). (**Figure 3.6-5**).



FIGURE 3.6-5: HABITATS OF NARROW-CLAWED CRAYFISH (ASTACUS LEPTODACTYLUS)

Conservation status of the aquatic invertebrates encountered in the 30-km zone is shown in **Table 3.6-4**.

 TABLE 3.6-4: Species composition and conservation status of aquatic invertebrates found within the 30-km zone of Kozloduy NPP.

⁹ Bulgurkov, K. 1961. Systematics, biology and geographic distribution of freshwater crabs of *Astacidae* and *Potamonidae* families in Bulgaria. News of the Zoological Institute and Museum, 10: 165-192

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Species	BDA Annex №	Directive 92/43/EEC/ Annex №	IUCN Red List (2013) Worldwide Endangered Species List / Level of threat
Striped Nerite (<i>Theodoxus</i> transversalis)	2, 3		Endagered
Thick Shelled River Mussel (Unio crassus)	2, 3	2, 4	Endagered
Depressed River Mussel (Pseudanodonta complanata)			Vulnerable
Narrow-Clawed Crayfish (Astacus leptodactylus)	4		Least concerned

3.6.2.3 AQUATIC INVASIVE ALIEN SPECIES

The activities foreseen during the civil works and operations of the new nuclear unit shall affect not only the native species but invasive alien species as well. The effect may be both negative and positive and will in turn reflect indirectly on native species and ecosystems. Not all of the alien species have expressed a negative impact on native species but such an effect may be obtained with changes in the environment (Panov *et al.* 2009)¹⁰.

The following alien species of aquatic invertebrates and fish with potentially negative impact on native species and ecosystems have been established or are expected to invade the 30-km zone of the Kozloduy NPP.

Chinese Pond Mussel (Anodonta woodiana)

The natural areal of the species is Southeast Asia. In Bulgaria, the species was first encountered in 2005 in the Danube River. Currently the species is found almost throughout the entire river section, going upstream of the tributaries of the Danube River. Live specimens are found in Dolni Tsibar within the 30-km zone of the Kozloduy NPP (km718) (05.09.2012), at Asparouhov val Pumping Station (km701) (05.09.2012 years) and at Oryahovo (km678) (06.09.2012) (own data). During field studies shells of the species are found widely in the hot canal (18.02.2013); single specimens in the Danube River at Radetzky Port and in the area between Mizia and Oryahovo and in high numbers in the Ogosta River at the bridge for Misia (19.02.2013). (**Figure 3.6-6**).

¹⁰ Panov, V. E., B. Alexandrov, K. Arbačiauskas, R. Binimelis, G. H. Copp, M. Grabowski, F. Lucy, R. SEW Leuven, S. Nehring, M. Paunović, V. Semenchenko, M. O. Son, 2009. Assessing the risks of aquatic species invasions via European inland waterways: From concepts to environmental indicators. Integrated Environmental Assessment and Management, 5 (1): 110–126.



FIGURE 3.6-6: HABITATS OF CHINESE POND MUSSEL (ANODONTA WOODIANA)

Mussels of the Dreissena genus – Zebra Mussel (Dreissena polymorpha) and Quagga Mussel (Dreissena bugensis)

The Zebra Mussel is a native species to the Danube River and it has massively spread in the inland water basins of the country in the last 15 years. The natural habitat of Quagga Mussel includes Dnepro-Bugski firth. In Bulgaria the species was found for the first time in 2005 in the Danube River. Within the 30-km zone of the NPP the species are encountered almost everywhere in the Danube River – at Dolni Tsibar, Asparuhov val Pumping Station and at Oryahovo (5-6.09.2012); shells of *D. polymorpha* were found in a lake below the town of Valchedram from the river valley of the Tsibritsa River (own data). During field studies shells of the two species are found in the Danube River at Radetzky Port and in the area between Misia and Oryahovo (19.02.2013). The massive invasion by both species is recorded in the Asparouhov val Dam in 2006 and in 2009. On the other hand no live specimens are found, but only massive build up of shells. Shells in the lake are found during the field study conducted on 14.01.2013 (**Figure 3.6-7**).



FIGURE 3.6-7: HABITATS OF ZEBRA MUSSEL (DREISSENA POLYMORPHA) AND QUAGGA MUSSEL (DREISSENA BUGENSIS)

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Asian Clam (Corbicula fluminea)

Originates from Central and Southeast Asia. In Bulgaria, the first specimens were found in 2001 in the Danube River. Currently, the species is found throughout the Bulgarian section of the river. In some areas the species is extremely high in numbers and rapidly spread upstream the Danube tributaries. Within the 30-km zone of the NPP, the species are found almost everywhere in the Danube River – in Dolni Tsibar (with numbers of 100 specimens/m²); at the Asparuhov val Pumping Station and Oryahovo (5-6.09.2012 years), including in Tsibritsa River, where the species is massively encountered (reaching Cherni vrah village, 29.07.2012, 1-2.11.2012) and Ogosta River (up to Portitovtsi, 28.07.2012) (own data). During field studies, the shells and live specimens of the species are found in the hot canal (18.02.2013); in the Danube River at Radetzky Port and in the area between Misia and Oryahovo; and massively in the Ogosta River at the bridge to Misia (19.02.2013). (FIGURE 3.6-8).



FIGURE 3.6-8: HABITATS OF ASIAN CLAM (CORBICULA FLUMINEA)

Chinese Mitten Crab (Eriocheir sinensis),

Originates from Southeast Asia. Found in 2005 at the Bulgarian section of the river.

Spiny-cheek Crayfish (Orconectes limosus)

Originates from the North America. Reported in the Serbian and Romanian section of the Danube River. It is expected to be encountered into the Bulgarian section.

3.6.2.4 FISH SPECIES

Paddlefish (Polyodon spathula)

Originates from the North America, the Mississippi River basin. In 2005 it was reported for the Bulgarian section of the Danube River, and in 2006 in the Serbian section.

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Asian carps – Bighead Carp (Aristichthys nobilis), Silver Carp (Hypophthalmichthys molitrix) and Grass Carp (Ctenopharyngodon idella)

Originating from China and the Amur River basin. They were first introduced in Bulgaria in 1964 and since then they are widely used for stocking of inland water basins of the country and the Danube River for the purpose of commercial fishing. Over the past few years, according to NAFA-MAF, the Danube River is not stocked. However, catches of the three species in the Danube River are stable in 2010 and 2011, though not high – an average of 6 t of Silver Carp, 12.5 t of Bighead Carp and 2.7 t of Grass Carp per year.¹¹ During an expedition along the Danube River in September 2012 juveniles were found in the area near the town of Vidin.

Based on information by fishermen in the area of the Kozloduy NPP the fish gather around the hot channel by the winter. The following species have been caught:

- Grass Carp – single specimens are being caught, 5-6 specimens per year, 5-20 kg,

- Silver Carp – massively enters the canal in April, 7 years ago was the most abundant, and then progressively decreased, 3-20 kg per year.

In 2001-2002 the canal is stocked with Grass Carp and Carp pursuant to recommendations of the Report to reduce the overgrowth of algae in the canal by the Green Balkans NGO (**Figure 3.6-9**).



FIGURE 3.6-9: HABITATS OF ASIAN CARPS

Gibel Carp (Carassius gibelio)

Originates from East Asia and Siberia. Encountered in the Danube River for the first time in 1948 and since then the species has been naturalized becoming a native species. According

¹¹ http://www.mzh.government.bg/mzh/bg/Documents/AgrarenDoklad.aspx

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to NAFA-MAF catches of Gibel Carp in the Danube River in 2011 were 6.4 tons that is a 2fold increase in comparison to 2010 – Agriculture Report – 2011¹². The species is captured in Stanevo 2005 within the 30-km zone of the NPP (Polačik et al., 2008). During the Joint Danube Survey 2, it is found in the section below Kozloduy (685 river km) in a relatively high numbers – 15.09.2007 (Liška et al., 2008)¹³. The species is also established in the Tsibritsa River in the area between Valchedram and Razgrad (02.11.2012) and "Asparuhov Val" dam (01.09.2009) (own data). During field studies the species is found in the BPS of Kozloduy NPP – at discharge of the old hot canal (06.03.2013) and in the Tsibritsa and Ogosta rivers (05.03.2013). (**Figure 3.6-10**).



FIGURE 3.6-10: HABITATS OF GIBEL CARP (CARASSIUS GIBELIO)

Topmouth Gudgeon (Pseudorasbora parva)

Originates from East Asia. The first report of the species is from the Danube River and adjacent water basins since 1975. Currently it is widely distributed species. It is found in the Danube River at Stanevo within the 30-km zone (May, October 2005, Polačik et al., 2008) and in the Tsibritsa River in the area between Valchedram and Razgrad (02.11.2012) (own data). During field studies the species is found in the Ogosta River (05.03.2013). (**Figure 3.6-11**).

¹² <u>http://www.mzh.government.bg/mzh/bg/Documents/AgrarenDoklad.aspx</u>

¹³ Liška I., F. Wagner, J. Slobodník 2008. Joint Danube Survey 2. Final Scientific Report. ICPDR, 242 pp.



FIGURE 3.6-11: HABITATS OF TOPMOUTH GUDGEON (PSEUDORASBORA PARVA

North American Catfishes (Ameiurus melas/ Ameiurus nebulosus / Ictalurus punctatus)

Originate from North America. Species are difficult to distinguish from one another. They are reported for the Danube River in Hungary, Serbia, Romania (Schiemer et al. 2004, etc.)¹⁴. In Bulgaria the species were introduced in 1959. A few years ago was reported a massive buildup of North American Catfishes in the Danube River at Orsoya.

Eastern Mosquitofish (Gambusia holbrooki)

Originates from America. Introduced in Bulgaria in 1924. In 2005-2006 it is reported for the Danube River. (Polačik *et al.* 2008).

Black-striped Pipefish (Syngnathus abaster)

Natural areal – brackish water basins of the Black and Azov seas. In the Bulgarian section of the Danube River the species is found for the first time in 1982 during the Danube expeditions in 2005-2006. It is one of the species with very high numbers, it is found at Stanevo and Kozloduy (October 2005) (Polačik *et al.*, 2008, Ondračková *et al.* 2011¹⁵). Is established at Oryahovo (06.09.2012) (own data). During field studies, the species is found in the Danube River at Radetzky Port (19.02.2013) (**Figure 3.6-13**).

¹⁴ Schiemer F., G. Guti, H. Keckeis and M. Staras 2004. Ecological status and problems of the Danube River and its fish fauna: a review. In: Welcomme R.L., T. Petr (Eds.), Proceedings of the Second International Symposium on the Management of Large Rivers for Fisheries "Sustaining Livelihoods and Biodiversity in the New Millennium", 11-14 February 2003, Phnom Penh, Kingdom of Cambodia. Vol. 1: 273-299.

¹⁵ Ondračková, M., I. Slováčková, T. Trichkova, M. Polačik, P. Jurajda, 2011. Shoreline distribution and parasite infection of black-stripped pipefish Syngnathus abaster Risso, 1827 in the lower River Danube. Journal of Applied Ichthyology, 28 (4): 590-596.



FIGURE 3.6-12: HABITATS OF BLACK-STRIPED PIPEFISH (SYNGNATHUS ABASTER)

Pumpkinseed (Lepomis gibbosus)

The species originates from the North America. For the first time it is reported in 1920 for the Danube River. Currently it is naturalized and had become a native species. It is found within the 30-km zone in the Danube River at Stanevo (May, October 2005, Polačik *et al.* 2008), at Asparuhov val Pumping Station and Oryahovo (5-6.09.2012), and in Asparuhov val Dam (01.09.2009) (own data). During field studies, the species is found in the Tsibritsa River at Razgrad village and in the Ogosota River (05.03.2013) (**Figure 3.6-13**).



FIGURE 3.6-13: HABITATS OF PUMPKINSEED (LEPOMIS GIBBOSUS)

Amur Sleeper (Perccottus glenii)

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Originates from the far East. For the first time, the species is found in 2005 at the Bulgarian section of the Danube River at the region of Vrav-Lom (Jurajda *et al.* 2006¹⁶); in the next years species is distributed along the entire section downstream (own data).

The analysis results show that a total of 3 alien species of mussels , 2 crab species and 13 fish species are encountered or are expected to enter the Bulgarian section of the Danube River. Since 2001 some of the most aggressive invasive alien species have entered – mussels *D. bugensis, C. fluminea, A. woodiana*, the crab *E. sinensis*, the fishes *P. spathula, G. holbrooki, P. glenii* and others. The majority of alien species are already naturalized with stable populations reaching large numbers, such as mussels and some fishes. The environment and the stability of local populations are essential factors for stabilization of the populations of other alien species of aquatic invertebrates and fishes in the Bulgarian section of the Danube River have been established within the 30-km zone of Kozloduy NPP. Most of them are thermophilic and the increased temperature of warmer water in the area of the discharge of waste water from the NPP is favorable for their development – metabolic processes are activated, nutrition activity rises, growth is accelerated and biomass increases, thus creating favorable conditions and accelerating breeding processes.

Distribution pathways of alien species can be natural expansion of the range due to climate change , including accidental or deliberate transfer as a result of human activity.

As a result of climate change in major European rivers, water temperature has risen by 1-3°C in the last century, and a number of studies showed an increase in water temperature throughout Europe during the last 60-90 years. This is mainly due to the increase of air temperature, but also locally as a result of the merger of the warm waters of TPP and NPP (EEA 2008¹⁷, 2010¹⁸). It has been predicted that the temperature of surface water of lakes to rise by about 2°C by 2070 (EEA 2008). Several impacts on aquatic ecosystems have been established as a result of climate change. Main of those changes are: reduction or increase in the number of species in the river; rise of the growth rate of algae; acceleration of growth of macrophytes; deterioration of water quality; shifting from stenothermic to eurythermic species; changes in the composition and structure of the phytoplankton,

¹⁶ Jurajda, P., M. Vassilev, M. Polacik, T. Trichkova, 2006. First record of exotic Perccottus glenii (Perciformes: Odontobutidae) in the Bulgarian Danube River. Acta zoologica bulgarica, 58 (2): 279-282.

¹⁷ EEA (European Environment Agency), 2008. Impacts of Europe's changing climate — 2008 indicator-based assessment. Joint EEA-JRC-WHO report; EEA Report No 4/2008, JRC Reference Report No JRC47756, 246 pp.

¹⁸ EEA (European Environment Agency), 2010. Climate change, impacts and vulnerability in Europe 2012: An indicator-based report. EEA Report No 12/2012, 300 pp.

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zooplankton, macrophytes, fish and food chains; spreading of alien invasive species (Kernan et al., 2010^{19}).

In a study of thermally influenced area after Kozloduy NPP conducted in 1991, the UACEG found that under normal operating conditions of the four reactors, the water temperature in the hot canal before the discharge into the river is 7.5-8.5°C above natural values. The width of the thermal pollution area (with $\Delta T = 3$ °C) then occurs at about 1700 m after the discharge of the hot canal with a maximum width of about 80 to 130 m. In 1999 are made calculations to determine the size of the thermally influenced area. The results obtained showed that during operation of the four reactors with a total volume of heated water 104 m³/s with temperature of 10°C above the temperature of the water in the Danube River, the thermally influenced area with probability of exceeding 5% and a temperature of +3°C above natural values in different months of the year varies within the section from km 684.3 to km 676.1 km, and is formed near the Bulgarian coast, and has a maximum width of 100 m to 185 m.

During different periods of operation of the NPP it is observed a long-term thermal load at Oryahovo (km678) compared to Lom (km743.3), although the difference is less than 3°C, pursuant to legal requirements. This confirms the studies showing that thermally influenced zone is less than 9 km downstream. For example are presented graphs of the average monthly temperatures in Lom and Oryahovo in different periods. (**Figure 3.6-14** to



Figure 3.6-17).

¹⁹ Kernan, M., R. W. Battarbee, B. Moss (eds.), 2010. Climate change impacts on freshwater ecosystems. Wiley-Blackwell Publ., 314 pp.
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FIGURE 3.6-14: AVERAGE MONTHLY WATER TEMPERATURES (°C) AT LOM AND ORYAHOVO STATIONS FOR THE PERIOD 1941-1970 – BEFORE PUTTING THE NPP INTO OPERATION²⁰



FIGURE 3.6-15: AVERAGE MONTHLY WATER TEMPERATURES (°C) AT LOM AND ORYAHOVO STATIONS FOR 1983 (DRY YEAR) – DURING OPERATION OF FOUR BLOCKS21



²⁰ Rusev, B. K., V. T. Naydenov (ed.) 1978. Limnology of the Bulgarian section of the Danube River. BAS edition, Sofia, p. 308.

²¹ EIA of Kozloduy NPP, 1999.

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FIGURE 3.6-16: AVERAGE MONTHLY WATER TEMPERATURES (°C) AT LOM AND ORYAHOVO STATIONS FOR 2006 (HIGH WATER YEAR) – DURING OPERATION OF FOUR BLOCKS (3, 4, 5, AND 6)²²



FIGURE 3.6-17: AVERAGE MONTHLY WATER TEMPERATURES (°C) AT LOM AND ORYAHOVO STATIONS FOR THE PERIOD 2008-2010 – DURING OPERATION OF TWO BLOCKS (5 AND 6)¹⁵

Data are not comparable because they cover different periods in terms of duration, but they show some trends. It is clear that before the launch of NPP there is no difference between the average monthly temperatures of the two stations at Lom and Oryahovo for almost 30 years (**Figure 3.6-14**). In 1983, when the four reactors are operating, the average difference for the year was 1.84°C, as the year is dry (**Figure 3.6-15**). In 2006, the difference is only 0.84°C, but then the water level reaches extremely high levels (**Figure 3.6-16**). For the period 2002-2006, the annual average temperature difference was 1.23°C, while the highest was in February – 1.66°C (according to EA EMDR). In the period 2008-2010 with two operating reactors, the average temperature difference between the two stations is 1.38°C (**Figure 3.6-17**), and for 2007-2012 – 1.43°C (according to EA EMDR). Differences are higher in the winter than in the summer, reaching 2.3°C, and in dry years. Furthermore, after comparing the two periods between 2002-2006 with operating 4 and between 2007-2012 with 2 operating reactors, the results show that the differences do not depend on the number of operating reactors and are even higher during the second period (according to EA EMDR).

²² Letter no. 438 dated 17.03.2013 with project study 34 / 17.03.2013 – data submitted by Executive Agency "Exploration and Maintenance of the Danube River" (EA EMDR<u>. www.appd-bg.org</u>) of the Client).

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During the field studies (18-19.02.2013) are measured physicochemical parameters of water at various points (**Table 3.6-5**). The measurement data show that the temperature in the hot canal is 11.7°C, which is 7.45°C higher than the values measured by the stations before Kozloduy NPP. Temperature difference between the stations before the NPP (at "Asparouhov Val" PS and at Radetzky Port) and after the NPP (between Oryahovo and Misia) is 1.75°C (**Table 3.6-5**). Data on water levels and temperatures of EA EMDR Ruse (http://www.appd-bg.org) for the same dates at Lom and Oryahovo stations confirm our results, showing a temperature difference of 1.7°C between the stations:

18.02.2013

^{km}743.30 Lom *565 cm (+4; and -12 dated 11.02.2013), 3.7*°*C* ^{km}678.00 Oryahovo *428 cm (+2; and -12 dated 11.02.2013), 5.4*°*C*

19.02.2013

^{km}743.30 Lom *564 cm (-1), 3.7*°*C* ^{km}678.00 Oryahovo *430 cm (+2), 5.4*°*C*

TABLE 3.6-5: PHYSICOCHEMICAL PARAMETERS OF WATER WITHIN THE 30-KM ZONE OF KOZLODUY NPP,MEASURED DURING FIELD STUDIES (18-19.02.2013)

N⁰	Station	Date, time	Temp., °C	Dissolved oxygen concentration, mg/l	Oxygen saturation, %	рН	Electrical conductivity, µS/cm
1	Kozloduy NPP – hot channel	18.02.2013 (11:00)	11.7	12.9	116	6.98	402
2	Danube River at "Asparuhov val" Pumping Station	18.02.2013 (18.00)	4.1	11.2		7.38	418
3	Danube River, Radezky Port	19.02.2013 (13.30)	4.2	11.5	89	7.77	398
4	Danube River between Mizia and Oryahovo	19.02.2013 (16.00)	7.2	10.9	92	8.03	430
5	Ogosta River – at the bridge on the road to Mizia	19.02.2013 (18.00)	5.9	12.2	100	7.96	467

Another major mechanism that most likely contributed to the introduction and establishment of alien species within the 30-km zone of the NPP is shipping. It is assumed that the transfer of larvae or adult by means of ships (via ballast water, containers, loads, etc.) and their subsequent introduction into the area of the ports is one of the primary mechanisms for spreading of aquatic invasive species (Panov *et al.* 2009).

3.6.2.5 ICHTHYOFAUNA

Danube River

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According to bibliography of the ichthyofauna (Drenski, 1951²³, Banarescu, 1964²⁴, Stefanov, 2007²⁵, Polačik *et al.* 2008²⁶) a total of 65 fish species are encountered in the common Bulgarian-Romanian section of the Danube River:

Ukrainian Brook Lamprey (Eudontomyzon mariae)	Common Roach (Rutilus rutilus)
Pontic Shad (Alosa pontica)	Sichel (Pelecus cultratus)
Black Sea Shad (Alosa maeotica)	Common Rudd (Scardinius erythrophthalmus)
Russian Sturgeon (Acipenser gueldenstaedtii)	Tench (<i>Tinca tinca</i>)
Starry Sturgeon (Acipenser stellatus)	Vimba Bream (<i>Vimba vimba</i>)
European Sea Sturgeon (Acipenser sturio)	Balkan Loach (Cobitis elongata)
Starry Sturgeon (Acipenser stellatus)	Spined Loach (Cobitis taenia)
Bastard Sturgeon (Acipenser nudiventris)	Balkan Golden Loach (Sabanejewia balcanica)
European Sturgeon (Huso huso)	Bulgarian Spined Loach (Sabanejewia bulgarica)
Northern Pike (Esox lucius)	Brown Bullhead (Ameiurus nebulosus)
European Mudminnow (Umbra krameri)	Wels Catfish (Silurus glanis)
Zope (Abramis ballerus)	Burbot (<i>Lota lota</i>)
Abramis brama (Abramis brama)	Black-striped Pipefish (Syngnathus abaster)
White-eye Bream (Abramis sapa)	Eastern Mosquitofish (Gambusia holbrooki)
Common Bleak (Alburnus alburnus)	Balon's Ruffe (Gymnocephalus baloni)
Asp (Aspius aspius)	Eurasian Ruffe (Gymnocephalus cernuus)
Barbel (Barbus barbus)	Striped Ruffe (Gymnocephalus schraetser)
Romanian Barbel (Barbus petenyi)	European Perch (Perca fluviatilis)
Silver Bream (Blicca bjoerkna)	Zander (Sander lucioperca)
Grass Carp (Ctenopharyngodon idella)	Volga Pikeperch (Sander volgense)
Silver Carp (Hypophthalmichthys molitrix)	Streber (Zingel streber)
Topmouth Gudgeon (Pseudorasbora parva)	Common Zingel (Zingel zingel)
Crucian Carp (Carassius carassius)	Pumpkinseed (Lepomis gibbosus)
Gibel Carp (Carassius gibelio)	Beardless Tadpole Goby (Benthophiloides brauneri)
Common Nase (Chondrostoma nasus)	Stellate Tadpole Goby (Benthophilus stallatus)
Common Carp (Cyprinus carpio)	Mushroom Goby (Neogobius eurycephalus)
Gudgeon (Gobio gobio)	Monkey Goby (Neogobius fluviatilis)
Kessler's Gudgeon (Romanogobio kessleri)	Racer Goby (Neogobius gymnotrachelus)
Chub (Squalius cephalus)	Kessler's Goby (Neogobius kessleri)

²³ Drenski P. 1951. Fishes of Bulgaria. Fauna of Bulgaria II. C., BAS, p. 270.

²⁴ Banarescu P. 1964. Pisces, Osteichthyes. Fauna Republici Populare Romine XIII. Bucuresti, 961 p.

²⁵ Stefanov T. 2007. Fauna and distribution of fishes in Bulgaria. – In: Fet V., A. Popov (eds): Biogeography and ecology of Bulgaria. Dordrecht (Springer), 109–139.

²⁶ Polačik, M., T. Trichkova, M. Janáč, M. Vassilev, P. Jurajda, 2008. The ichthyofauna of the shoreline zone in the longitudinal profile of the Danube River, Bulgaria. Acta zoologica bulgarica, 60 (1): 77-88.

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Ide (Leuciscus idus)		Round Goby (Neogobius melanost	tomus)		
Topmouth Gudgeon (Pseu	dorasbora parva)	Western Tubenose Goby (Protero	orhinus semilunaris)		
Danube Whitefin Gudgeon (Romanogobio vladykovi)		Amur Sleeper (Perccottus glenii)			
European Bitterling (Rhod	leus amarus)				

During the conduction of the modern international ichthyological studies (Joint Danube Survey 2 expedition – 2007 [JDS]) and those made in the field studies in March 2013 in the adjacent section of the Danube River, falling within the 30-km zone around the Kozloduy NPP and the future site of the new nuclear unit, 28 fish species are found. Part of the ichthyofauna referred to in scientific literature is not found due to the short time of studies and the period in which they are conducted. It is presented a summarized table with the conservation status of individual species including only those that are identified during the studies in the area.

TABLE 3.6-6: Species composition of ichthyofauna in the Danube River, found within the 30-kmzone of Kozloduy NPP

No.	Species	JDS	Our data
1.	Abramis brama (Abramis brama)	+	+
2.	White-eye Bream (Abramis sapa)		+
3.	Common Bleak (Alburnus alburnus)	+	+
4.	Asp (Aspius aspius)	+	+
5.	Barbel (Barbus barbus)	+	+
6.	Silver Bream (Blicca bjoerkna)	+	+
7.	Gibel Carp (Carassius gibelio)	+	+
8.	Common Nase (Chondrostoma nasus)	+	+
9.	Spined Loach (Cobitis taenia)	+	+
10.	Common Carp (Cyprinus carpio)	+	+
11.	Grass Carp (Ctenopharyngodon idella)		+
12.	Silver Carp (Hypophthalmichthys molitrix)		+
13.	Northern Pike (Esox lucius)	+	
14.	Eurasian Ruffe (Gymnocephalus cernuus)	+	+
15.	Striped Ruffe (Gymnocephalus schraetser)	+	
16.	Pumpkinseed (Lepomis gibbosus)	+	
17.	Chub (Squalius cephalus)	+	
18.	Ide (Leuciscus idus)	+	+
19.	Black-striped Pipefish (Syngnathus abaster)		
20.	Monkey Goby (Neogobius fluviatilis)	+	+
21.	Kessler's Goby (Neogobius kessleri)	+	
22.	Round Goby (Neogobius melanostomus)	+	+
23.	European Perch (Perca fluviatilis)	+	+
24.	Topmouth Gudgeon (Pseudorasbora parva)	+	
25.	Danube Whitefin Gudgeon (Romanogobio vladykovi)	+	
26.	European Bitterling (Rhodeus amarus)	+	

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No.	Species	JDS	Our data
27.	Common Roach (Rutilus rutilus)	+	+
28.	Zander (Sander lucioperca)	+	+
29.	Common Rudd (Scardinius erythrophthalmus)	+	
30.	Wels Catfish (Silurus glanis)	+	
31.	Vimba Bream (<i>Vimba vimba</i>)	+	+

Within the 30-km zone around the Kozloduy NPP are situated three zones of the NATURA 2000 habitats that are examined furing field studies.

Ogosta River

During field study of the Ogosota River within the region of the IP were encountered three species undetr Annex 2 of Directive 92/43 – Romanian Barbel (*Barbus petenyi*), Spined Loach (*Cobitis taenia*) and European Bitterling (*Rhodeus amarus*). Besides them, seven other fish species were also encountered: Chub (*Squalius cephalus*), Gibel Carp (*Carassius gibelio*), Common Bleak (*Alburnus alburnus*), Spirlin (*Alburnoides bipunctatus*), Topmouth Gudgeon (*Pseudorasbora parva*), Tubenose Goby (*Proterorhinus marmoratus*) and Round Goby (*Neogobius melanostomus*).

Tsibritsa River

During field study of the Tsibritsa River within the 30-km zone around Kozloduy NPP were found five fish species included in Annex 2 of Directive 92/43, and namely Spined Loach (*Cobitis taenia*), Balkan Golden Loach (*Sabanejewia balcanica*) and European Bitterling (*Rhodeus amarus*), Mediterranean Barbel (*Barbus meridionalis*) and Kessler's Gudgeon (*Gobio kessleri*). Besides them, seven other fish species are also encountered: Chub (*Squalius cephalus*), Gibel Carp (*Carassius gibelio*), Common Bleak (*Alburnus alburnus*), Common Nase (*Chondrostoma nasus*), Gudgeon (*Gobio gobio*), Stone Loach (*Barbatula barbatula*) and Pumpkinseed (*Lepomis gibbosus*).

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During field study are encountered 10 fish species: Spined Loach (*Cobitis taenia*), Common Bream (*Abramis brama*), Common Roach (*Rutilus rutilus*), Gibel Carp (*Carassius gibelio*), Common Bleak (*Alburnus alburnus*), Pumpkinseed (*Lepomis gibbosus*), European Perch (*Perca fluviatilis*), Monkey Goby (*Neogobius fluviatilis*), Round Goby (*Neogobius melanostomus*) and Western Tubenose Goby (*Proterorhinus semilunaris*).

TABLE 3.6-7: Species composition and conservation status of ichthyofauna within the 30-km Surveilance zone

Species	BDA	Dir.	B.C.	RB	IUCN
Abramis Brama (<i>Abramis brama</i>)					LC
White-eye Bream (Abramis sapa)				DD	LC
Common Bleak (<i>Alburnus alburnus</i>)					LC

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Species	BDA	Dir.	B.C.	RB	IUCN
Spirlin (Alburnoides bipunctatus)			III	DD	LC
Asp (Aspius aspius)	II, IV	II, V	III	VU	LC
Barbel (Barbus barbus)		V		VU	LC
Romanian Barbel (<i>Barbus petenyi</i>)	II, IV	V		DD	LC
Silver Bream (<i>Blicca bjoerkna</i>)					LC
Gibel Carp (<i>Carassius gibelio</i>)					
Common Nase (Chondrostoma nasus)			III		LC
Chub (Squalius cephalus)					LC
Spined Loach (Cobitis taenia)	II	II	III	DD	LC
Balkan Golden Loach (Sabanejewia balcanica)	II	II	III	VU	LC
Common Carp (<i>Cyprinus carpio</i>)					
Grass Carp (Ctenopharyngodon idella)					
Silver Carp (Hypophthalmichthys molitrix)					
Northern Pike (<i>Esox lucius</i>)					LC
Eurasian Ruffe (<i>Gymnocephalus cernuus</i>)					LC
Striped Ruffe (Gymnocephalus schraetser)	II, IV	II	III	VU	LC
Pumpkinseed (<i>Lepomis gibbosus</i>)					
Ide (Leuciscus idus)					LC
Black-striped Pipefish (Syngnathus abaster)					LC
Monkey Goby (<i>Neogobius fluviatilis</i>)			III		LC
Kessler's Goby (<i>Neogobius kessleri</i>)					LC
Round Goby (<i>Neogobius melanostomus</i>)					LC
European Perch (<i>Perca fluviatilis</i>)					LC
Topmouth Gudgeon (<i>Pseudorasbora parva</i>)					
Danube Whitefin Gudgeon (<i>Romanogobio vladykovi</i>)	II	II		VU	LC
Kessler's Gudgeon (Romanogobio kessleri)	II	II	III	EN	LC
Gudgeon (<i>Gobio gobio</i>)					LC
European Bitterling (<i>Rhodeus amarus</i>)	II	II	III		LC
Common Roach (<i>Rutilus rutilus</i>)					LC
Zander (Sander lucioperca)					LC
Common Rudd (Scardinius erythrophthalmus)					LC
Wels Catfish (Silurus glanis)			III		LC
Vimba Bream (<i>Vimba vimba</i>)			III		LC
Stone Loach (Barbatula barbatula)				VU	LC

Legend:

BDA (Biological Diversity Act): Annex III – protected species on the territory of the country;

Dir. (Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora): Annex II – Animal and plant species of Community interest whose conservation requires the designation of special areas of conservation; Annex V – Animal and plant species of Community interest whose conservation requires the designation of special areas of special areas of conservation.

B.C. (The Bern Convention on the Conservation of European Wildlife and Natural Habitats, 19.09.1979): Appendix III – Protected fauna species.

RB (Red Book of Bulgaria, vol. 2 – Fauna (2011)): EN (Endangered); VU (Vulnerable); DD (Data Deficient).

IUCN (IUCN Red List of Threatened Species, release 2010.2.): *LC* (Least Concern) – taxa that have been evaluated according to the IUCN criteria, but does not meet any of the criteria for inclusion into the "Critically Endangered", "Endangered" or "Least Concern" categories (in this category are included taxa that are widely distributed and in high numbers).

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3.6.2.6 HERPETOFAUNA

For the territory of Bulgaria are reported 19 amphibian and 38 reptile species. The Danubian Plain and especially its western parts are poorly studied, in terms of herpetofauna, but according to modern summary reports it is asserted that 10 amphibian and 10 reptile species can be encountered within the 30-km surveillance zone (Table **3.6-8**) (Biserkov et al., 2007²⁷; Naumov and Stanchev, 2010²⁸; Stojanov et al., 2011²⁹). Eighteen of them (9 amphibian and 9 reptile species) are included in the Annexes of Biological Diversity Act (BDA). Five of them are included in Annex II of the BDA and are considered species of conservation concern within the region, and namely: Danube Crested Newt (T. dobrogicus), European Fire-bellied Toad (B. bombina), European Pond Turtle (E. orbicularis), Hermann's Tortoise (T. hermanni) and Caspian Whipsnake (E. sauromates). The first three species are closely related to water and inhabit swamps, lakes, canals and slow flowing rivers. The Danube Crested Newt is encountered very close to the Danube River (not more than 2-3 km as a rule). The European Fire-bellied Toad and the European Pond Turtle are widely distributed in the entire Danubian Plain. The other species are entirely terrestrial and inhabit broad-leaf woods and bushes, pastures, meadows, abandoned agricultural lands, etc. The two species are rare for the Danubian Plain and their populations are very fragmented and low in numbers.

Species	BDA	Dir.	B.C.	RB	IUCN
Smooth Newt (<i>Lissotriton vulgaris</i>)	III	-	III	-	LC
Danube Crested Newt (<i>Triturus dobrogicus</i>)	II, III	II	II	VU	NT
European Fire-bellied Toad (Bombina bombina)	II, III	II, IV	II	-	LC
European Spadefoot Toad (<i>Pelobates fuscus</i>)	III	IV	II	-	LC
Caucasian Toad (<i>Bufo bufo</i>)	III	-	III	-	LC
European Green Toad (<i>Bufo viridis</i>)	III	IV	II	-	LC
European Tree Frog (<i>Hyla arborea</i>)	III	IV	II	-	LC
Edible Frog (Pelophylax kl. esculentus)	IV	V	III	-	LC
Marsh Frog (<i>Pelophylax ridibundus</i>)	IV	V	III	-	LC
Agile Frog (Rana dalmatina)	-	IV	II	-	LC
European Pond Turtle (<i>Emys orbicularis</i>)	II, III	II, IV	II	-	NT
Hermann's Tortoise (<i>Testudo hermanni</i>)	II, III	II, IV	II	EN	NT
European Green Lizard (<i>Lacerta viridis</i>)	III	IV	II	-	LC

TABLE 3.6-8: SPECIES COMPOSITION AND CONSERVATION STATUS OF HERPETOFAUNA WITHIN THE 30-KM SURVEILLANCE ZONE

²⁷ Biserkov V. (ed.) 2007. Key of amphibians and reptiles in Bulgaria. Green Balkans, Sofia, 196 c.

²⁸ Naumov B., M. Stanchev. 2010. Amphibians and reptiles in Bulgaria and Balkan Peninsula. Electronic edition of BHA, web: www.herpetology.hit.bg

²⁹ Stojanov A., N. Tzankov, B. Naumov. 2011. Die Amphibien und Reptilien Bulgariens. Frankfurt am Main, Chimaira, 588 pp.

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Species	BDA	Dir.	B.C.	RB	IUCN
Balkan Wall Lizard (<i>Podarcis tauricus</i>)	III	IV	II	-	LC
Caspian Whipsnake (Dolichophis caspius)	III	IV	II	-	-
Caspian Whipsnake (<i>Elaphe sauromates</i>)	II, III	II, IV	II	EN	-
Grass Snake (<i>Natrix natrix</i>)	-	-	III	-	LC
Dice Snake (Natrix tessellata)	III	IV	II	-	-
Aesculapian Snake (Zamenis longissimus)	III	IV	II	-	LC
Nose-horned Viper (Vipera ammodytes)	III	IV	II	-	LC

Legend:

- **BDA** (Biological Diversity Act): Annex II species for whose protection are declared protected areas for the conservation of their habitat; Annex III protected species on the territory of the country; Annex IV species under conservation and regulated use.
- **Dir.** (Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora): Annex II Animal and plant species of Community interest whose conservation requires the designation of special areas of conservation; Annex IV Animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation; Annex V Animal and plant species of Community interest whose taking from the wild can be restricted by European law.
- **B.C.** (The Bern Convention on the Conservation of European Wildlife and Natural Habitats, 19.09.1979): Appendix II Strictly protected fauna species; Appendix III Protected fauna species.
- **RB** (Red Book of Bulgaria, vol. 2 Fauna (2011)): **EN** (Endangered); A taxon belongs to this category when there is a very high risk of extinction due to small populations, fragmented distribution, isolation and/or rapid reduction (number or area of distribution) meeting the criteria A to E for this category according to IUCN. Taxa assigned to this category are more likely to switch to critically endangered if adverse factors continue to operate. VU (Vulnerable) A taxon is included in this category when there is a high risk of extinction due to the continuing decline of the population (even at local level), habitat destruction and over-exploitation. Observed or predicted rate of decrease is less than for the taxa that are referred to a higher threat category (according to criteria A-E). This category includes species whose populations are still numerous and/or stable, but with unfavorable future prospects. Their regress can be accelerated if the factors that cause it in the country and neighboring countries continue to operate.
- **IUCN** (IUCN Red List of Threatened Species, release 2010.2.): NT (Near Threatened)– taxa that have been evaluated according to the IUCN criteria, and although they does not meet any of the criteria for inclusion into the "Critically Endangered", "Endangered" or "Vulnerable" categories, it is very likely to cover some of the criteria under these categories in the near future. **LC** (Least Concern) taxa that have been evaluated according to the IUCN criteria, but does not meet any of the criteria for inclusion into the "Critically Endangered", "Vulnerable" or "Least Concern" categories (in this category are included taxa that are widely distributed and in high numbers

3.6.2.7 MAMMALS

Thirty-eight mammal species are inhabiting the Danubian Plain (Appendix 2 and 3), **4** of them are included in the Red Book of Bulgaria, **21** species are included in the Appendices of the Bern Convention, **3** species are listed in CITES, **4** species are included in the IUCN Red List, and **10** species are protected under the Biological Diversity Act (Golemanski, ed. 2011)³⁰.

The following species listed in BDA occur: European Hedgehog (*Erinaceus europaeus*), Mound-building Mouse (*Mus spicilegus*), European Ground Squirrel (*Spermophilus citellus*), Hamster Dobrogean (*Mesocricetus newtoni*) and European Hamster (*Cricetus cricetus*),

³⁰ Red Book of Bulgaria, 2011. it. 2, Animals. GOLEMANSKI, V., ed.

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Least Weasel (*Mustela nivalis*), European Otter (*Lutra lutra*), European Polecat (*Mustela putorius*).

Strictly protected mammals inhabiting the 30-km surveillance zone that are included in Appendix 2 of the Bern Convention are: European Otter (*Lutra lutra*), European Ground Squirrel (*Spermophilus citellus*), Hamster Dobrogean (*Mesocricetus newtoni*) and European Hamster (*Cricetus cricetus*).

European Otter (*Lutra lutra*) is established in all section of the Danube River with preserved natural and dense vegetation, including the swamps, fish breeding-ponds and lakes near the Danube River, but currently sufficient data are not available (Georgiev and Koshev, 2006)³¹. Their numbers are relative low within the surveillance zone. Species are found in a man-made water basin in the region of the Danube River km327. Otters are observed at discharge of the Hot Canal of Kozloduy NPP at the BPS of the Danube River: 43°45′04.7″ N and 23°51′41.1″ E and within Kozloduy Islands Protected Zone: 43°47′24.3″ N and 23°42′55.7″ E.

Traces of the presence of Otter (excrements) are established in the Tsibritsa River, to the south of Dolni Tsibar village: 43°48'24.3" N and 23°30'40.4" E; to the south of Dolno Tserovene village: 43°34'33.2" N and 23°13'47.1" E, as well as in the Skat River, near the town of Misia: 43°41'38.3" N and 23°50'41.4" E.

Pastures are the only habitat of the European Ground Squirrel (*Spermophilus citellus*), a worldwide threatened species (Stefanov, 2006)³². Stable local population with high numbers is established in the area of the Protected Area "Ogosta River" and just next to it:

43º 43'59.66" N and 23º54'41.11" E, alt. 140 m 43º 42'56.11" N and 23º51'55.33" E, alt. 45 m 43º 43'57.65" N and 23º55'45.73" E, alt. 153 m 43º 43'59.23" N and 23º54'47.23" E, alt. 131 m 43º 44'04.63" N and 23º54'06.44" E, alt. 135 m

³¹ Georgiev D., Koshev Y. 2006. Concept for protection of habitats of (*Lutra lutra*) within NATURA 2000.

³² Stefanov V. 2006. Concept for protection of habitats of (*Spermophilus citellus*) within NATURA 2000.

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FIGURE 3.6-18: PRESENCE OF EUROPEAN OTTER (*LUTRA LUTRA***) WITHIN THE 30-KM SURVEILANCE ZONE** - Alternative sites of the new nuclear unit; - Presence of Otter



FIGURE 3.6-19: HOLES IN THE PROTECTED AREA "OGOSTA RIVER" EXCAVATED BY THE EUROPEAN GROUND SQUIRREL

A small colony is established in a pasture to the north of Tsibar village and next to Dolni Tsibar village: 430°48'33.21" N and 230°29'20.10" E, 430°48'30.30" N and 230°29'45.10" E; to the south of Pali lula village is established a colony with relative high density. To the south and to the east of Valchedram: 43°39'36.0" N and 23°25'22.5"E.





FIGURE 3.6-20: COLONIES OF EUROPEAN GROUND SQUIRREL (SPERMOPHILLUS CITELLUS) WITHIN THE 30-KM SURVEILLANCE ZONE

♥ – Alternative sites of the new nuclear unit, ♥ – Colonies of European Ground Squirrel, ♥ – Habitats of European Ground Squirrel according to bibliographic data

Two rear species Hamster Dobrogean (*Mesocricetus newtoni*) (Gradev , 2003)³³ and European Hamster (*Cricetus cricetus*) are small rodents in relatively low numbers within the region. These steppe species are found in Dobrudzha, middle and eastern part of the Danubian Plain to the west near the Ogosta River. They colonize agricultural areas in the lowlands and plains dominated by perennial herbaceous crops on heavy soils. Their numbers in the rural areas is higher than in the "wild" grasses. Although the surveillance zone is a suitable habitat, traces of their vital activity have not been established.

The Common Vole (*Microtus arvalis*) is dominating mammal species in agrarian landscapes, and the Southern White-breasted Hedgehog (*Erinaceus concolor*) and Least Weasel (*Mustella nivalis*) are typical of the anthropogenically-influenced and the lower parts of the region.

Also typical are the species with high ecological plasticity that populate all possible mezophillic and wet lower habitats under the conditions of drier and continental climate such as Yellow-necked Mouse (*Apodemus flavicollis*), Wood Mouse (*Apodemus sylvaticus*).

³³ Gradev G. 2003. Dobrudja hamster (*Mesocricetus newtoni* Nehrig) (Mammalia: Cricetidae) of South Bulgaria. Newsletter of the Federation of the Green Balkans Associations, no. 9, page 11.

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On a mosaic principle throughout steppe meadows, pastures and arable land are found Lesser Mole Rat (*Nannospalax leucodon*) and Mound-building Mouse (*Mus spicilegus*).

The two species: Forest Dormouse (*Dryomys nitedula*) and Edible Dormouse (*Glis glis*) adhere mainly to forest habitats and outlying parts of forests and scrubs.

The European Badger (*Meles meles*) is frequently encountered on hilly terrains, open areas and forests alternating with pastures.

Typical representative of the predatory species – Red Fox (*Vulpes vulpes*), inhabits anthropogenically degraded landscapes.

Relatively high in numbers are European Hare (*Lepus europaeus*), Wild Boar (*Sus scrofa*), Golden Jackal (*Canis aureus*), Beech Marten (*Martes foina*) and European Polecat (*Putorius putorius*).

On **Table 3.6-9** is presented the species composition and conservation importance of mammals.

Code	Species	BDA/ Annex №	Red Book of Bulgaria	Bern Convention Appendix №	Bonn Convention Appendix №	CITES Annex №	Directive 92/43/EEC Annex №	IUCN Worldwide protected species
1335	European Ground Squirrel Spermophilus citellus	№2 +	+vulnerable	Nº2		+	№2; 4	+ vulnerable
1355	European Otter <i>Lutra lutra</i>	№2; 3+	+ threatened	№2; 4		№1 +	№2;4 +	+ vulnerable
2609	Hamster Dobrogean Mesocricetus newtoni	№2; 3+		Nº2				+ vulnerable
	Beech Marten Martes foina			№3+				least concerned
	Lesser Mole Rat Nannospalax leucodon							+ vulnerable
	Red Deer <i>Cervus elsphus</i>			Nº3		Nº 2		
	European Water Vole <i>Arvicola terrestris</i>			Nº3				
	European Hamster Cricetus cricetus	№3+	+ threatened	№2+			Nº4+	least concerned
	Bicoloured White- toothed Shrew <i>Crocidura leucodon</i>			Nº3+	+			
	Wood Mouse Apodemus sylvaticus							

TABLE 3.6-9: SPECIES COMPOSITION AND CONSERVATION STATUS OF MAMMALS ENCOUNTERED IN THE 30 KM SURVEILLANCE ZONE

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Code	Species	BDA/ Annex №	Red Book of Bulgaria	Bern Convention Appendix №	Bonn Convention Appendix №	CITES Annex №	Directive 92/43/EEC Annex №	IUCN Worldwide protected species
	Forest Dormouse Dryomys nitedula	№2+		№3+			Nº4+	least concerned
	Brown Hare Lepus capensis			Nº3 +				
	Wild Boar Sus scrofa							
	House Mouse Mus domesticus							
	Yellow-necked Mouse Apodemus flavicollis							
	Southern White- breasted Hedgehog Erinaceus concolor	Nº3 +					Nº2	
	Eurasian Red Squirrel <i>Sciurus vulgaris</i>			Nº3				least concerned
	Mole Talpa europaea	Nº3						
	Red Fox Vulpes vulpes threatened							
	Lesser White- toothed Shrew <i>Crocidura</i> <i>suaveolens</i>			№3			Nº2	
	Miller's Water Shrew <i>Neomys anomalus</i>			Nº3				
	Eurasian Pygmy Shrew <i>Sorex minutus</i>			Nº3				
	Least Weasel <i>Mustella nivalis</i>	Nº3		Nº3				
	Edible Dormouse <i>Glis glis</i>		+ least concerned to threatened	Nº3				least concerned
	Common Shrew Sorex araneus			№3				
	Common Vole Microtus arvalis							
	Common Rat Rattus norvegicus							
	Mound-building Mouse <i>Mus spicilegus</i>							least concerned
	European Roe Deer Capreolus capreolus			№3 +				
	Golden Jackal Canis aureus	Nº4 +				Nº2	Nº4	

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Code	Species	BDA/ Annex №	Red Book of Bulgaria	Bern Convention Appendix №	Bonn Convention Appendix №	CITES Annex №	Directive 92/43/EEC Annex №	IUCN Worldwide protected species
	Black Rat							
	European Polecat	№4 +		№3			Nº5	
	European Badger Meles meles			Nº3				
Code	Species	BDA/ Annex №	Red Book of Bulgaria	Bern Convention Appendix №	Bonn Convention Appendix №	CITES Annex №	Directive 92/43/EEC Annex №	IUCN Worldwide protected species
1335	European Ground Squirrel Spermophilus citellus	№2 +	+ vulnerable	Nº2		+	№2; 4	+ vulnerable
1355	European Otter <i>Lutra lutra</i>	№2; 3+	+ threatened	№2; 4		№1 +	№2;4 +	+ vulnerable
2609	Hamster Dobrogean <i>Mesocricetus</i> newtoni	№2; 3+		Nº2				+ vulnerable
	Beech Marten Martes foina			Nº3+				least concerned
	Lesser Mole Rat Nannospalax leucodon							+ vulnerable
	Red Deer <i>Cervus elsphus</i>			Nº3		Nº 2		
	European Water Vole <i>Arvicola terrestris</i>			Nº3				
	European Hamster Cricetus cricetus	Nº3+	+ threatened	№2+			Nº4+	least concerned
	Bicoloured White- toothed Shrew Crocidura leucodon			Nº3+	+			
	Wood Mouse Apodemus svlvaticus							
	Forest Dormouse Dryomys nitedula	№2+		Nº3+			№4+	least concerned
	Brown Hare <i>Lepus capensis</i>			№3 +				
	Wild Boar Sus scrofa							
	House Mouse Mus domesticus							
	Mouse Apodemus flavicollis							
	Southern White- breasted Hedgehog Erinaceus concolor	№3 +					Nº2	

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Code	Species	BDA/ Annex №	Red Book of Bulgaria	Bern Convention Appendix №	Bonn Convention Appendix №	CITES Annex №	Directive 92/43/EEC Annex №	IUCN Worldwide protected species
	Eurasian Red			Nº3				least
	Squirrel							concerned
I	Sciurus vulgaris	NoO						
	Mole Talna auronaga	Nº3						
1	Red Fox							
	Vulnes vulnes							
	Threatened							
	Lesser White-			Nº3			Nº2	
	toothed Shrew							
	Crocidura							
	suaveolens							
	Miller's Water			№3				
	Shrew							
1	Neomys anomalus			No2				
	Shrow			INº3				
	Sorex minutus							
	Least Weasel	Nº3		Nº3				
	Mustella nivalis							
	Edible Dormouse		+ least	Nº3				least
	Glis glis		concerned					concerned
			to					
1	a ai		threatened					
	Common Shrew			Nº3				
I	Sorex araneus							
	Microtus arvalis							
	Common Rat							
	Rattus norveaicus							
	Mound-building							least
	Mouse							concerned
	Mus spicilegus							
	European Roe Deer			№3 +				
	Capreolus							
	capreolus							
	Golden Jackal	№4 +				Nº2	Nº4	
	Canis aureus							
	Black Kat							
	Furopean Polocat	No4 +		No2			No5	
	Putorius nutorius	11-4 +		11=0			N≚J	
	European Badger			Nº3				
	Meles meles							

3.6.2.8 CHIROPTEROFAUNA

According to contemporary zoogeographical zoning of Bulgaria, the territory within the 30km surveillance zone falls within the sub-region of the West Danubian Plain. Regarding the bat fauna, it is one of the least studied areas in Bulgaria. Until 2003, reports of bats in this area accounted for only 1.9% of all reports for the presence of bats in Bulgaria (Benda et

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al., 2003³⁴). Only eight species of bats are known. After this period there have been two annual monitoring of the bat fauna in relation to the investment plans for new capacities from renewable energy sources, mainly wind farms (Michev, 2009³⁵; Conformity Assessment Report, 2009³⁶). The results of these monitoring are not published in scientific papers and were not analyzed in the scale of the zoogeographical region.

Based on all field studies until 2012, the total number of bat species within the 30-km surveillance zone reached 19: Common Pipistrelle (*Pipistrellus pipistrellus*), Nathusius' Pipistrelle (*Pipistrellus nathusii*), Serotine Bat (*Eptesicus serotinus*), Common Noctule (*Nyctalus noctula*), Lesser Noctule (*Nyctalus leisleri*), Savi's Pipistrelle (*Hypsugo savii*), Parti-coloured Bat (*Vespertilio murinus*), Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), Lesser Horseshoe Bat (*Rhinolophus hipposideros*), Mehely's Horseshoe Bat (*Rhinolophus mehelyi*), Mediterranean Horseshoe Bat (*Rhinolophus euryale*), Grey Longeared Bat (*Plecotus austriacus*), Common Bent-wing Bat (*Myotis schreibersii*), Greater Mouse-eared Bat (*Myotis myotis*), Lesser Mouse-eared Bat (*Myotis blythii*), Long-fingered Bat (*Myotis capaccinii*), Whiskered Bat (*Myotis mystacinus*), Geoffroy's Bat (*Myotis emarginatus*) and Alcathoe's Bat (*Myotis alcathoe*).

Most of the area of the 30-km surveillance zone is occupied by large arable agricultural areas that have very limited value as a food habitat for bats. Summer and winter shelters are located here in individual old trees or in buildings in the settlements. The monoculture fields and the several-month period with virtually no vegetation (periods prior to germination and maturing of wheat, sunflower, etc., including periods after harvest and plowing) minimize the role of these areas as a food habitat for bats due to the accompanying extremely low insect abundance in these periods. Additional negative factor is the treatment of agricultural fields with insecticides and other chemicals. These are the main reasons for the extremely low activity of bats flying over open arable lands – an average of only two flybys per hour at the observation points during the summer period. Five species are dominant, being a characteristic fauna of lowland areas throughout Northern Bulgaria, and namely: Common Pipistrelle (*Pipistrellus pipistrellus*), Nathusius' Pipistrelle (*Pipistrellus nathusii*), Serotine Bat (*Eptesicus serotinus*), Lesser Noctule (*Nyctalus leisleri*) and Common Noctule (*Nyctalus noctula*).

The main abundance of bats within the 30-km surveillance zone is concentrated in the Ogosta, Skat and Tsibritsa rivers, and near Shishmanov val Dam. Of particular importance

³⁴ Benda, P., T. Ivanova, I. Horacek, J. Cerveny, J. Gaisler, A. Gueorguieva, B. Petrov and V. Vohralik. 2003. Bats (Mammalia: Chiroptera) of the Eastern Mediterranean. Part 3. Review of bat distribution in Bulgaria. – Acta Soc. Zool. Bohem., 67: 245-337.

³⁵ Michev, T. (head). 2009. Avifauna monitoring on the territory of Valchedram Wind Farm. Sofia, CLGE at BAS (unpublished report).

³⁶ Conformity Assessment Report on the IP "Construction of Wind Farm with 55 WEA", over the lands of town of Oryahovo and Selanovtsi village, Oryahovo Municiplaity, Vratsa District, Kalin Eko Story EOOD, Sofia, 2009, p. 68.

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as a migration corridor is the valley of the Danube River, where the adjacent humid vegetation and riparian forests provide not only multiple daily shelters for migratory populations, but also create conditions necessary to feed them. In fact, dominant species composition is not differentiated from that found over open arable lands, but the continuing presence and activity of bats are considerably higher. Although of local importance, some valleys, except for the rivers, are fulfilling the role of migration corridors.

The association of bats within the 30-km surveillance zone is enriched by the presence of cave-inhabiting and petrophilic species: Long-fingered Bat (*Myotis capaccinii*), Savi's Pipistrelle (*Hypsugo savii*), Common Bent-wing Bat (*Miniopterus schreibersii*), Greater Mouse-eared Bat (*Myotis myotis*), Lesser Mouse-eared Bat (*Myotis blythii*), Geoffroy's Bat (*Myotis emarginatus*), Greater Horseshoe Bat (*Rhinolophus ferrumequinum*), Lesser Horseshoe Bat (*Rhinolophus hipposideros*), Mehely's Horseshoe Bat (*Rhinolophus mehelyi*) and Mediterranean Horseshoe Bat (*Rhinolophus euryale*). A prerequisite for this is the presence of karst landscapes and caves in the Ogosta River valley (Figure 3.6-31), and the existence of significant bat colonies in caves located in the Fore Balkan. During hunting some specimens of these colonies fly away for tens of kilometers from their daily shelter and the 30-km surveillance zone is part of their feeding grounds.



FIGURE 3.6-21: FIGURE 3.6-15. ROCKY BANKS OF THE OGOSOTA RIVER NEAR HAIREDIN VILLAGE AND THE MAN-MADE CAVE ENTRANCE "HOMICHINA DUPKA" WITH A TOTAL LENGTH OF 16 M

Shelters suitable for bats (migratory Common Pipistrelle (*Pipistrellus pipistrellus*), Nathusius' Pipistrelle (*Pipistrellus nathusii*), Parti-coloured Bat (*Vespertilio murinus*), Lesser Noctule (*Nyctalus leisleri*) and Common Noctule (*Nyctalus noctula*), local population

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of Serotine Bat (*Eptesicus serotinus*), including cave-inhabiting and synanthropic species of the *Rhinolophus* genus) are exisiting in abandoned constructions and other man-made shelters in the settlements.

The forest species Grey Long-eared Bat (*Plecotus austriacus*), Whiskered Bat (*Myotis mystacinus*) and Alcathoe's Bat (*Myotis alcathoe*) are relatively rare in this location and are known only by single specimens.

Bat species in the period 2003 – 2012 incl., are established in the observation points presented in **Figure 3.6-22**.



FIGURE 3.6-22

Observation Point 1 – Greater Mouse-eared Bat (Myotis myotis), Lesser Mouse-eared Bat (Myotis blythii), Geoffroy's Bat (Myotis emarginatus), Nathusius' Pipistrelle (Pipistrellus nathusii), Common Pipistrelle (Pipistrellus pipistrellus), Common Noctule (Nyctalus noctula); Observation Point 2 – Whiskered Bat (Myotis mystacinus), Alcathoe's Bat (Myotis alcathoe); **Observation Point 3** – Greater Horseshoe Bat (Rhinolophus ferrumequinum); **Observation Point 4** – Whiskered Bat (Myotis mystacinus), Nathusius' Pipistrelle (Pipistrellus nathusii), Common Pipistrelle (Pipistrellus), Grey Long-eared Bat (Plecotus austriacus); **Observation Point 5** – Long-fingered Bat (Myotis capaccinii), Nathusius' Pipistrelle (Pipistrellus pipistrellus), Common Noctule (Nyctalus noctula), Lesser Noctule (Nyctalus lesleri), **Observation Point 6** Savi's Pipistrelle (Hypsugo savii); **Observation Point 7** – Long-fingered Bat (Myotis capaccinii), Nathusius' Pipistrelle (Pipistrellus nathusii), Common Pipistrelle (Pipistrellus pipistrellus), Serotine Bat (Eptesicus serotinus); **Observation Point 8**, **9 and 10** – Long-fingered Bat (Myotis capaccinii), Nathusius' Pipistrelle (Pipistrellus nathusii), Common Pipistrellus pipistrelle (Pipistrellus pipistrelle (Pipistrellus pipistrelle), Nathusius' Pipistrelle (Pipistrellus nathusii), Common Pipistrelle (Pipistrellus pipistrellus), Serotine Bat (Eptesicus serotinus); **Observation Point 8**, **9 and 10** – Long-fingered Bat (Myotis capaccinii), Nathusius' Pipistrelle (Pipistrellus pipistrellus pipistrellus), Serotine Bat (Eptesicus serotinus); Lesser Noctule (Nyctalus lesleri).

All bat species that are reported for the 30-km surveillance zone have a conservation status according to the Bulgarian and international legislation (**Table 3.6-10**).

TABLE 3.6-10: CONSERVATION STATUS OF BAT SPECIES WITHIN THE 30-KM SURVEILLANCE ZONE

CONSORTIUM	DOCUMENT:	THE LATEST GENERATION	
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Species	Directive 92/43 EEC	Red Book of Bulgaria	IUCN 2012.2	Bern Convention	Bonn Convention	EURO BATS	BDA
Common Pipistrelle (Pipistrellus pipistrellus)	Annex IV	Least Concern	Least Concern	Appendix III	Appendix II	+	Annex 3
Nathusius' Pipistrelle (Pipistrellus nathusii)	Annex IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Savi's Pipistrelle (Hypsugo savii)	Annex IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Greater Mouse-eared Bat (Myotis myotis)	Annex II and IV	Near Threatened	Least Concern	Appendix II	Appendix II	+	Annex 2 and 3
Lesser Mouse- eared Bat (Myotis blythii)	Annex II and IV	Near Threatened	Least Concern	Appendix II	Appendix II	+	Annex 2 and 3
Common Noctule (Nyctalus noctula)	Annex IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Lesser Noctule (Nyctalus leisleri)	Annex IV	Vulnerable	Least Concern	Appendix II	Appendix II	+	Annex 3
Serotine Bat (Eptesicus serotinus)	Annex IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Parti-coloured Bat (Vespertilio murinus)	Annex IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Greater Horseshoe Bat (Rhinolophus ferrumequinu m)	Annex II and IV	Near Threatened	Least Concern	Appendix II	Appendix II	+	Annex 2 and 3
Lesser Horseshoe Bat (Rhinolophus hipposideros)	Annex II and IV	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 2 and 3
Mehely's Horseshoe Bat (Rhinolophus mehelyi)	Annex II and IV	Vulnerable	Vulnerable	Appendix II	Appendix II	+	Annex 2 and 3
Mediterranean Horseshoe Bat (Rhinolophus euryale)	Annex II and IV	Vulnerable	Near Threatened	Appendix II	Appendix II	+	Annex 2 and 3

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Species	Directive 92/43 EEC	Red Book of Bulgaria	IUCN 2012.2	Bern Convention	Bonn Convention	EURO BATS	BDA
Long-fingered Bat (Myotis capaccinii)	Annex II and IV	Vulnerable	Vulnerable	Appendix II	Appendix II	+	Annex 2 and 3
Whiskered Bat (Myotis mystacinus)	Annex II	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Geoffroy's Bat (Myotis emarginatus)	Annex II and IV	Vulnerable	Least Concern	Appendix II	Appendix II	+	Annex 2 and 3
Alcathoe's Bat (Myotis alcathoe)	Annex II	-	Data Deficient	Appendix II	Appendix II	+	Annex 3
Grey Long- eared Bat (Plecotus austriacus)	Annex II	Least Concern	Least Concern	Appendix II	Appendix II	+	Annex 3
Common Bent- wing Bat (Miniopterus schreibersii)	Annex II and IV	Vulnerable	Near Threatened	Appendix II	Appendix II	+	Annex 2 and 3

Abbreviations used: IUCN – International Union for Conservation of Nature; Bonn Convention – The Convention on the Conservation of Migratory Species of Wild Animals); Bern Convention – Convention on the Conservation of European Wildlife and Natural Habitats; EUROBATS – Agreement on the Conservation of Populations of European Bats.

3.6.2.9 AVIFAUNA

The surveillance zone (with a range of 30 km around the Kozloduy NPP) has an area of almost 3000 km². More than the half of this territory is within the borders of Bulgaria and the rest of the territory is in Romania. The territory encompasses partly or entirely dried swamps (Tsibar, Kozloduy, Ostrov), lakes and swamps used for fish breeding ponds (at Bistrets, Nedeya, Dabuleni and others), danubian islands with flood forests (Gatanuy, Tsibar, Tsibritsa, Svraka, Kozloduy, Kopanitsa), river mouths (Zhiu, Ogosota, Tsibritsa, Skat), wide plateaus (Zlatiyata), dunes (to the south of Bistrets), old river beds, pit lakes, etc. The territory conditions the richness of bird species within the surveillance zone. According to Yankov (2007)³⁷, species composition of the nesting avifauna in different 10-km UTM grid squares, of the so described surveillance zone (with a range of 30 km around the Kozloduy NPP), amounts to 147 species (of total 409 species for Bulgaria according to BUNARCO, 2009). The species are included in **Table 3.6-11**, key to which is given in **Figure 3.6-23**:

³⁷ Yankov P. 2007. Atlas of nesting birds in Bulgaria.

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FIGURE 3.6-23: NUMBERING OF THE 10-KM UTM GRID SQUARES IN THE REGION OF KOZLODUY NPP

Legend:

 $\langle \rangle$

- in the lower left corner are indicated numbers of the squares of the territory of Bulgaria
- in the lower left corner are indicated numbers of the squares in the territory of Bulgaria and Romania
 - in the lower left corner are indicated numbers of the squares of the territory of Romania

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TABLE 3.6-11: Species Richness within the 10-km UTM coordination system in the surveillance zone (According to Yankov, 2007); GLOBALLY THREATENED SPECIES ARE MARKED IN RED

N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
1	Tachybaptus ruficollis				*	*	*		*	*	*		*	*			*		III	+	VU
2	Podiceps cristatus				*		*	*		*									III	+	VU
3	Podiceps nigricollis				*				*	*									III	+	CR
4	Phalacrocorax carbo							*	*			*	*						III		
5	Phalacrocorax pygmeus							*											III	+	EN
6	Botaurus stellaris				*	*		*	*	*			*						III	+	EN
7	Ixobrichus minutus				*	*	*	*	*	*			*						III	+	EN
8	Nycticorax nycticorax							*							*				III	+	VU
9	Ardeola ralloides							*											III	+	EN
10	Egretta garzetta							*	*				*						III	+	VU
11	Ardea cinerea							*	*			*	*						III	+	VU
12	Ardea purpurea				*	*		*	*	*		*	*						III	+	EN
13	Ciconia nigra							*							*				III	+	VU
14	Ciconia ciconia	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	III	+	VU
15	Platalea leucorodia							*											III	+	CR
16	Anas strepera							*											III		CR
17	Anas platyrhynchos	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	IV		
18	Anas querquedula					*	*	*											IV		VU
19	Aythya ferina							*											III		VU
20	Aythya nyroca							*											III	+	VU
21	Pernis apivorus			*		*			*										III	+	VU
22	Milvus migrans								*										III	+	VU
23	Haliaeetus albicilla														*				III	+	VU
24	Circaetus gallicus					*			*										III	+	VU
25	Circus aeruginosus	*			*	*		*	*	*	*		*					*	III		EN

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N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
26	Circus pygargus				*	*	*		*	*							*	*	III	+	VU
27	Accipiter gentilis				*	*		*	*	*		*	*						III		EN
28	Accipiter nisus	*			*	*		*	*	*		*	*		*				III		EN
29	Accipiter brevipes				*	*	*	*	*	*	*		*					*	III	+	VU
30	Buteo buteo	*		*	*	*		*	*	*		*	*	*	*	*	*	*	III		
31	Buteo rufinus			*	*	*			*	*		*	*	*			*	*	III	+	VU
32	Aquila pomarina					*			*			*							III	+	VU
33	Falco tinnunculus	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	III		
34	Falco vespertinus	*			*	*	*		*	*	*		*	*					III	+	CR
35	Falco subbuteo	*			*	*	*	*	*	*	*	*	*	*	*			*	III		VU
36	Perdix perdix	*	*	*	*		*	*	*	*	*	*	*	*		*	*	*	IV		
37	Coturnix coturnix	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	IV		
38	Phasianus colchicus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	IV		
39	Rallus aquaticus					*	*	*	*	*	*		*						III	+	NT
40	Porzana porzana							*											III	+	EN
41	Porzana parva							*											III	+	EN
42	Porzana pusiilla							*											III	+	CR
43	Gallinula chloropus	*	*			*	*	*	*	*	*	*	*		*				III		
44	Fulica atra					*	*	*	*	*			*						IV		
45	Otis tarda						*		*										III	+	CR
46	Himantopus himantopus														*				III	+	CR
47	Burhinus oedicnemus							*											III	+	VU
48	Charadrius dubius	*	*		*			*	*		*	*	*					*	III		VU
49	Vanellus vanellus	*			*			*		*			*		*			*	III		LC
50	Gallinago gallinago							*											IV	+	CR
51	Tringa ochropus							*											III	+	EN
52	Actitis hypoleucos							*	*										III	+	LC
53	Larus ridibundus								*										III		EN
54	Larus								*				*		*			*			

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N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
	cach/michahellis																				
55	Sterna hirundo							*	*										III	+	EN
56	Sterna albifrons							*											III	+	EN
57	Chlidonias hybrida							*											III	+	VU
58	Columba livia	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	IV		
59	Columba palumbus		*			*	*	*	*	*	*	*	*					*	IV		
60	Streptopelia decaocto	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	IV		
61	Streptopelia turtur	*	*	*	*	*	*	*	*	*	*	*	*	*				*	IV		
62	Cuculus canorus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
63	Tyto alba					*			*	*		*	*						III		VU
64	Otus scops			*	*	*	*	*	*	*		*	*	*			*	*	III		
65	Bubo bubo										*								III	+	VU
66	Athene noctua	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
67	Strix aluco					*			*	*								*	III		
68	Asio otus	*	*		*	*	*	*	*	*	*	*	*		*	*		*	III		
69	Caprimulgus europaeus							*		*									III	+	
70	Apus apus										*								III		
71	Alcedo atthis	*	*			*	*	*	*	*	*	*	*	*	*	*		*	III		
72	Merops apiaster	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	III		
73	Coracias garrulus			*	*	*	*	*	*	*	*	*	*	*		*		*	III	+	VU
74	Upupa epops	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	III		
75	Jynx torquilla	*	*			*	*	*	*	*	*	*	*					*	III		
76	Picus canus				*	*	*	*	*	*			*		*			*	III	+	EN
77	Picus viridis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	III		
78	Dendrocopos major		*		*	*		*	*	*	*	*	*		*			*	III		
79	Dendrocopos syriacus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III	+	
80	Dendrocopos medius				*			*							*			*	III		

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N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
81	Dendrocopos minor	*			*			*	*		*	*	*		*	*	*	*	III		
82	Melanocorypha calandra									*									III	+	EN
83	Cal. brachydactyla						*			*									III		VU
84	Galerida cristata	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
85	Lullula arborea						*			*									III	+	
86	Alauda arvensis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
87	Riparia riparia	*					*	*			*		*					*	III		
88	Hirundo rustica	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
89	Hirundo daurica							*											III		
90	Delichon urbica	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
91	Anthus campestris						*	*		*	*								III	+	
92	Motacilla flava	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	III		
93	Motacilla alba	*	*		*	*	*	*	*	*	*	*	*	*	*	*		*	III		
94	Troglodytes troglodytes					*			*	*	*	*	*		*	*		*	III		
95	Erithacus rubecula	*	*		*	*		*	*	*	*	*	*	*	*	*		*	III		
96	Luscinia luscinia							*											III		
97	Luscinia megarhynchos	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
98	Phoenicurus ochruros						*			*									III		
99	Phoenicurus phoenicurus						*			*									III		VU
100	Saxicola torquata			*			*			*	*	*							III		
101	Oenanthe oenanthe					*	*		*	*			*						III		
102	Turdus merula	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
103	Turdus philomelus		*		*		*	*		*	*				*				III		
104	Locustella fluviatilis						*			*									III		
105	Locustella luscinioides						*			*									III		

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N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
106	Acroc. schoenobaenus						*	*											III		
107	Acrocephalus palustris	*	*				*	*		*	*		*	*	*	*		*	III		
108	Acrocephalus scirpaceus						*	*		*									III		
109	Acroc. Arundinaceus		*			*	*	*		*		*	*	*	*			*	III		
110	Hippolais pallida					*	*		*	*									III		
111	Sylvia nisoria						*		*	*									III	+	
112	Sylvia curruca	*	*		*	*	*	*	*	*	*		*	*		*			III		
113	Sylvia communis	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	III		
114	Sylvia atricapilla		*			*	*	*	*	*	*	*	*		*	*		*	III		
115	Phylloscopus collybita					*		*	*										III		
116	Muscicapa striata					*			*	*		*	*	*				*	III		
117	Panurus biarmicus								*										III		
118	Parus caeruleus	*	*	*		*		*	*	*	*	*	*		*				III		
119	Parus major	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
120	Sitta europea		*			*		*	*	*		*	*		*			*	III		
121	Certhia brachydactyla														*				III		
122	Remiz pendulinus						*		*		*			*				*	III		
123	Oriolus oriolus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
124	Lanius collurio	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III	+	
125	Lanius minor	*			*	*	*	*	*	*	*	*	*	*		*	*	*	III	+	
126	Lanius excubitor								*										III		CR
127	Lanius senator								*				*						III		
128	Garrulus glandarius	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*			
129	Pica pica	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	IV		
130	Corvus monedula	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	IV		
131	Corvus frugilegus	*		*	*	*			*	*	*	*	*	*	*	*	*	*	IV		

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N⁰	Species	FP82	FP92	FP93	FP94	GP03	GP04	GP05	GP13	GP14	G15	GP22	GP23	GP24	GP25	GP32	GP33	GP34	BDA	BD	RBB
132	Corvus corone	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	IV		
133	Corvus corax			*		*			*	*				*					III		NT
134	Sturnus vulgaris	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
135	Passer domesticus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			
136	Passer hispaniolensis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	III		
137	Passer montanus	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
138	Fringilla coelebs	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	III		
139	Carduelis chloris	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	III		
140	Carduelis carduelis	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
141	Cocc. coccothraustes		*					*	*	*		*	*		*			*	III		
142	Emberiza citrinella														*				III		
143	Emberiza cirlus						*								*			*	III		
144	Emberiza hortulana	*	*	*	*	*	*	*	*	*	*	*	*	*				*	III	+	
145	Emberiza schoeniclus					*													III		
146	Emberiza melanocephala			*		*	*	*	*	*	*			*			*		III		
147	Miliaria calandra	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	III		
	Total	56	56	49	69	84	82	106	101	97	71	71	86	58	59	49	41	73	142	49	56

Legend:

BDA – Biological Diversity Act – (+) Annex III (protected species – 128) and Annex IV (species of regulated use – 14)

BD – Birds Directrive (Annex I and II) – (+)

RBB – Red Book of Bulgaria, second edition, 2011:

- EN Endangered
- VU Vulnerable
- NT Near Threatened
- LC Least Concern

CR – Critically Endangered Brown column – 10-km grid square, in which the Kozloduy NPP site is located

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As seen from the table the bird species richness is higher in GP05 – 106 species, and the lowest in GP33 – 41 species. The grid square, in which the Kozloduy NPP site is located (GP24), includes 58 species that is just below the average for the surveyed territory (71.1 species/grid square).

Nesting species within the surveillance zone of Kozloduy NPP can be grouped into the following categories, given in **Table 3.6-12**:

 TABLE 3.6-12: NESTING BIRD CATEGORIES WITHIN THE ZURVEILANCE ZONE AROUND KOZLODUY NPP

Category	Number
Spesies, distributed in all grid squares	22
Protected species under the BDA	127
Worlwide threatened species	5
Species of the Birds Directive	49
Species of the Red Book of Bulgaria	56

The worldwide threatened nesting birds within the surveillance zone are:

- Ferruginous Duck (*Aythya nyroca*) nesting and migratory and partly wintering species included in the Red Book of Bulgaria; recorded in grid square GP05;
- Pygmy Cormorant (*Phalacrocorax pygmeus*) non-migratory species included in the Red Book of Bulgaria; nesting with the large heron colony on Tsibar island (Ibisha);
- White-tailed Eagle (*Haliaeetus albicilla*) non-migratory, passing and wintering species included in the Red Book of Bulgaria; nests are found on the Romanian islands of Gatanul and Kopanitsa;
- Red-footed Falcon (*Falco vespertinus*) passing, nesting and migratory species included in the Red Book of Bulgaria; the species is recorded to nest in 9 of the grid squares in consideration, but is more likely to has stop nesting in most of the grid squares;
- European Roller *(Coracias garrulus)* passing, nesting and migratory species included in the Red Book of Bulgaria; the species is recorded to nest in 13 of the grid squares in consideration.

None of the considered globally threatened species nests at the sites of Kozloduy NPP, provided for the construction of new nuclear unit.

Detailed data for the species included in the Birds Directive are included in the Conformity Assessment Report (CAR) of this Investment Proposal with protected areas of NATURA 2000 network.

The territory in the surveillance zone is an important feed base for: White-tailed Eagle (*Haliaeetus albicilla*), Mallard (*Anas platyrhynchos*), Great Cormorant (*Phalacrocorax carbo*), Pygmy Cormorant (*Phalacrocorax pygmeus*), Night Heron (*Nycticorax nycticorax*),

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Little Egret (*Egretta garzetta*), Black Stork (*Ciconia nigra*), White Stork (*Ciconia ciconia*), Long-legged Buzzard (*Buteo rufinus*), Montagu's harrier (*Circus pygargus*) and others.

The surveillance zone falls in the eastern part of the migration area "Via Aristotelis", which is characterized by a relatively small migration flows from soaring birds. During migrations the following species are registered: Common Buzzard (*Buteo buteo*), Lesser Spotted Eagle (*Aquila pomarina*), Montagu's Harrier (*Circus pygargus*), Marsh Harrier (*Circus aeruginosus*) and Northern Harrier (*Circus cyaneus*), White Stork (*Ciconia ciconia*) and Black Stork (*Ciconia nigra*), Dalmatian Pelican (*Pelecanus crispus*) (Data from a project by the MIEW on the migration of birds – LOT 7, Biserkov et al. 2011³⁸).

In the surveillance zone around Kozloduy NPP are found several wintering species of the waterfowl, which are presented in **Table 3.6-13**.

Tsibar – Somovit	Average 1977- 1999	Max 1977- 1999	11.1.2003	16.1.2004	13.1.2007	Average 2003- 2007	14-15.1. 2013
Gavia arctica	0	1				0	
Tachibaptus ruficollis	2	9	1	4	1	2	
Podiceps cristatus	2	7	1	2		2	
Podiceps grisegena	0	3				0	
Phalacrocorax carbo	21	139	156	1236	42	478	27
Phalacrocorax pygmeus	20	157	22	8		15	0
Pelecanus crispus	1	10	22	117		70	41
Egretta alba	5	43		15		15	0
Ardea cinerea	1	4		2	2	2	2
Cygnus olor	5	31	8	9		9	0
Anser albifrons	1598	6703	205			205	61
Anser anser	57	433	1			1	1
Anser spp.	9	100				0	0
Branta ruficollis	0	5				0	0
Tadorna tadorna	0	3				0	9
Anas penelope	4	16	2			2	1
Anas crecca	629	4450	19		8	14	5
Anas platyrhynchos	5074	17629	154	420	667	414	11053
Anas acuta	44	282				0	0
Anas clypeata	9	100				0	0

TABLE 3.6-13: WINTER AVERAGE NUMBERS OF THE WATERFOWL SPECIES IN THE SECTION TSIBAR – SOMOVIT OF THE DANUBE RIVER IN THE PERIOD 1977-2013 (OWN DATA OF MICHEV & PROFIROV, 2003)

³⁸ Biserkov et al. 2011. Red Book of Bulgaria, it. 2, animals on-line.

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Tsibar – Somovit	Average 1977- 1999	Max 1977- 1999	11.1.2003	16.1.2004	13.1.2007	Average 2003- 2007	14-15.1. 2013
Aythya ferina	9	44				0	0
Aythya nyroca	0	1				0	0
Aythya fuligula	5	28				0	0
Bucephala clangula	2	12	6	9		8	34
Mergus albellus	14	80	5	32		19	2
Mergus merganser	9	43		2		2	10
Clangula hyemalis	0	0		1		1	0
Anatinae spp.	0	0	4		1100	552	0
Gallinula chloropus	1	3				0	0
Fulica atra	3	32				0	0
Vanellus vanellus	0	2				0	0
Numenius arquata	2	15			4	4	0
Tringa ochropus	0	1				0	0
Larus ridibundus	129	596	14	5	40	20	2
Larus canus	15	61	28	4		16	0
Larus cachinnans/michah	5	33	4	6	17	9	21
Larus spp.	1	12	1			1	0
Other water birds	0	1	1			1	0
Total	7676	25820(*)	654	1872	1881	1862	11269
Species Number	13	22	20	17	10	16	13

(*) The number of all specimen is not a mechanical addition.

The Section Tsibar – Somovit (between km715 and km607 with a total length of 108 km) is characterized by 25 islands. The total water surface of the Bulgarian section of the river is about 2370 ha. In addition to this section is also included Asparouhov val Dam, which was not reported in the period 1977 -1999 (Michev, Profirov 2003).

The average number of waterfowl during the first period of 22 years, of which only in 13 years were made standard countings, is 7676 specimens with a maximum of 25 820 specimens, as species diversity varies between 13 to 22 species. While taking into account that studies in these periods until 2013 coincided with the operation of Kozloduy NPP, there are no significant differences in the numbers and diversity. Their changes are most likely due to the specific conditions in the middle of January for each year of the studies. Globally threatened species are the Dalmatian Pelican (*Pelecanus crispus*), Pygmy Cormorant (*Phalacrocorax pygmeus*), Red-breasted Goose (*Branta ruficollis*) and Ferruginous Duck (*Aythya nyroca*). Species that reached the Ramsar criterion for 1% significance of wetlands for some years are the Greater White-fronted Goose (*Anser albifrons*) and Greylag Goose (*Anser anser*), and a total number of waterfowl species over 20 000 specimens; large variety of waterfowl birds and their high abundances are usually

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established between the major islands such as Kozloduy and Kopanitsa or between islands and riverbanks.

The large number and surface area of running and standing water basins determines the largest gatherings of 11 269 specimens of the waterfowl of 13 species along the Danube River, which are established during the mid-winter count in January 2013.

Observations on the biological diversity of the 4 alternative sites and those falling under the influence within the 30-km surveillance zone of the new nuclear unit cover the protected flora and fauna under the BDA (**Figure 3.6-24**).



FIGURE 3.6-24: ALTERNATIVE SITES FOR REALIZATION OF THE NEW NUCLEAR UNIT

<u>Site 1</u>

At the site are located opened drainage channels (**Figure 3.6-25**). Part of the site is used for cultivation of crops. Located on the territory of the former Kozloduy swamp.

Flora

Relatively large areas are occupied by cane or grasslands dominated by Dhoob (*Cynodon dactylon*), Cocksfoot (*Dactylis glomerata*) or Blackthorn (*Prunus spinosa*), Rose (*Rosa sp.*), etc. Here are also encountered Mugwort (*Artemisia vulgaris*), Yellow Star-thistle (*Centaurea solstitialis*), Wild Liquorice (*Glycyrrhiza echinata*). Drainage channels are covered with dense Cattail (*Typha sp.*) with almost no open water surfaces.



FIGURE 3.6-25: SITE 1. DRAINAGE CHANNELS OVERGROWN WITH CANES

Parts of the territory are occupied by Desert False Indigo (*Amorpha fruticosa*) – species included in the list of the worst invasive alien species threatening biodiversity in Europe (2007). There were no species included in the BDA. In the Terms of Reference for the EIA is noted that the rare species Liquorice (*Glycyrrhiza glabra*) is likely to be encountered at the site, but thorough re-examination of the site did not prove its existence. Three of the species – Blackthorn (*Prunus spinosa*), Mugwort (*Artemisia vulgaris*) and Yellow Star-thistle (*Centaurea solstitialis*) are included in the Medicinal Plants Act.

Invertebrates

There are suitable habitats and food basis for mesophilic and hygrophilic representatives of terrestrial invertebrates. This is the most likely area to be encountered permanently residing population or temporary crossing specimens of the species Ornate Bluet (*Coenagrion ornatum*). The habitat is typical of the significant number of molluscs, waterresistant plants, dragonflies of the *Lestes* and *Caloptery* genera, locusts of the species *Metrioptera roeselii, Conocephalus* spp., *Ruspolia nitidula, Pteronemobius heydenii*, Mole Cricket (*Gryllotalpa stepposa*), *Xya* spp., *Tetrix* spp., *Aiolopus thalassinus*, beetles of the species *Bembidion* spp., *Amara* spp., *Harpalus* spp. Overmoistened habitats overgrown with hygrophytous vegetation are wetlands of utmost important for the maintenance and protection of biodiversity and provide conditions for the existence of a rich and unique communities of invertebrates. On the other hand, arable lands are significantly poorer of habitats for invertebrates and are characterized by the highly depleted species composition of little importance in terms of conservation of unique and representative species associations.

Aquatic invertebrates

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Constructed channels do not provide sufficient habitat for aquatic invertebrates. This can only exist in case enough water is secured throughout the year. Temporary residence of some aquatic invertebrates is possible, e.g. the Narrow-Clawed Crayfish (*Astacus leptodactylus*), moving at night onshore, looking for food and new water basins. The development of aquatic invertebrates of least concern that have rapid development cycle (some water and air insects).

Ichthyofauna

During field studies the drainage channel running through the site was full of water. No ichthyofauna was established in it, but there is a suitable habitat for the existence of European Weatherfish (*Misgurnus fossilis*).

Herpetofauna

Existing drainage channels are temporary or permanent habitat for all kinds of reptiles and amphibians that are related to water, including those of the highest conservation concern. In qualitative terms (abundant overgrowth and lack of flow) this habitat can be estimated as optimal for Danube Crested Newt (*T. dobrogicus*), European Fire-bellied Toad (*B. bombina*), European Pond Turtle (*E. orbicularis*) and other aquatic or temporarily residing water species of the herpetofauna. According to the nature of agricultural practices and the presence of shrubby vegetation, terrestrial part of the site can be defined as a suitable habitat for some reptile species (including Caspian Whipsnake (*E. sauromates*)), as well as for the terrestrial phase of the life cycle of all amphibians.

Mammals

Scattered bushes and applied agricultural practices create habitat for the existence of small mammals (*Micromammalia*). Near drainage channels, wetlands and lower areas is encountered the Miller's Water Shrew (*Neomys anomalus*) of the *Insectivora* order – often a dominant species among shrews. In dry open places are encountered Bicoloured White-toothed Shrew (*Crocidura leucodon*) and Mole (*Talpa europea*). The entire site is inhabited by small rodents of the *Microtus* and *Apodemus* genera, with relatively low numbers; Golden Jackal (*Canis aureus*) – protected under the BDA.

Hiropterofauna

There is no solid evidence of the presence of bats in the four alternative sites for the implementation of the investment plan. The following conclusions regarding the potential impacts on bats are based on a field study carried out from 14th to 16th of January, 2013. The importance of each of the four project sites for the local and migratory bat species occurring within the 30-km surveillance zone is evaluated.

The site provides very limited conditions for the presence of summer and winter shelters for bats, mostly from Nyctalus and Pipistrellus genera, only in isolated old willows and poplars. We evaluate the potential of the area as a favorable hunting habitat of medium significance.

Avifauna

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At the site are recorded the following bird species and their habitats: Wild Duck (*Anas platyrhynchos*), Common Buzzard (*Buteo buteo*), Moorhen (*Gallinula chloropus*), Eurasian Coot (*Fulica atra*), Common Wood Pigeon (*Columba palumbus*), Little Owl (*Athene noctua*), European Scops Owl (*Otus scops*), Syrian Woodpecker (*Dendrocopus syriacus*), Common Kingfisher (*Alcedo atthis*), Great Reed Warbler (*Acrocehalus arundinaceus*), Eurasian Reed Warbler (*Acrocephalus scirpaceus*), Eurasian Jackdaw (*Coleus monedula*), Rook (*Corvus frugilegus*), European Magpie (*Pica pica*), Eurasian Jay (*Garrulus glandarius*), Hooded Crow (*Corvus cornix*), Tree Sparrow (*Passer montanus*), Common Blackbird (*Turdus merula*). The terrain of Site 1 is inhabited by 10 species protected under the BDA. There are no bird species of high conservation value, except for the Syrian Woodpecker (*Dendrocopus syriacus*), which is included in the Red Book of Bulgaria and the Birds Directive.

No habitats of rare and threatened species are registered on the territory of Site 1, which is provided for the construction of new capacities.

<u>Site 2</u>

The site encompasses part of the former farmyard and agricultural lands (Figure 3.6-26).



FIGURE 3.6-26: SITE 2. AGRICULTURAL LANDS

Flora

There are no species included in the BDA. In the Terms of Reference for the EIA is noted that the rare species Liquorice (*Glycyrrhiza glabra*) is likely to be encountered at the site, but thorough re-examination of the site did not prove its existence.

Invertebrates

Although the fragmentation of habitats, determined by a variety of anthropogenic activities, is defining the relatively diverse species composition, the anthropogenization leads to ruderalization and drying of the habitat and its occupation by widespread

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generalist species. These species are displacing the communities of conservation importance, which leads to the impoverishment of the species composition. The species composition of molluscs is highly depleted and dominated by snails of the *Helix* genus and *Cepaea vindobonensis*. Habitats at the site are not permanently inhabited by dragonflies and most of the butterflies, as representatives of the two groups, are mainly crossing. Depending on cultivated crops daily butterflies may be regular visitors to the area for food, but the predominance of cereals defines low species diversity. There are basically beetles and grasshoppers with wide ecological requirements – *Amara* and *Harpalus* genera and species of the *Orthoptera* genus – *Melanogryllus desertus, Pezotettix giornae, Omocestus rufipes, Euchorthippus declivus*, and ants of the species *Lassius niger, Tetramotium caespitum, Myrmica rufa*, etc.

Aquatic invertebrates

At the site are located no habitats that allow the development of aquatic invertebrates.

Ichthyofauna

There are no water basins at the site. Ichthyofauna is not present.

Herpetofauna

There are no water habitats at the site, which excludes to a greater degree its occupation of near-water species of amphibians and reptiles. Most of the area is occupied by arable land, which can be assessed as unfit for habitation by most species of the herpetofauna (including those of the highest conservation value). Most likely part of the site is occupied by the widespread and numerous species, such as the European Green Lizard (*L. viridis*) and Green Toad (*P. viridis*). It is possible that at the periphery of the site other species may enter, but probably this is on an occasional basis and may not be decisive for the overall assessment of the suitability of the site.

Mammals

The site provides very limited opportunities for the presence of shelters for mammal fauna except for the representatives of small rodents of the *Microtus* and *Apodemus* genera.

Hiropterofauna

The site provides very limited opportunities for the presence of shelters for bats and has a low potential for hunting area for migratory species.

Avifauna

Bird species that use the site as a feeding ground are: Wild Duck (*Anas platyrhynchos*) (using agricultural land for feeding and rest only in the winter), Rook (*Corvus frugilegus*), Great Cormorant (*Phalacrocorax carbo*), Sparrowhawk (*Accipiter nisus*). On the field of Site 2 is recorded one species protected under the BDA . There are no bird species of high conservation value, except for the Sparrowhawk (*Accipiter nisus*), which is included in the Red Book of Bulgaria.
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There are no registered habitats of rare and threatened species on the territory of Site 2, which is provided for the construction of new capacities..

<u>Site 3</u>

Flora

The site encompasses open drainage channels, abandoned and arable lands, pastures with shrubs and lower terrains (probably part of the former Kozloduy marsh) with marsh vegetation dominated by Reed (*Phragmites australis*), and grasslands dominated by Dhoob (*Cynodon dactylon*), Cocksfoot (*Dactylis glomerata*) with the participation of Mugwort (*Artemisia vulgaris*), Common Chicory (*Cichorium inthybus*), Danewort (*Sambucus ebulus*), etc. Extensive areas are dominated by the Horseweed (*Erigeron canadensis*) – one of the most widespread invasive alien species. Individual sections are occupied by shrub associations of the Common Dogwood (*Cornus sanguinea*), Common Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Rose (*Rosa sp.*), There are poplar trees. Significant is the presence of Desert False Indigo (*Amorpha fruticosa*) and Acacia (*Robinia pseudoacacia*) – species included in the list of the worst invasive alien species threatening biodiversity in Europe (2007), and Silver Berry (*Elaeagnus angustifolia*) – foreign species with invasive behavior. Here are registered and communities of the Narrowleaf Cattail (*Typha angustifolia*). Part of the site is occupied by abandoned arable lands where the Horseweed (*Erigeron canadensis*) is growing (**Figure 3.6-27**).



FIGURE 3.6-27: GENERA L VIEW OF SITE 3

There are no species included in the BDA. In the Terms of Reference for the EIA is noted that the rare species Liquorice (*Glycyrrhiza glabra*) is likely to be encountered at the site, but thorough re-examination of the site did not prove its existence. Six of the identified species are included in the Medicinal Plants Act – Mugwort (*Artemisia vulgaris*), Common

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Chicory (*Cichorium inthybus*), Danewort (*Sambucus ebulus*), Common Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Narrowleaf Cattail (*Typha angustifolia*).

Invertebrates

The habitat is characterized by considerable diversity of microhabitats. The wet zone in the lowered area, located at the embankment in the southeastern part of the site, is considered to be the most important part of the site. It is possible the encountering of permanent population of dragonflies Ornate Bluet (*Coenagrion ornatum*), Broad-bodied Chaser (*Libellula depressa*), Southern Skimmer (*Orthetrum brunneum*), etc. Usual species of the *Orthoptera* order are *Metrioptera roeselii, Conocephalus* spp., *Ruspolia nitidula, Pteronemobius heydenii*, Mole Cricket (*Gryllotalpa stepposa*), *Xya* spp., *Tetrix* spp., *Aiolopus thalassinus*, beetles of the species *Bembidion* spp., *Amara* spp., *Harpalus* spp. Arable lands and ecotones at the shrub and tree borderlines maintain a species composition that has been significantly influenced by the anthropogenic activities, but overall diversity of seminatural and anthropogenically affected habitats are defining the significant diversity of species at the site.

Aquatic invertebrates

Channel system is not suitable habitat for aquatic invertebrates. The system would be suitable only if a sufficient water quantity is constantly maintained (year-round). Temporary residence of some aquatic invertebrates is possible, e.g. the Narrow-Clawed Crayfish (*Astacus leptodactylus*), moving at night onshore, looking for food and new water basins.

Ichthyofauna

During field studies, the drainage channel running through the site was dry. Ichthyofauna is not present.

Herpetofauna

Existing drainage channels are temporary or permanent habitat for all kinds of reptiles and amphibians that are related to water, including those of the highest conservation concern. In qualitative terms (abundant overgrowth and lack of flow) this habitat can be estimated as optimal for Danube Crested Newt (*T. dobrogicus*), European Fire-bellied Toad (*B. bombina*), European Pond Turtle (*E. orbicularis*) and other aquatic or temporarily residing water species of the herpetofauna. According to the nature of agricultural practices and the presence of shrubby vegetation, terrestrial part of the site can be defined as a suitable habitat for some reptile species (including Caspian Whipsnake (*E. sauromates*)), as well as for the terrestrial phase of the life cycle of all amphibians.

Mammals

Scattered bushes and applied agricultural practices create prerequisites for the existence of small mammals.

Of the insectivorous mammals is recorder the Mole (*Talpa europaea*), including small rodents of the *Microtus* and *Apodemus* genera. It is identified the presence of European

Polecat (*Mustela putorius*), Wild Boar (*Sus scrofa*), Red Fox (*Vulpes vulpes*), Golden Jackal (*Canis aureus*), Beech Marten (*Martes foina*).

Hiropterofauna

The site provides favorable conditions as a hunting territory of migratory bat species, and limited presence of shelters in isolated old trees (mainly species of the *Pipistrellus* and *Nyctlaus* genera).

The site provides favorable conditions as a hunting territory of migratory bat species, and limited presence of shelters in isolated old trees.

Avifauna

Bird species that can be encountered at the site and have feeding habitats in it are: Great Tit (*Parus major*), Blue Tit (*Parus coeruleus*), Yellowhammer (*Emberiza cirtinella*), Common Blackbird (*Turdus merula*), Eurasian Collared Dove (*Streptopelia decaocto*), Fieldfare (*Turdus pilaris*), Red-backed Shrike (*Lanius collurio*). At the site are identified 6 bird species protected under the BDA. No species of high conservation value are identified, with the exception of Red-backed Shrike (*Lanius collurio*), which is included in the Birds Directive.

There are no registered habitats of rare and threatened species on the territory of Site 3, which is provided for the construction of new capacities.

<u>Site 4</u>

On the terrain are located buildings and a parking.

Flora

No plants under the BDA are reported.

Terrestrial invertebrates

Fully technogenic nature of the site does not provide habitats or such exists with low significance. Passage of flying terrestrial invertebrates (mainly lepidopteran, dipteran and hymenopteran species) is of an occasional nature.

Aquatic invertebrates

Within the site there are no habitats, allowing the development of aquatic invertebrates.

Ichthyofauna

There are no water basins at the site. Ichthyofauna is not present.

Herpetofauna

The site is entirely urbanized area, making it unsuitable as a habitat of amphibians and reptiles. Possible accidental encountering of individual specimens of certain species, but this does not change the overall assessment of the site.

Mammals

No habitats of the mammal fauna.

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Hiropterofauna

The site provides limited opportunities for the presence of daily summer shelters of synanthropic bat species, but such has not been established. The probability of existing of such shelters decreases in view of the constant presence of people and transport equipment related to the operation of the NPP.

Avifauna

The site provides limited opportunities for the presence of daily summer shelters of synanthropic bird species such as the Great Tit (*Parus major*), Spanish Sparrow (*Passer hispaniolensis*), Brambling (*Fringuillacoelebs*), Blue Tit (*Parus coeruleus*), Domestic Pigeon (*Columba livia domestica*), etc. The avifauna at Site 4 is low in species diversity and of low conservation interest. At the site are reported four birds species that are protected under the BDA. There are no species of high conservation value.

There are no registered populations of rare and threatened species on the territory of Site 4, which is provided for the construction of the new unit.

Conclusion:

Flora

On the territory of the sites of the IP are not registered plant species of conservation value. At Site 1 and Site 3 are found 6 species of widespread medicinal plants. The surveyed territory within the 30-km range around the Kozloduy NPP is mainly treeless, occupied mainly by arable lands. On some spots are formed secondary forest communities or grasslands with a secondary origin, some of which are natural habitats of European importance and are covered by the national ecological network NATURA 2000. The presence of a number of ruderal and invasive plant species is notable, some of which occupy very large areas. The analysis of bibliographic and herbarium sources and the field studies conducted in the framework of this project show that within the 30-km surveillance zone are found or there is evidence of the existence of 7 species of plants covered by the BDA: Water Soldier (Stratiotes aloides), critically endangered; Centaurea rumelica, endangered Balkan endemic; Yellow Waterlily (Nuphar lutea), endangered; Astragalus dasyanthus, critically endangered, included in the 1997 IUCN Red List of Threatened Plants under "rare" category; Giant Snowdrop (Galanthus elwesii), endangered; Floating Fern (Salvinia natans); Sea Spray (Goniolimon collinum). There are 55 species of Medicinal Plants Act, of which only 2 are of limited distribution – Yellow Waterlily (Nuphar lutea) and Giant Snowdrop (Galanthus elwesii).

Invertebrates

The area of the 30-km surveillance zone – under the influence of the IP – is inhabited by significantly depleted fauna of terrestrial invertebrates mainly due to the strong anthropogenization of the habitats, expressed in the agrarian exploitation of the territory, and less to buildings, road infrastructure, etc. In partly influenced forest and riparian habitats are found suitable habitats for the following species of conservation importance – Ornate Bluet (*Coenagrion ornatum*), Green Snaketail (*Ophiogomphus cecilia*), (*Bolbelasmus*)

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unicornis), Great Capricorn Beetle (*Cerambyx cerdo*), Saproxylic Beetle (*Cucujus cinnaberinus*), Stag Beetle (*Lucanus cervus*), (*Morimus asper funereus*), Hermit Beetle (*Osmoderma eremita*), Rosalia Longicorn (*Rosalia alpina*), Jersey Tiger (*Euplagia quadripunctaria*), Large Copper (*Lycaena dispar*), Zerintiya (Ferdinand's butterfly) (*Zerynthia polyxena*), Lesser Purple Emperor (*Apatura ilia*).

There are no species of conservation importance on the territory of the site designated for assessment for implementation of IP. At Site 3 and Site 1 (especially Site 3) are located wet zones, residues of the former Kozloduy swamp, which provide habitat for communities of species of conservation significance

Aquatic invertebrates

There are no species of conservation importance on the territory of the site designated for assessment for implementation of IP. At Site 1 and Site 3 are located wet zones and channels, which in case of sufficient water quantities, would be possible temporary habitats for the Narrow-Clawed Crayfish (*Astacus leptodactylus*), moving at night onshore, looking for food and new water basins.

Ichthyofauna

At the site has not been identified any ichthyofauna. Only Site 1 is a suitable habitat for the existence of European Weatherfish.

Herpetofauna

Populations of most species of amphibians and reptiles (including those of the highest conservation status) within the 30-km surveillance zone are highly fragmented due to anthropogenic activities (intensive agriculture, reclamation of wetlands, watercourses correction, urbanization, etc.). Therefore, any new disruption or destruction of suitable habitats (such as those at Site 1 and Site 3) will have a major negative impact on the herpetofauna as a whole.

Mammal fauna

Results of visual inspection of the areas of the alternative sites, designated for realization of the new nuclear unit, give reason to conclude that Site 3 and Site 1 are located on terrains that are wetlands for the most part and create suitable habitats for certain groups of mammal fauna. Three species are protected under the Biological Diversity Act – Mole, ferret and Goldie. The mammal fauna at the site is low in species diversity and of low conservation interest.

Avifauna

As a result of the visual inspection of the 4 sites it may be concluded that terrains of Site 1 and Site 3 (especially Site 3) are located within the former Kozloduy marsh and provide food and habitats for species of conservation significance. They would hold the eventual partial recovery of this swamp.

The terrain of Site 4 is the most urbanized and most poor in species diversity of the avifauna. Site 2 is the most promising site in terms of the avifauna.

3.6.3 PROTECTED AREAS

The four alternative sites for the IP do not fall in protected zones. According to the Register of protected areas and protected zones in Bulgaria (Letter by EEA, RIEW-Vratsa, RIEW Montana) the territory of the 30-km range of the IP impact covers the following protected areas:

- Maintained Reserve "Ibisha" with an area of 34.47 ha on the land of the village of Dolni Tsibar, Valchedram Municipality; declared by Order No. РД-794/08/10/1984 with the purpose of preserving typical Danube island associations: flood forests and swamps inhabited by protected plant and animal species.
- Protected area "Kozloduy" with an area of 10 ha, on the land of the town of Kozloduy; re-classified from hystorical place with Order by MoEW No. РД-639/26.05.2003 for preservation of typical landscape.
- Protected area "Kochumina" with an area of 2.5 ha, on the land of the Selanovtsi village, Oryahovo Municipality, declared by Order No. РД-2109/20.12.1984 and reclassified by Order No. РД-642/ 26.05.2003; with the purpose of preserving water-lily habitats.
- Protected area "Gola bara" with an area of 2 ha, on the land of Selanovtsi village, Oryahovo Municipality, declared by Order No. РД-2109/20.12.1984 and reclassified by Order No. РД-643/ 26.05.2003; with the purpose of preserving waterlily habitats.
- Protected area "Kalugerski grad Topolite" with an area of 0.2 ha, on the land of Selanovtsi village, Oryahovo Municipality, declared by Order No. РД-2109/20.12.1984 re-classified by Order No.РД-644/ 26.05.2003; with the purpose of preserving Water Soldier (*Stratiotes Aloides*).
- Protected area "Koritata" with an area of 2 ha, on the land of Sofronievo village, Mizia Municipality, declared by Order No. РД-407/07.05.1982 and re-classified by Order No. РД-641/ 26.05.2003; with the purpose of preserving the natural habitat of Peony (*Paeonia Peregrina*) and remarkable landscape.
- Protected area "Daneva Mogila" with an area of 4.9 ha, on the land of Sofronievo village, Mizia Municipality; declared by Order No. РД 413 /10.05.1982, aiming to protect the characteristic river landscape and a group of century-old trees.
- Protected area "Tsibar Island" with an area of 101.48 ha, on the lands of Gorni Tsibar and Dolni Tsibar villages, Valchedram Municipality; declared by Order No. PД-292/10.04.2007, aiming to protect habitats for nesting, wintering and resting during migration of protected bird species (Common Tern, White-fronted Tern, Oystercatcher, Dalmatian Pelican, mixed heron colony, etc.).

3.6.4 NATURA 2000 AREAS

The nearest Protected zones of the European Ecological Network NATURA 2000 to the Kozloduy NPP and sites foreseen for the construction of a new nuclear unit are:

- Protected area BG0000533 Kozloduy islands type "B" according to Directive for habitats and Directive 92/43/EEC for preservation of natural habitats of wild flora and fauna;
- Protected area BG0002009 Zlatiyata according to Birds Directive;
- Protected zone BG0000614 Ogosta River type "K" according to Directive 92/43/EEC for preservation of natural habitats of wild flora and fauna;
- Protected area BG0000336 Zlatiya type "K" according to Directive 92/43/EEC for preservation of natural habitats of wild flora and fauna, which is partly covered by protected area under the Birds Directive.

Detailed description of Protected Areas is subject to a separate Conformity Assessment Report of the IP with objectives for protected areas preservation ³⁹

3.7 WASTE

3.7.1 NON-RADIOACTIVE WASTE

On the territory of Kozloduy NPP are accumulated various types of non-radioactive waste in the premises and sites as a result of different activities and repair works. Nonradioactive waste is the waste whose radioactive contamination does not exceed the thresholds for release within the meaning of the existing regulations and internal documents, and which may leave the site of Kozloduy NPP (area for preventive and protective measures) in accordance with the radiation protection requirements.

Locations in the plant where waste is generated are related to production processes or the type of repairworks.

3.7.1.1 Sources of generation of non-radioactive waste in NPP Kozloduy

Waste in Kozloduy NPP EAD is generated as a result of:

- → production activity of the NPP;
- → operation of the auxiliary units;
- → operation of external companies working at the site under a contract with the Company;

³⁹ Regulation on the conditions and procedures for assessing the compatibility of plans, programs, projects and investment proposals with the object and purpose of the preservation of protected areas (Adopted by a Resolution of the Council of Minsiters no. 201/31.08.2007, promulgated by SG no. 73/11.09.2007)

→ decommissioning of commodity materials.

In the period from 1970 to 1993 under a Russian project at the site of Kozloduy NPP were built *six power units* with total installed capacity of 3760 MW, equipped with reactors with pressurized water (VVER 440 for units $1 \div 4$ and VVER 1000 for units 5 and 6). In fulfillment of the commitments of the Republic of Bulgaria concerning accession to the European Union, the operation of the first four units of Kozloduy NPP has been terminated by a Resolution of the government before the end of their design lifetime (Units 1 and 2 – 31.12. 2002, units 3 and 4 – on 31.12.2006). The current state of the plant is as follows:

- → Units 1 and 2 were shut down on the 31.12.2002 by a Resolution of the Council of Ministers dated 20.12.2008, units 1 and 2 were announced as radioactive waste management facilities, and, together with the required movable property, the same were transferred to the State Enterprise Radioactive Waste (SE RAW), which is an independent business entity. On the 18.10.2010, the BNRA issued licenses to the SE RAW for the operation of Units 1 and 2 as radioactive waste management facilities, which are subject to decommissioning, and revoked the licenses of Kozloduy NPP for operation of the first two units in E mode of operation. No nuclear fuel is stored at the site of units 1 and 2.
- → Units 3 and 4 were shut down on the 31.12.2006 by a Resolution of the Council of Ministers No. 1038 dated 19.12.2012, units 3 and 4 of Kozloduy NPP EAD were announced as a RAW management facility, which are subject to decommissioning. Their property was transferred for management by the SE RAW. On the 26.02.2013, the BNRA issued licenses to the State Enterprise Radioactive Wastes for the operation of units 3 and 4 as radioactive wastes management facilities, which are subject to decommissioning, and revoked the licenses of Kozloduy NPP for operation of the two units in E mode of operation. No nuclear fuel is stored at the site of units 3 and 4.
- → Units 5 and 6 are in operation. The Company has licenses issued by the BNRA for their operation until 05.11.2017 for Unit 5 and until 02.10.2019 for Unit 6.

Kozloduy NPP EAD holds a license issued by the State Energy and Water Regulatory Commission (SEWRC) for the production of *electricity and heat from a nuclear source*. For the purpose of supplying with fresh nuclear fuel is built *own port*. At the site is located *RAW treatment complex* and *repository for temporary storage*, owned by the SD RAW, division of the SE RAW. In NPP Kozloduy is built a Spent Fuel Storage Facility (SFSF). In the basins of the SFSF is stored Spent Nuclear Fuel (SNF) from VVER – 440 and VVER – 1000, once SNF has been standing from 3 to 5 years in ponds adjacent to the reactors. Dry Spent Fuel Storage Facility (DSFSF) is located north-northwest of the SFSF building.

Processes involved in water treatment for cooling also generate non-radioactive waste.

For *cooling* the turbine condensers and in other systems is used *water from the Danube River*, delivered to the plant by Bank Pumping Station (BPS) through the so called Cold Intake Channel CC-1, and is fed back through Hot Outlet Channels HC-1 and HC-2. From the

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CC the water is fed into the turbine condensers of the Central Pumping Station (CPS). Water from the Danube River is used for *production of chemically demineralized water* for the needs of the plant. Waste alkaline and acidic solutions of this production are discharged – after neutralization in HC-1/HC-2 (waste is periodically generated in neutralization shafts during cleaning).

Other sources of non-radioactive waste are associated with the operation of diesel generator stations, oil farms, workshops, laboratories, etc.

Diesel generator stations are built for emergency powering of the safety systems of Units 1÷6 and SFSF. In each of the EP-1 and EP-2 is built a *compression installation for compressed air, nitrogen-oxygen stations* for the production of gaseous oxygen, gaseous and liquid nitrogen, *electrolysis facilities* for the production of hydrogen, and *oil farms* for the fuels and lubricants used. On the territory of the plant are operating *repair workshops* at sections "Construction and Repair", "Repair and Mechanical", Electrical Repair Workshop, etc. *Chemical and / or radiochemical laboratories* are built in EP-1, EP-2 and in several general plant sites/units: "Diagnostics and Control" Test Center, "Spent Fuel Storage" workshop, "Open Switchgear" workshop, "Radioecological Monitoring" Department. In the "Occupational Medicine" service is operating a *Clinical Laboratory*.

"Supply and Warehousing" Department has *17 storage facilities* – 15 of them are within and around the industrial site; one is located in the Town of Kozloduy and one in the town of Vratsa.

Several storage facilities are used for temporary storage of waste (001, 008, 009, 106, 003 – Town of Vratsa).

Separate storage facilities for *equipment* (001 and 002), spare parts (005, 006, 101), cars' spare parts (011 and 012), for fuels and lubricants (013 and 107), for metal (102, owned by SE RAW), for paints, chemicals and glassware (106), for cables, building materials and resins (104), work clothing (202) and sales warehouse ("Sdruzhenie" warehouse).

To the "Motor Transport" unit are operating Motor Park-1 – for cars and buses, and Motor Park-2 – for heavy machinery and specialized equipment (trucks, cranes, earth excavating equipment, trailers, containers, etc.). On the area of Motor Park-2 is situated the *Company's petrol station*.

On the territory of the plant are also operating canteens, shops and other catering establishments (*sources of municipal waste*).

Other sites serving the Kozloduy NPP: The *Heating Plant* in the town of Kozloduy was decommissioned and part of the basic equipment is dismantled and sold.

"Kozloduy NPP" EAD is the owner of non-production sites located in the town of Kozloduy (*generating municipal waste for the most part*) – Power Engineering House, Sports and Health Center, "Istar" hotel, dormitories, a restaurant and a warehouse ("Sdruzhenie"), including one Storage Facility (003) in the town of Vratsa and a Recreation and Health Complex "Ledenika" (RHC "Ledenika") in the *Vratsa Balkan*.

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3.7.1.2 WASTE GENERATED BY SOURCES FROM THE ACTIVITY OF KOZLODUY NPP

Municipal waste – Generated in all workplaces, administrative and industrial buildings, cafeterias, catering facilities, and during cleaning of the plant site from branches, leaves, etc. They gather in a specially fitted vessels that are daily dumped in containers and periodically transported to a landfill (Regular disinfection of municipal waste is performed in the containers by suing lime or chlorinated lime).

Waste of the Precautionary protective action planning zone (PPAPZ) is transported and disposed at a regulated landfill – Landfill for non-radioactive and industrial waste of NPP Kozloduy after mandatory radiation control. Waste of the sites outside this area is transported to a regional landfill, town of Oryahovo.

Construction waste – generated at repairs. Collected separately and transmitted to a specialized company in compliance with the Regulation on management of construction waste and use of recycled building materials ⁴⁰. Construction waste is generated depending on the volume of repair works. The amount varies. Under the Repair Contracts with external companies, the last should collect and dispose of the construction waste to sites defined by the NPP. The control over quality and quantity of construction waste and its treatment by external companies, which are hired to perform repair works within the plant, is increased.

Industrial waste includes:

- → Metal waste, which is not the result of direct power generation activities, generated during routine repair and stored at specific locations in the plant and at well organized open temporary storage facility. The largest share of industrial waste in the Kozloduy NPP is metal and steel scrap (old worn machine parts, etc.). The place of their generation depends on the sub site, in which repair works are performed. Essential part of industrial waste is worn steel ropes. Besides metal scrap of repairing brass pieces of equipment, brass waste is also generated.
- → Waste and sludge from municipal waste water treatment plants from the Controlled Zone (CZ) and the Clear Zone (CZ). On the bars of the Waste Water Treatment Plant are accumulated floating materials and during biological waste water treatment sludge is generated.
- → Sludge from neutralization pits facilities for neutralization of waste water from the production of chemically demineralized water.
- → In the motor stocks are collected worn-out tires, whose quantity of is high for Kozloduy NPP and depends on the current number of vehicles in motion and their mileage through the year.

 $^{^{40}}$ Regulation on management of construction waste and use of recycled building materials, SG no. 89/13.11.2012

→ Industrial non-hazardous paper waste, plastic waste, wood waste, etc. are transferred to specialized recycling companies.

Hazardous waste includes

fluorescent and mercury lamps – generated in almost all workplaces. Their quantities are different and depend on the timing and conditions of use and the period of replacement. They are collected in temporary storage in special containers.

batteries – are generated as hazardous waste in the emergency power lighting, control and other systems, including in the motor stocks during replacement of exhausted batteries.

packaging of chemicals – the majority of the chemicals are brought in the Kozloduy NPP in tanks. When the amount of chemicals is lesser, they are in drums, cans, glass containers and the like. Waste is mainly generated in laboratories from different production activities and in the Chemical Water Cleanup Facility (CWCF) in EP-1 and EP-2. A system for their treatment is provided.

waste from laboratory and industrial chemical substances and mixtures with expired shelf life, packaging of fuel and lubricants, oily rags, thread and wood chips. They are stored separately in specially organized temporary storage facilities at the Kozloduy NPP site. After accumulating certain amounts, they are transferred to subsequent treatment by specialized companies holding permits under the Waste Management Act.

waste petroleum products – generated during treatment of oily wastewater into the local treatment facilities on the NPP territory – sludge and oil retainers.

3.7.1.3 NON-RADIOACTIVE WASTE CLASSIFICATION ACCORDING TO REGULATION NO. 3 (PROMULGATED IN STATE GAZETTE NO. 44/25.05.2004, AS AMENDED AND SUPPLEMENTED, NO. 23/20.03.2012)

Waste is classified in accordance with Regulation № 3 on Waste Classification 3 (promulgated in State Gazette no. 44/25.05.2004, as amended and supplemented, no. 23/20.03.2012). The classification is given in 68 worksheets, verified and certified by the Regional Inspectorate of Environment and Water (RIEW) – Vratsa. The originals are stored in a central archive and are available for use in the information system SmartDoc. For the purpose of completeness of information are prepared worksheets for waste and annual quantities that are relatively small and/or generated once during a relatively long period of time.

In the "Non-radioactive waste management program" in Kozloduy NPP are taken measures to identify all types of hazardous waste and determining their quantities.

Classification of non-radioactive waste under Regulation N° 3 and their quantitative characteristics, generated within the Kozloduy NPP for the period 2007-2011 are given in **Table 3.7-1**.

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TABLE 3.7-1: NON-RADIOACTIVE WASTE GENERATED IN KOZLODUY NPP EAD IN THE PERIOD 2007 –2011, CLASSIFIED ACCORDING TO REGULATION NO. 3

		Code under		Quantity, t				
No.	Name	Regulation no. 3	2007	2008	2009	2010	2011	
		Haza	rdous was	te				
1	Non-chlorinated mineral based hydraulic oils	13 01 10*	-	-	-	-	-	
2	Non-chlorinated mineral based engine, lubrication and geared transmission oils	13 02 05*	13.10	-	26.60	-	7.8	
3	Non-chlorinated mineral based insulation and heat- transfer oils	13 03 07*	-	-	4.60	23.14	24.8	
4	Sludge from oil-retainer shafts (collectors)	13 05 03*	7.60	13.3	-	6	-	
5	Oil from oil-water separators	13 05 06*	-	-	2.50	11.5	7.86	
6	Diesel oil, boiler and diesel fuel	13 07 01*	-	-	-	-	-	
7	Other emulsions	13 08 02*	-	-	-	-	-	
8	Waste, mentioned nowhere else (scavenged grease and lubricants)	13 08 99*	-	-	-	-	-	
9	Packing containing residues from hazardous substances or polluted by hazardous substances	15 01 10*	-	-	0.20	2.4	3.264	
10	Absorbents, filter materials, towels and protective clothes contaminated by hazardous substances	15 02 02*	-	-	-	-	-	
11	Obsolete vehicles	16 01 04*	-	-	-	-	234.58	
12	Oil filters from vehicles	16 01 07*	-	-	-	-	-	
13	Antifreeze liquids containing hazardous substances	16 01 14*	-	-	-	-	-	
14	Transformers and capacitors containing PCBs	16 02 09*	-	12.50	-	0.676	-	
15	Obsolete equipment containing hazardous components (3), other than mentioned in codes from 16 02 09 to 16 02 12	16 02 13*	-	-	2.10	3.2	4.302	
16	Inorganic waste containing hazardous substances	16 03 03*	-	0.50	0.032	-	-	

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		Code under	Quantity, t				
No.	Name	Regulation no. 3	2007	2008	2009	2010	2011
17	Organic waste containing hazardous substances	16 03 05*	-	0.40	-	-	-
18	Gases in pressure vessels (including halons) containing hazardous substances	16 05 04*	-	-	-	-	-
19	Lead rechargeable batteries	16 06 01*	-	-	104.7	20.650	47.469
20	Ni – Cd batteries	16 06 02*	-	-	0.30	1.46	1.9
21	Insulation materials containing asbestos Not generated in 2012	17 06 01*	0.50	-	13.60	0.06	22.280
22	Building materials containing asbestos Not generated in 2012	17 06 05*	-	-	-	-	-
23	Deposits from physical- chemical treatment containg hazardous substances	19 02 05*	-	-	-	-	-
24	Solvents	20 01 13*	-	-	-	-	-
25	Photographic chemical substances and compounds	20 01 17*	-	-	-	-	-
26	Fluorescent pipes and other waste containing mercury	20 01 21*	1.40	1.40	0.40	3.5	4.29
		Indu	strial was	te			
27	Chips, shavings, cuttings, pieces, timber material, pressed timber particle sheets and veneers, different from the ones specified in 03 01 04	03 01 05	5.40	0.90	6.40	5.2	7.8
28	Photographic films and paper containing silver or silver compounds	09 01 07	-	-	-	-	-
29	Photographic films and paper, free of silver or silver compounds	09 01 08	-	-	-	-	-
30	Shavings, turnings and cuttings of ferrous metals	12 01 01	-	-	6.90	6.2	8.08
31	Shavings, turnings and cuttings of non-ferrous metals	12 01 03	-	-	-	0.22	0.420
32	Paper and cardboard packaging	15 01 01	-	0.10	-	-	-
33	Plastic packaging	15 01 02	-	-	-	-	-
34	Metal packaging	15 01 04	-	-	-	-	-
35	Glass packaging	15 01 07	-	-	-	-	-
36	Absorbents, filter materials, towels and	15 02 03	3.30	3.50	1.50	-	-

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		Code under	Quantity, t				
No.	Name	Regulation no. 3	2007	2008	2009	2010	2011
	protective clothes other than those mentioned in 15 02 02						
37	Obsolete tires	16 01 03	-	15.0	-	2.2	8.212
38	Obsolete vehicles free of liquids or other hazardous components	16 01 06	-	-	-	-	-
39	Antifreeze liquids other than those mentioned in 16 01 14	16 01 15	-	-	-	-	-
40	Obsolete equipment other than that mentioned in codes from 16 02 09 to 16 02 13	16 02 14	-	7.80	18.2	64.2	54.739
41	Components removed from obsolete equipment other than that mentioned in code16 02 15	16 02 16	-	-	8.78	71	41.322
42	Inorganic wastes other than that mentioned in 16 03 03	16 03 04	-	2.40	1.80	6.26	4.392
43	Organic wastes other than that mentioned in 16 03 05	16 03 06	-	0.60	5.20	-	-
44	Alkaline batteries (except for 16 06 03)	16 06 04	-	-	-	-	0.099
45	Other batteries and rechargeable batteries	16 06 05	-	-	-	-	-
46	Sediments from physical-chemical treatment other than that mentioned in 19 02 05	19 02 06	5.0	-	-	-	-
47	Infiltrate from waste landfills other than that mentioned in 19 07 02	19 07 03	1234	1139	839	1365.5	1365.5
48	Residues from screens and seives	19 08 01	8.0	-	-	-	-
49	Sediments from urban wastewater treatment	19 08 05	-	-	-	-	-
50	Wastes mentioned nowhere else	19 09 99	-	-	16.0	-	-
51	Ferrous metals	19 12 02	-	1186	1052.9	1314.2	1508.324
52	Non-ferrous metals	19 12 03	-	16.70	143.28	66.955	81.155
53	Sharp tools	18 01 01	-	-	-	-	-
54	Wastes collection and making harmless whereof is not subject to special provisions aimed to prevent infections	18 01 04	-	-	-	-	-
Const	ruction waste						

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N 7		Code under	Quantity, t					
NO.	Name	Regulation no.	2007	2008	2009	2010	2011	
55	Concrete	17 01 01	15.0	4.3	4.0	3.0	4.0	
56	Excavated earth masses other than those mentioned in 17 05 05	17 05 06	-	-	-	-	-	
57	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	17 06 04	73.0	131.0	79.0	99.9	265.16	
 Combined waste from civil works and demolition other than thise mentioned in 17 09 01, 17 09 02 and 17 09 03 		17 09 04	67.50	16.60	111.5	156.5	49.75	
		Mun	icipal wast	te				
59	Paper and cardboard	20 01 01	74.2	31.30	19.1	6.855	65.03	
60	Glass	20 01 02	-	-	-	-	-	
61	Medical products other than those mentioned in 20 01 31	20 01 32	0.20	0.20	0.20	-	-	
62	Wood materials other than those mentioned in 20 01 37	20 01 38	-	90.39	56.91	131.2	168.1	
63	Plastics	20 01 39	-	6.80	0.30	-	-	
64	Other fractions nowhere else mentioned (sediments from Cold Channel cleaning)	20 01 99	-	-	-	-	-	
65	Bio-degradable waste	20 02 01	28.6	40.0	43.50	44.,3	36.9	
66	Soil and stones	20 02 02	2.0	13.0	2,0	-	-	
67	Mixed municipal waste	20 03 01	1114.0	1238.9	881	899	957.35	
68	Waste from sewerage systems cleaning	20 03 06	16.0	-	-	-	-	

(*) Wastes, containing hazardous substances (inflammable, irritating, hazardous, toxic, carcinogenic, corrosive, mutagenic, etc.), are classified as hazardous and are marked by the star symbol.

According to Article 8 of the WMA⁴¹, transmission and reception of industrial, construction and hazardous waste are carried out only on the basis of a written contract with persons holding permit, complex permit or a registration document under Article 35 of the WMA for the respective activity and a waste site by its code under Regulation no. 3 (2004), Article 3 on waste classification of¹.

⁴¹ Waste Management Act, SG no. 53/12.07.2012

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3.7.1.4 NON-RADIOACTIVE WASTE MANAGEMENT IN KOZLODUY NPP

Non-radioactive waste management in Kozloduy NPP is executed according to the chart given in **Figure 3.7-1**.



FIGURE 3.7-1: NON-RADIOACTIVE WASTE MANAGEMENT CHART

Legend:

1. Storage Facility no. 104 - chemical substances and preparations

2. Landfill for non-radioactive municipal and industrial waste – municipal and unusable industrial waste (waste from wood treatment, photo tapes, etc.); small size construction waste, asbestos, insulation materials not containing hazardous substances, biodegradable waste, soil and stones; TEMPORARY STORAGE – mercury and luminescent lamps, paper, cardboard

3. Storage Facility no. 001 – metal and plastic packaging; packaging containing or contaminated with hazardous substances; motor tires; plastics; rechargeable batteries; alkaline batteries; electrical and electronic equipment and components thereof

5. Storage Facility no. 008 – electrical and electronic equipment; components of discarded electrical and electronic equipment

6. Storage Facility no. 009 - metals, shavings, wood waste

7. Storage Facility no. 003 - chemical substances, electrical and electronic equipment

8. Regional Landfill Oryahovo – mixed municipal waste, waste generated outside the borders of the Kozloduy NPP site

9. Protected Area of the Kozloduy NPP

10. EP-2

- 11. Sludge and oil retainer oil of processed oil water
- 12. Storage facility for metal and wood waste metals; wood waste
- 13. Neutralization pit sludge of physical and chemical treatment (19 02 05*)
- 14. Fuel and oil stock used oils

15. EP-1

- 16. Neutralization pit sludge of physical and chemical treatment (19 02 06)
- 17. Diagnostic and Control solutions of water-based developers and fixing solutions
- 18. Fuel oil and lubricant stock fuel oil, used oils

The strong sides of the non-radioactive waste management at the Kozloduy NPP EAD site are:

- Available own Landfill for non-radioactive municipal and industrial wastes (LNMIW);
- Execution of programs for radiation and non-radiation monitoring of environment within the landfill region;
- Separate collection and treatment of generated waste;
- Introduced accounting for categorization of waste, keeping of logbooks and issuing periodic and annual reports.

Waste management is implemented in compliance with WMA (SG no. 53/2012) and sub-regulatory acts thereto.

Kozloduy NPP EAD has permission to collect waste, transport, utilize and safely dispose it. The Permit is issued by RIEW-Vratsa, which also exercises control on the activities performance.

3.7.1.5 WASTE COLLECTION AND TRANSPORTATION

The waste collection and transportation system depends on waste type, quantities generated and sub-sites. At present, part of the waste is collected separately and for the remaining waste is developed an effective organization of the collection (used grease and lubricants, small batteries (in special containers), sodium and other lamps with metal halogenides, packing of chemical substances, preparations, etc.)

Subject to separate collection and treatment is:

- → Waste defined as hazardous due to specific features thereof and/or provisions of regulatory acts;
- → Industrial waste, hazardous and utilizable industrial waste are stockpiled temporary in specified locations at the Plant Site, and further on they are sold or transferred to persons with license, complex license or registering document as per the WMA or to organization for utilization. A site of LNMIW is set with *Decision 05-Д0-72-01/12.06.2008 of RIEW-Vratsa* for temporary storage of waste before disposal, regulating the composition and quantities of waste whereof such storage is allowed. Activities for safe waste disposal in specially designed repository, code D5⁴², are allowed at that site. The permit complements the provisions of *Decision 05-Д0-72-01/24.01.2006 and has been in force since 31.12.2010* with last amendment in force till 31.12. 2015⁴³.

⁴² Waste Management Act, SG no. 53/2012.

 $^{^{43}}$ Letter by Kozloduy NPP EAD, "Safety and Quality Control" Department, with ref. no. Д "Б и К" 190/08.02.2013

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On **Figure 3.7-1** is given the principal chart of the storage spaces and temporary storage of different types of waste.

Municipal waste within the Kozloduy NPP is collected in 80 containers with a volume of 4 m³, located in EP-1 and EP-2. Municipal waste containers are located on the territory of the BPS and others. Containers are transported by motor vehicles owned by Kozloduy NPP. Municipal waste is passing through radiation control.

Industrial waste generated by the plant sub-sites (limiting factor is the amount of dismantled equipment, steel structures and other metal ferrous and non-ferrous metals) is collected directly to the site of their generation and after radiation control is transported by vehicles of the plant in certain storage facilities in- and off-site – in the area around the port of NPP, Vratsa Loading Station, etc.

Collection of generated scrapped fluorescent and mercury lamps in the plant is performed in specially designed containers for temporary storage.

Hazardous waste is collected separately and submitted to companies specializing in this field for subsequent disposal. Waste oil from vehicles of the motor stock are gather in certain amounts and delivered to a licensed company for further treatment.

3.7.1.6 RADIATION CONTROL

Radiation control is performed in the protected area of Kozloduy NPP in the sites of waste generation and collection – containers and temporary storage sites. All waste and vehicles leaving the protected area through the checkpoints are submitted to radiation control and reports are issued thereof. Radiation control is performed in accordance with statutory requirements and is based on internal corporate documents. The information is stored at responsible persons receiving waste for temporary storage or disposal ("Landfill" Unit at "Supply and Warehousing" Department or others). Radiation control is executed for waste generated at the site of Kozloduy NPP, but outside the protected area, which are disposed at a regional landfill under contract with the Oryahovo Municipality. A copy of the issued reports shall be submitted by the driver of the motor vehicle in the Regional Landfill upon delivery of waste in the landfill, and the second copy is given by the driver to the manager of Motor Park-2, who, at the beginning of each month, sends reports for the previous month in UOS Department for control. From UOS Department the reports are sent to a central backup archive of the "Administration & Control".

3.7.1.7 WASTE TRANSPORTATION

Waste transportation is carried out with own specialized and universal vehicles or with machinery of external companies working under contract and after undergoing radiation control.

Transportation of hazardous waste between sites of the Kozloduy NPP is carried out in accordance with the requirements of the Waste Management Act and the Regulation on the requirements for treatment and transportation of industrial and hazardous waste.

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3.7.1.8 TEMPORARY STORAGE

Temporary storage is an activity related to the storage of waste at sites within the area of their generation or related to collection of waste at sites for a period not longer than:

- a) three years upon subsequent delivery for utilization;
- b) one year upon subsequent deposition.

Places for temporary storage of waste are given in **Table 3.7-2**, and the principal chart of the places for temporary storage and treatment of non-radioactive waste are given on **Figure 3.7-1**.

TABLE 3.7-2: PLACES FOR TEMPORARY STORAGE OF WASTE IN KOZLODUY NPP EAD

Waste	Code	Place of temporary storage
Ferrous and non-ferrous metals	19 12 02, 19 12 03	Storage Facility 009, outside NPP borders
Shavings, cuttings and scrap of ferrous and non-ferrous metals	12 01 01, 12 01 03	Storage Facility 009
Wood waste	20 01 38	Storage Facility 009, site in EP-2
Obsolete equipment other than that mentioned in codes from 16 02 09 to 16 02 13	16 02 14	Storage Facility 008
Components removed from obsolete equipment other than that mentioned in code16 02 15	16 02 16	Storage Facility 008
Obsolete equipment containing hazardous components (3), other than mentioned in codes from 16 02 09 to 16 02 12	16 02 13*	Storage Facility 008
Hazardous components removed from obsolete equipment	16 02 15*	Storage Facility 008
Lead rechargeable batteries	16 06 01*	Storage Facility 001
Ni – Cd batteries	16 06 02*	Storage Facility 001
Alkaline batteries (except for 16 06 03)	16 06 04	Storage Facility 001
Bulk waste	20 03 07	Storage Facility 001 and "Sdruzhenie"
Disused tires	16 01 03	Storage Facility 001
Fluorescent lamps and other mercury-containing waste	20 01 21*	LNMIW
Paper and cardboard	15 01 01,20 01 01	LNMIW
Waste chemical substances	16 03 03*, 16 03 04, 16 03 05*, 16 03 06	Storage Facility 001
Waste oil and emulsions of water and oil	13 01 10*, 13 02 05*, 13 03 07*, 13 07 01*,	At sites of generation, Oil Mangement Unit of EP-1 and EP-2
Solutions of water based developer and activator and fixing solutions	09 01 01*, 09 01 04*	"Diagnostics and Control" Test Center

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The spent fluorescent and mercury lamps are temporarily stored on LNMIW in reinforced concrete containers.

In the landfill may be accepted for temporary storage more waste paper and cardboard. Papers subject to destruction are cut and cutted paper is baled before submitting for recycling.

In the "Supply and Warehousing" Department are separated storage facilities for temporary storage of: ferrous and non-ferrous metals, incl. filings and clippings, tires, rechargeable batteries, discarded electrical and electronic equipment and components, wood waste, bulk waste, glass and plastic waste.

In Storage Facility no. 001 are temporarily separated six individual cells for temporary storage of lead acid batteries and alkaline batteries. (According to the Regulation on the placing on the market of batteries specified in section 10.9 of the Waste Management Authorization of Kozloduy NPP EAD; uncontrolled release and/or disposal of spent batteries, including the uncontrolled disassembly and/or spillage of the electrolyte thereof).

In the same Storage Facility are temporarily stored metal and plastic packaging and containers of hazardous substances.

Significant amount of waste chemicals is located in the storage facilities of "Supply and Warehousing" Department" – no. 106 (Kozloduy NPP) and no. 003 (in Vratsa). Among them there are paints, varnishes, substances with unknown contents, etc.

Storage Facilities are not designed as storages for temporary storage of waste, so that there are significant deviations from the requirements of Regulation no. 7 / 24.08.2004

Waste oil and oil-in-water emulsions are collected in suitable containers and stored at the point of generation and in the Oil Workshop of EP-1 and EP-2.

Solutions of water-based activator and developers, and fixer solutions are collected separately and stored in the unit of their generation – "Diagnostics and Control" Test Center.

3.7.1.9 WASTE DISPOSAL

Most of the waste generated in Kozloduy NPP are collected, transported and disposed without further treatment.

Since the beginning of 2001 Kozloduy NPP has its own Landfill for non-radioactive municipal and industrial wastes (LNMIW). In this landfill is disposed only waste of the protected area. The waste of the sites outside the protected area are transported to the regional landfill in Oryahovo under a contract concluded with the Oryahovo Municipality.

LNMIW fully complies with the current requirements. In LNMIW is disposed solid nonradioactive municipal, unused industrial and small construction waste. Construction and operation of the landfill is designed in two stages and the total area for disposal is just

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above 11 daa. Design capacity of the facility is 45 000 m³, and the operation period is 9 years for the first stage and 15 years for the second.

The Landfill is approximately 3.7 km to the south of midstream of the Danube River against its ^{km}693. To the east of the landfill are located the raw water channels of Kozloduy NPP. To the west of the landfill are situated overhead power lines. From its southern side are located the limestone facility, site for temporary storage of Conditioned RAW and Outdoor Switchgear.

Effective management during operation of LNMIW, including the strict control, is a guarantee of the good ecological status of the region.

TABLE 3.7-3: LIST OF THE WASTE DISPOSED IN LANDFILL FOR NON-RADIOACTIVE MUNICIPAL WASTEACCORDING TO DECISION NO. 05-ДО-72-00/24.01.2006 OF RIEW VRATSA (EXTENDED AND AMENDEDDECISION NO. 05-ДО-72-00/12.06.2008. DECISION NO. 05-ДО-72-00/03.01.2011)

N	Nome	Code under	Quantity, t						
NO.	Name	no. 3	2007	2008	2009	2010	2011		
	Hazardous waste								
1	Insulating asbestos-containing materials Permitted quantity – 90 t/y <i>Currently not generated</i>	17 06 01*	0.5	-	13.60	0.06	22.280		
2.	Construction asbestos-containing materials Permitted quantity – 90 t/y Currently not generated.	17 06 05*	-	-	-	-	-		
		Industrial	waste						
3	Chips, shavings, cuttings, pieces, timber material, pressed timber particle sheets and veneers, different from the ones specified in 03 01 04 Permitted quantity – 40 t/y	03 01 05	5.40	0.90	6.40	5.2	7.8		
4	Photographic films and paper containing silver or silver compounds Permitted quantity 0.2 t/y	09 01 07	-	-	-	-	-		
5	Photographic films and paper, free of silver or silver compounds Permitted quantity – 0.2 t/y	09 01 08	-	-	-	-	-		
6	Absorbents, filter materials, towels and protective clothes other than those mentioned in 15 02 02. Permitted quantity – 15 t/y	15 02 03	3.30	3.50	1.50	-	-		
7	Inorganic wastes other than that mentioned in 16 03 03. Permitted quantity – 50 t/y	16 03 04	-	2.40	1.80	6.26	4.392		
8	Organic wastes other than that mentioned in 16 03 05 Permitted quantity – 15 t/y	16 03 06	-	0.60	5.20	-	-		

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No. Norma		Code under	Quantity, t				
NO.	Name	no. 3	2007	2008	2009	2010	2011
9	Sediments from physical-chemical treatment other than that mentioned in 19 02 05 Permitted quantity – 160 t/y	19 02 06	5.0	-	-	-	-
10	Residues from screens and seives Permitted quantity – 60 t/y	19 08 01	8.0	-	-	-	-
11	Sediments from urban wastewater treatment Permitted quantity – 1.5 t/y	19 08 05	-	-	-	-	-
12	Sharp tools Permitted quantity – 1.5 t/y	18 01 01	-	-	-	-	-
13	Wastes collection and making harmless whereof is not subject to special provisions aimed to prevent infections. Permitted quantity – 2.0 t/y	18 01 04	-	-	-	-	-
		Municipal	waste				
14	Medical products other than those mentioned in 20 01 31 Permitted quantity – 1.0 t/y	20 01 32	0.20	0.20	0.20	-	-
15	Bio-degradable waste Permitted quantity – 25.0 t/y	20 02 01	28.6	40.0	43.50	44.,3	36.9
16	Soil and stones Permitted quantity – 15.0 t/y	20 02 02	2.0	13.0	2,0	-	-
17	Mixed municipal waste Permitted quantity – 1800.0 t/y	20 03 01	1114.0	1238.9	881	899	957.35
18	Waste from sewerage systems cleaning Permitted quantity – 3 t/y	20 03 06	16.0	-	-	-	-
Const	truction waste						
19	Concrete Permitted quantity – 75 t/y	17 01 01	15.0	4.3	4.0	3.0	4.0
20	Excavated soil masses, different from the ones specified in 1705 05	17 05 06	-	-	-	-	-
21	Insulation materials, different from the ones specified in 17 06 01 and 17 06 03	17 06 04	73.0	131.0	79.0	99.9	265.16
22	Mixed wastes from construction and demolition works, different from the ones specified in 17 09 01, 17 09 02 and 17 09 03	17 09 04	67.50	16.60	111.5	156.5	49.75

TABLE 3.7-4: LIST OF THE WASTE TEMPORARY STORED IN LNMIW

No		Nomo	Code under	Quantity, t			
NO.	NO.	Name	no. 3	2007	2008	2009	
	26	Fluorescent lamps and other mercury- containing waste	20 01 21*	-	-	-	

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No		Nama	Code under	Quantity, t		
	NO.	Name	no. 3	2007	2008	2009
	32	Paper and cardboard packings	15 01 01	-	0.10	-
	59	Paper and cardboard	20 01 01		31.30	19.1

On **Figure 3.7-2** are shown annual amounts of non-radioactive waste that is disposed in the Landfill in the period 2001 – 2011.



FIGURE 3.7-2: ANNUAL AMOUNTS OF NON-RADIOACTIVE WASTE THAT IS DISPOSED IN THE LANDFILL IN THE PERIOD 2001 – 2011

In **Table 3.7-5** is given the characteristics of the disposed waste volumes and times for filling up LNMIW of Kozloduy NPP EAD with the generated waste in the period 2001-2011 ⁴⁴.

Amount of receivedYearswaste,m³		Amount of received waste with accumulation, m ³	Time of filling [years]
as of 31.XII 2001	7 298	-	1
as of 31.XII 2002	5 397	12 695	2
as of 31.XII 2003	4 690	17 385	3
as of 31.XII 2004	4 267	21 652	4
as of 31.XII 2005	4 690	26 342	5
as of 31.XII 2006	5 153	31 495	6
as of 31.XII 2007	4 421	35 916	7
as of 31.XII 2008	4 836	40 752	8

TABLE 3.7-5: VOLUME OF DISPOSED WASTE AND TIME FOR FILLING UP LNMIW OF KOZLODUY NPP EAD

⁴⁴ Annual Report of Kozlodyu NPP EAD about own non-radiation monitoring.

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	Years	Amount of received waste, m ³	Amount of received waste with accumulation, m ³	Time of filling [years]	
	as of 31.XII 2009	5 519	46 271	9	
	as of 31.XII 2010	4 747	51 018	10	
	as of 31.XII 2011	4 949	55 967	11	

Source: Annual Report of Kozloduy NPP about own non-radiation monitoring

Since the last *Annual report by Kozloduy NPP EAD about plant non-radiation monitoring* of the NHIWD specifies that only 85% of the first stage capacity of the depot are filled up (from 2001 till 2011) then with a 9% increase of waste disposal per annum the first stage will be used till 2016.

Kozloduy NPP EAD has a *Program for own monitoring of the Landfill for non-radioactive municipal and industrial waste* (LNMIW) aimed to identify and ensure organization of efficient own monitoring of the LNMIW at Kozloduy NPP. The Program covers: Monitoring of gas emissions from a waste body; Water monitoring; Monitoring the condition of the landfill body; Meteorological monitoring.

Periodically updated **Action Plan (2011 – 2013)** is prepared. It reflects the degree of significance of problems in connection to the effective waste management by Kozloduy NPP.

In **Figure 3.7-3** is presented a plan with disposition of boreholes for ground water control in four monitoring stations to the North of the Landfill for municipal, construction and industrial waste of Kozloduy NPP EAD.



FIGURE 3.7-3: PLAN WITH DISPOSITION OF BOREHOLES AROUND LANDFILL FOR MUNICIPAL, CONSTRUCTION AND INDUSTRIAL WASTE OF KOZLODUY NPP EAD

3.7.2 RADIOACTIVE WASTE

The Kozloduy NPP radioactive waste (RAW) management activities cover preliminary treatment, treatment and storage of primary liquid and solid RAW. The said activities are carried out at the Plant Site.

Operational RAW at the site of Kozloduy NPP are stored in the various premises as untreated, treated or conditioned RAW and possible alternatives for consequent treatment, release and/or burying thereof are not limited.

The approach adopted since 2005 to date for management of RAW from Kozloduy NPP consists in transferring currently generated solid RAW and liquid concentrate for treatment by the RAW State Enterprise, and stage-by-stage release of previously generated solid RAW.

Solid RAW that are intermediate level volume-activated materials are stored in special protective facilities (mortuary tubes) located in the central reactor halls of Units 1 - 4 and the auxiliary building (AB – 3) at Units 5 and 6.

Liquid RAW generated at Kozloduy NPP is water-soluble waste mainly, and comparatively small by volume organic substances. The technological radioactive contaminated wastewater is collected through special systems and is treated, whereat distillate and concentrate is obtained. The distillate is released to the environment upon established compliance with requirements of technological regulations for specific and general activity.

The concentrate is stored in tanks of stainless steel located in the auxiliary buildings of the Kozloduy NPP Units. Facilities for storage of liquid RAW are constructed together with the respective units. Technologies are being implemented at present for extraction and treatment of concentrates from Units 1÷4.

Organic liquid RAW (spent sorbents) are collected and stored in separate tanks in the auxiliary buildings of the Kozloduy NPP Units. A technology is under implementation at present for treatment thereof at Units $1\div4$.

Sewage sludges and sediments form a comparatively quantity but are referred to as the so called specific waste since their generation is irregular and they require special methods for treatment and storage. A technology is under implementation at present for treatment thereof at Units $1\div4$.

Annually, Kozloduy NPP generates comparatively small quantities of radioactive contaminated waste oils that are treated and managed as non-radioactive liquid waste.

In 2005, a Specialized Division (SD) for radioactive waste treatment (Kozloduy SD RAW) was established at the Kozloduy NPP site as a part of State Enterprise RAW. Technologically, the Division comprises of:

- \rightarrow Line for solid RAW treatment;
- → Line for treatment of secondary liquid RAW and RAW conditioning;
- → Workshop for metal RAW decontamination.

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The volume of solid compactable RAW is reduced through compaction with volume reduction coefficient of about 7. Solid uncompactable waste is comparatively small part of the total quantity and is collected in 200-liters drums without any further treatment. Great part of metal RAW are decontaminated in the decontamination workshop and released from regulatory control for recycling or reuse.

The volume of liquid RAW is reduced through evaporation while observing the restriction stipulated in the technological regulations.

Solid and liquid RAW are conditioned through cementation. Conditioned RAW for final disposal is stored in reinforced-concrete containers (RCC). Conditioned RAW from Kozloduy NPP is transported to the temporary storage (until final disposal). The storage is an over-ground reinforced-concrete facility ensuring requisite engineering barriers between stored RAW and environment and staff. The capacity of the CRAWS (Conditioned Radioactive Wastes Storage) is 1 920 reinforced-concrete containers with conditioned RAW (960 containers in each of the two fields: "A" and "B", arranged in four rows one upon another). RAW is stored also at the Lime Yard site.

Sub-sites for RAW storage have been differentiated at the Lime Yard site and used by the State Enterprise RAW, as presented in **Table 3.7-6**.

Type of facility	Function	Features
Trench-type storage	Temporary storage of solid RAW of categories 1 and 2.	Reinforced-concrete design of hopper type. Separated in forty cells with top manhole, each cell with dimensions 2.7x5.9x6.0 m and capacity 96.5 m ³ . Instruction by Kozloduy RAW SD for grouping of drums will reach free release levels in 60 years
Storage facility for storage of treated solid RAW	Temporary storage of treated solid RAW of categories 1 and 2.	Building type, reinforced-concrete panel design with receiving transport corridor. The storage useful capacity is 1130 RCCs.
Site No. 1 for solid RAW storage in RCC	Temporary storage of treated solid RAW, category 2a, packed in reinforced-concrete containers.	Capacity to hold 130 RCC with external dimensions 1.95x1.95x1.95 m and useful capacity of 5 m ³ . The site is empty at present.
Site No. 2 for solid RAW storage in RCC	Temporary storage of RCC with solid RAW of category 2a.	Capacity to receive 2000 RCC (of the RCC-2 type).
Site for solid RAW storage in multiton containers	Temporary storage of low-level solid RAW.	Capacity to receive 14 MTC (large freight container) with external dimensions 5.8x2.2x2.4 m and useful capacity 30m ³ .
Contaminated soil repository (CSR)	Storage of low level contaminated soil.	Closed reinforced-concrete design with cast-in-situ walls and bottom slab and assembled roof structure: width – 15.80 m; length – 107 m; height – 6.75 m. The whole available capacity is unoccupied at present.

 TABLE 3.7-6: SUB-SITES AT THE LIME YARD SITE

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As a part of preparation for Units 1÷4 decommissioning, the following Works are in various stages of implementation at present:

- Facility for retrieval and conditioning of spent ion-exchange resins;
- Facility for retrieval and treatment of radioactive concentrate;
- Size reduction and equipment decontamination workshop;
- Facility for high volume reduction and RAW treatment (plasma melting facility);
- Other facilities covering treatment of all types of RAW generated in the course of Units operation and as a result of the decommissioning process.

The state of RAW storage facilities at Kozloduy NPP as at 31.12.2009 according to data presented in the Strategy for management of spent nuclear fuel and radioactive waste till 2030 (approved with Decision of the Council of Ministers on 5 January 2011):

→ Electricity Production – 1 Site (EP-1) – Units 1÷4 at Kozloduy NPP;

✓ State of solid RAW storage facilities:

- Kozloduy NPP Units 1-2 RAW **storage facilities** (AB-1): 393 m³ untreated solid RAW, filling 39%;
- Kozloduy NPP Units 3-4 RAW storage facilities (AB-2): 100 m³ untreated solid RAW, 120 m³ compacted, filling – 22%%;
- Mortuary tube (facility for storage of category 2-II) for RAW from Kozloduy NPP units 1-2 (Central Hall – 1): 52 m³, filling – 64%;
- Mortuary tube for RAW from Kozloduy NPP Units 3-4 (Central Hall-2): 32 m³, filling – 39%.

It is expected that Units 1÷4 shall generate annually some 160 m³ compactable RAW in the form of special clothing, personal protective equipment, plastics, etc. 160 m³ solid RAW are planned for retrieval from each of Units 1 and 2 annually and 40 m³ from each of Units 3 and 4.

State of liquid RAW storage facilities:

Evaporate Concentrate Tanks (ECTs) of Units 1 and 2 of Kozloduy NPP (AB-1) are storing a total of 1890 m³ solidified concentrate. A project for concentrate retrieval and treatment is under way. At present some 1140 m³ of boron solution are stored in AB-1 containing approximately 14 440 kg of boron acid. The expected evaporate concentrate to be obtained after treatment shall amount to about 75 m³ – 90 m³. The tanks for spent sorbents shall store about 360 m³ of spent sorbents (ion-exchange resins, activated carbon).

The technological systems contain about 360 m^3 sewage sludge and sediments. The expected quantities of liquid RAW upon decommissioning of Units 1 and 2 are as follows: from decontamination of technological facilities – about 570 m^3 conditioned RAW and

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secondary RAW generated in the form of water from special washing machines, special sewage systems, etc. – about 18 m³ of conditioned RAW.

The ECTs of Kozloduy NPP Units 3-4 (AB-2) store a total of 1910 m³ solidified concentrate. A project for concentrate retrieval and treatment is under way. At present some 2700 m³ boron solutions are stored in AB-2. The expected evaporate concentrate to be obtained after treatment shall be about 180 m³ – 220 m³. The tanks for sorbents store 240 m³ of spent sorbents (ion-exchange resins, activated carbon).

The technological systems contain about 410 m^3 of sewage sludge and sediments. Some 2000 m^3 conditioned product is expected from activities related to equipment decontamination upon decommissioning.

→ Electricity Production – 2 (EP-2) – Kozloduy NPP Units 5 and 6

- **/** State of solid RAW storage facilities:
 - RAW storage facility (AB-3), category 2-I, 2-II: 871 m³ compacted RAW and 15.7 m³ activated materials. Storage facility volume is to about 35 % full.
 - Storage out of AB-3: 700 m³ compactable low-level waste (dose rate < 1μSv/h and specific activity less than 104 Bq/kg.

State liquid RAW storage facilities:

The ECTs store a total of 2100 m³ solidified concentrate with 1310 m³ of them being solidified phase and 790 m³ liquid phase. The free capacity (ullage) is 1491 m³.

Tanks for spent sorbents hold 146 m³ of spent sorbents (ion-exchange resins, activated carbon). The free capacity is 54 m³.

AB-3 stores about 130 m³ of sludge. As at present, no project for sludge retrieval and treatment has been elaborated. Some 180 m³ of evaporate concentrate is expected to be generated annually during the period 2010-2030. About 250 m³ shall be transferred annually for treatment to the SD RAW Kozloduy. With the designed rates of generation and transfer, in ten years time, just the solid phase of previously generated liquid concentrate will remain.

At present there are not any implemented facilities for retrieval and conditioning of evaporate concentrate, sludge, sewage sludge and resins.

Summarized data of radioactive waste stored in SD RAW Kozloduy are presented in Table 3.7-7. 45

⁴⁵ Strategy for management of spent nuclear fuel and radioactive waste till 2030 approved by Decision of the Council of Ministers acc. to Item 5 of the agenda of Record No. 1/05.01.2011, pp. 46/47.

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TABLE 3.7-7: SUMMARY DATA OF RADIOACTIVE WASTE STORED AT SD RAW KOZLODUY ACCORDING TOTYPE AND NUMBER OF PACKAGINGS, AS AT 31.12.2009

SITE	Quantity of stored RAW
Storage facility for conditioned RAW, number	1130 pcs. RCC (capacity)
RCC-1	296
RCC-3	647
TOTAL	943
Trench storage facility for temporary storage of solid RAW, m ³	386 m ³ (capacity)
Untreated, m ³	1.917
Packed in 4 drums of 210 l, m ³	0.840
Compacted with a force, m ³	0.983
TOTAL m ³	3.740
Storage facility for temporary storage of treated solid RAW, m ³	-
Untreated	0
Packed in drums of 210 l	0
Compacted with a force of 910 t.	386
TOTAL	386
Site for temporary storage of solid RAW in RCC-1	-
RCC -1 (pcs.)	0
Site for storage of solid RAW in RCC-2	0
RCC – 2 (pcs.)	233
Site for temporary storage of solid RAW in large freight containers [m ³]	420 m ³ (capacity)
Untreated	78
Packed in drums of 210 l	125
Compacted with a force of 910 t.	0
TOTAL	203

Part of RAW is conditioned at the SD RAW Kozloduy and is intended for final disposal in the National Disposal Facility for Low and Intermediate Level RAW after the erection thereof in 2015.

The National Disposal Facility for Low and Intermediate Level RAW (NDRAW) is intended for final disposal of conditioned low and intermediate level RAW generated during the Kozloduy NPP operation, decommissioning of Kozloduy NPP and Belene NPP operation.

NDRAW shall also ensure:

- Capacity for final disposal of the backlog of low and intermediate level RAW generated in the country and stored in places where generated and in facilities of RAW management of SE RAW;
- Capacity for final disposal of all RAW expected to be generated till 2075;

According to preliminary calculations, the RAW quantities expected to be disposed in the NDRAW will amount to 138 200 m³ (345 500 t), which determines also the maximum capacity of the disposal facility.

3.8 HAZARDOUS SUBSTANCES

The Protection from Harmful Effects of Chemical Substances, Preparations and Products Act and the regulations thereof are the basis for management of the activities related to hazardous substances.

According to the Protection from Harmful Effects of Chemical Substances, Preparations and Products Act, they are classified as hazardous if they fall into at least one of the properties of chemical substances, preparations and products that define them in the classification category 'hazardous' are given in **Table 3.8-1**.

Harmful Explosive Ε Xn Oxidizing 0 Corrosive С F+ Extremely flammable Xi Irritant Highly flammable F Sensitizing* Xi Flammable F Carcinogenic effect T, Xn T+ Reproductive damage* Very toxic T, Xn Mutagenic effect * Т Toxic T, Xn Harmful to the environment Ν

TABLE 3.8-1: PROPERTIES AND HAZARD SYMBOLS OF CHEMICAL SUBSTANCES AND PREPARATIONS

Note: Postponed effects on organism (*) exerted by substances and preparations that cause damages after prolonged exposure to their effect.

In NPP Kozloduy are used many types of materials, products, substances and mixtures that are classified as 'hazardous substances'. Their use is under strict control management of handling hazardous substances.

The substances used are classified according to the hazard categories in terms of risk to the health of workers and the environment and the instructions for handling hazardous substances are strictly observed.

All safety instructions for handling hazardous substances are regularly updated: In storage facilities for materials that are classified as hazardous substances, in chemical reagents storage facilities, in laboratories, etc. Instructions are intended to regulate the rules and requirements for the safe storage of harmful and hazardous chemicals and materials. Thus ensuring the protection of people, material assets and the environment against accidents.

For the safe storage of harmful and hazardous substances and materials, in Kozloduy NPP EAD have been developed Directions for Safe Storage of Harmful and Hazardous Chemicals and Materials.

Types and quantities of non-radioactive materials and raw materials used at Kozloduy NPP EAD, classified as hazardous substances:

• *Liquid fuels* – are used for the operation of diesel generators, which are reserve sources of electricity for power units; for the purposes of motor vehicles and the

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various workshops and units of Kozloduy NPP EAD. Certain quantities of diesel fuel, gasoline, etc., are stored according to the statutory regulations.

- **Oil and lubricants** the operation of new nuclear unit is expected to use various types and quantities of oil and lubricants engine and compressor oil, turbine oil, engine oil, various kinds of lubricants. They will be accompanied by the relevant certificates and other documents such as Material Safety Data Sheets indicating the correct method of storage, use and treatment.
- **Chemical substances and mixtures** various types of chemical reagents certified for operation in the nuclear industry shall be delivered and used for the main technology process. The main and more important substances and mixes are: ammonia, sulfuric acid, hydrochloric acid, nitric acid, sodium hydroxide, etc. During the storage and use of hydrazine hydrate, ammonia and other substances, there is a potential risk that in case of emergency surge emissions of hazardous toxic substances may occur in the operation and ambient environment.

To ensure the water and chemical regime of the Kozloduy NPP units, including the other production and auxiliary activities, delivery and the use of large quantities of chemical reagents is required, some of which are: boric acid, nitric acid, sulfuric acid, hydrochloric acid, sodium hydroxide, technical potassium hydroxide, ferric chloride, ammonia, hydrazine, hydrated lime, etc. – **Table 3.8-2.**

No.	Name	CAS №	EC №				
Chemical reagents for the production of demineralized water, deactivation, etc.							
1.	Hydrochloric acid	-	231-595-7				
2.	Calcium hydroxide (hydrated lime)	1305-62-0	215-137-3				
3.	Sodium hydroxide	1310-73-2	215-185-5				
4.	Ferrous trichloride	7705-08-0	231-729-4				
5.	Boric acid	10043-35-3	233-139-2				
6.	Nitric acid	7697-37-2	231-714-2				
7.	Ammonium water	1336-21-6	215-647-6				
8.	Sulfuric acid	7664-93-9	231-639-5				
9.	Hydrazine hydrate	302-01-2	206-114-9				
10.	Potassium hydroxide	1310-58-3	215-181-3				
11.	Oxalic acid	144-62-7	205-634-3				
12. Citric acid		77-92-9	201-069-1				
13.	Potassium permanganate	7722-64-7	231-760-3				
14.	Detergent	-	-				

TABLE 3.8-2: DESCRIPTION OF CHEMICAL SUBSTANCES USED

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No.	Name	CAS №	EC №				
Ion-exchange resins							
15.	Ion-exchange resin LEWATIT	-	-				
16.	Ion-exchange resin type AMBERLITE	-	-				
17.	Ion-exchange resin type Wofatit	-	-				
Liquid fu	els and maintenance of motor vehicles						
18.	Diesel fuel Euro-diesel	68334-30-5	269-822-7				
19.	Car gasoline unleaded	68334-30-5	269-822-7				
20.	Antifreeze ⁴⁶	107-21-1	203-473-3				
21.	Gas for lighting (kerosene)	106-97-8	203-448-7				
22.	Extraction benzene	-	-				
Oils							
23.	Turbine oils	-	-				
24.	Engine oils	-	-				
25.	Transformer oils	-	-				
26.	Hydraulic oils	-	-				
27.	General purpose mechanical oils	-	-				
28.	Compressor oils	-	-				
29.	Transmission oils	-	-				
Greases a	nd lubricants						
30.	Lubricants (K2, graphite, with MoS ₂ , etc.)	74869-21-9	278-011-7				
31.	Greases (Litol, Ciatim, graphite, with MoS ₂ , high-temperature, etc.)	74869-21-9	278-011-7				
Adhesive	s and sealing compounds						
32.	Sealants, pastes, adhesives (loctite, Univer, Proma), silicon, liquid metal, etc. ⁴⁷	-	-				
Paints, pr	imers, varnishes, thinners and cleansers						
33.	Paints non-water based (alkyd, oil, etc.) ⁴⁸	-	-				
34.	Paints water based (facade paint, emulsion paint) ⁴⁹	-	-				

 $^{^{46}}$ Hazard category, R and S – phrases are for the subtsance ethyleneglycol, the contents of which in antifreeze is > 90%.

⁴⁷ Due to the absence of information on the contents of the adhesives, sealants and silicons, their hazard phrase is quoted in the list as R 20/22 (Hazardous for breathing and swallowing).

⁴⁸ The hazard category, R and S – phrases are for the substance terpentine, the contents of which in the nonwater based paints, varnishes and thinners varies within the range of 15 and 40%.

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No.	Name	CAS №	EC №
35.	Thinners, diluters, rust converters, etc.	-	-
36.	Koresilin	-	-
37.	Primers	-	-
38.	Varnishes	-	-
39.	Alcohol/ethyl alcohol	64-17-5	200-578-6
Gas and ga	as mixtures		
40.	Gaseous nitrogen	7727-37-9	2317839
41.	Liquid nitrogen	7727-37-9	2317839
42.	Oxygen	7782-44-7	231-956-9
43.	Hydrogen	215-605-7	1333-74-0
44.	Propane butane	74-98-6 106-97-8	200-827-9 203-448-7
45.	Argon	7440-37-1	2311470
46.	Cargon gaseous mixture (82% Ar and 18% CO_2)	7440-37-1 124-38-9	7440-37-1 2046969
47.	Crysal gaseous mixture (80% Ar and 20% CO_2)	7440-37-1 124-38-9	2311470 2046969
48.	Freon 22 (chlordifluormethane)	LD	LD
49.	Reference gaseous mixture Ar –CH ₄ (9 0%-10 %)	7440-37-1 74-82-8	2311470 200-812-7
50.	Carbon dioxide	124-38-9	2046969

When the chemical substances and mixtures are delivered, the good practice shall continue and they shall be accompanied by safety data sheets, which specify the way for their environmentally friendly storage and use.

It is necessary for all used materials, chemicals, etc. that are classified as hazardous substances to be specified EC and CAS number. Classification to classes, categories and hazard statements shall be made under *Regulation (EC) No 1272/2008 – classification, labeling and packaging of substances and mixtures – Annex I on Classification and labeling requirements for hazardous substances and mixtures.*

Industrial and laboratory chemicals for the needs of the main and auxiliary activities in Kozloduy NPP are stored in a small part of the whole storage base of the Plant, including a total of 35 separate storage compartments – mainly in the main Storage Facility no. 106 and no. 104 with the Plant area, and in Storage Facility no. 003 – Loading Station in the

⁴⁹ The hazard category, R and S – phrases are for the substance ethyl glycol, the contents of which in the water based paints are < 1.5%.</p>

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town of Vratsa. Besides these there are separate intermediate storage facilities in the chemical workshops, laboratories in the EP-1 and EP-2, etc.

The *majority of materials used, and reagents, etc.,* classified as "hazardous substances", are stored mainly in the Storage Facility no. 106 in packages, containers and individual spaces and cells according to the instructions for their safe storage.

No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
1	CORESILIN /thinner/	metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
2	linseed oil	plastic packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
3	thinner AMB	metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
4	thinner MRT	metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
5	thinner XK	Metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage	The group is defined according to I

TABLE 3.8-3: LIST OF HAZARDOUS SUBSTANCES RECEIVED AT STORAGE FACILITY NO. 106

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						as well as with substances of the sixth group according to the physical state	
6	primer	Metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
7	alkyd primer	metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
8	epoxy primer	metal packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
9	toluene /for analytical purposes/	glass packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
10	pure toluene	glass packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
11	ethyl alcohol	Metal packaging	5.2	liquid	Cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
12	chemical reagent BREX	plastic packaging	CK 8A	liquid	cell 1	Corrosive substances can be stored together with flammable liquids only in several cases	The group is defined according to II
13	detergent and deactivator	plastic packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
14	paint cleaner "Kemstrip"	plastic packaging	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
15	solvent for degreasing and	Aerosol /bottle/	5.2	liquid	cell 1	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
16	degreasers /spray/	Aerosol /bottle/	СК 2В	liquid	cell 1	Can be stored with CK 3A (5.2). as the specific storage conditions are set by the manufacturer in MSDS	The group is defined according to II
17	methanol	glass bottle	5.2	liquid	cell 2	For substances of this group with solid and liquid state is	The group is defined according to I
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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						allowed joint storage as well as with substances of the sixth group according to the physical state	
18	ethyl alcohol	glass and metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
19	epoxy varnish NEOPLAST EP-71	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
20	azure varnish for wood	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
21	varnish KO- 85 GOST 11066-74 (K2000	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
22	varnish TM – 50	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						physical state	
23	varnish – FLOCCULANT PAP-1. waste	Waste	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
24	isopropyl alcohol /for analytical purposes/	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
25	methanol	glass bottle	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
26	liquid paraffin	metal and plastis packaging	6.2	liquid	cell 2	Joint storage of substances of this group is allowed	The group is defined according to I
27	glycerin	plastic packagings	6.2	Liquid	cell 2	Joint storage of substances of this group is allowed	The group is defined according to I
28	technical alcohol	metal packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
29	petroleum ether	glass packaging	5.2	liquid	cell 2	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						according to the physical state	
30	white car varnish	metal packaging	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
31	latex colorant – yellow	plastic packaging	9.2	liquid	cell 3	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
32	oil paint	metal packaging	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
33	oil paint	metal packaging - 0.900 kg	5.2	Liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
34	oil paint	metal packaging	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
35	road marking paint	metal packaging	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						according to the physical state	
36	alkyd paint /oil paint for steel structures/	metal packaging	6.2	liquid	cell 3	Joint storage of substances of this group is allowed	The group is defined according to I
37	minium iron	metal packaging	5.2	powdered	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
38	paint spray	Aerosol /bottle/	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
39	white latex	Plastic containers 25 kg	9.2	liquid	cell 3	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
40	oil paint	metal packaging	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
41	oil paint	metal packaging - 0.900 kg	5.2	liquid	cell 3	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
42	alutin /enamel/	Metal containers	5.2	Liquid	cell 3	For substances of this group with solid	The group is defined

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
		25 kg				and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	according to I
43	contact spray CONTAKT-60	aerosol /bottle/	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
44	grease – Spray HILTI Cat no. 59	aerosol /bottle/	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
45	preparation for rust deactivation	aerosol /bottle/	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
46	preparation for rust deactivation	metal tubes	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
47	DEVCON glue	trunks	6.2	liquid	shelf	Joint storage of substances of this group is allowed	The group is defined according to I
48	silicone sealant (Silicone	plastic packaging	9.2	liquid /paste/	shelf	Store in dry and well-ventilated pace. Avoid contact with water during storage	The group is defined according to III – MSDS

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
49	rust remover LOCTITE 8	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
50	rust remover ROSTLOSER	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
51	rust solvent C10, Cat no.	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
52	universal rust solvent	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
53	degreasing solvent SS	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
54	silicone grease BAYER- SILICO	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						substances of the sixth group according to the physical state	
55	computer cleaning preparation	aerosol /bottle/	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
56	LOCTITE 302 adhesive, 250 ml	metal tubes	6.2	liquid	shelf	Joint storage of substances of this group is allowed	The group is defined according to I
57	agent for prevention of	aerosol /bottle/	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
58	metal grease LOCTITE 8151 15	plastic packaging	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
59	protective cream "Phantom sleeves"	plastic packaging	9.2	liquid	shelf	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
60	N-hexane cat. No. 1.04371.1000	glass vial or bottle	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
61	Standard I CP	plastic	6.2	liquid	shelf	Store in a dry place.	The group is

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
	I – II Cat no.1.1570	packaging				Keep container tightly closed in a dry and well- ventilated place	defined according to III – MSDS
62	Oxalic acid /for analytic purposes/	plastic packaging	6.1	solid	shelf	Joint storage of substances of this group is allowed	The group is defined according to I
63	/Hydranal Coulomat/ A	glass vials	6.2	liquid	shelf	Store in a dry place. Keep container tightly closed in a dry and well- ventilated place	The group is defined according to III – MSDS
64	methyl alcohol /for analytic purposes/	glass bottle	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
65	sodium hydroxide /for analytic purposes/	plastic packaging	9.1	Solid	shelf	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
66	boric acid /for analytic purposes/	plastic packaging	9.1	solid	shelf	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
67	Sodium diethyldithioc arbamate	glass bottle 2 kg	6.1	solid	shelf	Storage – tightly sealed in dry places at temperatures from +15 to +20 °C	The group is defined according to III
68	citric acid /for analytic purposes/	paper bags	6.1	solid	shelf	Joint storage of substances of this group is allowed	The group is defined according to I
69	hydrochloric acid	glass bottle	9.2	liquid	shelf	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
70	acetic acid 100%	glass bottle	5.2	liquid	shelf	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						sixth group according to the physical state	
71	uranyl nitrate Cat no. 108476 of	in metal box	4.1	solid	shelf	Joint storage of substances of this group is allowed according to the physical state	The group is defined according to I
72	liquid paraffin	plastic bottle	6.2	liquid	shelf	Joint storage of substances of this group is allowed	The group is defined according to I
73	potassium sodium tartrate chemically pure	plastic bottle	9.1	solid	shelf	Tightly sealed in dry places at temperatures from +5 to +30 °C	The group is defined according to III
74	sulfuric acid /for analytic purposes/	plastic drums	4.2	liquid	Compartment for acids	Joint storage of substances of this group is allowed according to the physical state	The group is defined according to I
75	nitric acid	glass bottle	4.2	liquid	Compartment for acids	Joint storage of substances of this group is allowed according to the physical state	The group is defined according to I
76	hydrochloric acid	glass bottle	9.2	liquid	Compartment for acids	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
77	sulfuric acid /for analytic purposes/	plastic drums and glass bottle	4.2	liquid	Compartment for acids	Joint storage of substances of this group is allowed according to the physical state	The group is defined according to I
78	fuming nitric acid	glass bottle	4.2	liquid	Compartment for acids	Joint storage of substances of this group is allowed according to the physical state	The group is defined according to I
79	copper sulfate /for analytic purposes/	glass bottle	9.1	solid	Compartment for acids	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
80	orthophosph oric acid /for analytic	plastic tubes	9.2	liquid	Compartment for acids	Substances and materials of this group can be jointly	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
	purposes/					stored with those of group 3.4.5.6	
81	hydrogen peroxide	plastic drums	2.2	liquid	Separate compartment with door next to acids	Substances of this group are stored alone	The group is defined according to I
82	hydrogen peroxide	glass bottle	2.2	Liquid	Separate compartment with door next to acids	Substances of this group are stored alone	The group is defined according to I
83	epoxy resin	plastic containers 25 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
84	epoxy resin	plastic packaging	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
85	hardener for epoxy resin	plastic containers 2.2 kg and 3 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
86	oxalic acid /for analytic purposes/	bags 25 kg	6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
87	zeolite NaA Ø 4 mm, granulated	bags 50 kg	9.1	solid	In the storage facility	To be stored at room temperatures in dry places and tightly sealed	The group is defined according to III
88	trilon B Titriplex – III; C10	paper bags	6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
89	trilon B	paper bags	6.1	solid	In the storage facility	Joint storage of substances of this	The group is defined

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
	Titriplex – III; C10					group is allowed	according to I
90	citric acid /for analytic purposes/	paper bags 25 kg	6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
91	citric acid /for analytic purposes/	paper bags 25 kg	6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
92	potassium hydroxide /for analytic purposes/	nylon bags 25 kg	9.1	solid	In the storage facility	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
93	oxalic acid /for analytic purposes/		6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
94	caustic soda calcined	flakes in bags 25 kg	9.1	solid	In the storage facility	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
95	epoxy resin	plastic containers 18 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
96	anti- corrosive paint	plastic tubes 10 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
97	anti- corrosive paint	plastic bucket 5 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
98	detergent for washing of oiled	plastic tubes 5 kg	5.2	liquid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
99	3-butyl phosphate 1.08354.2500 ;	bags 50 kg	6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
100	oxalic acid /for analytic purposes/		6.1	solid	In the storage facility	Joint storage of substances of this group is allowed	The group is defined according to I
101	adrinakol / degreaser /	paper bag 50 kg	5.1	solid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
101	adrinakol / degreaser /	paper bag 50 kg	5.1	solid	In the storage facility	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
102	Sodium hydroxide /for analytic purposes/		9.1	solid	In the storage facility	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
103	Potassium hydroxide in isopropanol	powder in nylon bag	9.1	solid	In the storage facility	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
104	anion exchange resin 1-X4 Cat. no.	metal bucket	5.2	liquid	In the storage facility in front of the cells	For substances of this group with solid and liquid state is allowed joint storage as well as with	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
						substances of the sixth group according to the physical state	
105	Hydro-X (reagent)	plastic tubes	7.2	liquid	In the storage facility in front of the cells	To be stored at well- ventilated places and tightly sealed. Product should not freeze and exposed to direct sun light	The group is defined according to III
106	sodium hydroxide /for analytic purposes/	plastic bottle 5 kg	9.1	solid	In the storage facility in front of the cells	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
107	Potassium permanganat e	metal containers	2.1	Solid	Below stairs	Substances of this group are stored alone	The group is defined according to I
108	SFL-strip 24- 50	(rolled in nylon envelope in cardboard boxes)	9.1	solid	Compartment for storage of glass flasks and test-tubes	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
109	dichloroethan e	glass bottle	5.2	Liquid	Compartment for storage of discarded resins, chemical substances and anesthetic substances	For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
110	Tetrachlorom ethane – chemically pure	glass bottle 2.51	9.2	liquid		Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I
111	acetone	glass packaging	5.2	liquid		For substances of this group with solid and liquid state is allowed joint storage as well as with substances of the sixth group according to the physical state	The group is defined according to I
112	Iron(III) chloride (ferric	metal drum	9.1	solid	bay – planting materials	Substances and materials of this group can be jointly	The group is defined according to I

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No.	Materials	Packaging	Group	Physical state	Storage	Storage conditions	Note
	chloride)					stored with those of group 3.4.5.6	
113	potassium dichromate	plastic packaging	4.1	solid	Hazardous substances cabinet	Joint storage of substances of this group is allowed according to physical state	The group is defined according to I
114	potassium dichromate	bag	4.1	solid	Hazardous substances cabinet	Joint storage of substances of this group is allowed according to physical state	The group is defined according to I
115	cockroach poison	Packet	9.1	solid	Hazardous substances cabinet	Substances and materials of this group can be jointly stored with those of group 3.4.5.6	The group is defined according to I

Legend:

I Guide for fire-safe storage of substances and materials

- II Guide for storage of chemicals and preparations
- III MSDS material safety data sheet

Explanation of digital signage of substances and materials according to I:

<u>The first digit represents the group:</u> 1 – Industrial explosives; 2 – Unstable substances; 3 – Substances *combustible* in *air*; 4 – Substances reacting with other substances and materials by exothermic reaction, 5 – Substances forming explosive mixtures with air, 6 – Combustible solids and liquids; 7 – Very toxic substances and materials with strong action; 8 – Radioactive substances and materials; 9 – Inert substances and materials

<u>Second digit means: 1</u> – solid physical state, 2 – liquid physical state, 3 – gaseous physical state; 7 – poisonous.