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

ANNEX 2: APPROPRIATE ASSESSMENT UNDER ART. 6 OF THE HABITATS DIRECTIVE OF THE INVESTMENT PROPOSAL WITH THE SUBJECT AND OBJECTIVES OF PROTECTED AREA CONSERVATION

BG0002009 "ZLATIYATA" PROTECTED AREA UNDER THE BIRDS DIRECTIVE

BG0000533 "OSTROVI KOZLODUY" PROTECTED AREA UNDER THE HABITATS DIRECTIVE

BG0000614 "REKA OGOSTA" PROTECTED AREA UNDER THE HABITATS DIRECTIVE

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DEVELOPED BY:	RUMYANA MECHEVA - BIODIVERSITY EXPERT VERJINIA DIMITROVA - PM	VERSION: 03
VALIDATED BY:	TZVETANKA DIMITROVA - TQ CONTROL EXPERT	DATE: AUGUST 2013

TEAM DEVELOPED THE AA REPORT

No.	Name, Surname, Family name	Expert in the field of:
1.	**Prof. Rumyana Panayotova Mecheva**	Biodiversity
2.	**Assoc. prof. Dr. Svetlana Temelkova Bancheva**	Forest and Non-Forest Habitats
3.	**Assoc. prof. Dr. Tanyu Manev Michev**	Birds
4.	**Lyubomir Atanasov Profirov**	Birds
5.	**Sen. Res. Assoc. Dr. Borislav Yasenov Naumov**	Amphibians and Reptiles
6.	**Tihomir Stefanov Rusinov**	Fish
7.	**Assoc. prof. Dr. Dragan Petrov Chobanov**	Terrestrial Invertebrates
8.	**Sen. Assoc. Dr. Lyubomir Angelov Kenderov**	Aquatic Invertebrates
9.	**Res. Assoc. Teodora Angelova Trichkova**	Invasive Species

CONTENTS

INTRODUCTION 12
1 ANNOTATION OF THE INVESTMENT PROPOSAL 13
1.1 GENERAL DESCRIPTION AND BRIEF HISTORY OF KOZLODUY NPP 13
1.2 NUCLEAR FACILITIES AND GENERAL PLANT INFRASTRUCTURE AT THE KOZLODUY NPP SITE 13
1.3 OTHER INFRASTRUCTURE AND FACILITIES OWNED BY "RAW" SOE 19
1.3.1 GENERAL-PURPOSE FACILITIES AND INFRASTRUCTURE 21
1.3.1.1 NON-RADIOACTIVE WASTEWATERS 24
1.3.1.2 RADIOACTIVELY CONTAMINATED WASTE WATERS 28
1.4 EMERGENCY PLANNING ZONES OF KOZLODUY NPP 29
1.5 RADIO-ECOLOGICAL MONITORING 31
1.6 RATIONALE OF THE INVESTMENT PROPOSAL 32
1.7 KEY OBJECTIVES, PRINCIPLES AND CRITERIA FOR SAFETY 32
1.8 DESCRIPTION OF THE PHYSICAL CHARACTERISTICS OF THE INVESTMENT PROPOSAL AND THE REQUIRED AREA 32
1.8.1 LOCATION OF THE NEW SITES AND EXISTING INFRASTRUCTURE 32
1.8.2 REQUIRED AREAS FOR IMPLEMENTATION OF IP (CONSTRUCTION AND OPERATION) 34
1.8.3 REQUIRED AREAS DURING DECOMMISSIONING 36
1.9 DESCRIPTION OF THE KEY CHARACTERISTICS OF THE GENERATION PROCESS 36
1.9.1 TECHNOLOGY 36
1.10 TYPE AND QUANTITY OF MATERIALS USED DURING OPERATION 37
1.10.1 NON-RADIOACTIVE 37
1.10.1.1 RADIOACTIVE 40
1.10.1.2 FRESH NUCLEAR FUEL INTENDED FOR USE BY THE NNU 40
1.10.1.3 SPENT NUCLEAR FUEL (SNF) 41
1.11 DETERMINING THE TYPE AND QUANTITY OF EXPECTED WASTE AND EMISSIONS DURING OPERATION 42
1.11.1 WASTE 42
1.11.1.1 NON-RADIOACTIVE WASTE 42
1.11.1.2 RADIOACTIVE WASTE 43
1.11.2 EMISSIONS 46
1.11.2.1 AIR 46
1.11.2.1.1 NON-RADIOACTIVE EMISSIONS 46
1.11.2.1.2 EMISSIONS OF RADIOACTIVE PRODUCTS 46
1.11.2.2 WATER 47
1.11.2.2.1 NON-RADIOACTIVELY CONTAMINATED WASTE WATER 48
1.11.2.2.2 RADIOACTIVELY CONTAMINATED INDUSTRIAL WASTE WATER 49
1.11.2.3 SOILS 50
1.11.2.4 NOISE AND VIBRATIONS 51
1.11.2.5 RADIATION 52
1.11.2.5.1 IONIZING 52
1.11.2.5.2 NON-IONIZING RADIATION 52
2 DESCRIPTION OF THE CHARACTERISTICS OF OTHER PLANS, PROGRAMS AND PROJECTS/INVESTMENT PROPOSALS, EXISTING OR IN A PROCESS OF DEVELOPMENT OR APPROVAL, WHICH IN COMBINATION WITH THE ASSESSED INVESTMENT PROPOSAL MAY HAVE ADVERSE EFFECTS ON THE PROTECTED AREAS 52
3 AN OUTLINE OF THE ELEMENTS OF THE INVESTMENT PROPOSAL THAT SEPARATELY OR IN COMBINATION WITH OTHER PLANS, PROGRAMMES AND PROJECTS/INVESTMENT PROPOSALS COULD HAVE A SIGNIFICANT IMPACT ON THE PROTECTED AREAS OR THEIR ELEMENTS 64
3.1 CLIMATE AND ATMOSPHERIC AIR 65
3.1.1 CLIMATE 65
3.1.2 NON-RADIOACTIVE POLLUTION OF ATMOSPHERIC AIR 65
3.1.3 RADIOACTIVE POLLUTION OF ATMOSPHERIC AIR 66
3.1.4 ATMOSPHERIC ACTIVITY 66
3.2 WATER 68
3.2.1 SURFACE WATER 68
3.2.2 HYDROLOGY OF THE DANUBE RIVER 71
3.2.3 GROUND WATER 71

3.2.3.1 ESTIMATED MIGRATION OF RADIONUCLIDES IN THE SUBSOIL OF THE DESIGN SITES FOR THE CONSTRUCTION OF A NEW NUCLEAR UNIT AT THE KOZLODUY NPP SITE AND THE ADJACENT TERRITORIES 71
3.2.3.2 IMPACT FORECAST 73
3.3 SOILS IN THE AREA OF THE NNU 74
3.3.1 IN NON-RADIATION ASPECT 75
3.3.2 IN RADIATION ASPECT 75
3.4 WASTE 76
3.4.1 NON-RADIOACTIVE WASTE 76
3.4.2 RADIOACTIVE WASTE 77
3.5 HEAT IMPACT ON THE DANUBE RIVER 77
3.5.1 TEMPERATURE PROFILE OF DANUBE RIVER 77
3.5.2 THERMAL POLLUTION 78
4 DESCRIPTION OF PROTECTED AREAS, HABITATS, SPECIES AND OBJECTIVES FOR THEIR PROTECTION AND THEIR REPORTING DURING PREPARATION OF THE INVESTMENT PROPOSAL 80
4.1 GENERAL DESCRIPTION OF THE ZLATIYATA PROTECTED AREA WITH CODE BG0002009 UNDER THE BIRDS DIRECTIVE 80
4.1.1 GENERAL CHARACTERISTICS 81
4.1.2 DESIGNATION 81
4.1.3 QUALITY AND RELEVANCE 82
4.1.4 DESCRIPTION OF SPECIES' HABITATS 83
4.2 GENERAL DESCRIPTION OF THE OSTROVI KOZLODUY PROTECTED AREA WITH CODE BG0000533 UNDER THE HABITATS DIRECTIVE 83
4.2.1 GENERAL CHARACTERISTICS 84
4.2.2 DESIGNATION 84
4.2.3 QUALITY AND RELEVANCE 84
4.2.4 VEGETATION TYPES AND HABITATS UNDER CONSERVATION WITHIN THE PROTECTED AREA 84
4.2.5 ANIMAL SPECIES SUBJECT TO PROTECTION 90
4.2.5.1 INVERTEBRATES (INVERTEBRATA) 90
4.2.5.2 VERTEBRATES (VERTEBRATA) 92
4.2.5.2.1 PISCES 92
4.2.5.2.2 AMPHIBIANS 95
4.2.5.2.3 REPTILES – REPTILIA 95
4.2.5.2.4 MAMMALS – MAMMALIA 96
4.3 GENERAL DESCRIPTION OF OGOSTA RIVER PROTECTED AREA, WITH A CODE BG0000614 UNDER THE HABITATS DIRECTIVE 97
4.3.1 GENERAL CHARACTERISTICS 97
4.3.2 DESIGNATION 97
4.3.3 QUALITY AND RELEVANCE 98
4.3.4 TYPES OF VEGETATION AND NATURAL HABITATS SUBJECT TO PROTECTION IN THE PROTECTED AREA 98
4.3.5 ANIMAL SPECIES SUBJECT TO CONSERVATION 102
4.3.5.1 INVERTEBRATES 102
4.3.5.2 VERTEBRATES 106
4.3.5.2.1 PISCES 106
4.3.5.2.2 AMPHIBIANS 109
4.3.5.2.3 REPTILES 110
4.3.5.2.4 MAMMALS 110
5 DESCRIPTION AND ANALYSIS OF THE LIKELIHOOD AND EXTENT OF IMPACT OF THE INVESTMENT PROPOSAL ON THE OBJECT AND PURPOSE OF CONSERVATION IN THE PROTECTED AREAS IN QUESTION 112
5.1 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA "ZLATIYATA", CODE BG0002009 UNDER THE BIRDS DIRECTIVE, IN TERMS OF ITS STRUCTURE, FUNCTIONS AND CONSERVATION OBJECTIVES (LOSS OF HABITAT, FRAGMENTATION, DISTURBANCE OF SPECIES, DISRUPTION OF THE SPECIES' COMPOSITION, CHEMICAL, HYDROLOGICAL, AND GEOLOGICAL CHANGES, ETC.). DURING THE IMPLEMENTATION AND OPERATION OF THE INVESTMENT PROPOSAL 114
5.1.1 THE BIRD SPECIES SUBJECT TO CONSERVATION 114
5.1.2 FRAGMENTATION 137
5.1.3 IMPACT ON THE SPECIES COMPOSITION 137
5.1.4 DISTURBANCE TO SPECIES 137
5.1.5 CHEMICAL CHANGES 137

5.1.6 HYDROLOGICAL CHANGES 137
5.1.7 GEOLOGICAL CHANGES 138
5.1.8 OTHER CHANGES 138
5.1.9 IMPACTS OF INDIVIDUAL ENVIRONMENTAL COMPONENTS/FACTORS AS A RESULT OF THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA ZLATIYATA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE 138
5.1.9.1 AMBIENT AIR 138
5.1.9.2 WATER 139
5.1.9.3 SOILS AND LANDSCAPE 139
5.1.9.4 NOISE 139
5.1.9.5 WASTE 140
5.2 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON „OSTROVI KOZLODUY“ PROTECTED AREA WITH CODE BG0000533 UNDER THE HABITATS DIRECTIVE WITH A VIEW TO ITS STRUCTURE, FUNCTIONS AND ENVIRONMENTAL AIMS (LOSS OF HABITATS, FRAGMENTATION, DISTURBANCE OF SPECIES, DAMAGE OF THE SPECIES COMPOSITION, CHEMICAL, HYDRO GEOLOGICAL AND GEOLOGICAL CHANGES ETC.) DURING THE REALIZATION AS WELL AS DURING OPERATION OF THE INVESTMENT PROPOSAL 140
5.2.1 IMPACT ON THE VEGETATION AND THE TYPES OF NATURAL HABITATS 140
5.2.1.1 LOSS OF HABITATS AND SPECIMENS 140
5.2.1.2 FRAGMENTATION 141
5.2.1.3 DAMAGE OF THE SPECIES COMPOSITION 141
5.2.1.4 CHEMICAL CHANGES 141
5.2.1.5 HYDROLOGICAL CHANGES 141
5.2.1.6 GEOLOGICAL CHANGES 142
5.2.1.7 OTHER CHANGES 142
5.2.2 ON ANIMAL SPECIES 142
5.2.2.1 LOSS OF HABITATS AND SPECIMENS 142
5.2.2.1.1 INVERTEBRATE ANIMALS 142
5.2.2.1.2 FISHES 143
5.2.2.1.3 AMPHIBIANS 151
5.2.2.1.4 REPTILES 152
5.2.2.1.5 MAMMALS 152
5.2.2.2 FRAGMENTATION 153
5.2.2.2.1 INVERTEBRATE ANIMALS 153
5.2.2.2.2 FISHES 153
5.2.2.2.3 AMPHIBIANS 153
5.2.2.2.4 REPTILES 153
5.2.2.2.5 MAMMALS 153
5.2.2.3 DAMAGE OF THE SPECIES COMPOSITION 153
5.2.2.3.1 INVERTEBRATE ANIMALS 153
5.2.2.3.2 FISHES 154
5.2.2.3.3 AMPHIBIANS 154
5.2.2.3.4 REPTILES 154
5.2.2.3.5 MAMMALS 154
5.2.2.4 CHEMICAL CHANGES 154
5.2.2.5 HYDROLOGICAL CHANGES 155
5.2.2.6 GEOLOGICAL CHANGES 155
5.2.2.7 OTHER CHANGES 155
5.2.3 IMPACT OF PARTICULAR COMPONENTS /FACTORS OF THE ENVIRONMENT AS A RESULT FROM THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON „OSTROVI KOZLODUY“ SITE WITH CODE BG0000533 IN THE HABITATS DIRECTIVE 156
5.2.3.1 AIR 156
5.2.3.2 WATER 156
5.2.3.3 SOIL AND LANDSCAPE 156
5.2.3.4 NOISE 157
5.2.3.5 WASTE 157
5.3 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON "REKA OGOSTA" PROTECTED AREA WITH CODE BG0000614 UNDER THE HABITATS DIRECTIVE IN VIEW OF ITS STRUCTURE, FUNCTION AND CONSERVATION OBJECTIVES (HABITATS LOSS, FRAGMENTATION, DISTURBANCE OF SPECIES, DISRUPTION OF SPECIES COMPOSITION, CHEMICAL, HYDROLOGICAL AND GEOLOGICAL CHANGES, ETC.). BOTH DURING IMPLEMENTATION AND DURING OPERATION OF THE INVESTMENT PROPOSAL 158
5.3.1 IMPACT ON VEGETATION AND NATURAL HABITAT TYPES 158
5.3.1.1 LOSS OF HABITATS AND SPECIES 158
5.3.1.2 FRAGMENTATION 158

5.3.1.3 DISRUPTION OF SPECIES COMPOSITION 159
5.3.1.4 CHEMICAL CHANGES 159
5.3.1.5 HYDROLOGICAL CHANGES 159
5.3.1.6 GEOLOGICAL CHANGES 159
5.3.1.7 OTHER CHANGES 159
5.3.2 IMPACT ON ANIMAL SPECIES 160
5.3.2.1 LOSS OF HABITATS AND SPECIES 160
5.3.2.1.1 INVERTEBRATES 160
5.3.2.1.2 FISH 164
5.3.2.1.3 AMPHIBIANS 171
5.3.2.1.4 REPTILES 172
5.3.2.1.5 MAMMALS 173
5.3.2.2 FRAGMENTATION 174
5.3.2.2.1 INVERTEBRATES 174
5.3.2.2.2 FISH 174
5.3.2.2.3 AMPHIBIANS 174
5.3.2.2.4 REPTILES 174
5.3.2.2.5 MAMMALS 174
5.3.2.3 VIOLATION OF SPECIES COMPOSITION 175
5.3.2.3.1 INVERTEBRATES 175
5.3.2.3.2 FISH 175
5.3.2.3.3 AMPHIBIANS 175
5.3.2.3.4 REPTILES 175
5.3.2.3.5 MAMMALS 175
5.3.2.4 CHEMICAL CHANGES 176
5.3.2.5 HYDROLOGICAL CHANGES 176
5.3.2.6 GEOLOGICAL CHANGES 176
5.3.2.7 OTHER CHANGES 176
5.3.3 IMPACT OF THE ENVIRONMENTAL MEDIA/FACTORS AS A RESULT OF THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA OF OGOSTA RIVER, CODE BG0000614 UNDER THE HABITATS DIRECTIVE 177
5.3.3.1 AMBIENT AIR 177
5.3.3.2 WATER 177
5.3.3.3 SOIL AND LANDSCAPE 177
5.3.3.4 NOISE 178
5.3.3.5 WASTE 178
6 PROPOSALS FOR MITIGATION MEASURES ENVISAGED TO PREVENT, REDUCE AND POSSIBLY ELIMINATE THE ADVERSE EFFECTS OF THE INVESTMENT PROPOSAL ON PROTECTED AREAS AND DETERMINE THE LEVEL OF THEIR IMPACT ON THE SUBJECT AND OBJECTIVES OF CONSERVATION OF PROTECTED AREAS AS A RESULT OF THE IMPLEMENTATION OF THE PROPOSED MITIGATION MEASURES 179
6.1 "ZLATIYATA" PROTECTED AREA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE 179
6.2 "OSTROVI KOZLODUY" PROTECTED AREA, CODE BG0000533 UNDER THE HABITATS DIRECTIVE 179
6.2.1 TYPES OF HABITATS AND PLANT HABITATS 179
6.2.2 ANIMAL SPECIES 179
6.2.2.1 INVERTEBRATES 179
6.2.2.2 FISH 180
6.2.2.3 AMPHIBIANS 181
6.2.2.4 REPTILES 181
6.2.2.5 MAMMALS 181
6.3 "REKA OGOSTA" PROTECTED AREA, CODE BG0000614 UNDER THE HABITATS DIRECTIVE 181
6.3.1 TYPES OF HABITATS AND PLANT HABITATS 181
6.3.2 ANIMAL SPECIES 181
6.3.2.1 INVERTEBRATES 181
6.3.2.2 FISH 182
6.3.2.3 AMPHIBIANS 183
6.3.2.4 REPTILES 183
6.3.2.5 MAMMALS 183
7 EXAMINATION OF ALTERNATIVE SOLUTIONS AND ASSESSMENT OF THEIR IMPACT ON THE PROTECTED AREAS, INCLUDING ZERO ALTERNATIVE 183
7.1 ZERO ALTERNATIVE 183
7.2 SITE ALTERNATIVES 184
7.3 ALTERNATIVES FOR TECHNOLOGICAL OPTIONS IN THE CONSTRUCTION OF THE NEW NUCLEAR UNIT 190

7.4 CONCLUSIONS 191
8 MAP MATERIAL 194
9 CONCLUSION ON THE TYPE AND LEVEL OF NEGATIVE IMPACT ACCORDING TO THE CRITERIA SET OUT IN ARTICLE 22 197
9.1 REGARDING INDIVIDUAL PROTECTED AREAS 197
9.1.1 "ZLATIYATA" PROTECTED AREA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE 197
9.1.2 "OSTROVI KOZLODUY" PROTECTED AREA, CODE BG0000533 UNDER THE HABITATS DIRECTIVE 197
9.1.2.1 TYPES OF HABITATS ANDPLANT HABITATS 197
9.1.2.2 ANIMAL SPECIES 198
9.1.2.2.1 INVERTEBRATE ANIMALS 198
9.1.2.2.2 FISHES 198
9.1.2.2.3 AMPHIBIANS 198
9.1.2.2.4 REPTILES 198
9.1.2.2.5 MAMMALS 198
9.1.3 "OGOSTA RIVER" PROTECTED AREA, CODE BG0000614 UNDER THE HABITATS DIRECTIVE 199
9.1.3.1 TYPES OF HABITATS AND PLANT HABITATS 199
9.1.3.2 ANIMAL SPECIES 199
9.1.3.2.1 INVERTEBRATE ANIMALS 199
9.1.3.2.2 FISHES 199
9.1.3.2.3 AMPHIBIANS 199
9.1.3.2.4 REPTILES 199
9.1.3.2.5 MAMMALS 200
9.2 GENERAL CONCLUSION 200
10 PRESENCE OF THE CIRCUMSTANCES UNDER ARTICLE 33 OF THE BDA WHEN THE CONCLUSION UNDER ITEM 9 IS THAT THE SUBJECT OF CONSERVATION OF THE RESPECTIVE PROTECTED AREA WILL BE SIGNIFICANTLY AFFECTED BY THE IMPLEMENATTION AND OPERATION OF THE INVESTMENT PROPOSAL AND NO OTHER ALTERNATIVE SOLUTION IS AVAILABLE 200
11 DETAILS ON RESEARCH METHODS USED, INCLUDING DURATION AND PERIOD OF FIELD STUDIES, FORECASTING AND IMPACT ASSESSMENT METHODS, SOURCES OF INFORMATION, DIFFICULTIES IN GATHERING THE NECESSARY INFORMATION 201
11.1 RESEARCH METHODS, FORECASTING AND IIMPACT ASSESSMENT METHODS USED IN RESPECT OF PROTECTED AREAS UNDER THE BIRDS DIRECTIVE 201
11.2 RESEARCH METHODS, FORECASTING AND IIMPACT ASSESSMENT METHODS USED IN RESPECT OF PROTECTED AREAS UNDER THE HABITATS DIRECTIVE 201
11.2.1 METHODS USED FOR RESEARCH, FORECASTING AND ASSESSMENT OF THE IMPACT ON PLANT SPECIES AND TYPES OF HABITATS IN THE PROTECTED AREAS UNDER THE HABITATS DIRECTIVE 201
11.2.2 METHODS USED FOR RESEARCH, FORECASTING AND ASSESSMENT OF THE IMPACT ON TARGET ANIMAL SPECIES IN THE PROTECTED AREAS UNDER THE HABITATS DIRECTIVE 202
11.2.2.1 INVERTEBRATE ANIMALS 203
11.2.2.2 FISHES 204
11.2.2.3 AMPHIBIANS 205
11.2.2.4 REPTILES 205
11.2.2.5 MAMMALS 205
11.3 SOURCES OF INFORMATION 205
11.3.1 ON THE BIRDS DIRECTIVE 205
11.3.2 REGARDING THE HABITATS DIRECTIVE 208
11.3.2.1 TYPES OF VEGETATION AND NATURAL HABITATS 208
11.3.2.2 FAUNA 209
12 CONSULTATIONS 211
13 DOCUMENTS UNDER ARTICLE 9, PARAGRAPHS 2 AND 3 OF THE REGULATION ON THE TERMS AND PROCEDURE FOR EVALUATION OF THE COMPATIBILITY OF PLANS, PROGRAMMES, DESIGNS AND INVESTMENT PROPOSALS WITH THE SUBJECT AND OBJECTIVES FOR CONSERVATION OF PROTECTED AREAS 232
14 DOCUMENTS OF EXPERTS OF THE AUTHOR'S TEAM 233

LIST OF FIGURES

FIGURE 1.2-1: MASTER PLAN OF KOZLODUY NPP AND SITUATIONAL PLAN OF THE PROPOSED SITES OF THE NNU 17
FIGURE 1.4-1: EMERGENCY PLANNING ZONES 31
FIGURE 1.8-1: SITUATION OF THE SITES OF THE IP 33
FIGURE 3.1-1: GAMMA-SPECTROMETRIC ANALYSIS OF 137CS AND 7BE IN GROUND AIR (MBQ/M3) FROM THE AREA OF THE KOZLODUY NPP, CHECKPOINT-9 (VILLAGE OF HARLETS), 1992 – 2011 67
FIGURE 4.2-1: DISTRIBUTION OF THICK SHELLED RIVER MUSSEL (UNIO CRASSUS) IN THE REGION OF KOZLODUY ISLANDS PA 91
FIGURE 4.2-2:. HABITATS OF THE EUROPEAN OTTER (*LUTRA LUTRA*) IN OSTROVI KOZLODUY PA AND THE MOUTH OF THE HOT CHANNEL 96
FIGURE 4.3-1: DISTRIBUTION OF THICK SHELLED RIVER MUSSEL (*UNIO CRASSUS*) IN THE REGION OF THE OGOSTA RIVER PA 103
FIGURE 4.3-2: COLONIES OF THE EUROPEAN GROUND SQUIRREL IN THE OGOSTA RIVER PA 111
FIGURE 4.3-3: ENCOUNTERS OF THE EUROPEAN OTTER (*LUTRA LUTRA*) IN THE OGOSTA RIVER PA AND THE MOUTH OF THE HOT CHANNEL 112
FIGURE 5.1‑1: OBSERVATORIES FOR MONITORING MIGRATORY SOARING BIRDS NEAR THE VILLAGE OF RAZGRAD AND THE TOWN OF VALCHEDRAM, MONTANA DISTRICT, THE VILLAGE OF GALICHE AND THE TOWN OF ORYAHOVO (VRATSA DISTRICT) 132
FIGURE 5.1‑2: PROTECTED AREAS UNDER THE BIRDS DIRECTIVE IN THE MONITORED ZONE (30 KM RADIUS AROUND NPP KOZLODUY) 135
FIGURE 8-1: LOCATION OF THE NNU SITE ALTERNATIVES ON THE TERRITORY OF KOZLODUY NPP 194
FIGURE 8-2: AREA OF THE NNU SITE ALTERNATIVES INCLUDING SITES OF THE EUROPEAN ENVIRONMENTAL NETWORK NATURA 2000 ON THE TERRITORY OF BULGARIA AND ROMANIA. 195
FIGURE 8-3: LOCATION OF THE FORMER KOZLODUY SWAMP (IN RED) 195
FIGURE 8-4: MAP OF PA "ZLATIYATA" CODE BG0002009 FOR BIRDS FROM NATURA 2000 196
FIGURE 8-5: PROTECTED AREA "OSTROVI KOZLODUY" CODE BG0000533 ACCORDING TO HABITATS DIRECTIVE 196
FIGURE 8-6: PROTECTED AREA "OGOSTA RIVER" CODE BG 0000614 ACCORDING TO HABITATS DIRECTIVE 197

LIST OF TABLES

TABLE 1.1-1: DATA ON UNITS 1÷4 OF KOZLODUY NPP 13
TABLE 1.3-1: ANNUAL QUANTITIES OF WATER MASSES USED FOR INDUSTRIAL AND POTABLE WATER SUPPLY 24
TABLE 1.10-1: DESCRIPTION OF CHEMICAL SUBSTANCES USED 38
TABLE 4.2-1: TARGET SPECIES IN OSTROVI KOZLODUY PA ACCORDING TO THE STANDARD FORM 93
TABLE 4.3-1: TYPES OF HABITATS LISTED IN ANNEX 1 TO DIRECTIVE 92/43/EEC 99
TABLE 4.3-2: TARGET FISH SPECIES IN THE OGOSTA RIVER PA UNDER THE STANDARD FORM 107
TABLE 4.3‑1: ASSESSMENT MATRIX FOR THE DEGREE OF IMPACT 113
TABLE 5.1‑1: SUMMARY DATA ON THE NUMBER OF BIRD SPECIES SUBJECT TO CONSERVATION IN THE PROTECTED AREA AFFECTED BY VARIOUS NEGATIVE IMPACTS AS A RESULT OF THE IMPLEMENTATION OF THE IP 130
TABLE 5.1‑2: MIDWINTER WATERFOWL NUMBERS IN THE TZIBAR-SOMOVIT SECTION OF THE RIVER DANUBE IN THE PERIOD 1977-2013 133
TABLE 5.1‑3: PROTECTED AREAS AND AREAS UNDER THE BIODIVERSITY ACT AND THE PROTECTED AREAS ACT IN THE VICINITY OF NPP KOZLODUY 136
TABLE 7.2-1: ANALYSIS OF THE SITES 187
TABLE 7.3-1: ASSESSMENT OF THE EQUIPMENT OPTIONS 190

Approved by:		
Prepared by:	**Head of the Biology Team**	**Project Director**
Rumyana Mecheva – Biodiversity Expert and Head of the Biology Team **Verjinia Dimitrova – PM Project Manager**		
Validated by:		
Tzvetanka Dimitrova – TQ Control Expert		

Recipients				
Organization	**Recipient's Name**	**# copies**	**Re:**	
			Activities	**Information**
"Kozloduy NPP – New Builds" EAD	**Valentin Iliev** – Executive Director	**1**	**x**	**x**
Consortium "Dicon – Acciona Ing."	**Zoya Marvakova** – Secretary	**1**	**x**	**x**
Consortium "Dicon Acciona Ing."	Key Experts	**1 copy each**	**x**	**x**

Revisions			
Revision	**Date**	**Editor**	**Comments**
03	August	RUMYANA MECHEVA AND TEAM OF EXPERTS	NA

Corrections		
Section	**Reason for and essence of the change**	**Revision**
NA	Statements of opinion Ref. No. 630/24.06.2013, Ref. No. РиМ-122/25.06.2013, Bilyana Simeonova, Ecologist, "Kozloduy NPP – New Builds" PLC	01
NA	Statements of opinion Ref. No. 633/24.06.2013, Ref. No. РиМ-122/25.06.2013, Ivaylo Ninov, Engineering and Project Development Director, "Kozloduy NPP – New Builds" PLC	01
NA	Statement of opinion Ref. No. НМ-61/04.07.2013, Valentin Iliev Head of "New Builds" Division, "NPP Kozloduy" PLC	01
NA	Statements of opinion Ref. No. 13. УОС.СТ.308, Ref. No. ДБиК941/25.06.2013, Veselka Alexieva Environmental Management Expert, Quality Division, Safety and Quality Directorate	01
NA	Statement of opinion Ref. No. РиМ-313/05.07.2013, Ivan Andreev, International Projects Division	01
NA	Statement of opinion Ref. No. РиМ-292/19.06.2013, Tsvetomir Marinov, Head of Hydrotechnical Facilities and Building Structures Department	01
NA	Statement of opinion Ref. No. У(Б) 528/27.06.2013, Rusiyan Tsibranski, Radiological Monitoring Department, Safety Division	01
NA	Statement of opinion Ref. No. 790/01.08.2013, Bilyana Simeonova, Ecologist, "Kozloduy NPP – New Builds" PLC	02
NA	Statement of opinion Ref. No. 787/01.08.2013, Ivaylo Ninov, Engineering and Project Development Director, "Kozloduy NPP – New Builds" PLC	02
NA	Statement of opinion Ref. No. 73/08.05.2013, Daniela Georgieva, Head of B&A Sector, "NPP Kozloduy" PLC	02

INTRODUCTION

The investment proposal (IP) of "Kozloduy NPP – New builds" EAD refers to construction of a new nuclear unit of the latest generation (generation III or III+) with installed electric power up to 1200 MW. As it comes under Annex 1 of the Environmental protection act, point 2.2. "Nuclear electric power plants and other nuclear reactors, including disassembly or decommissioning of such plants and reactors, except for plants for production and processing of fissionable or fertile materials, which maximum power does not exceed 1 kW continuous heat load", the IP shall be subject of a mandatory EIA. The competent authority to take decision on EIA is the Minister of environment and water.

The project of the nuclear unit will meet the European requirements, listed in the European Utility Requirements for LWR Nuclear Power Plants and the Bulgarian legislation on nuclear power engineering.

This assessment has been compiled based on:

- Article 2, paragraph 1, item 1 and in conjunction with Article 39, paragraph 5 of the Regulation on the conditions and procedure for appropriate assessment of the compatibility of plans, programs, projects and investment proposals with the object and purpose of protected areas conservation (SG, Issue 73/2007 with amendments and supplementations.).
- the requirements of Article 23, paragraph 2 of the Regulation on the conditions and procedure for appropriate assessment of the compatibility of plans, programs, projects and investment proposals with the object and purpose of protected areas conservation, respecting the criteria of Article 22 and in accordance with Article 9, paragraph 1 thereof;
- letter Ref. No. OBOC-220/09.07.2012 on undertaking Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) of the New Nuclear Unit (NNU);
- letters of the Regional Inspectorates for Environment and Waters (RIEWs) in Montana and Vratsa with information provided to estimate the cumulative impacts;
- field inspections of the four sites and the nearest protected areas within the scope of impact, according to the instructions of the Ministry of Environment and Waters (MoEW);
- data from the "Mapping and determining the conservation status of natural habitats and species – Phase I" project of the MoEW, authorized for use with letter Ref. No. 48-00-467/26.04.2013 of the MoEW;
- use of the best available information;
- outcomes, evaluations, analyzes and conclusions of experts on the relevant individual environmental components from the EIA report to the Investment Proposal (IP).

1 ANNOTATION OF THE INVESTMENT PROPOSAL

1.1 GENERAL DESCRIPTION AND BRIEF HISTORY OF KOZLODUY NPP

The nuclear power sector in Bulgaria was initiated on 15 July 1966 with the signing of a cooperation agreement between Bulgaria and the former Soviet Union to build a nuclear power plant. After a detailed feasibility study the site for the construction of nuclear power plant was selected on the Danube River, near the town of Kozloduy. The first sod for the construction of Kozloduy NPP was turned on 14 October 1969. On 6 April 1970 began the erection of the main building of Units 1 and 2 of Kozloduy NPP.

The official opening of Kozloduy NPP was held on 4 September 1974. The construction and commissioning of the nuclear facilities of the Bulgarian nuclear power plant were carried out in three phases:

- → Phase I: 1970 – 1975 – Construction and commissioning of Units 1 and 2 with pressurized water reactors WWER-440, Model V-230, with two independent channels of the safety systems.
- → Phase II: 1973 – 1982 – Construction and commissioning of Units 3 and 4 with pressurized water reactors WWER-440, advanced model V-230 with triple redundancy of the safety systems.
- → Phase III: 1980 – 1991 – Construction and commissioning of Units 5 and 6 with WWER-1000 reactors, model V-320 with pressurized containment, triple redundancy of the safety systems.

In relation to the commitments made by Bulgaria on the country's accession to the European Union, Kozloduy NPP suspended the operation of the first four units before the end of their design lifetime, which is 30 fuel cycles – **Table 1.1-1**.

TABLE 1.1-1: DATA ON UNITS 1÷4 OF KOZLODUY NPP

Unit	Reactor type and power, MW	Year of Inclusion in the Energy Grid	Date of Shutdown	Fuel cycles	Electricity generated during the period, MWh
Unit 1	WWER-440	1974	31.12.2002	23	66 675 397
Unit 2	WWER-440	1975	31.12.2002	24	68 905 334
Unit 3	WWER-440	1980	31.12.2006	22	68 703 260
Unit 4	WWER-440	1982	31.12.2006	21	66 711 966

1.2 NUCLEAR FACILITIES AND GENERAL PLANT INFRASTRUCTURE AT THE KOZLODUY NPP SITE

The Kozloduy NPP site is situated in North-West Bulgaria, at the territory of Vratsa region and Kozloduy municipality, mainly on the lands belonging to the town of Kozloduy and to the village of Harlets. The site is located at around 2.6 km to the southeast of the town of Kozloduy, 3.5 km to the northwest of Harlets village, 65 km north of the regional center –

the town of Vratsa, 200 km north of Sofia city. It is located on the second non-flooding river terrace of the Danube, with absolute elevation of +35 m, about 3.5 km from its right bank, where the river flows from northwest to southeast direction. To the north the Kozloduy NPP site borders on the Danubian Plain, and to the south-southwest – with the watershed plateau with altitude 90 m above sea level.

On the territory of Kozloduy NPP there are no natural water bodies. Inland rivers that are closest to the plant on the territory of the Republic of Bulgaria are Ogosta and Skat rivers to the East, and Tsibritsa River to the West. Crucial for the operation and safety of Kozloduy NPP is only Danube. The elevation of the site is formed on significant in terms of size deposition area, identified during the design phase of the plant with reserve for non-floodability upon a flow of a 10,000-years tidal wave on the Danube River.

Between theKozloduy NPP site and Danube River have been built embankments sized for a flow of a 1,000-years tidal wave on the Danube with the required statutory reserve. Drainage systems in the area are designed for drainage of surface runoff from intense rain of varying duration and 0.01% probability of precipitation height.

The Danube is a surface water body, of River Category named DunavRWB01 and code BG1DU000R001, as defined in the Danube Area River Basin Management Plan (RBMP) drawn up in accordance with Directive 2000/60 of the EU and the Law on Waters and approved by Order No. 293/22.03.2010 of the Minister of Environment and Waters. The entire length of the Bulgarian section of Danube River from the village of Novo Selo near the town of Silistra is Grade III receiving water in accordance with Order No. RD-272/03.5.2001[1] of the Minister of Environment and Water. It is defined as a heavily modified water body with moderate ecological potential, and its chemical condition is poor according to the country's Danube Area RBMP and Letter No. 3804/0801.2013 of the Basin Directorate for Water Management – Danube Region (BDWMDR).

The more important facilities and infrastructure available at the Kozloduy NPP site (**Figure 1.2-1**) currently are:

- → Main Housing (Reactor Building and Power Island) – the casings of Units 1 and 2 and Units 3 and 4 are housed in the same building (all 8 of turbine generators for Units 1 ÷ 4 are in a single Power Island);
- → Main Housing of Units 5 and 6;
- → Auxiliary Buildings 1 and 2 (AuB-1, -2) – servicing respectively Units 1&2 and 3&4 of PG-1 (Power Generation), Auxiliary Building 3 (AuB-3) – servicing Units 5 and 6 of PG-2;
- → CWCP-1 (Chemical Water Cleanup Plant) – servicing Units 1÷4;
- → CWCP-2 – servicing Units 5 and 6;

[1] In the process of drafting these Terms of Reference Regulation No. 7/1986 on indicators and norms for determining the quality of flowing surface waters was repealed by a Regulation repealing Regulation No. 7 prom. SG , Issue 22 from 05.03.2013.

- CPS-1 and 2 (Circulation Pumping Stations) servicing Units 1÷4 and CPS-3 and -4 servicing Units 5 and 6;
- 2 DGSs (Diesel Generator Stations) servicing Units 1÷4 and 3 DGSs servicing Units 5 and 6;
- OS (Outdoor Switchgear) – consisting of three sections: 110 kV, 220 kV, 400 kV;
- Cold (Intake) Channel (CC-1);
- Hot (Outlet) Channel (HC-1,-2);
- Spray ponds for Units 1 ÷ 6;
- Under-Water Repository for Spent Nuclear Fuel (UWRSNF);
- Dry Storage of Spent Nuclear Fuel (DSSNF);
- Oil and Diesel Facility at PG-2;
- Fire-Extinction Pumping Station-2 (FEPS-2);
- Warehouse Facility;
- Landfill for Non-Radioactive Industrial and Domestic Waste – DNRIDW.
- United Auxiliary Building (UAB-1) and Mechanical Repair Workshop (MRW) – PG-1, UAB-2 at PG-2 (Units 5 and 6);
- Waste Water Treatment Plant (WWTP) – PG-2;
- Sanitary-Amenity Block (SAB-1,-2) – at PG-1;
- Engineering Laboratory Building (ELB) – at PG-2;
- Training-Technical Center (TTC);
- Information Center;
- Administration Buildings: Kozloduy NPP Headquarters; EG-2 Division; Investments Division; Engineering Building of Development and Modernization Directorate;
- Warehouses (within the restricted access area and beyond it).

The construction works zone of Kozloduy NPP has an area of 4,471,712 decares. Within its boundaries are territorially detached the following main sub-zones:

I. Power Generation-1 (PG-1), with Units 1÷4, Auxiliary Buildings 1 and 2, and ancillary facilities. This sub-zone also hosts Under-Water Repository for Spent Nuclear Fuel (UWRSNF) and Dry Storage of Spent Nuclear Fuel (DSSNF). Units 1 and 2 have been shut down in 2002, and Units 3 and 4 –

in 2006. As at the present moment the Power Units 1÷4 have been designated as facilities for radioactive waste management – property of the "Radioactive Waste" State-Owned Enterprise ("RaW" SOE);

II. Power Generation-2 (PG-2), with Units 5 and 6, Auxiliary Building 3 and ancillary facilities. This subzone also hosts an Enterprise for processing of radioactive waste owned by „RaW" SOE;

III. Sub-zone of the cold (intake) channel CC-1, hot (outlet) channels HC-1 and HC-2, as well as the facilities of the On-Shore Pumping Stations (OSPSs) – all providing the service water supply of the power plant.

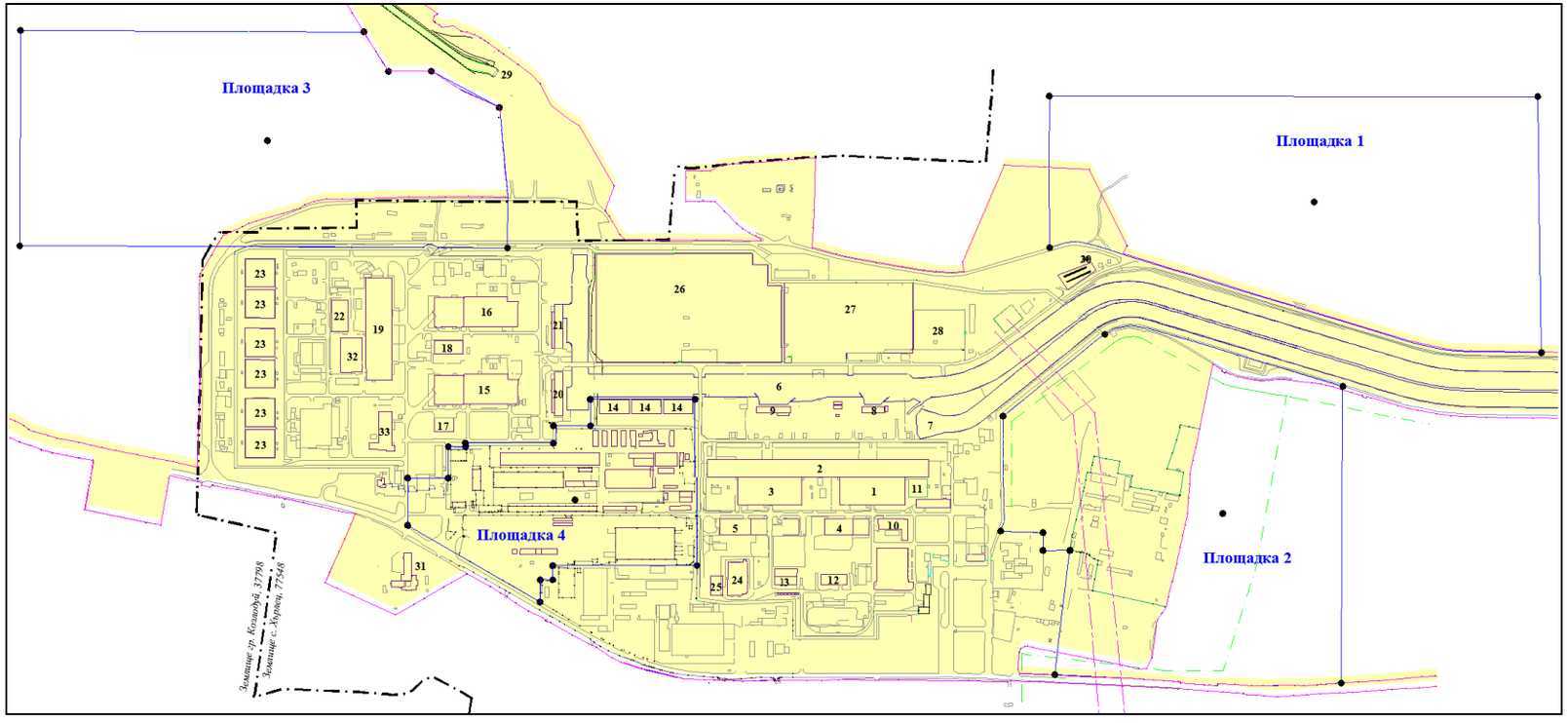

FIGURE 1.2-1: MASTER PLAN OF KOZLODUY NPP AND SITUATIONAL PLAN OF THE PROPOSED SITES OF THE NNU

Key:

1. Reactor Building Units 1, 2.	**13.** Diesel Generator Station 2.	**24**. Spent Nuclear Fuel Repository (SNFR).
2. Power Island Units 1÷4.	**14.** Spray ponds Units 3, 4.	**25**. Dry storage of spent nuclear fuel (DSSNF).
3. Reactor Building Units 3, 4.	**15.** Power Unit 5.	**26**. Outdoor Switchgear – 400 kV.
4. Auxiliary Building 1.	**16.** Power Unit 6.	**27**. Outdoor Switchgear – 220 kV.
5. Auxiliary Building 2.	**17.** Diesel Generator Station Unit 5.	**28**. Outdoor Switchgear – 110 kV.
6. Cold Channel 1.	**18.** Diesel Generator Station Unit 6.	**29**. Hot Channel 2.
7. Hot Channel 1.	**19.** Auxiliary Building 3.	**30**. Landfill for Non-Radioactive industrial and Domestic Waste – DNRIDW.
8. Circulation Pumping Station 1.	**20.** Circulation Pumping Station 3.	**31.** Fire Safety Center.
9. Circulation Pumping Station 2.	**21.** Circulation Pumping Station 4.	**32**. Workshop SD "RaW" of „RaW" SOE.
10. Chemical Workshop.	**22.** Warehouse for RaW.	**33**. Occupational Medicine Service
11. Decontamination and Size Reduction Workshop – design.	**23.** Spray ponds Units 5, 6.	
12. Diesel Generator Station 1.		

Nuclear facilities at the Kozloduy NPP site

At the Kozloduy NPP site have been assembled: 6 power units with a total electric power of 3 760 MW, equipped with pressurized water reactors, spent nuclear fuel repository (SNFR) and dry storage of spent nuclear fuel (DSSNF). Other facilities and sites owned by „RaW" SOE also fall into this category.

Units 1 and 2

Units 1 and 2 have been shut down on 31.12.2002. By decision of the Council of Ministers from 20.12.2008 Units 1 and 2 have been designated as facilities for radioactive waste management and, along with the required movable property, have been given to the "Radioactive Waste" State-Owned Enterprise, which is an independent business entity. On 18.10.2010 the NRA has issued licenses to the "Radioactive Waste" State-Owned Enterprise for operation of Units 1 and 2 as facilities for radioactive waste management that are subject to decommissioning and has suspended the licenses of Kozloduy NPP for operation of the first two units in Status "E" operating mode. No nuclear fuel has been stored at the site of Units 1 and 2.

Units 3 and 4

Units 3 and 4 have been shut down on 31.12.2006. By decision of the Council of Ministers No. 1038/19.12.2012 Units 3 and 4 of the "NPP Kozloduy" have been designated as facilities for radioactive waste management that are subject to decommissioning. The corresponding assets have been provided for maintenance and management to the „RaW" SOE. On 26.02.2013 the NRA has issued licenses to the "Radioactive Waste" State-Owned Enterprise for operation of Units 3 and 4 as facilities for radioactive waste management that are subject to decommissioning and has suspended the licenses of Kozloduy NPP for operation of both units in Status "E" operating mode. No nuclear fuel has been stored at the site of Units 3 and 4.

At present the spent nuclear fuel (SNF) of all four units has been taken out of the casings, and is stored at the Spent Nuclear Fuel Repository (SNFR).

Units 1÷4 have been transferred for management to the „RaW" SOE PLC Sofia and are managed via two specialized affiliates: Specialized Division "Decommissioning-Kozloduy" (Units 1 and 2) and Specialized Division "RaW Management – Units 3 and 4" (SD "RaWM 3 and 4").

Units 5 and 6

Units 5 and 6 are in operation – unit 5 in its 19th and unit 6 in its 18th fuel cycle. Both units operate at base load with rated power under the terms of the licenses for operation.

Power units 5 and 6 of Kozloduy NPP have been built with WWER-1000 type B-320 reactors. They are Russian-made – second-generation, with pressurized water. In terms of the safety concept, design features and structure they are analogues to the Western-design reactors of type PWR. The WWER-1000/V-320 units have been designed in accordance with the standards set out in the "General Safety Provisions" (GSP-73), later updated with

"Rules for nuclear safety of nuclear power plants" (RNSNPP-04-74), "Basic safety rules" (BSR-82) and "Radiation Protection Norms" (RPN-76) of the former USSR. The basic safety concept of "defense-in-depth" has been implemented through design solutions characterized by redundancy, diversity, independence, protection against failures and passive elements. Each WWER-1000/V-320 reactor has a containment – protective casing (shell) that is lined with steel and is mechanically strained, as in Western-design units. In respect of both units are ongoing procedures for extending the service life and increasing the power (up-rating).

Within this zone has been established an Enterprise for treatment of radioactive waste owned by the „RaW" SOE, under the management of the Specialized Division "RaW" (SD "RaW").

SNFR

The Spent Nuclear Fuel Repository is located southwest of Units 3 and 4 at the Kozloduy NPP site. The SNFR enables temporary storage of the spent fuel from WWER-440 and WWER-1000 under water for up to 10-year period of operation of all units of the Kozloduy NPP and implementation of transport-technological operations for its acceptance, loading into the storage compartments, storage and transportation from the SNFR in compliance with the safety requirements.

DSSNF

The DSSNF site is located north-northwest of the SNFR building. The DSSNF storage technology of Kozloduy NPP uses air-cooled storage containers after the principle of natural convection. The containers are of CONSTOR 440/84 type with a capacity of 84 fuel assemblies from WWER-440. The DSSNF is located within the existing boundaries of Kozloduy NPP and represents an extension of the current operation of Kozloduy NPP – temporary storage of spent nuclear fuel at the SNFR.

1.3 OTHER INFRASTRUCTURE AND FACILITIES OWNED BY "RAW" SOE

Currently, under the terms of the license issued by the NRA to the State-Owned Enterprise "Radioactive Waste" to operate a nuclear facility for radioactive waste management through Specialized Division (SD) "RaW – Kozloduy" is given the right to perform core, auxiliary and service activities. The nuclear facility for RaW management of the SD "RaW – Kozloduy" includes the following key facilities:

1. **RaW Treatment Workshop (RaWTW)** – key facility designated to perform *pre-treatment, treatment and conditioning* of the radioactive waste from Kozloduy NPP ;

2. **Conditioned RaW Storage Warehouse (CRaWSW)** – designated for temporary storage (prior to internment) of conditioned radioactive waste from Kozloduy NPP. It is a ground-level reinforced concrete structure that provides the necessary engineering barriers between the stored radioactive waste and the environment and staff. It is built near the RaWTW;

3. "Lime Plant" Ground

At the "Lime Plant" Ground are situated:

- Trench repository for temporary storage of solid RaW [untreated and treated (compressed and sealed in barrels)];
- Warehouse for storage of treated solid RaW ("baskets" with RaW compressed and sealed in barrels);
- Ground 1 (not to be mistaken with the numbering of the sites for construction of the new nuclear unit) for storage of solid RaW in Reinforced Concrete Containers (RCC) – (packaging RCC-1 or packaging RCC-2 as per the Technical Specifications of packaging for conditioned RaW – see below);
- Ground 2 (not to be mistaken with the numbering of the sites for construction of the new nuclear unit) for storage of solid RaW in Reinforced Concrete Containers (RCC) – (packaging RCC-2);
- Area for storage of solid RaW in large capacity containers (LCC);
- Contaminated Soils Repository (CSR) – designated for the storage of low-active contaminated soil masses.

Below are listed the facilities outside the arrangement of the power units that are planned for construction at the Kozloduy NPP site:

1. Plasma Incineration Facility – at the stage of detailed design and drawn up ISAR;
2. Decontamination and Size Reduction Workshop – at the stage of technical design;
3. National Repository for Short-Lived Low- and Intermediate Level Radioactive Waste. "Radiana" site is not within the Kozloduy NPP site, but close enough to take into account its impact at the time of drawing up the CAREI. The National Repository is a facility with multi-barrier protection for permanent storage of pre-treated radioactive waste, secured and packaged in reinforced concrete cubes. The repository will be of near-the-surface trench type with capacity of 138,200 m³. It will comprise several buried reinforced concrete structures (modules) divided into chambers with in-built partition walls. After being filled with packagings the chambers are covered with reinforced concrete slab and are isolated from ambient waters by building a multi-layered soil coat. The repository is planned to be in operation, i.e. to be gradually filled up, in the next 60 years. So far in respect of "Radiana" site has been approved the Detailed Development Plan (DDP) – Zoning and Building Plan (ZBPP) for construction of the National Repository for Low- and Intermediate Level Radioactive Waste (NRLILRaW). Its commissioning is expected in 2015.

1.3.1 GENERAL-PURPOSE FACILITIES AND INFRASTRUCTURE

→ **Outdoor Switchgear**

Kozloduy NPP is connected to the electric power system (EPS) of the Republic of Bulgaria through three proprietary outdoor switchgears (OS), respectively at 400 kV, 220 kV and 110 kV. These are interconnected via auto-transformers. The 400 kV switchgear has been implemented with a "double sectioned busbar system" circuit, the 220 kV switchgear – with a "double busbar system" circuit, and the 110 kV switchgear – with a "double busbar system with a bypass busbar".

→ **Potable Water Supply**

The Kozloduy NPP site has a very good water supply network for potable and industrial water needs. The potable water for Kozloduy NPP is provided from three "Ranney" type collector wells located on the Danube terrace upstream from the town of Kozloduy under a contract with "Water Supply and Sewerage- Vratsa" Ltd. They are providing water for the villages of Harlets and Glozhene. The BDWMDR has issued a Water Use Permit as per the Law on Waters to Kozloduy Municipality for those groundwater intakes. From the water reservoirs of the town of Kozloduy the water is gravity-fed to a pump station /PS/ via main water pipeline with length of 11 km and diameter Ø 500 mm; the maximum rated water volume is 260 l/s. The pumping station pumps the water up to the tank of the power plant at elevation 93.0 m, with a volume of 2x2,000 m³, from where by gravity it reaches the individual points of water demand. The length of pressure water line to the tank is 0.5 km[2]. The external water supply system – wells, pumping stations, water pipelines and other facilities – up to the first distribution shaft is serviced by "Water Supply and Sewerage – Vratsa" Ltd. Kozloduy NPP concludes annual contract with the water operator "Water Supply and Sewerage – Vratsa" Ltd. for supply of potable-quality water. The consumed water quantities are metered by means of water meters. External consumers of drinking water at the site of the power plant are supplied with water from the in-house water mains of Kozloduy NPP and their water demand is metered.

The calculations made for the average monthly demand of potable water by the users at Kozloduy NPP show that the actual quantity of drinking water is about 35÷40 l/s.

Balance of drinking water supplied to consumers at the Kozloduy NPP site:

1. Drinking water supply mains to the Kozloduy NPP – **Ø = 500 mm** and flow rate **260 l/s**

2. Points of water demand

[2] Letter of the "Water Supply and Sewerage – Vratsa" Ltd., Ref. No.264/04.04.2013.

POINTS OF WATER DEMAND	SERVICE CONNECTION- Ø mm	CONSUMPTION l/s
PG-1	315	73.00
PG-2	315	73.00
AER	150	17.50
FC	60	5.00
INV.	57	3.40
MONTAZHI	100	8.00
FEPS – Unit 5	125	9.20
	TOTAL:	**189.10**

3. Reserve – **70.90 l/s**.

The shower baths of PG-1 use a pit well in the "Valyata" locality. For that groundwater intake the BDWMDR has issued a Water Use Permit as per the Law on Waters.

→ **Industrial water supply**

The industrial water supply provides cooling water /circulating water – for the turbines' condensers, and feed water – for other facilities/. It is implemented by means of three on-shore pumping stations from the Danube, and six shaft pumping stations located on the terrace of Danube River – for emergency water supply of units 5 and 6. Feed water – for technological needs and for the fire extinguishing system at the OSPS 1, 2 and 3 – is provided by "Raney" 5 well.

The water intake from the Danube River and the on-shore pumping stations are located at kilometer 687 from the Danube's mouth, after the island near the town of Kozloduy. It is a deep-water intake. The existing OSPSs -1, -2 and -3 provide Kozloduy NPP with feed water. The flow rate of the cold channel is 180 m³/s, with the proven maximum flow rate of 200 m³/s[3]. For the use of water from the Danube River and from underground water sources have been issued Water Intake Permits by BDWMDR.

Danube water is supplied to the power plant through the existing hydro-technical facilities that are crucial for normal plant operation. The cold channel connects the outpour tanks of OSPS with the CPS-1 /Circulation Pumping Station/ with length 7,023 m. At the end of curve 8 has been built a bottom lateral sill to elevation 29.25, providing for an emergency volume in case of blackout. With the consecutive adding-up of power units, it has been extended first to the CPS-2 and later on to CPS-3 and CPS-4, where it has been swabbed. The CPSs /Circulation Pumping Stations/ are located in front of the power islands of the respective power units. The width at the bottom of the intake "cold" outdoor channel for Danube water is 19.50 m; it has 1:2 slopes and a depth of 5.6 m.

The water used by the power units goes back to the Danube through the outlet "hot" channel HC-1. The hot channel HC-1 begins from the outlet shaft of the low-pressure channels and ends up in the spillway of the bypass channel for discharging the hot waters

[3] Scientific Research and Technology Institute "Energoproekt" – 1991 – Existing channels for industrial water supply of NPP "Kozloduy".

in the Danube River. Its length is 6,930 m. The flow rate of the hot channel is 180 m³/s with proven maximum conductivity 200 m³/s and depends on the elevation of the spillway after the low-pressure channels and the water level in the Danube River. The outlet "hot" channel runs in parallel with the "cold" CC-1 along most of the track. Both channels share a common dike and form a double channel. For the needs of power units 5 and 6 has also been built HC-2 designed for 110 m³/s.

A bypass channel has also been built to serve as connection between HC-1 and the Danube river bed and for redeeming the energy of the water flow with a built HPP having Q_{built} = 95 m³/s, for which there is a Water Intake Permit issued by BDWMDR. It has a rectangular cross section with a width of 35.00 m and vertical reinforced concrete enclosure walls. The bottom is at elevation 27.40. At its beginning has been built a bridge-barrier facility with nine openings fitted with sluices. The canal ends with a spillway and chute with annihilator, as well as hot water bank that serves to feed hot water from HC-1 to the intake basins of OSPS-1, -2 and -3 during the winter months. The aim is to reduce losses from overcooling the condensate of the steam after the turbines. It is made of 6 pipelines with diameter 1.20 m and is designed for 12 m³/s of water flow. The intake of hot water is via a channel discharging upstream to a spillway at the end of HC-1.

The channels' route is crossed by passing pipelines for drinking water to the village of Harlets and for industrial water from the "Valyata" PS.

A reference mark monitoring system is established to monitor the deformations along the double channel.

Around the channels have been built 44 drainage wells (17 at the non-flooded terrace and 27 in the lowlands) to control the groundwater. They are used for water monitoring purposes to control the water levels and for isotopic measurements.

In addition to these HTF, on the territory of the plant have been built also spray ponds (SPs) for cooling the water from the industrial water systems of PG-1 and PG-2. For each of the units 5 and 6 have been built 3 SPs (with dimensions 68 x 65 m and a depth of 3 m).

The industrial water users are classified into two groups – critical and non-critical, depending on their relevance to the nuclear safety. The critical users are those consumers from the safety systems and consumers from the normal operation systems that are directly related to the safety. In emergency situations where CC-1 cannot be fed with water from the Danube, industrial water from intake basins of CPS is only fed to the critical users and its cooling is ensured by the spray ponds. In such cases reserve water is provided by the barrier wall-spillway near curve 8. When the water in the intake basins of CPS is insufficient, it is possible that the water losses (from evaporation and wind drift) in the SP to be offset via other sources. For Units 1÷6 these are 3 emergency industrial water pumps (EIWPs) installed in the OSPSs 2 and 3, which supply water from the Danube to the intake basins of CPS, and for Units 5 and 6 – additionally from underground sources as well (ShPSs 1÷6).

The existing protection dikes along the Danube in the area of Kozloduy lowlands are also important for the safe operation of the power plant.

From the point of view of the provision of industrial water, given that the first four units are shut down, there is free capacity of up to 100 m³/s, considering that the conservatively assumed value required for the new nuclear unit is 60 m³/s, according to Letter No. 236 from 11.03.2013 of "NPP Kozloduy New Builds" PLC. At the time of operation of the new nuclear unit the quantities of water used for technological needs are not expected to exceed those appropriated under the Water Intake Permit.

The water system of Kozloduy NPP for both feed and industrial water, and for potable water is appropriately designed and reliable, and properly maintained by the operational staff.

TABLE 1.3-1: ANNUAL QUANTITIES OF WATER MASSES USED FOR INDUSTRIAL AND POTABLE WATER SUPPLY

Water Intake Point	Authorized quantity [thousand m³]	Utilized quantity [thousand m³]						
		2006	2007	2008	2009	2010	2011	2012
Surface waters from Danube river	5 000 000	3 331 722	2 323 800	2 629 876	2 593 459.5	2 564 530	2 660 788	2 415 903
Six pit wells (SPS 1÷6)	7884	-	-	0	0	0	24.779	55.556
Ranney – 5 collector well	1 600	190	314	75	15.929	24	2.729	1.578
"Valyata" pit well	788.4	291	183	204	192.27	193	216.7	289.59
Urban water supply mains	-	1 877.707	1 846	1 259	1 460	1 435	1 379	1 142.565

Source: Annual reports for the In-house Non-radiation Monitoring of the Environment at the Kozloduy NPP for the period 2006-2012.

The information presented (**Table 1.3-1**) shows that the requested water masses substantially exceed the amounts of water quantities used, so therefore there is no overexploitation of the relevant water bodies, and adequate water quantities are available for drinking and industrial water supply upon implementation of the future Investment Proposal.

→ **Sewerage network**

Kozloduy NPP has a sewerage network for domestic-faecal, industrial and storm waters – mixed for PG-1 and separated for PG-2. It covers the entire territory of the power plant and takes in all wastewaters.

The individual sewer branches have been built at different times during the construction of PG-1 and PG-2.

1.3.1.1 NON-RADIOACTIVE WASTEWATERS

The non-radioactive waste waters of Kozloduy NPP are domestic-faecal, industrial and storm waters. They come from administrative buildings, power islands, sanitary-amenity

blocks, auxiliary buildings, united auxiliary building, engineering laboratory building, CWCP, oil and diesel facilities, diesel generator stations, vehicle workshops and others.

In PG-2 may be outlined the following main streams:

- → Domestic-faecal water – from lavatories and laundries at the "restricted zone" and "clean zone", which is discharged via autonomous collectors to the WWTP for PG-2;
- → Industrial waste water – acidic and alkaline wastewater from CWCP, water contaminated with petroleum products and oils, which is discharged via autonomous collectors to the existing local wastewater treatment facilities depending on the types of water;
- → stormwater – from drainage of roofs, streets and lawns within the territory of the power plant, which is discharged to the Main Sewage Channel via the storm water sewers.

On this territory has been organized a stream of cooling non-contaminated water from various sub-sites that are drained to the storm water sewers.

Receiver of the above wastewater is the MSC of Kozloduy drainage-irrigation system where are discharging four wastewater streams from the whole Kozloduy NPP site and then via PS the water from MSC is transferred to the Danube river, as follows:

Stream 1: Mixed flow of domestic-faecal (untreated) waste water, industrial waste water and storm water, brought to the MSC via trapezoidal open channel (from the mixed sewage of PG-1 – domestic-faecal water from Power Islands of Units 1 ÷ 4, Auxiliary Buildings 1 and 2, DGS, and other administrative and amenity buildings, some of which are already owned by Specialized Division "Decommissioning-Kozloduy" of the „RaW" SOE; industrial water from PG-1 excluding those flowing into the HC-1; stormwater from PG-1; part of the production, domestic and storm water from the site of PG-2, domestic-faecal and stormwater from industrial and office buildings and grounds of "Atomenergoremont" PLC (AER), "Atomenergo-Stroyprogres" PLC, "Factory Construction – Kozloduy" JSC (FC), "Energomontazh" Ltd., "Energomontazh-AEK" JSC; water from the carwash of "AESP" PLC – after pre-treatment in a local sludge and oil retainer).

Stream 2: Domestic-faecal waste water from the so called "clean zone" of PG-2, SD "RaW – Kozloduy" and "AESP" PLC, discharged (without treatment) into MSC via Ø 300 mm collector upon repair works or in emergency situations.

Stream 3: Mixed flow of faecal water from the restricted and "clean" zone treated in the Waste Water Treatment Complex of PG-2 (WWTC), industrial wastewater from the TH, DGS and oil and diesel facility (pre-treated in the sludge and oil retainer of the WWTC), as well as stormwater from PG-2 and SD "RaW – Kozloduy" discharged into MSC via a Ø 1000 mm collector.

Stream 4: Domestic-faecal wastewater and stormwater formed at the OSy discharged into the MSC via collector with egg-shaped profile 130/195 cm and open lined channel.

A Discharge Permit has been issued by BDWMDR for these waste streams to be discharged into the MSC.

Besides the above four streams, wastewater is also discharged into the Danube via HC-1 and HC-2, for which a Discharge Permit has been issued by BDWMDR. This is mainly cooling water downstream from the condensers and from the industrial water systems. Other waters discharged via HC are:

- residual waters from the special water treatment systems (SWT-3, SWT-5, SWT-7), including hot steam condensate;
- water from the demineralized water generating plants (after treatment in neutralization pits);
- water from expanders of the spillways of high-pressure deaerators (HPD) and from expanders of the blowdowns of steam generators (SG);
- water from secondary circuit drainage tanks and from the flushing of the main condensate system;
- flush water from circulating water filters.

Water treatment facilities

At the territory of NPP there are various treatment facilities to handle the wastewaters formed at the individual sub-sites.

Waste Water Treatment Complex of PG-2

For treatment of domestic-faecal wastewaters from EP-2 is built a Waste Water Treatment Complex (WWTC). It comprises two stations – one for the waters from the Restricted Zone (RZ) and one for the waters from the "Clean Zone" (CZ). They are equipped with similar treatment facilities, which differ only in terms of their capacity. The waste water treatment station for the RZ is designed for average daily water flow of 106 m³. It is equipped with a dosimetric control installation. If the water's activity exceeds the admissible values, it is returned to the RZ for re-treatment.

The station for waters from the "Clean Zone" is designed for 146 m³ per day.

The treated waters from both zones are discharged by means of Ø 1000 collector into the MDC of Kozloduy drainage system.

For the proper operation of the treatment facilities have been developed guidelines which set out the requirements for operation in normal service mode and upon possible malfunctions. In cases of emergency or repairs is envisaged a possibility for the domestic-faecal waters from the CZ to be discharged into the MSC untreated.

Sludge and oil retainers

Adjacent to the WWTC is built a sludge and oil retainer for purification of industrial waste waters from the Power Island, DGS and diesel and oil facility. Its capacity is 50 l/s. At its

outlet the oil concentration is less than 0.5 mg/l. From the sludge and oil retainer treated waters enter an Ø 1000 collector of the sewer network through which they are discharged into the MSC. It has been put into operation at the end of 2011.

The formerly existing sludge and oil retainer (with capacity 14.0 l/s) is currently used for treatment of certain small quantities of waters contaminated by petroleum products (e.g. from washing various engines), delivered with tank trucks.

Neutralization pits

In the installations for chemical water treatment (CWT) of Power Generation 1 (Units 1÷4) and Power Generation 2 (Units 5 and 6) of Kozloduy NPP is treated water from the Danube (raw water), using precipitation tanks, mechanical and ion exchange filters. The waste waters from this treatment, as well as the solutions from the filters' regeneration may contain sulfuric, hydrochloric and nitric acids, sodium hydroxide, slaked lime, ferric chloride.

The organization of neutralization and process technology are identical for PG-1 and PG-2. The effluent is collected for neutralization in one of the two chambers (neutralization pits), where they are mutually neutralized. After control of pH (within the range 6.5 – 8.5) they are discharged as follows:

- for Units 1÷4 – in the HC-1;
- for Units 5 and 6 – into distribution shaft DS-1, and from there – into HC-1 and HC-2.

In case that the waters do not satisfy the above requirement, they are retained for achieving the required degree of neutralization.

The permits issued by the Ministry/BDWMDR in respect of the water intake facilities at the Danube River, the underground water intake facilities, and in respect of waste water discharge are as follows:

- Permit No. 0562/14.03.2005;
- Permit No. 11590203/30.05.2008;
- Permit No. 11530128/30.05.2008;
- Permit No. 11530127/30.05.2008;
- Permit No. 13750001/20.04.2007 with subsequent amendments;
- Permit No. 13120037/22.11.2010.

With Water Intake Permit No. 11530127/30.05.2008 by means of six shaft wells (ShPS 1÷6) has been regulated the intake for reserve (emergency) industrial water supply of the spray ponds for Units 5 and 6 at the Kozloduy NPP. During normal operation, the water losses in the spray ponds of Power Generation at Units 5-6 are replenished from CPS-3 and CPS-4. To increase the safety level has been built a system for emergency industrial water

supply which provides water for the spray ponds in the cases where this cannot be done through the CPS. The emergency industrial water supply system has been designed for water flow of 280 l/s and comprises 6 shaft pumping stations (ShPS). The ShPS are located in the terrace of the Danube River at about 25 to 30 m south of the base of the state-owned dike. They are equipped with 2 submersible pumps.

With Water Intake Permit No. 11530128/30.05.2008 from "Raney 5" collector well is provided industrial water – for technological needs and for the fire extinguishing system at OSPS-1, -2 and -3. The well has a diameter of 4 m and is located about 1,200 m southeast of the OSPS site. The design-based flow of the pumping station is 116 l/s., distributed as follows:

- for technological needs – 46 l/s; installed are two pumps, each with flow rate of 50 l/s (one pump works, the second is in reserve);
- fire-extinguishing water – 70 l/s; installed are two pumps, each with flow rate of up to 140 l/s.

Water Intake Permit No. 11590203/30.05.2008 from "Valyata" shaft well ensures the potable water supply of Units 1÷4 of Kozloduy NPP.

If necessary, the permits issued for discharge, pursuant to the Law on Waters for water intake and for use of a water body for discharge will be amended, if in the course of implementation and operation of the IP cannot be observed all terms and conditions set out therein. Into account will be taken also the ban on new discharges of wastewaters in irrigation-drainage systems as per Article 6, paragraph 1, item 3, item 4 of Regulation No. 2 from 08.06.2011 /SG, Issue No. 47 from 21.06.2011/ on issuing permits for discharge of wastewaters into water bodies and setting individual emission limits for point-sources of pollution.

1.3.1.2 RADIOACTIVELY CONTAMINATED WASTE WATERS

In the process of operation of the power units is formed industrial radioactive effluent from:

- leakages from the primary circuit (loop I) of the nuclear reactors;
- ponds and spent nuclear fuel repository;
- decontamination of equipment;
- regeneration and flushing of ion-exchange filters;
- laundries for special clothing and sanitary fumigation and bath units;
- radio-chemical laboratories, etc.

These effluents will be treated (purified) consistently in evaporating units and ion-exchange filter complexes (special water treatment systems SWT-3) at the Auxiliary Buildings- 1, -2 and -3. The treated water, called "residual" is collected in intermediate

tanks and following a radioactivity check is disposed into HC-1,-2, if they meet the standards. Otherwise they are returned for re-treatment.

The purpose of the special water treatment systems is:

- SWT-3 – designated for treatment of floor drain water from the Restricted Zone (RZ). Sources of such water are unscheduled leaks from the primary circuit, decontamination of equipment and systems, flushes and regeneration of filters, the SWT-3 itself – if the treated waters do not meet the standards of water chemistry at the NPP or of residual water, etc.;
- SWT-5 – designated for purification of waters from blowdown (continuous and periodic) of the steam generators;
- SWT-7 – designated for purification of radioactive waters from special laundries and shower-baths.

Residual are also the waters from the expansion vessels of deaerators and of the blowdown of the steam generators. These waters are purified by ion-exchange filters and if they cannot be reused in the technology cycle, they are discharged (after dosimetric control) into the HC.

Radioactive sludge from the special water treatment is collected and stored in special tanks for evaporated concentrate. It is subject to further treatment and internment as RaW.

- **Interfaces of Units 1÷4 with Units 5 and 6 (steam, water, fire extinguishing ring)**

Between the first 4 units (1 ÷ 4) on one hand, and units 5 and 6 on the other hand, are established interfaces of the technological systems to ensure supply of demineralized water, steam, fire extinguishing water, should such technological necessity arise:

- fire extinguishing systems of units 1÷4 and of units 5 and 6 are combined in fire extinguishing rings that are interrelated and, if necessary, a provision has been made for transfer of firewater from one to another;
- steam systems – own needs of units 5 and 6 are interrelated to those of units 1÷4 with the aim to supply steam for technological needs;
- systems for demineralized water of units 5 and 6 are interrelated to those of units 1÷4, with the possibility of exchange of demineralized water between units as needed.

1.4 EMERGENCY PLANNING ZONES OF KOZLODUY NPP

Based on the undertaken estimate analyses of the maximum possible design-basis accidents and beyond design-basis accidents of VVER-440 (B-230) and VVER-1000 (B-320) units and their radiological consequences, according to risk categories I, II, III and threshold dose criteria as per REGULATION on Emergency Planning and Emergency Action Response in case of Nuclear and Radiological Accident (Promulgated SG, Issue 94 from

29.11.2011), have been identified the following emergency planning zones, in line with Appendix 3.1-1 of the Emergency Plan of Kozloduy NPP):

- **Site Emergency Planning Zone – *Protection Zone* No. 1**, the Kozloduy NPP site);

- **Precautionary Actions Zone (PAZ) – Zone No. 2**, with radius of 2 km and geometric center between the vent pipes of the fifth and sixth unit. The area of the zone is 12,566 decares, where 3,012 decares or 24% are occupied by the production site of Kozloduy NPP and the site for storage and handling of the radioactive waste of SD "RaW Kozloduy". Its purpose is to limit the exposure in case of accidents.

- **Urgent Protective Actions Zone (UPAZ)[4] – Zone No. 3**, with a provisional radius of 30 km around the Kozloduy NPP and an area of 284,874 decares. Its role is to ensure the necessary controls for the purposes of radiation protection:

  - ✓ On the territory of Republic of Bulgaria this zone includes fully the municipalities: Kozloduy, Valchedram, Hayredin, Mizia and partially the municipalities of Lom, Byala Slatina, Oryahovo, Boychinovtsi, Krivodol and Borovan. Within the scope of the zone there are no major Bulgarian industrial and military sites;

  - ✓ On the territory of the Republic of Romania the zone covers a total of 19 populated areas in the counties of Dolj and Olt[5].

    (NPP "NPP" has an obligation to perform environmental monitoring within a 12 km zone in case of accident)

The Emergency Planning Zones are divided into 16 sectors of 22.5° each and are labeled with the first 16 letters of the Latin alphabet starting from north and moving clockwise (A, B, C, D, E, F, G, H, J, K, L, M, N, P, R and S) – **Figure 1.4-1**. Depending on the emergency situation, in the emergency planning zones are carried out various measures of different nature to protect the staff and public.

[4] UPAZ of 30 km is determined for the purposes of emergency planning. The same zone of 30 km for the purposes of radiation monitoring is called "Surveillance zone" (SZ).

[5] Up-to-date data for the territory of the Republic of Romania – Letter of NPP "Kozloduy – New Builds" PLC No. 297/01.04.2013.

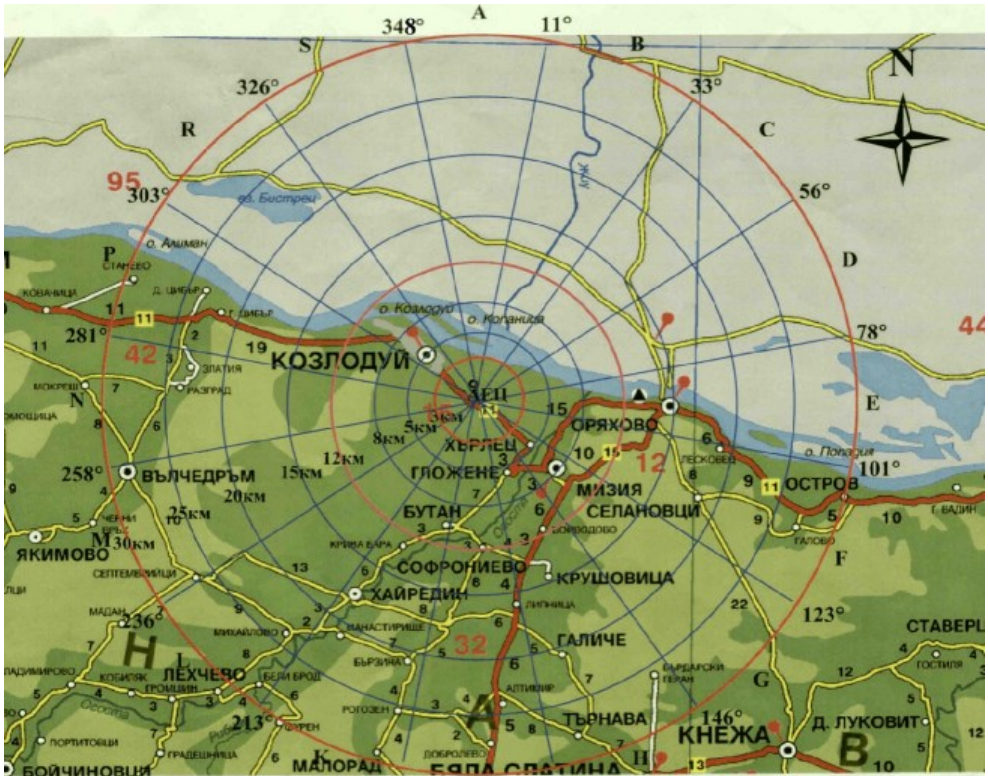

FIGURE 1.4-1: EMERGENCY PLANNING ZONES

1.5 RADIO-ECOLOGICAL MONITORING

Radio-ecological monitoring carried out by Kozloduy NPP covers all major components of the environment (air, water, soil, vegetation, etc.) within a radius of 100 km around the power plant on Bulgarian territory.

The volume, scope and controlled parameters are specified in a long-term program for radio-ecological monitoring during normal plant operation, which has been coordinated with the control and supervisory authorities in the country – the NRA, National Centre of Radiobiology and Radiation Protection (NCRRP) of the Ministry of Health (MoH) and the Executive Environment Agency (EEA) to the Ministry of Environment and Waters (MEW). The program fully complies with the national and European regulatory requirements in the field, including Art. 35 of the EURATOM Treaty, the EU Recommendations 2000/473/EURATOM and 2004/2/EURATOM.

The monitoring zone includes the industrial site of NPP, the 2-kilometer Precautionary Actions Zone (PAZ), the 30-kilometer Surveillance Zone (SZ) and reference points within a 100 km radius around the nuclear power plant.

The establishment of special status zones around Kozloduy NPP is related to the need to create a tool for zoning and management of the territory in accordance with the laws and regulations of the country and Pan-European standards safety and security, in accordance with the stipulations of Article 104, paragraph 1 of the Law on Safe Use of Nuclear Energy (SG, Issue 63, 2002, last amend. SG, Issue 82, 2012.).

1.6 RATIONALE OF THE INVESTMENT PROPOSAL

The reliable and successful operation of nuclear power reactors of pressurized water (PWR) type since 1974 at the Kozloduy NPP indicates that the Republic of Bulgaria has a scientific and engineering capacity to benefit from such high-tech production as the nuclear power generation. The logic behind the investment proposal for the construction and commissioning of a new nuclear unit is the successful utilization of the full capacity of Kozloduy NPP , including the existing infrastructure and the experienced and highly qualified staff.

1.7 KEY OBJECTIVES, PRINCIPLES AND CRITERIA FOR SAFETY

The investment proposal envisages construction of a new latest-generation nuclear unit (Generation III or III+) with light-water reactor with pressurized water (such as PWR – Pressurized Water Reactor), with installed power of about 1 200 MW at one of the 4 potential sites and applying one of three key technical and layout solutions for next-generation reactor installations.

A key advantage of the design of this generation of nuclear facilities, as compared to the second generation designs, currently being operated worldwide, including Units 5 and 6 of NPP "Kozloduy" with reactors of WWER-1000/B320 type, is that it will include mainly passive safety systems, new design solutions for the construction of the containment and specific means of protection, including a design solution for the concept of core melt trap in case of beyond design basis accidents (BDBA), considerably enhancing the safety of the nuclear power unit.

In terms of safety, the project for construction of new nuclear unit at the Kozloduy NPP site will be consistent with the requirements of the Bulgarian legislation in the field of nuclear energy utilization, the requirements of the International Atomic Energy Agency (IAEA), as well as with the European safety requirements set out in the European Utility Requirements (EUR) for LWR Nuclear Power Plants (Requirements of European organizations operating NPPs with light-water reactors).

1.8 DESCRIPTION OF THE PHYSICAL CHARACTERISTICS OF THE INVESTMENT PROPOSAL AND THE REQUIRED AREA

1.8.1 LOCATION OF THE NEW SITES AND EXISTING INFRASTRUCTURE

The Kozloduy NPP site is located on the right bank (at kilometer 694) of the Danube River. It is located 3.7 km south of the midstream of the river and the national border with the Republic of Romania. By straight line it is about 120 km north, and by the national road network about 200 km away from the capital – Sofia city.

The site is located in the northern part of the first non-flooded terrace of the Danube river (elevation +35.0 m as per the Baltic altitude system) and has an area of 4,471.712 decares.

To the north the site borders the Danubian Lowlands. To the south of the site the watershed plateau slope is relatively high (100-110 m), to the west it is about 90 m, and to the east it is lower and decreases to 30 m above sea level.

The populated areas located closest to the Kozloduy NPP are: Kozloduy town – 2.6 km to the northwest, Harlets village – 3.5 km to the southeast, Glozhene village – 4.0 km to the southeast, Mizia town – 6.0 km to the southeast, Butan village – 8.4 km to the south and Oryahovo town – 8.4 km to the east of the site.

The sites considered appropriate for the installation of the NNU in the vicinity of Kozloduy NPP are shown in **Figure 1.8-1**.

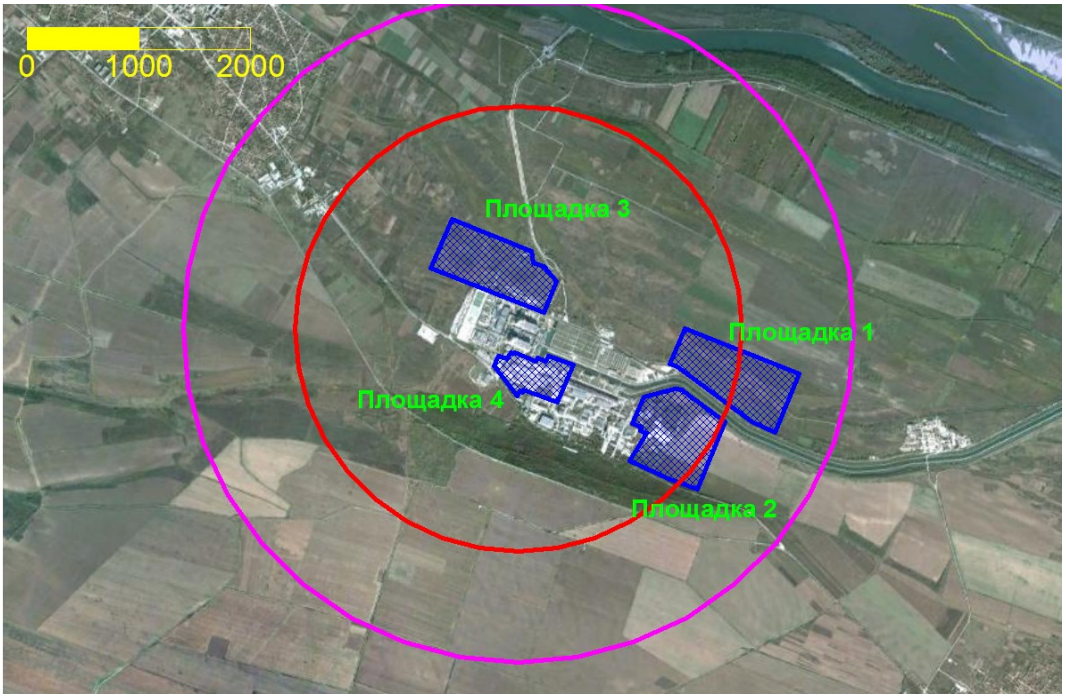

FIGURE 1.8-1: SITUATION OF THE SITES OF THE IP

(The red circle ( ) is a 2,000 meter precautionary actions zone (PAZ) and the pink one ( ) is a 3000-meter zone around the Kozloduy NPP)

Provisionally named Site 1 – The site is located northeast of Units 1 and 2 of Kozloduy NPP , between the outdoor switchyard and the "Valyata" locality, close to the existing hot and cold channels – to the north. The plot area is about 55 ha. The terrain is flat with slight slope from southwest to northeast. In the vicinity of the site are situated open drainage channels, which should be reconstructed. The humus layer of loess of the arable land should be seized beforehand.

The expropriated terrain is used for growing agricultural crops.

Provisionally named Site 2 – The site is located east of Units 1 and 2 of Kozloduy NPP towards Harlets village, to the south of existing hot and cold channels. The plot area is about 55 ha. The terrain is hilly with a significant slope from south to north, more

pronounced in the southeast of the site. In the vicinity of the site is situated a former farmyard. The remaining land is used for growing agricultural crops.

Provisionally named Site 3 – The site is located northwest of Units 5 and 6 of Kozloduy NPP , near the bypass road of the existing power plant. The plot area is about 53 ha. The terrain is flat with a slight slope from south to north. In the vicinity of the site are situated open drainage channels, which should be reconstructed. The humus layer of loess of the arable land should be seized beforehand.

From the point of view of the engineering utilization and interconnection to the electric power system a large number of activities and complex reconstructions of the fan of 400 kV overhead line are needed.

The expropriated terrain is used for growing agricultural crops.

Provisionally named Site 4 – The site is located west of units 3 and 4 of Kozloduy NPP and SNFR, south of the cold and hot channels. The available area is about 21 ha, within the expropriated terrains of Kozloduy NPP. The terrain lies within the existing auxiliary facilities – "Equipment Storage Facility", "Vehicle Repair Workshop" and "Assembly Workshop". The utilization of this site implies reconstruction and reallocation of major underground utilities of the NPP and release and reallocation of these auxiliary functions.

None of the sites affects any forests.

Within the area of the proposed sites will be located all main and auxiliary buildings and facilities, equipment necessary for the operation, as well as all local water treatment facilities and wastewater treatment plant. The master plans with detailed layout solutions will depend on the function of the buildings and facilities, by detaching the respective zones.

The site chosen for the installation of the new nuclear unit will be fenced off and secured in accordance with the requirements of the Regulation for the provision of physical protection of nuclear facilities, nuclear material and radioactive substances (SG, Issue 44, 9.05.2008) and will be established a restricted zone, PAZ and UPAZ in accordance with the requirements of the REGULATION on Emergency Planning and Emergency Action Response in case of Nuclear and Radiological Accident (promulgated., SG, Issue 94 from 29.11.2011).

The required areas, as per the layout solutions, are discussed and analyzed in the EIAR.

1.8.2 REQUIRED AREAS FOR IMPLEMENTATION OF IP (CONSTRUCTION AND OPERATION)

Pursuant to the Terms of Reference of the Employer for the implementation of the IP are considered on equal footing three key technical and layout solutions for next-generation reactors (Generation III or III+): alternative A1 (reactor AES-92) and the alternative A2 – including 2 models of brand new design reactors – AES-2006 and AP-1000.

The required areas, in line with the layout solutions for construction of NNU at the potential sites, are determined based on the following criteria:

- ✓ Hazards such as internal and external floodings and fires.
- ✓ Autonomy of components belonging to different categories relevant to the safety is maintained by means of functional isolation and/or physical detachment.
- ✓ ALARA principle to achieve the target doses by separating the contaminated systems or components from one another and from the non-contaminated systems, in different premises and taking into account in the spatial design options enhancing the ease of inspection and maintenance.
- ✓ Orientation of turbine generators to avoid risks of flying objects resulting from incidents or accidents towards the nuclear island.
- ✓ Functional connection between the main building, auxiliary buildings and the circulating water flow scheme.
- ✓ Minimum length of piping and cable tracks.
- ✓ Electrical connections for connection to external power sources and feeding power into the EPS.
- ✓ Minimum built-up space.
- ✓ Spatial arrangement of the buildings in view of the construction and maintenance.
- ✓ Building structures containing equipment and systems important to the safety:
  - Reactor compartment and secondary structure of the containment (in some reactors)
  - Auxiliary building
  - Spent Nuclear Fuel Repository (this facility may be integrated with the reactor compartment for some types of reactors)
  - Affiliated power island and electrical auxiliary buildings
  - Facility for safety backup AC power supply
  - Center for Accidents Management
  - Safety-related tanks or ponds for storage.

All building structures and equipment performing functions related to safety are of seismic category 1.

The necessary space for the construction of NNU with one unit are shown below:

	AP-1000	AES-92	AES-2006
Phase	1 Unit	1 Unit	1 Unit
Construction	21	35	35
Operation	7	15÷25	15÷25

Each of the alternative sites is large enough to accommodate the NNU. Sites 1, 2 and 3 may provide also the necessary space for the construction of temporary buildings during the construction phase. In the case of Site 4 the design itself will be aligned with the area available as proposed by the Employer for the temporary buildings and they must be located off-site, away from the ground for the new unit.

The areas necessary for operating the NNU with one unit are: 7 ha for AP-1000 and between 15 and 25 ha for AES-92 and AES-2006. In the case of site 4 the design itself will be aligned with the area proposed by the Employer.

1.8.3 REQUIRED AREAS DURING DECOMMISSIONING

The decommissioning of nuclear installations is a long and complicated process. This process is part of the technical design of the NNU to be drawn after the selection of reactor type, continues with the licensing, construction and operation of the nuclear unit. Depending on the adopted strategy for dismantling in the technical design is estimated the need for extra areas in view of the need to erect additional buildings for the facilities related to decommissioning of the radioactive materials from a given reactor.

The process of decommissioning of the NNU is activity that should be separately analyzed and assessed in terms of its impact on the environment.

1.9 DESCRIPTION OF THE KEY CHARACTERISTICS OF THE GENERATION PROCESS

1.9.1 TECHNOLOGY

The new nuclear unit envisaged for building at the Kozloduy NPP site will be a high-tech unit for generation of electric power based on nuclear fuel process.

The parameters for the construction of such energy unit imply two main groups of sub-sites and infrastructure:

- nuclear power plants and facilities, performing the core technological process – the production of electric power, as well as plants and facilities representing sources of radiation effects;
- other industrial sites and facilities providing for supportive/ancillary technological processes that are important for securing the core nuclear energy process and/or representing sources of various types of non-radiation environmental impacts.

The **technology** to be used for the generation of electricity from a nuclear source, will be with a reactor with light water under pressure (type PWR – Pressurized Water Reactor), where the retarder and the heat carrier is light water.

The **technological diagram** of the new nuclear unit comprises two circuits and will include:

- *Primary circuit* – with circulating radioactive medium, which consists of one power reactor and circulating circuits. Each circuit includes a main circulation pump, a steam generator and coolant pipes.

- *Secondary circuit* – with non-radioactive medium, including the steam generating part of the steam generator, a turbine and the auxiliary equipment of the power island.

The new nuclear unit will have:

- high availability (over 90%) and long service resource – at least 60 years;
- usability with fast load changes within 80% – 100% of the rated power without compromising the efficiency;
- highly reliable systems, implementing the concept of defense in depth in all modes, including passive safety systems;
- ability to perform fundamental safety functions – control of reactivity, removal of the heat from the reactor core, confinement of radioactive substances within the specified limits under all operating and emergency conditions;
- design that uses the principle of diversity and self-diagnosis;
- design providing technical means by which human errors are excluded or their consequences are limited;
- high resistance to internal and external impacts, including earthquakes, aircraft crashes, floods, etc.;
- in case of fire – ensuring the implementation and long-term maintenance of the safety functions and control of the power capacity, where the implemented fire precautions will provide in-depth protection by preventing the emergence and spreading of a fire, localizing the spread of a fire and limiting its consequences;
- technical means and solutions for management of severe accidents and minimizing their consequences, reduced likelihood of melting of the reactor core;
- higher burnup leading to reduction of fuel demand and amount of waste;
- burnable absorbers to extend the nuclear fuel resource.

The most significant advantage of the project for the new nuclear unit as compared to the second generation projects is that the project of the envisaged construction of the unit **will include passive and specific protective means**, including also the concept of core melt trap, which increase significantly the safety of the nuclear power plant.

The design of a nuclear unit will correspond to the EU requirements described in the European Utility Requirements for LWR Nuclear Power Plants (Requirements of the European organizations operating NPPs with light water reactors).

1.10 TYPE AND QUANTITY OF MATERIALS USED DURING OPERATION

1.10.1 NON-RADIOACTIVE

The following substances and mixtures are expected to be used in the operation of the new nuclear unit:

- ***Liquid fuels*** – they are used in the operation of diesel generators, representing a spare power sources for the power units, for the needs of the motor vehicles and in various workshops and units of the "NPP Kozloduy". Certain amounts of diesel fuel, gasoline, etc. will be required. In the EIAR are specified sample quantitative

and qualitative characteristics of the fuels and analyzed the options for their safe storage.

→ ***Lubrication materials*** – a variety of types and quantities of oils and lubricants are expected to be used in the operation of the new nuclear unit – engine and compressor oils, turbine oils, motor oils, and various kinds of lubricants. They will be accompanied by the relevant certificates and other documents such as Material Safety Data Sheets, showing the proper way for their storage, use and disposal.

→ ***Chemical substances and mixtures*** – to provide the core technological process are delivered and used different types of chemical reagents, certified for use in the nuclear industry. The main and more important hazardous substances and mixtures are: ammonia, sulfuric acid, hydrochloric acid, nitric acid, sodium hydroxide and the like. Upon delivery of the chemical substances and mixtures, they will be accompanied by Material Safety Data Sheets, which is a prerequisite for environmentally safe storage and use. The storage and use of hydrazine hydrate, ammonia and other substances and mixtures implies, in cases of accidents, potential danger of fusillade emissions of hazardous toxic substances into the working and surrounding environment.

In order to provide the water chemistry modes of the power units at "NPP Kozloduy" and for other production and support activities are delivered and consumed large quantities of chemical reagents, some of which are: boric acid, nitric acid, sulfuric acid, hydrochloric acid, potassium hydroxide, sodium hydroxide – technical, ferric chloride, ammonia, hydrazine hydrate, hydrated lime and others. Information about the chemical substances and mixtures used within the Kozloduy NPP is shown in **Table 1.10-1**.

TABLE 1.10-1: DESCRIPTION OF CHEMICAL SUBSTANCES USED

No.	Description	CAS No.	EU No.
Chemical reagents for production of desalinated water, decontamination, 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.	Ferric chloride	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.	Ammonia 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

No.	Description	CAS No.	EU No.
14.	Cleaning solution	-	-
Ion-exchange resins			
15.	Ion exchange resin LEWATIT	-	-
16.	Ion exchange resin type AMBERLITE	-	-
17.	Ion exchange resin type Wofatit	-	-
Liquid fuels and motor vehicle maintenance			
18.	Diesel fuel Euro-diesel	68334-30-5	269-822-7
19.	Motor gasoline unleaded	68334-30-5	269-822-7
20.	Antifreeze[6]	107-21-1	203-473-3
21.	Gas for lighting (kerosene)	106-97-8	203-448-7
22.	Extraction gasoline	-	-
Oils			
23.	Turbine oils	-	-
24.	Engine oils	-	-
25.	Transformer oils	-	-
26.	Hydraulic oils	-	-
27.	General purpose machine oils	-	-
28.	Compressor oils	-	-
29.	Transmission oils	-	-
Greases and lubricants			
30.	Lubricants (K2, graphite, with MoS2, etc.	74869-21-9	278-011-7
31.	Greases (Litol, Ciatim, graphite, with MoS2, high-temperature, etc..)	74869-21-9	278-011-7
Adhesives and sealant mixtures			
32.	Sealants, pastes, adhesives (loctite, Univer, Proma), silicones, liquid metal, etc.[7]	-	-
Paints, primers, varnishes, thinners and cleansers			
33.	Non-aqueous paint (alkyd, oil, etc.)[8]	-	-
34.	Water-based paints (fasagen, latex)[9]	-	-
35.	Thinners, solvents, rust converters, etc.	-	-
36.	Coresilin	-	-
37.	Primers	-	-
38.	Varnishes	-	-
39.	Alcohol/ethyl alcohol	64-17-5	200-578-6
Gases and gas mixtures			
40.	Gaseous nitrogen	7727-37-9	2317839
41.	Liquid nitrogen	7727-37-9	2317839
42.	Oxygen	7782-44-7	231-956-9

[6] Hazard category, R and S – phrases are for the substance ethyleneglycol, the contents of which in antifreeze is > 90%.

[7] Due to the lack of information on the composition of adhesives, sealants and silicones, their hazard phrase is quoted in the list as R 20/22 (Hazardous by inhalation and ingestion).

[8] The hazard category, R and S – phrases are for the substance terpentine, the contents of which in non-aqueous paints, varnishes and solvents is between 15 and 40%.

[9] The hazard category, R and S – phrases are for the substance ethyleneglycol, the contents of which in water based paints is < 1.5%.

No.	Description	CAS No.	EU No.
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 (chlorodifluoromethane)	No data	No data
49.	Reference gaseous mixture Ar-CH_4 (90% – 10%)	7440-37-1 74-82-8	2311470 200-812-7
50.	Carbon dioxide	124-38-9	2046969

Upon delivery of chemical substances and mixtures will be retained the good practice and they will be accompanied by Material Safety Data Sheets, which is a prerequisite for their environmentally safe storage and use.

1.10.1.1 RADIOACTIVE

There are different types of nuclear fuel – one of the most common types is that in which the uranium is incorporated in the form of UO_2 and enriched by the isotope U^{235}. This type of fuel is used in pressurized water reactors (WWER) or PWR as per the Western European abbreviation.

As feedstock, all types of nuclear fuel use natural uranium mined via different methods.

Taking into account the fact that the fuel cycle is an important element of the operation of a new nuclear unit, it will be considered at all stages in terms of the assessment of environmental impact – delivery of fresh nuclear fuel (NF), storage of fresh nuclear fuel, operation of nuclear fuel, temporary storage of spent nuclear fuel and transportation of spent nuclear fuel.

NF to be used must meet the design basis for maximum burnup of the fuel as set out in the European Utility Requirements.

1.10.1.2 FRESH NUCLEAR FUEL INTENDED FOR USE BY THE NNU

NF types that are developed by the Russian producers in connection with WWER technology, and in particular TVSA fuel and the new modification TVS-2M[10], will be suitable for use at the new nuclear unit AES-92 hybrid and/or AES-2006. The trend is that increase in the efficiency of use of the nuclear fuel in the combustion cycles is achieved by raising the level of average enrichment with ^{235}U. The highest enrichment of Russian fuel today is 4.95% (NF type TBC-2M).

[10] V. Molchanov, Nuclear Fuel for WWER Reactors: Actual State and Trends. In: Proceedings of the 9-th International Conference on WWER Fuel Performance, Modeling and Experimental Support, 17-24 September 2011, Helena Resort, Bulgaria, pp 27-39, INRNE, 2011, ISSN 1313-4531

AP-1000 uses fuel type RFA (robust fuel assembly), produced by the plant of Westighouse in the State of Columbia, USA and in Sweden.

1.10.1.3 SPENT NUCLEAR FUEL (SNF)

The spent nuclear fuel is inevitable technological product in the generation of nuclear electric power. It is irradiated nuclear fuel. The averaged composition of the SNF relative to the initial amount of heavy metal (HM) includes 94-95% of uranium, about 1% of plutonium and 4-5% of fission products whose radioactivity is 99% of the activity of all materials used in nuclear power sector and industry. The presence of fissile radionuclides of uranium and plutonium in the spent nuclear fuel fundamentally distinguishes it from the radioactive waste. Under commercial contracts between NPP "Kozloduy" and the Federal Sate Unitary Enterprise "Federal Centre for Nuclear and Radiation Safety" – Moscow, Russian Federation, our country has significant reserves of fissile material stored on the territory of the Russian Federation. The ownership over the fissile material (Pu and U) obtained after processing of the spent nuclear fuel is reserved for proprietor, pursuant to the Euratom Treaty.

The present-day research studies show that SNF can be successfully processed and used as nuclear fuel for fast neutron reactors. This option will transform the SNF into an essential energy resource. The use of SNF as a raw material, instead of its processing as radioactive waste, will result in significant financial savings for the country. This policy in respect of the SNF is adhered to also by other small countries with nuclear power generation – the Czech Republic, Hungary, Finland, Slovakia and others. The alternative option for the management of spent nuclear fuel implies intermediate storage in the country with a view to its future use as resource.

The strategy for managing spent nuclear fuel and radioactive waste of the Republic of Bulgaria[11] envisages an open fuel cycle. In essence, this solution is not a cycle. After use, the fuel is deposited in storage facilities (repositories) without further processing, and by means of adequate packaging is provided isolation of the radioactive substances from the biosphere. This method is favored by six countries: United States, Canada, Sweden, Finland, Spain and South Africa. In some countries, notably Sweden and Canada, such repositories are designed to allow for the future use of nuclear material, if such need arises, while other countries plan for its permanent internment in a geological repository.

In the Republic of Bulgaria the spent nuclear fuel is considered usable resource that can be processed to bring benefits to the country[12]. The strategy envisages storage of spent nuclear fuel in interim repositories, with dry storage as preferred technology. It is relied upon the introduction of new, advanced types of nuclear fuel that result in reduced amounts of generated spent nuclear fuel and in safe management and storage of high-level

[11] Strategy for the management of spent nuclear fuel and radioactive waste till 2030, Council of Ministers' Decision from 5 January 2011.

[12] Fourth national report on the implementation of obligations under the Joint Convention on the Safety of Spent Nuclear Fuel Management and on the Safety of Radioactive Waste Management, Sofia, 2011.

radioactive waste arising from the reprocessing of the spent nuclear fuel in the country of production of nuclear fuel or another country.

The practices in the management of spent nuclear fuel in the Republic of Bulgaria are related to the storage of spent nuclear fuel at the Kozloduy NPP site in by-the-reactor spent nuclear fuel ponds (SNFP) and in the SNFR under water, with subsequent transportation of the spent nuclear fuel for technological storage and processing. The processing of SNF reduces the volume of stored waste and provides for the use of its energy resource in the future. The high-level radioactive waste (HLRW) obtained from the processing of spent nuclear fuel is brought into a form suitable for their long-term storage and final internment.

Each of the considered alternatives of the nuclear unit envisages in its design a Spent Nuclear Fuel Pond (SNFP) where the spent fuel will remain for 3 to 5 years, after which it may be transported outside the facility. SNFP provides location for accommodating the nuclear fuel assemblies upon repair of the unit and for storing activated components under water. The requirements for the SNFP in terms of safety are to ensure subcriticality of 5% in normal operation mode and upon design-basis accidents. The alternatives for management of SNF used at the NNU are discussed in Chapter 2 of the EIAR.

1.11 DETERMINING THE TYPE AND QUANTITY OF EXPECTED WASTE AND EMISSIONS DURING OPERATION

1.11.1 WASTE

1.11.1.1 NON-RADIOACTIVE WASTE

During the operation of the new nuclear unit is expected generation of domestic, industrial, construction and hazardous waste, as every year in the work premises and at the sites upon various operating activities, repairs, reconstruction of buildings and premises, etc. are created conditions for generation of various types and amounts of non-radioactive waste. Pursuant to Article 7 of the LWM[13], the persons whose activities produce waste and holders of the waste shall treat them themselves or make them available for collection, transportation and treatment to persons who are authorized to carry out these activities in accordance with this Law.

Construction waste – generated upon repair works. They will be collected separately and will be made available to a specialized company in compliance with the Regulation on the management of construction waste and on the input of recycled building materials[14].

Domestic waste – the waste from the Protected Zone is transported and disposed at an authorized landfill – Landfill for non-radioactive domestic and industrial waste (LNRDRW) of Kozloduy NPP , after mandatory radiation control. The waste from sites outside this area

[13] Waste Management Act (WMA).

[14] Regulation on the management of construction waste and on the input of recycled building materials, SG, Issue 89 from 13/11/2012.

is transported to a regional landfill of the town of Oryahovo. As far as the biodegradable waste is concerned, information will be required on their separate collection from Kozloduy Municipality, and they will be made available for composting or anaerobic decomposition.

Industrial waste which includes:

- metal scrap that is not direct result of the power generation activity, but are formed from repair and will be stored at specified locations at the plant and at well organized open temporary storage;
- sludge from treatment plant for treatment of domestic wastewater from the new nuclear unit;
- sludge from neutralization pits – facilities for neutralization of wastewaters from the production of demineralized water.

Hazardous waste – generated from exhaust fluorescent and mercury vapor lamps, sludge from sludge and oil retainers, expired laboratory and industrial chemical substances and mixtures, packagings of fuels and lubricants (FL), oily rags, threads and wooden shavings. They will be stored separately, in specially organized temporary storages at the Kozloduy NPP site. After accumulation of certain amounts, they will be made available for subsequent treatment to specialist companies holding permits under the Law on Waste Management.

Pursuant to Article 8 of the LWM, the transmission and acceptance of industrial, construction and hazardous waste will be made only on the basis of a written contract with persons holding permits, complex permit or registration document under Article 35 of the LWM for the relevant activity and waste site with the relevant code, as per Regulation No. 3 (2004) under Article 3 for classification of the waste.

1.11.1.2 RADIOACTIVE WASTE

Source for the formation of radioactive waste (RaW) are the radionuclides generated by the operation of nuclear reactors. In terms of their origin, radionuclides are essentially divided into two groups:

- Fission products,
- Neutron activation products.

Accumulation of fission and activation products in the primary circuit coolant, in the reactor containment and containment apparatuses may be provisionally referred to as primary contamination.

All other contamination of equipment, tools, premises, special clothing, etc. is formed as a result of migration and redistribution of radionuclides occurring by different mechanisms – dissolution and crystallization, evaporation and condensation, sorption, diffusion and chemical interactions. These contaminants are termed secondary contamination. Radioactively contaminated objects that can no longer be used for their intended purpose

and at the same time are contaminated with radionuclides above the stipulated norms (clearance levels) are classified as RaW.

At the new nuclear unit is envisaged the use of ionizing radiation sources for the purposes of control of the metal, for calibration of dosimetric and radiometric apparatuses, for process measurements and control. After their discarding, they are also treated as radioactive waste.

The "Joint Convention on the Safety of Spent Nuclear Fuel Management and on the Safety of Radioactive Waste Management" adopted by the IAEA and the Regulation for safe management of radioactive waste of the NRA define international criteria and national regulatory requirements in all aspects of the activities involving RAW. The Regulation of the NRA from 2004 sets 3 (three) categories of solid RaW depending on their activity – I, II and III category, also referred to as low-, medium-and high-level radioactive waste. The liquid radioactive waste is classified according to the characteristics of the solid RaW, which are expected to be obtained after their conditioning.

In connection with the processing of radioactive waste, and in compliance with Article 5 of the Regulation for safe management of radioactive waste, have been defined three categories of solid RaW:

- Category 1: transitional radioactive waste, which may be cleared following appropriate treatment and/or temporary storage for a period of not more than 5 years, after which their specific activity drops below the clearance levels,
- Category 2: low- and medium-level radioactive waste containing radionuclides at concentrations that do not require special measures for heat removal during storage and internment; radioactive waste in this category is further subdivided into:
  - ✓ category 2a – short-lived low- and medium-level radioactive waste containing mainly short-lived radionuclides (with half-life of less than or equal to the half-life of ^{137}Cs), and long-lived alpha-active radionuclides with specific activity less than or equal to 4.106 Bq/kg for a single package, and less than or equal to 4.105 Bq/kg in the entire volume of the RaW;
  - ✓ category 2b – long-lived low and medium-level radioactive waste containing long-lived alpha-active radionuclides (with half-life longer than the half-life of ^{137}Cs) with specific activity exceeding the limits for category 2a;
- Category 3: high-level radioactive waste, in which the concentration of radionuclides is such that the heat release must be taken into consideration during storage and internment.

As far as RaW management is concerned, the Kozloduy NPP has introduced a comprehensive program for radioactive waste management. The program covers the entire technological cycle from the occurrence of RaW until its transfer to the „RaW" SOE (SD

"RaW-Kozloduy"), as well as the implementation of activities for clearance from regulatory control.

In connection with the specificities of the applied methods of treatment of the RaW and in line with the contractual relations with "RAW" SOE, in accordance with Article 7 of the Regulation for safe management of radioactive waste Kozloduy NPP has introduced additional categories of radioactive waste. The additional categories work out the details of the requirement of Article 5, paragraph 2 of the Regulation and are associated with operationally measurable parameters within ranges proposed by „RaW" SOE, SD "RAW-Kozloduy" and are in compliance with the "Procedure for acceptance of RaW at the repository for radioactive waste management by Kozloduy NPP. Specified are the following two main groups:

- Additional categories of solid RaW (category 2a);
- Additional categories of liquid RaW.

The additional categories of **solid RaW (category 2a)** from Kozloduy NPP are defined as follows:

- **2-I** – category – with equivalent dose rate of gamma-radiation at a distance of 0.1 m from the surface of the waste ranging from 1 μSv/h to 300 μSv/h;
- **2-II** – category – with equivalent dose rate of gamma-radiation at a distance of 0.1 m from the surface of the waste ranging from 0.3 mSv/h to 10 mSv/h;
- **2-III** – category – with equivalent dose rate of gamma-radiation at a distance of 0.1 m from the surface of the waste of more than 10 mSv/h.

The solid RaW in each of the above categories is further characterized as compactable (textile, wool and waste based on polyvinyl chloride, polyethylene and other plastics) and non-compactable (metal, wood, construction, etc.).

The additional categories of **liquid RaW** from Kozloduy NPP are defined as follows:

- **2 – H** – category – with radioactivity up to 3.7E+5 Bq/l;
- **2 – C** – category – with radioactivity from 3.7E+5 Bq/l to 7.2E+7 Bq/l;
- **2 – B** – category – with radioactivity over 7.2E+7 Bq/l.

Depending on their origin, the liquid RaW in each additional category may be characterized as:

- liquid radioactive concentrate;
- ion exchange resins;
- slurries and sludges;
- oils.

1.11.2 EMISSIONS

1.11.2.1 AIR

1.11.2.1.1 Non-radioactive emissions

In the course of normal operation are expected gaseous emissions from transport activities associated with the project at the national road network. The transport plan for delivery (of equipment) and disposal of waste concerns easement areas of those sections of the roads that will be used by the project. They are a linear source of pollutants.

The assessment of emission levels for the individual pollutants from the road transport along the republican road network will be made as per Tier 2[15] of the European Guide for emission inventory EMEP/EEA CORINAIR'2009 for the key pollutants from: (a) passenger cars (NFRcode1.A.3.bi), (b) light commercial vehicles under 3.5 t (1.A.3.b.ii), (c) heavy goods vehicles over 3.5 t and (d) buses (1.A.3. b.iii) in paragraph **Transport**.

In the EIAR are assessed the emissions of the following pollutants:

- Ozone precursors – CO, NO_X, NMVOC (non-methane volatile compounds);
- Greenhouse gases (CO_2, CH_4, N_2O);
- Oxidizing substances (NH_3, NO_X, SO_2);
- Particulate matter (PM) – only the fraction PM2.5, since the higher fraction PM2.5 ÷ 10 is negligible in the soot of the exhaust gases;
- Carcinogenic compounds:
  - ✓ PAH – polycyclic aromatic hydrocarbons (Benzo (α) pyrene, Benzo (b) fluoranthene + Benzo (k) fluoranthene, indeno (1,2,3-cd) pyrene – for unleaded petrol));
  - ✓ POP – Persistent Organic Pollutants;
  - ✓ toxic substances (DIOX – Dioxins and furans (for unleaded petrol);
- Heavy metals.

In the EIA report have been evaluated also the emissions from diesel generators for emergency power supply of the safety systems based on fuel consumption.

1.11.2.1.2 Emissions of radioactive products

The sources of organized gas-aerosol radioactive releases into the atmosphere will be the ventilation ducts of the new nuclear unit.

[15] In IPCC methodology for determining the levels of greenhouse gases (GHG) are used methods of varying complexity. The level of complexity of the method is indicated by Tier X, i.e. the higher number is X, the more complex and more accurate method is used

During normal operation at the premises of the reactor compartment are released radioactive substances as a result of organized and unorganized passes of the primary circuit coolant and of ventilation of technological areas. Radionuclides will also be present in the air at the premises of the Auxiliary Building. The special ventilations are organized for disposal of gases from the premises, after passing through appropriate gas purification systems.

The radioactive gases and aerosols are treated by means of systems for purifying the gases, equipped with apparatuses for capturing the RNG and tritium and for reducing their radioactivity prior to being discharged into the atmosphere, as well as by means of apparatuses for purification of gases from iodine isotopes and from radioactive aerosols.

The radioactive emissions into the atmosphere are a mixture of dozens of radionuclides, the prevailing amongst them being over 50 types with different half-life from a few seconds to tens of years. The major radioactive releases into the atmosphere are presented in three groups – radioactive noble gases (RNG), long-lived aerosols (LLA) and iodine-131 (^{131}J).

The limits of the radioactive emissions in the atmosphere, pursuant to the European Utility Requirements for the normal operation modes and faulty conditions are:

- For radioactive noble gases – 50 TBq;
- For long-lived aerosols and halogens – 1 GBq.

These reference values have been determined on the basis of 1500 MWe. They may be considered conservatively when assessing the environmental impact of new nuclear unit, whereby the actual releases from the various models of reactors are expected to be lower.

Under all operating conditions of the NNU the annual individual effective dose from internal and external exposure of the population, caused by the impact of liquid and gaseous releases to the environment for all units and facilities that are and will be located at the Kozloduy NPP site should not be higher than 0.25 mSv (instructions to the NRA with Letter No. 47-00-171/12.02.2013, in line with the Final Provisions § 3, para. 2, item 2 of Regulation on ensuring the safety of nuclear power plants (2004) for the nuclear power plants existing at the time of entry into force of the Regulation).

1.11.2.2 WATER

The main receiver of all types of waste waters for the NNU will be the Danube River.

The Danube is the second largest river in Europe, with more than 80 million people inhabiting its adjacent regions. It passes through 13 countries, provides the river link between them as the main transportation corridor and ensures fresh water to their national economies. There are a significant number of existing HTF that use its hydropower potential, including nuclear power plants, but it is also a source of fresh water for their technological needs, and is the receiving water body of their waste water and heat. Water quality in the river is vital for all and therefore the ICPDR (International Commission for the Protection of the Danube River) was created with its domicile based in Vienna. The Republic of Bulgaria is its active member.

In line with the Bulgarian legislation, LW and FDW 2000/60 of the EU, the RBMP developed for the Danube region basin management determines the Bulgarian section of the Danube River as a river category named DanubeRWB01 and code BG1DU000R001. This water body of is a "strongly modified water body" type with moderate ecological potential and poor chemical status. Objectives and measures in the RBMP require these parameters to be adjusted in the next planning years to achieve good status and good potential. Danube River and the whole Danube basin for basin management of waters in the country have been identified as sensitive area in terms of anthropogenic pollution pursuant to Order No. RD-970/28.07.2003 of the Minister of Environment and Waters, so the requirements applicable to the users of water bodies are more stringent. These requirements have been imposed on the NPP in the permits issued by the MEW/BDWMDR for discharges of wastewater from production activities in the receiving water body Danube River.

The wastewater from the NNU (New Nuclear Unit) will be the analogous as those from the existing power plant. (Letter of the MoEW, RIEW – Vratsa, Ref. No. V2975/10.01.2013).

The sewerage network of the new nuclear unit will be autonomous for the different types of wastewater. According to Regulation No. 2/08.06.2011 for issuing permits for discharge of wastewater into water bodies and setting emission thresholds for point sources of pollution in Article 6, paragraph 1, items 3 and 4 it is prohibited to effect new inclusions of wastewater and permits are not issued for discharges of wastewater in irrigation-drainage systems and of industrial wastewater in drainage systems. The main receiving body of the wastewater will be only the Danube River, in compliance of all the strict requirements of the environmental legislation.

1.11.2.2.1 Non-radioactively contaminated waste water

Domestic-faecal wastewaters

The will be formed from all administrative, main and auxiliary buildings outside the "restricted zone". They will pass through the WWTP, which will be designed with modern technology of purification scheme that ensures at the output station the parameters specified in the Permit for the Danube River as receiving water body – III-rd category, in line with Order No. RD-27283.5.2001 of the MoEW and in the Permit for discharge of such wastewaters, issued in accordance with the Law on Waters. The expected quantity will be justified pursuant to the current regulations governing the required amount of drinking water according to the number of consumers. The location and capacity of the WWTP for domestic-faecal waters will take into account the arrangement of the buildings at the site, as well as the landscaping, providing the shortest possible route for the treated waste water to the main sewer, discharging all wastewaters to the receiving water body.

Industrial wastewaters

These are drainage waters from the Power Island, DGS, transformer beds, oil and diesel facility and other auxiliary activities for which infrastructure will be built within the new unit. They will be fed to a treatment plant for oil products, and in respect of the rough capture of oils it is planned to provide for local facilities such as separator shafts, oil-

catching pits and other appropriate installations. For the waste waters from CWT will be provided neutralization facilities prior to their discharge into the site's sewers for industrial waters. These wastewaters are different in terms of their quality and quantity. The positioning of local treatment facilities will be preconditioned by the arrangement of the main buildings and infrastructure, as well as by the design solution of the underground sewer system which ensures discharge of the treated industrial waste waters to the receiving water body.

Stormwaters

The expected amount of runoff will be determined by the marginal intensity of a 5-minute shower method and the drainage rate and will depend on the arrangement of buildings and facilities, landscaping, lawns, areas covered with durable surface and others.

Exhaust cooling waters that will be discharged into the Danube via HC-1 and HC-2.

Domestic-faecal waste waters from the "restricted zone", after passing through specialized treatment plant and subsequent radiation control for strictly defined parameters, will be passed to follow-up treatment with the other domestic-faecal waste waters prior to their discharge into the sewers to be delivered to the receiving water body.

1.11.2.2.2 Radioactively contaminated industrial waste water

Radioactively contaminated wastewater that will be generated by the NNU will be similar to the one discharged from the currently operating units.

In the process of operation of the power units will be formed radioactive industrial waste water from:

- leakages from the primary circuit (loop I) of the nuclear reactors;
- ponds and spent nuclear fuel repository;
- decontamination of equipment;
- regeneration and flushing of ion-exchange filters;
- laundries for special clothing and sanitary fumigation and bath units;
- radio-chemical laboratories, etc.

These effluents will be treated (purified) consistently in evaporating units and filter complexes (special water treatment systems SWT-3) at the Auxiliary Building of the new power unit. The treated water, called "residual" will be collected in intermediate tanks and following a radioactivity check will be disposed into HC-1,-2, if they meet the standards. Otherwise they will be returned for re-treatment.

The purpose of the special water treatment systems is:

- SWT-3 – designated for treatment of floor drain water from the Restricted Zone (RZ). Sources of such water are unscheduled leaks from the primary circuit, decontamination of equipment and systems, flushes and regeneration of filters,

the SWT-3 itself – if the treated waters do not meet the standards of water chemistry at the NPP or of residual water, etc.;

→ SWT-5 – designated for purification of waters from blowdown (continuous and periodic) of the steam generators;

→ SWT-7 – designated for purification of radioactive waters from special laundries and shower-baths.

Residual are also the waters from the expansion vessels of deaerators and of the blowdown of the steam generators. These waters will be purified by ion-exchange filters and if they cannot be reused in the technology cycle, they are discharged (after dosimetric control) into the HC.

Radioactive sludge will be discharged in special tanks for evaporated concentrate. It is subject to treatment (cementing) at the SD "RaW–Kozloduy" of the "Radioactive waste" SOE.

1.11.2.3 SOILS

Wind is one of the elements that have a direct impact on the spreading of emissions and deposition of radioactive elements onto the soil. The sites considered for the new nuclear facility are located in an area characterized by year-round predominance of west and northwest winds. Wind regime in a given location is strongly influenced by the local conditions. Undulating terrain results in redistribution and deformation of the air flow as a result of which changes both the wind speed and the frequency of the dominant directions. No less important is the role of a large body of water, such as the Danube river, which in this case can be considered as a large aeration channel.

To assess the spreading of radionuclides emitted from the new nuclear unit and their close-to-ground concentrations, series of tasks have been resolved, including elaboration of models to describe the relevant processes.

The major radioactive releases into the atmosphere from the NPP are classified in three groups – radioactive noble gases (RNG), long-lived aerosols (LLA) and iodine 131 (^{131}I). Essential for assessing the likelihood of soil contamination due to aerosol emissions are the long-lived radioactive aerosols – LLA (mainly the isotopes of: ^{134}Cs, ^{137}Cs, ^{89}Sn, ^{90}Sn, ^{95}Zr, ^{59}Fe, ^{58,60}Co, ^{54}Mn, ^{51}Cr, ^{110m}Ag). Their period of half-life compared to the other two groups of radionuclides present in the radioactive emissions is higher, so they are particularly interesting in terms of assessing the impact on the soils, regardless of their much smaller involvement in the emission activity of the NPP. Based on many years of observations of Kozloduy NPP (EIA NPP, 1999), the maximum model values of ground-level concentration of LLA (3.2 μBq/m³ in 1994 and 1996 to 1.06 in 1998.) were obtained along the boundary of the 2 km Area of Preventive Safeguarding Measures /APSM/, mostly to the west of NPP. These values are in good compliance with the emission activity of LLA by years. They decrease strongly with increasing the distance from the power plant.

It is not appropriate to compare the model-based results obtained in respect of the depositions of LLA discharged from the vent pipes of Kozloduy NPP with the experimental results obtained by the Environmental Radiological Control Department of the NPP, as well as with the experimental data of the NCRBRP on the total beta activity of the samples from the continuously controlled points in the surveillance zones, because the fallout of radioactive products present in the form of aerosols in the atmosphere are a result of both emissions from the NPP operation, and caused by remote transmission. A better idea of the ratio between the two components can be given by the example of the logged average total beta activity of atmospheric depositions in the towns of Pleven and Lom in 1998, which was about 0.35 Bq/m², i.e. similar and even higher than the one at the control point in the town of Berkovitsa. These values are much higher than the specified depositions of LLA emissions from the power plant, indicating its negligible impact on the radioactivity of the atmosphere in these areas.

1.11.2.4 NOISE AND VIBRATIONS

Source of noise in the environment in connection with the project for construction and commissioning of the new nuclear unit at the Kozloduy NPP site will be the main and auxiliary technological equipment and the transport servicing the production activity. Noise emission in the environment will be determined on the basis of passport data for the noise characteristics of the planned facilities. In the absence of such data, Bulgarian legislation (Regulation No. 6 for the indicators of environmental noise, taking into account the degree of discomfort during the different hours of the day, the threshold values of environmental noise indicators, the assessment methods for the values of noise indicators and the adverse effects of noise on the health, Ministry of Health, Ministry of Environment and waters, SG, Issue 58/2006, which is in line with European Directive 2002/49/EU) allows the use of data from a similar site (with technology and equipment similar to those in the Investment Proposal considered). In the EIAR as a source of noise is considered also the transport servicing the operation of the site, and the expected equivalent noise level produced by such transport is determined on the basis of data on the expected traffic intensity.

As per the design, the future technological equipment is not expected to be a source of vibrations in the environment. Vibrations are typical for large-size machine parts, at high rotational speeds. In the case of power generation, these are mainly the turbines located in the power islands. Limiting the spread of vibrations beyond their source, in the case of plant and equipment, is achieved with implementation of specific technical requirements for their installation: anti-vibration treatment of their foundation by means of rubber pads, insulating joints of low-impact materials, removing the solid connection between the vibrating grounds and the structural elements of the buildings, etc. Vibrations in industrial facilities are a factor only in the working environment.

It is not expected that the vehicles servicing the operation of the new nuclear unit will be sources of vibrations in the environment. They will run on roads of class II republican road

network, whose design takes into account the relevant category of traffic, so the vibrations from heavy vehicles subside over short distances around the road route.

For these reasons, in the EIAR vibrations are not considered as a factor of the environment.

1.11.2.5 RADIATION

1.11.2.5.1 Ionizing

Ionizing radiation is largely a result of nuclear interactions and decay of nuclei of natural and artificial radionuclides. This radiation affects living organisms through its ionization component.

Throughout almost the entire chain of the technological process at the NPP there are radioactive materials. Most of them are operationally preconditioned (required by the technology), such as nuclear fuel and radioisotopes used in the control and diagnostic equipment. The specific radioactive material – spent nuclear fuel, the product of the basic technological flow at the NPP, is stored, handled and transported in accordance with the statutory requirements for nuclear and radiation safety at the NPP.

1.11.2.5.2 Non-Ionizing Radiation

The main sources of MLF electric and magnetic fields (with industrial frequency of 50 Hz) in the work environment are the outdoor switchgears (OSy) of the transformer systems, bus systems, circuit breakers, electric power lines. Sources of MLF fields (mainly magnetic) may as well be the turbine generators, rectifiers, low-voltage power supply systems.

Sources of radio frequency and (microwave) MHF electromagnetic emissions at the Kozloduy NPP are present at:

- → the security systems;
- → the mobile communication systems;
- → the emergency warning systems.

2 DESCRIPTION OF THE CHARACTERISTICS OF OTHER PLANS, PROGRAMS AND PROJECTS/INVESTMENT PROPOSALS, EXISTING OR IN A PROCESS OF DEVELOPMENT OR APPROVAL, WHICH IN COMBINATION WITH THE ASSESSED INVESTMENT PROPOSAL MAY HAVE ADVERSE EFFECTS ON THE PROTECTED AREAS

According to information concerning proceeded investment intentions provided by RIEW Montana, with letter Ref. No. 421/15.05.2013 about industrial or manufacturing plants within the protected areas located within the 30-km zone around the Kozloduy NPP for the period from 2008 until now. Due to the fact that the IP in question does not directly affect any protected Areas falling within Natura 2000, in the CAREI are presented projects and investment intentions within the 30-km Surveillance Zone of the NPP.

No.	Investment proposal	Letter/Decision No.
1	"Wind farm "Valchedram" in the "Zlatiyata" locality on the land belonging to the villages of Gorni Tsibar, Zlatia, Razgrad, Cherni Vrah, Septemvriytsi and to the town of Valchedram." The IP envisages construction of 150 wind turbines with power of 2 to 3 MW and their associated infrastructure.	Decision No. MO 2 – 2/2009
2	"Construction and operation of a photovoltaic solar power plant for electricity generation from renewable sources" in the land belonging to the town of Valchedram – PI No. 517001, with an area of 101,867 decares	Decision No. MO 3-EO/2011 on assessing the need for environmental assessment.
3	"Production of pellets in existing building stock" in Zoned real estate VIII, quarter 37 in the plan of the town of Valchedram, Montana Region.	Letter Ref. No. 1791/15.08.2012.
4	Proposal for elaboration of a Detailed Site Development Plan – Plan of Zoning and Building of properties Nos. 810023, 814024, 818021, 818006, 817044, 814031, 811089, 811010 on the land belonging to the town of Valchedram, envisaging construction of a farm for fattening of kids and lambs; farm for fattening of calves; fodder kitchen, carwash and repair workshop; farm for industrial algae cultivation for production of vegetable oils for biofuels; production of biofuels; production of biogas.	Decision No. MO 2-EO/2012 on assessing the need for environmental assessment.
5	"Planting of perennial species of the Paulownia genus, building of production storage area and installation of photovoltaic power plant on the roof of the production area in Zoned Real Estate III-50, Zoned Real Estate IV-50, Zoned Real Estate V-50 as per the zoning plan of the village of Septemvriytsi, Valchedram Municipality.	Letter Ref. No. 699/05.04.2013.

According to information concerning proceeded investment intentions provided by RIEW Vratsa with letter Ref. No. 453/23.05.2013:

- **In 2008** have been issued 20 opinions on IPs falling within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment – not in PAs under Natura 2000.
- **In 2009** have been issued 30 opinions on IPs not falling within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment – not in PAs under Natura 2000.

- **In 2010** have been issued 20 opinions on IPs not falling within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment – not in PAs under Natura 2000.
- **In 2011** have been issued 20 opinions on IPs not falling within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment – not in PAs under Natura 2000.
- **In 2012** have been issued 62 opinions on IPs not falling within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment – not in PAs under Natura 2000.

Issued have been also the following decisions for assessing the need of undertaking environment impact assessment, in respect of investment proposals that are not in PAs under Natura 2000.

In 2008 have been issued 20 decisions on IPs within Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment, which are not in PAs under Natura 2000.

No.	Investment proposal	Decision No.
1	Site for buying-up, temporary storage and trade in ferrous and non-ferrous metal scrap (TFNFMS) on Zoned Real Estate VII, quarter 228 as per the plan of the town of Kozloduy.	Decision No. VR-06-ZP/2008 from 22.02.2008.
2	Building a car wash, car dealership and covered parking in the town of Kozloduy.	Decision No. VR-10-ZP/2008 from 11.04.2008.
3	Correction of Skat river bed near the town of Mizia.	Decision No. VR-14-ZP/2008 from 29.04.2008.
4	Construction of a protective embankment in the area of "Paradise" Complex in the zone of the heating plant Kozloduy, town of Kozloduy.	Decision No. VR-20-ZP/2008 from 29.05.2008.
5	Extraction of gravel in the Ogosta river bed from three sites.	Decision No. VR-21-ZP/2008 from 16.05.2008.
6	Conversion of existing building from a former town hall into a home for young people with mental disabilities – sheltered home, village of Manastirishte.	Decision No. VR-22-ZP/2008 from 30.05.2008.
7	Construction of "MHPP-Mihaylovo on Ogosta river – flood type, elevation – top water level (TWL) 55.00 m, elevation – bottom water level (BWL) 50.5 m, with power of 720 kW, on the land belonging to the village of Manastirishte, "Lukanov Varbak" locality.	Decision No. VR-23-ZP/2008 from 30.05.2008.
8	Building of "MHPP-ELENA on Ogosta river – flood type, elevation – top water level (TWL) 50.30 m, elevation – bottom water level (BWL) 44.30 m, with power of 960 kW, on the land belonging to the village of Hayredin,	Decision No. VR-24-ZP/2008 from 24.06.2008.

No.	Investment proposal	Decision No.
	"Livadeto" locality.	
9	Building "MHPP-Glozhene on Ogosta river – flood type, elevation – top water level (TWL) 36.80 m, elevation – bottom water level (BWL) 31.30 m, with power of 880 kW, on the land belonging to the village of Glozhene.	Decision No. VR-28-ZP/2008 from 11.07.2008.
10	Construction of a building – packing center for eggs and reconstruction and refurbishing of two existing poultry breeding facilities numbered respectively No. 3 and No. 4 for laying hens, with a total capacity of both buildings 39,520 chicken. Real estate No. 715002 "Merite" on the land belonging to the town of Kozloduy.	Decision No. VR-29-ZP/2008 from 15.07.2008.
11	Construction of protective retaining wall to reinforce the left bank of Ogosta river within the boundaries of Hayredin village, Hayredin municipality.	Decision No. VR-40-ZP/2008 from 03.09.2008.
12	Emergency – fortifying measures of a landslide on road II – 15 "Vratsa-Mizia-Oryahovo", on the land belonging to the town of Oryahovo.	Decision No. VR-43-ZP/2008 from 12.09.2008.
13	Extension of a cemetery, Real Estate No. 000344, "Nad selanovski dol" locality, on the land belonging to the town of Mizia.	Decision No. VR-44-ПР/2008 from 12.09.2008.
14	Installation of one wind turbine with power of 2 MW, on the land belonging to the village of Ostrov, Oryahovo municipality, Real Estate No. 082019, "Circassian Depression".	Decision No. VR-51-ZP/2008 from 13.11.2008.
15	Installation of one wind turbine with power of 2 MW, on the land belonging to the village of Selanovtsi, Oryahovo municipality, Real Estate No. 074019, "Koritishte" locality.	Decision No. VR-52-ZP/2008 from 18.11.2008.
16	Construction of an agricultural facility in Mizia, Real Estate No. 073011, "Krushovitsa road", on the land belonging to the village of Sofronievo, Mizia municipality.	Decision No. VR-53-ZP/2008 from 18.11.2008.
17	Installation of one wind turbine with power of 2 MW, on the land belonging to the village of Selanovtsi, Oryahovo municipality, Real Estate No. 075015, "Greda" locality.	Decision No. VR-58-ZP/2008 from 18.12.2008.
18	Extraction of sand from the Danube river, on the land belonging to the village of Leskovets, Oryahovo municipality.	Decision No. VR-59-ZP/2008 from 18.12.2008.

No.	Investment proposal	Decision No.
19	Construction of "MHPP-OGOSTA 4" on Ogosta river – flood type, on the land belonging to the village of Sofronievo, Mizia municipality and to the village of Hayredin, Hayredin municipality.	Decision No. VR-06-ZP/2008 from 22.02.2008.
20	Construction of "MHPP-OGOSTA 5" on Ogosta river – flood type, on the land belonging to the village of Hayredin and of the village of Manastirishte, Hayredin municipality.	Decision No. VR-10-ZP/2008 from 11.04.2008.

In 2009 have been issued 15 decisions on IPs within the Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment, which are not in PAs under Natura 2000.

No.	Investment proposal	Decision No.
1	Construction of a wind farm by installing 50 WEA, on the land belonging to the town of Oryahovo and land belonging to the village of Selanovtsi, Oryahovo municipality.	Decision No. VR-11-ZP/2009 from 25.02.2009.
2	Growing fish in an existing microdam, Real Estate No. 000356, "Brestovets" locality, 193 quarter, on the land belonging to the village of Butan, Kozloduy municipality.	Decision No. VR-15-ZP/2009 from 18.03.2009.
3	Extraction of inert materials (gravel and sand) from the Danube river with a vessel, Dolni Vadin village, Oryahovo municipality.	Decision No. VR-16-ZP/2009 from 24.03.2009.
4	Extraction of inert materials from the bed of the Danube river near the village of Dolni Vadin, from kilometer 653.000 to kilometer 651.000, Oryahovo municipality.	Decision No. VR-46-ZP/2009 from 12.11.2009.
5	Site for collection, temporary storage and transportation of ferrous and non-ferrous metal scrap, "Durvarski road" locality, on the land belonging to the village of Selanovtsi, Oryahovo municipality.	Decision No. VR-17-ZP/2009 from 26.03.2009.
6	Establishment and operation of a Complex for Social Services to children and families at risk, Kozloduy municipality.	Decision No. VR-18-ZP/2009 from 27.03.2009.
7	Construction of an auto service, residential building and parking lot with up to 50 places, Lipnitsa village, Mizia municipality.	Decision No. VR-27-ZP/2009 from 29.04.2009.
8	Overhaul of a restaurant complex "Three Pines" and installation of 6 bungalows, Hayredin village.	Decision No. VR-20-ZP/2009 from 14.04.2009.
9	Plantation of perennial species through forestation of non-agricultural land in the town of Kozloduy.	Decision No. VR-30-ZP/2009 from 21.05.2009.

No.	Investment proposal	Decision No.
10	Construction of "Hristo Botev" stadium and a sports complex in the town of Kozloduy.	Decision No. VR-24-ZP/2009 from 27.04.2009.
11	Correction of Ogosta river bed on the land belonging to the village of Hayredin.	Decision No. VR-34-ZP/2009 from 28.07.2009
12	Extraction of coarse aggregate in the bed of Ogosta river, Estate No. 000271, on the land belonging to the village of Kriva bara, Vratsa Region.	Decision No. VR-31-ZP/2009 from 25.05.2009.
13	Construction of a sewage network with effluent treatment plant for 1,000 PE in the village of Krushovitsa, Vratsa municipality.	Decision No. VR-28-ZP/2009 from 12.05.2009.
14	Rehabilitation of water mains and construction of a sewage network with effluent treatment plant for 1,000 PE in the village of Krushovitsa, Vratsa municipality.	Decision No. VR-29-ZP/2009 from 12.05.2009.
15	Restoration and renovation of a sheep farm for breeding of 500 livestock heads, Hayredin village.	Decision No. VR-37-ZP/2009 from 02.09.2009.

In 2010 have been issued 8 decisions for IPs within the Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment, which are not in PAs under Natura 2000.

No.	Investment proposal	Decision No.
1	Installation of one wind turbine with power of 1 MW, on the land belonging to the village of Gorni Vadin, Oryahovo municipality.	Decision No. VR-03-ZP/2010 from 28.01.2010.
2	Installation of one wind turbine with power of 1 MW, on the land belonging to the village of Leskovets, Oryahovo municipality.	Decision No. VR-02-ZP/2010 from 28.01.2010.
3	Reconstruction and replacement of street water supply mains and construction of sewerage network, as well as completion of effluent treatment plant for the waste waters of the town of Kozloduy, with capacity of 16,000 PE.	Decision No. VR-12-ZP/2010 from 30.04.2010.
4	Construction of a fish farm for sturgeon species, on the land belonging to the village of Saraevo and to the town of Mizia, Mizia municipality.	Decision No. VR-09-ZP/2010 from 21.04.2010.
5	Fish pond on the land belonging to the village of Sofronievo, Mizia municipality.	Decision No. VR-17-ZP/2010 from 18.06.2010.
6	Construction of a workshop for production of edible	Decision No. VR-20-ZP/2010

No.	Investment proposal	Decision No.
	vegetable oils from oil sunflower, Butan village, Kozloduy municipality.	from 09.07.2010.
7	Construction of a protective embankment on Ogosta river and of security channels for flood protection, on the land belonging to the village of Glozhene, Kozloduy municipality.	Decision No. VR-33-ZP/2010 from 27.10.2010.
8	Construction of security channels for protection against floods caused by surface waters and correction of a gully on the territory of the town of Mizia.	Decision No. VR-34-ZP/2010.

In 2011 have been issued 23 decisions for IPs within the Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment, which are not in PAs under Natura 2000.

No.	Investment proposal	Decision No.
1	Construction of a recreation and fishing tourism facility, on the land belonging to the village of Sofronievo, Mizia municipality.	Decision No. VR-01-ZP/2011 from 05.01.2011.
2	Construction of a sewerage network and effluent treatment plant in Hayredin village, Hayredin municipality.	Decision No. VR-07-ZP/2011 from 16.03.2011.
3	Construction of a new pipeline route for network water for the town of Kozloduy from HES (Heat Exchange Station) to the existing ground section after the service connection to "Atomenergostroykompleks".	Decision No. VR-13-ZP/2011 from 12.04.2011.
4	Construction and reinforcement of infrastructure to prevent flooding and inundations of territories in residential areas in Oryahovo municipality, Vratsa region.	Decision No. VR-04-ZP/2011 from 01.03.2011.
5	Water use from Ogosta river for irrigation of crops on land belonging to the village of Sofronievo, Mizia municipality.	Decision No. VR-10-ZP/2011 from 24.03.2011.
6	Water use from Ogosta river for irrigation of crops on land belonging to the town of Mizia.	Decision No. VR-09-ZP/2011 from 24.03.2011.
7	Construction of a factory for preservation of primarily processed fish within the village of Hayredin, Hayredin municipality.	Decision No. VR-09-ZP/2011 from 24.03.2011.
8	Construction of a pipe well for water supply to the Administration & Business Complex and vineyards on the land belonging to the village of Leskovets, Oryahovo municipality, Vratsa region.	Decision No. VR-15-ZP/2011 from 26.04.2011.

No.	Investment proposal	Decision No.
9	Change of design data in investment proposal "Integrated investment project in the water sector of Kozloduy town.	Decision No. VR-18-ZP/2011 from 31.05.2011.
10	Use of the Danube river water body to seize rubble from the dynamic inventory, processing and sale of the latter at a location in the Danube river – from kilometer 693.000 to kilometer 691.000 at a minimum distance from the Bulgarian Bank 80 m and a maximum distance at kilometer 693.000 – 200 m, Kozloduy town, Kozloduy municipality.	Decision No. VR-24-ZP/2011 from 05.08.2011.
11	Use of the Danube river water body to seize rubble from the dynamic inventory, processing and sale of the latter at a location in the Danube river – from kilometer 690.000 to kilometer 689.000 at a minimum distance from the Bulgarian Bank 80 m and a maximum distance at km 689.000 – 80 m from the tail of the Kozloduy island, on the lands belonging to the town of Kozloduy and to the village of Harlets, Kozloduy municipality.	Decision No. VR-33-ZP/2011 from 30.08.2011.
12	Conversion of existing farm buildings into a dairy farm for 20 cattle heads, Real Estate No. 000378 on land belonging to the village of Selanovtsi, Oryahovo municipality.	Decision No. VR-25-ZP/2011 from 10.08.2011.
13	Reconstruction and modernization of existing farm buildings into a dairy farm for 32 ruminant cattle heads, Real Estate No. 000443 and Real Estate No. 091029, on the land belonging to the village of Mihaylovo, Hayredin municipality.	Decision No. VR-41-ZP/2011 from 27.10.2011.
14	Construction of a facility for storage of agricultural machinery and implements, in 28 quarter, Zoned Real Estate 176-IX and Zoned Real Estate XII-177 Lipnitsa village, Mizia municipality.	Decision No. VR-39-ZP/2011 from 12.10.2011.
15	Construction of a site for collection and pre-treatment (R12) of waste electrical and electronic equipment (WEEE), end-of-life vehicles (ELVs), packaging, site for collection of waste batteries and accumulators (WBA), waste oils and discarded tires (DTs) in Estate No. 37798.507.456 in the town of Kozloduy, Kozloduy municipality, Vratsa region.	Decision No. VR-50-ZP/2011 from 14.12.2011.
16	Internal refurbishment of an existing building for breeding of 300 oviparous type chickens in Real Estate No. 007033 on the land belonging to the village of Botevo, Hayredin municipality.	Decision No. VR-52-ZP/2011 from 22.12.2011.

No.	Investment proposal	Decision No.
17	Addendum to approved investment project concerning site HPP "Kozloduy" on HC-1 "Using the residual energy resource of the spent water of the Kozloduy NPP for construction of HPP on HC-1 for building of Outdoor Distribution Switchgear 110 kV" in part of the Estate No. 218 under the current cadastral plan of the Kozloduy NPP and the map of the restored property of the village of Harlets.	Decision No. VR-51-ZP/2011 from 14.12.2011.
18	Registration and validation of a water intake from a well located near a petrol station in the town of Mizia, Mizia municipality, Vratsa region, at Zoned Real Estate No. I-1526, quarter 83 of the town of Mizia.	Decision No. VR-45-ZP/2011 from 12.12.2011.
19	Registration and validation of a water intake from a well located near a petrol station in the village of Glozhene, Kozloduy municipality, at Zoned Real Estates No. XIV, XV, XVI, pl. No. 595, quarter 36 of the village of Glozhene.	Decision No. VR-43-ZP/2011 from 12.12.2011.
20	Registration and validation of a water intake from a well located near a petrol station in the village of Sofronievo, at Zoned Real Estate No. III, quarter 116a, Cad. No. 300 in the village of Sofronievo, Mizia municipality.	Decision No. VR-48-ZP/2011 from 12.12.2011.
21	Registration and validation of a water intake from a well located near the Vehicle Base "Kosanya" in the town of Mizia, Real Estate No. 000439 on the land belonging to the town of Mizia, Mizia municipality.	Decision No. VR-46-ZP/2011 from 12.12.2011.
22	Registration and validation of a water intake from a well located near a petrol station in the village of Selanovtsi, Zoned Real Estate No. 311. XXV, Real Estate No. 70723501.780, village of Selanovtsi Oryahovo municipality.	Decision No. VR-49-ZP/2011 from 12.12.2011.
23	Gas transmission pipeline for high pressure with AGDS from TGDS "Chiren" to the towns of Kozloduy and Oryahovo.	Decision No. VR-29-ZP/2011 from 12.08.2011.

In 2012 have been issued 11 decisions for IPs within the Appendix No. 1 and Appendix No. 2 of the Law on Protection of the Environment, which are not in PAs under Natura 2000.

No.	Investment proposal	Decision No.
1	Improving the properties and utilization of meat and bone meal to obtain soil conditioners, at a site on Real Estate No. 48043.290.38.1 from the Cadastral Map and	Decision No. VR-16-ZP/2012 from 14.06.2012

No.	Investment proposal	Decision No.
	Cadastral Registers (CMCR) of the town of Mizia, Mizia municipality, Vratsa region.	
2	Construction of wastewater treatment plant (WWTP), sewerage network and accompanying water supply network in the town of Mizia.	Decision No. VR-7-ZP/2012 from 30.03.2012.
3	Setting up a site for buying-up and temporary storage of ELVs and collection and temporary storage of WBA in Real Estate No. 37798.507.522, in the town of Kozloduy.	Decision No. VR-10-ZP/2012 from 25.04.2012.
4	Construction of a factory for processing and preserving of fruits and vegetables through reconstruction of the existing solid building and wood building in Real Estate No. 964023, plot 23, array 964, Selanovtsi village, Oryahovo municipality, Vratsa region EKATE: 70723, in the "Durvarski road" locality.	Decision No. VR-17-ZP/2012 from 12.07.2012.
5	Construction of a cemetery in the village of Glozhene in the "Merite" locality, Real Estate No. 431004 on the land belonging to the village of Glozhene, Kozloduy municipality, Vratsa region.	Decision No. VR-17-ZP/2012 from 14.06.2012.
6	Sports Hall, Zoned Real Estate (plot XLIII), quarter 60, in the town of Oryahovo.	Decision No. VR-20-ZP/2012 from 16.08.2012.
7	Construction of a second power supply of the town of Oryahovo from the existing overhead line 22 kV "Danube" to SS "Oryahovo" 110/20 kV along a new track with a length of 2885 m passing through the land belonging to the town of Oryahovo.	Decision No. VR-23-ZP/2012 from 12.10.2012.
8	Planting and creation of 200 decares of perennial plantations of Paulownia for biomass production in the town of Oryahovo.	Decision No. VR-34-ZP/2012 from 14.11.2012.
9	Planting of locust for biomass production on abandoned and uncultivated lands in the region of Oryahovo municipality.	Decision No. VR-24-ZP/2012 from 15.10.2012.
10	Building a sheep farm for 100 sheep in the village of Manastirishte, Hayredin municipality.	Decision No. VR-40-ZP/2012 from 30.11.2012.
11	Setting up of a site for buying-up and temporary storage of ferrous and nonferrous metal scrap, collection and temporary storage of ELVs, collection and temporary storage of WBA, in the town of Oryahovo.	Decision No. VR-36-ZP/2012 from 26.11.2012.

For the period **2008 – 2012** have been made 6 Environmental Assessments.

No.	Assessment	Decision No.
1	Detailed Development Plan for site – Oryahovo town – reinforcement of a landslide in Iztok neighbourhood of the town of Oryahovo.	№ BP-1-EO/2008 from 17.04.2008
2	Detailed Development Plan for site – modernization, expansion and renovation of port of regional significance DDF "Dounim" – Kozloduy and on land belonging to the town of Mizia, Mizia municipality, Vratsa region.	№ BP-1-EO/2009 from 01.09.2009
3	Programme for Management of the Waste of Oryahovo municipality for the period 2010-2015.	№ BP-09-EO/2010 from 14.06.2010
4	Detailed Development Plan – Plan for Zoning and Building of Real Estates (REs) No. 000084, 000087 in the "Gladno pole" locality on the land belonging to the village of Sofronievo, Mizia municipality, Vratsa region for building a photovoltaic power plant.	№ BP-10-EO/2010 from 05.07.2010
5	Detailed Development Plan for Real Estate No. 500200 in the "Selishteto" locality on the land belonging to the village of Rogozen, Hayredin municipality, Vratsa region for building a photovoltaic power plant with installed power of 2 MW.	№ BP-21-EO/2010 from 08.12.2010
6	Detailed Development Plan for Real Estate No. 37798.625.55 in a locality of the "Yantra" neighborhood on the land belonging to the town of Kozloduy, Kozloduy municipality, Vratsa region for building a photovoltaic power plant with power of 2 MW.	№ BP-01-EO/2012 from 09.04.2012

The investment proposal for the construction of new nuclear unit, Kozloduy is located beyond the boundaries of the considered Protected Areas under Natura 2000. It may therefore be concluded that the proposal in question, in combination with the above listed IPs submitted by the RIEW Montana and RIEW Vratsa, will not have a cumulative effect on the habitat types and target species.

The nature of the existing structure of the industry, energy and transport infrastructure within the 30-km zone of Kozloduy NPP has no or predominantly low cumulative impacts on the biodiversity and target habitats and species in the Protected Areas. With respect to each of the four grounds, the main and most important industrial sites are the facilities of the existing power plant.

The distance of the boundaries of the Protection Areas from each of the four alternative sites of the new nuclear unit is reasonably sufficient. The closest is the "Zlatiyata" Protected Area – 1.2 km away, "Ostrovi Kozloduy" Protected Area is 3.03 km away and "Ogosta River" is 6.09 km away. This suggests a lack of direct cumulative impact, through direct

destruction or damage to habitats and species (respectively, revocation of surface area from the habitats and protected areas in question).

The NPP is the major industrial site in the 30-km zone of the 4 considered sites. At the site of the existing power plant are situated many diverse facilities that will not have significant cumulative impacts on the Protected Areas. From the above-described IPs/PPs may be concluded that they cannot have any direct or indirect effect due to the fact that they are not situated in the PA, and are not sources of harmful emissions to the environment.

Data from the ongoing regular monitoring of the environment – radiation and non-radiation surveillance in the recent years also gives reason to conclude that cumulative impacts shall not be expected.

Within the 30-km zone of Kozloduy NPP passes an industrial gas pipeline that is not currently being used. In process of design are the pipelines “Chiren – Kozloduy”, as well as "Nabucco" and "South Stream".

The "Nabucco" gas pipeline passes about 6.7 km away from Site 1. The gas pipeline crosses PA "Ogosta River” in its northern end by going under the river and thus the impact on the Protected Area is mitigated.

The "South Stream" project passes about 7 km away to the South of Kozloduy NPP ’s grounds.

Cumulative impact of the two gas pipelines is not expected, as this IP does not take away surface areas from the Protected Areas (does not take away habitats and does not fragment such), and does not burden the environment with non-radioactive and radioactive emissions.

Conclusion:

The territory earmarked for the construction of the new nuclear unit does not affect Protected Areas within the meaning of the Biodiversity Act. Located nearest are the Protected Areas "Zlatiyata" for the protection of wild birds with code BG 0002009, "Ostrovi Kozloduy" with code BG0000533 and “Ogosta River” with code BG0000614, where both latter are for conservation of natural habitats and of wild flora and fauna under the "Natura 2000" network.

In this context may be outlined the following conclusions:

1. Cumulative impact of this IP and of the approved, implemented or pending PPPs/IPs, located within the boundaries of Protected Areas "Zlatiyata" for protection of wild birds with code BG0002009, "Ostrovi Kozloduy" with code BG0000533 and “Ogosta River” with code BG0000614 for conservation of natural habitats and of wild flora and fauna, due to direct destruction or damage to natural habitats and habitats of species subject to protection therein (respectively, revocation of surface area from the habitats and protected areas in question), fragmentation of habitats, disturbance of species, is not expected.

2. Cumulative impact of this IP and of the approved, implemented or pending PPPs/IPs, located within the boundaries of Protected Areas "Zlatiyata" for protection of wild birds

with code BG0002009, "Ostrovi Kozloduy" with code BG0000533 and “Ogosta River” with code BG0000614 for conservation of natural habitats and of wild flora and fauna, due to disturbance of species or indirect destruction/damage to natural habitats and habitats of species subject to protection therein, as a consequence of generation of waste or emissions in soil, water, air, as key elements of the Protected Areas, is not expected.

3. Cumulative impact of this IP and of the approved, implemented or pending PPPs/IPs, located within the boundaries of Protected Areas "Zlatiyata" for protection of wild birds with code BG0002009, " Ostrovi Kozloduy" with code BG0000533 and “Ogosta River” with code BG0000614 for conservation of natural habitats and of wild flora and fauna, due to disturbance of species or indirect destruction/damage to natural habitats and habitats of species subject to protection therein, as a consequence of generation of waste or emissions in soil, water, air, as key elements of the Protected Areas, inclusive of consideration of also the proceeded infrastructural sites (2 gas pipelines) passing close to the Protected Areas and the existing environmental burden from Kozloduy NPP, is not expected.

3 AN OUTLINE OF THE ELEMENTS OF THE INVESTMENT PROPOSAL THAT SEPARATELY OR IN COMBINATION WITH OTHER PLANS, PROGRAMMES AND PROJECTS/INVESTMENT PROPOSALS COULD HAVE A SIGNIFICANT IMPACT ON THE PROTECTED AREAS OR THEIR ELEMENTS

The parameters for the construction of a NNU presuppose the existence of three primary groups of sub-sites and facilities:

- Nuclear power sub-sites and facilities implementing the main technological process – the generation of electric power – as well as ones representing sources of radiation impact;
- Other production sub-sites and facilities implementing auxiliary/accompanying technological processes, providing key support to the main nuclear power process and/or representing sources of various types of non-radiation impact on the environment;
- Supporting infrastructure.

The area of one of the proposed sites will accommodate all primary and auxiliary buildings and facilities, as well as the necessary operational equipment.

In addition to the NNU, the following more important IP and Projects are situated within the Kozloduy NPP site:

- The project for the decommissioning of units 1÷4;
- A project for the construction of a facility for the treatment and conditioning of radioactive waste with a high rate of volume reduction (PMF).

The factors/components of the environment over which the IP could have an impact in the context of the assessment of the degree of impact of the investment proposal on the subject and objectives of the protected areas are presented below.

3.1 CLIMATE AND ATMOSPHERIC AIR

3.1.1 CLIMATE

The implementation of the IP will have no impact on the conditions and the spatial distribution of the values of climatic elements for the areas adjacent to the alternative sites.

No climate change is expected to occur as a result of the potency of non-radiation emissions during all three phases: construction, operation and decommissioning.

3.1.2 NON-RADIOACTIVE POLLUTION OF ATMOSPHERIC AIR

During construction

Impact of area-based sources

The assessment of the dispersion of emissions from ground level sources during construction (for each of the 4 sites) is based on the model of the U.S. Environmental Protection Agency (EPA) ***ISC-AERMOD*** (Industrial Source Complex) with a Windows interface, developed by the Canadian software company Lakes Environmental.

The analysis on the results from the use of the model are presented in the EIAR. The following conclusion has been reached:**"The gaseous and dust emissions will not have any significant impact on the quality of atmospheric air during the construction stage. In order to prevent excessive pollution, a schedule must be observed regarding the movement of the transportation vehicles servicing the construction site, and the schedule must take into account the meteorological conditions (no wind), i.e. to allow the natural ability of the atmosphere to clean itself."**

Impact of linear sources

It is assumed that the pollution from the movement of transport vehicles along road sections can be described as continuously acting linear sources.

The pollution from linear sources is determined, in adherence to the European norms and the respective Bulgarian legislation, via the *Method for determining the diffusion of harmful substance emissions from transport vehicles and their concentration in the surface atmospheric layer – based on the software product* **TRAFFIC ORACLE** (Order № РД 994/04.08.2003 of the MoEW).

The analysis on the results from the use of the model are presented in the EIAR. The following conclusion has been reached:**"The linear gaseous emissions will not have any significant impact on the quality of atmospheric air during the construction stage.**

During operation

During the operation of the NNU no pollution from area-based dust emissions is expected. Gaseous emissions will be insignificant compared to the pollution from the average 24-hour intensity of the road vehicle traffic along Road II-11 from the national road network.

During decommissioning

The Impact of all types of emissions during the decommissioning stage will be similar to those established during the construction, but since the impact will be distributed over a greater time interval, their significance is expected to be negligible.

Based on the above rationale regarding the favourable climatic and meteorological characteristics of the area and the fact that the region has no major industrial polluters, could be concluded that the impact of the implementation of the IP on air quality will be negligible. The indirect impact – via air as a medium – on other components of the environment: soil, flora and fauna, and the health and hygiene conditions, will also be negligible.

3.1.3 RADIOACTIVE POLLUTION OF ATMOSPHERIC AIR

The radioactive pollution of atmospheric air is caused by radioactive releases (emissions) from the nuclear power plant. Airborne radionuclides can lead to exposure via two principal pathways: externally – by the photons emitted as a result of radioactive decay, and internally – through their inhalation.

In terms of human health, these releases are evaluated by the radiation exposure of the human body in comparison to the threshold concentration levels for conventional pollutants in atmospheric air.

The assessment of the exposure dose on the population within the 30 km zone from gaseous and aerosol releases is made by means of modelling in **Section 4.11 of the EIAR**. The LEDA-CM, "SHIELD Normal Operation" modelling software program, adapted to the geographic and meteorological characteristics of the region of the Kozloduy NPP, has been used. The methodology accounts for both the external and the internal impact of radioactive releases and evaluates the individual effective dose, the annual individual equivalent dose, and the critical group dose, as well as the collective population dose by age groups. The program is based on the method adopted by the European Union (EU) – CREAM (Consequences of Releases to the Environment Assessment Methodology) Radiation Protection 72 – Methodology for assessing the radiological consequences of routine releases of radionuclides to the environment.

The evaluations made using mathematical modelling techniques demonstrate that the additional exposure dose to the population within the 30 km zone from the operation of the NNU is negligibly low.

3.1.4 ATMOSPHERIC ACTIVITY

Aerosols – the radioactivity of atmospheric air is examined on a weekly basis at 11 control checkpoints within the 100 km Monitoring Zone (MZ) around the NPP. The summarised data from the aerosol monitoring performed during the period 2009-2011 (Results from the radioecological monitoring of the Kozloduy NPP, Annual report for 2011) shows that the results are within the normal limits and the operation of the Kozloduy NPP, as a potential source of ground air pollution with radioactive substances **has not resulted in any changes to the radiation gamma background** and to atmospheric radioactivity.

The values for total beta-activity in ground air (**Figure 3.1-1***)* are within the normal parameters, characteristic for this geographical region, within the range from 0.50 to 0.68 μBq/m^3. The results are closely comparable throughout the years. ^{137}Cs content from 0.8 μBq/m^3 to 10 μBq/m^3 with an average value of 2.8 μBq/m^3 is within the minimal detectable activity for this analysis method, and 10^6 times lower than the standards for the country, established under the *Regulation on the Basic Norms of Radiation Protection, 2012*.

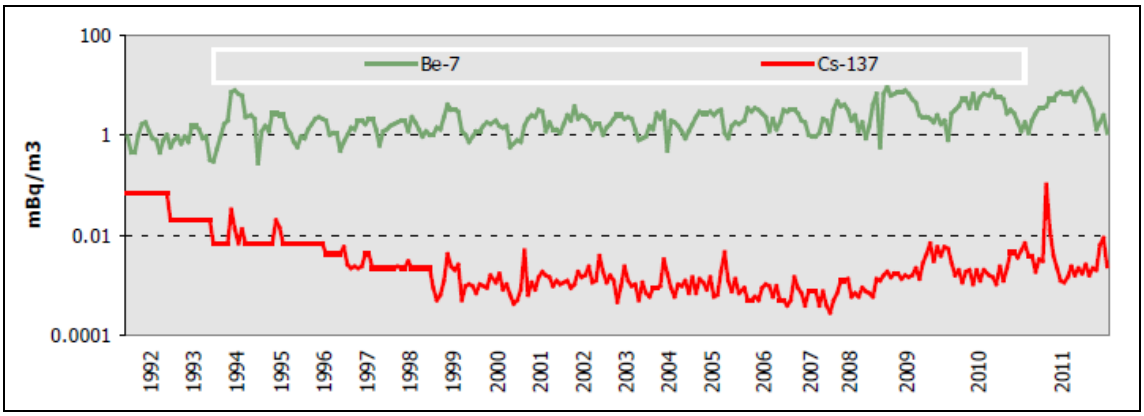

FIGURE 3.1-1: GAMMA-SPECTROMETRIC ANALYSIS OF 137CS AND 7BE IN GROUND AIR (MBQ/M3) FROM THE AREA OF THE KOZLODUY NPP, CHECKPOINT-9 (VILLAGE OF HARLETS), 1992 – 2011

The monitoring data establishes a relative increase of long-lived beta-activity in the aerosol filters of some of the control checkpoints, mainly during the winter months. This is due to the snowfall during this period.

No significant negative impacts are expected.

Atmospheric depositions – atmospheric depositions are controlled on a monthly basis at 33 of the 36 control checkpoints within the 100 km Monitoring Zone around the NPP. A slight seasonal dependence has been established, with maximum values during the spring-summer period, which is due to the intense rainfall and self-cleaning of the atmosphere, resulting in a reduced aerosol activity and respectively an increased deposition activity.

The controlled total beta-activity of atmospheric depositions varies within the range 0.058 Bq/(m^2.d) ÷ 1.96 Bq/(m^2.d) with an average value of 0.43 Bq/(m^2.d). The results are comparable to previous multi-annual measurements and represent natural values characteristic for the region. The results for ^{90}Sr in atmospheric depositions display a stable reduction tendency due to the self-cleaning of the atmosphere from the Chernobyl ^{90}Sr.

It is generally recognized that the radioactivity of atmospheric depositions within the 100 km zone is within the normal limits and has not been affected by the operation of the NPP.

Background gamma radiation – In 2012 a total of 1315 measurements were made on the background gamma radiation at the control checkpoints and routes using portable dosimetric devices and stationary thermo-luminescent dosimeters. Out of them, 1039

measurements were made using portable dosimetric devices at a total of 77 control checkpoints within the 100 km zone. For passive independent control of the gamma background radiation, a total of 70 thermo-luminescent dosimeters Panasonic UD-802AS were used, for a total of 276 measurements.

The summarised data and results for 2012 and its comparison with the data for the period 2007 – 2011 shows that:

- The gamma background radiation at points of NPP's fence and at the control checkpoints and the settlements within the 100 km Monitoring Zone is completely comparable to the natural background radiation of 0.05 μSv/h ÷ 0.15 μSv/h;
- The radiation situation in the area is stable and has not been changed by the operation of the Kozloduy NPP.

3.2 WATER

3.2.1 SURFACE WATER

The existing Kozloduy NPP site is situated on the right bank (at the 694th km) of the Danube River. It is situated in the northern part of the first unflooded terrace of the Danube River (elevation level +35.0 m based on the Baltic Elevation System) and has an area of 4471.712 decares. No natural water bodies pass through it.

In close proximity and of major significance to the NPP, to the north of the site flows the Danube River, signified by the name "Danube River RWB01" and by the code BG1DU000R001, in accordance with the River Basin Management Plans for the Danube Region, responsible for the basin water management in Bulgaria.

There is a hydraulic connection between the river water and the groundwater in the terraces. The latter are situated at a shallow depth and that is why high water levels case marshes in the lowest sections of the lowlands. In order to reduce these influences, a system of drainage channels has been constructed to the north of the site – leading the water to pumping stations (PS) which transfer the water back into the Danube River. This is how a relatively low level of ground water is controlled and maintained in the lowlands situated to the north of the existing Kozloduy NPP site.

Due to the constantly high level of ground water across a large area of the lowlands in the region of the Kozloduy NPP, and in order to provide protection against the slope water running down the north slopes of the plateaus, a system of drainage channels and facilities has been constructed. These systems protect the area during heavy rainfall and also prevent marshes in the lowlands. The drainage systems also protect the power plant site against flooding. They include three types of channels: drainage, collector, and main ones. The water from the main channels is transferred to the Danube River over the embankments via pump stations (PS). The Main Drainage Channel (MDC) is one of the recipients of four streams of wastewater from the NPP, entirely from the territory of Electricity Production – 1 (EP-1), via the constructed mixed sewerage system, and a part of the wastewater from Electricity Production – 2 (EP-2). These drainage facilities are

essential to the protection of the agricultural land in the area and the existing infrastructure, and that is why their existence is clearly necessary.

During construction

- During construction wastewater will have a local impact on the ecological status of the region. No irreversible negative impact is expected on the environment under strict implementation of the investment plan for the construction of the necessary sewerage and water supply system and the construction of wastewater treatment facilities, ensuring compliance with statutory requirements;
- The discharge of wastewater into the recipient water body – the Danube River – during the construction works will not lead to any significant change in the quality of the river water;
- It is possible to expect some impact during construction if the treatment and organised removal of wastewater to the point of discharge is not ensured.

Based on the conducted analysis on the construction and assembly works and the expected impact during the construction of the NNU, the impact on surface water can be estimated as follows:

Impact Scope – direct, negative, with a low degree of impact, limited – if regulatory requirements and the relevant planned measures are observed.

Impact Characteristics – temporary, short-term (during the construction period) and with no cumulative effect, region-sensitive, reversible after the end of the construction works.

During operation

- ✓ No significant contamination of the recipient of the conventional household and industrial wastewater resulting from the operation of the NNU is expected.
- ✓ The statutory requirements regarding the implementation of a separate sewerage network in compliance with the modern requirements on the prevention of leaks into and contamination of groundwater and avoidance of the mixing of the flows from the radioactive and the non-radioactive zone, as well as compliance with all the requirements for proper operation of the treatment facilities, will ensure conformity with the environmental standards for the operation of the NNU.
- ✓ Wastewater discharge into the recipient water body during operation is not expected to cause any significant changes in the qualitative composition of the water in the Danube River.
- ✓ The investment proposal will envisage measures aimed at minimising the quantity and contamination level of the production wastewater.
- ✓ The implementation of the treatment facilities envisaged in the Investment Proposal – for household wastewater and oil-containing wastewater, as well as arrester tanks for rain water – is not expected to cause any impact on the recipient water body and the environment.

- ✓ The operation of the local treatment plants will target the emission limit values that will be prescribed in the wastewater discharge permit, issued by the Water Basin Management Directorate for the Danube Region.
- ✓ The monitoring process currently conducted at the NPP, will be further continued after the implementation of the IP for the new nuclear unit and will be improved and expanded to effectively monitor the performance of the new unit.
- ✓ The efficient control and management of the treatment processes, as well as the continuous monitoring on water quality in terms of radiation and non-radiation impact, will guarantee that the emission limit values of the water discharged into the recipient water body – the Danube River – will be met and the quality of the aquatic ecosystem will be preserved.

The strategic and well-defined goals laid down in the River Basin Management Plan for the Danube River Basin, focused on efficient water management and aimed at preventing the degradation of the aquatic ecosystem and achieving "a good ecological status" of Danube River water, will not be threatened by the construction of the new nuclear unit.

During operation, wastewater will have a local impact on the ecological status in the region. No irreversible negative impact on the environment is expected.

- **Impact Scope**– local.
- **Impact Type** – direct, negative, with a low level of impact. Negative impact could be expected in case of improper operation of the treatment facilities or as a result of accidental releases.
- **Impact Characteristics** – continuous, long-term, cumulative, reversible.

Based on the reviewed impact of the NNU investment proposal, we can categorically state that the impact of the non-radioactive wastewater on the receiving basin – the Danube River – during operation will be local, continuous, irreversible, but negligible.

Decommissioning

The estimates indicate that during this period the need for raw water from the Danube River will decrease substantially, due to the fact that cooling water will no longer be needed. The water supply for the needs of the CWT facility, necessary for all activities related to the decontamination of machinery, facilities, etc. could continue to operate in the same way. Increased water consumption can be predicted due to the increased operation of the laundries and bathrooms, and for the cleaning of floors and corridors.

No contamination of the Danube River with household and industrial wastewater is expected. The availability of constructed and operating treatment facilities is a mandatory condition for all stages of decommissioning, all the way to the final stage of recultivation.

The estimates indicate that the contamination level of wastewater will be considerably reduced in comparison to the operational period.

- ✓ **Impact Scope**– local.
- ✓ **Impact Type** – direct, negative, with a low level of impact. Negative impact could be expected in case of improper operation of the treatment facilities or as a result of accidental releases.
- ✓ **Impact Characteristics** – continuous, long-term, reversible after the decommissioning.

The existing non-radiation and radiation monitoring of the Kozloduy NPP, the NNU and the RAW SE will be continued throughout the decommissioning of the NNU. The advancement of knowledge over the years will provide new methods and opportunities for improvements to the monitoring process. This monitoring process will continue even after the closure and recultivation of the site, in accordance with the designated purpose.

In the final phase of closure and recultivation of the site, after the demolition of all water intake facilities drawing raw water from the river, the natural state of the coastline, disrupted during the years of operation, will be restored through appropriate engineering, technical and recultivation solutions. The project to be implemented will review the status and decide about the need for preservation, modernisation and subsequent operation of the constructed meliorative hydrotechnical facilities.

3.2.2 HYDROLOGY OF THE DANUBE RIVER

During operation

The abstraction of water for the cooling of the existing and the new reactors of the Kozloduy NPP in none of the considered 4 options for the site is expected to have any long-term, continuous, including cumulative and transboundary, impact on the regime of the flowing water quantities of the Danube River, which is ensured through the use of the existing infrastructure – bank pump station, cold (intake) and hot (outlet) channels.

During decommissioning

We believe that regardless of the choice of the specific site, the decommissioning of the new nuclear unit will not have any significant impact on the hydrological regime of the Danube River.

3.2.3 GROUND WATER

3.2.3.1 ESTIMATED MIGRATION OF RADIONUCLIDES IN THE SUBSOIL OF THE DESIGN SITES FOR THE CONSTRUCTION OF A NEW NUCLEAR UNIT AT THE KOZLODUY NPP SITE AND THE ADJACENT TERRITORIES

"Kozloduy NPP – NM" EAD has provided a report entitled "MODELLING RADIONUCLIDE MIGRATION IN THE SUBSOIL OF THE SITES", authored by: Ass. Prof. Dr. N. Stoyanov and Prof. Dr. of Geological Sciences M. Galabov, 2013, REL-1000-ST-005-E-1. This report is a component of the project: "EXAMINING AND DETERMINING THE LOCATION OF THE

PREFERRED SITE FOR THE CONSTRUCTION OF A NEW NUCLEAR UNIT AT THE KOZLODUY NPP SITE EAD AND THE ADJACENT TERRITORIES," РИ/ДИ-1000.

The EIAR presents data on the estimated behaviour and the migration of radionuclides into the subsoil of the alternative sites proposed for the construction of a NNU for the Kozloduy NPP.

The assessments on the risk of contamination to the geological environment and the groundwater during the operation of the NNU of the Kozloduy NPP are based on the assumption that as a result of an outflow of technological water and flooding of the concrete foundation of the reactor room, radionuclides of different type and different activity will be infiltrated into the subsurface space.

The summary of the results obtained through the mathematical modelling of radionuclide migration from the four sites under consideration allows us to make the key conclusions presented below.

- The estimates have been projected for a period of 10 000 years. This period is sufficiently long and actually goes far beyond the foreseeable future.
- The migration of radionuclides into the subsoil and the groundwater and the differences in their spread pattern are determined mostly by the sorption capacity (retention) of the corresponding radionuclide in the geological environment and its decay rate over time. From this point of view, the chosen "key" radionuclides represent quite a diverse “bunch” of isotopes with quite dissimilar decay rates and largely different with regard to their sorption capacity. The varied combinations of these properties contribute to the wide representative quality of the research and investigation done.
- The results are shown through the values of “relative activity rate” (the ratio between the “current” and initial (input) activity of the given isotope), i.e. the decline of activity rates over time and space. This was done because at this early design stage there is no sufficient clarity on the initial activity levels of radionuclides in the reactor room.
- Among all isotopes the most “active” is tritium (^{3}H), which is practically non-sorbable. Its spread depends only on the permeability of the medium (the filtration rate, respectively) and on its decay rate in during the migration process.
- The remaining radionuclides that were reviewed (^{137}Cs, ^{90}Sr, ^{60}Co, ^{241}Am, ^{239}Pu) have different properties – some (such as ^{242}Am) are long-lived but highly sorbable, while others (such as ^{90}Sr) are less sorbable but have a high rate of decay. The multiple and multi-variant investigations revealed a very important result, and namely: out of all radionuclides (with the exception, of course, of tritium), the greatest range of distribution and outreach is displayed by ^{90}Sr. The remaining radionuclides (throughout the forecast period of 10 000 years) have a more limited distribution. Consequently, the presented figures show specifically the spread of strontium in groundwater.
- An important barrier for the spread of radionuclides is the substructure platform of the reactor and the aeration zone beneath it (the non-saturated zone between the

bottom side of the slab and the groundwater level). Here we observe a significant reduction of isotope activity – in most cases by 3-5 to 10-15 and more orders of magnitude. The only exception is tritium.

- One very important finding of the studies and analysis is worth noting. The spreading of all radionuclides marks a peak "maximum" (different in time and place for the different radionuclides and sites), followed by a gradual "shrinking" of the contaminated zone. For all studied radionuclides (without tritium) however, even with the accepted very low values of relative activity (10^{-10}-10^{-40}), the scope of contamination never reaches the Danube River.
- Only tritium could reach the Danube River within the first centuries with relative activity level between 10^{-10} and 10^{-30}, followed by a shrinking of the "plume" and a further decrease of activity. This estimate incorporates a reserve, since the calculations are made for low water levels of the Danube River. In high water periods the underground flow to the Danube is "blocked" (its direction is temporarily reverse), so that the time it takes for tritium to reach the river will be much longer than the one shown, and accordingly, the activity rate of the isotope will be even lower.

3.2.3.2 IMPACT FORECAST

During construction

The expected impact on groundwater will be identical for all sites considered as suitable to accommodate the NNU.

GROUNDWATER – (non-radioactive aspect)

Likelihood of impact during construction as a result of the excavation works, the utilised machinery and the supporting activities within the territory of the selected site – direct, negative, with a high level of impact, limited – if regulatory requirements and the relevant planned measures are observed.

Impact characteristics – continuous, due to the potential construction and maintenance of a dewatering system with an expected cumulative effect at groundwater level.

GROUNDWATER – (radioactive aspect)

No substantial negative impact from the implementation of the investment proposal is expected due to the planned engineering barriers preventing the transmission of radionuclides into the environment and the groundwater. No impact is likely to occur during construction. Positive impact may be expected if advanced designs and technologies are utilised – developed on the basis of the accumulated experience, the current statutory requirements and the envisaged safety measures.

During operation

GROUNDWATER – (non-radioactive aspect)

The manifestation of impact during the operation stage is only expected as a result of unforeseen accidents related to collection, transportation and possibly a leakage due to a fault in a pipeline or damaged collection or storage facilities. Impact scope within the territory of the selected site: direct, negative, with a medium level of impact, limited – if regulatory requirements and the relevant planned measures are observed. Impact Characteristics: temporary, short-term, but with a cumulative effect in case of regional sensitivity. Reversible after the end of this stage.

GROUNDWATER – (radioactive aspect)

The manifestation of impact during operation is only expected as a result of unforeseen accidents related to collection, transportation, storage and conditioning of radioactive waste, and possibly a leakage due to a fault in a pipeline or damaged collection or storage facilities. Impact scope within the territory of the selected site: direct, negative, with a medium level of impact, limited – if regulatory requirements and the relevant planned measures are observed. Impact Characteristics: temporary, short-term, but with a cumulative effect in case of regional sensitivity. Reversible after the end of this stage.

During decommissioning

GROUNDWATER – (non-radioactive aspect)

Considering the regulatory requirements, the selected option for the decommissioning the nuclear unit will be optimal and safe upon observance of the requirements under which no negative impact on groundwater is expected. The occurrence of impact after the decommissioning is only expected as a result of unforeseen accidents or natural disasters. Impact scope within the territory of the selected site: direct, negative, with a low degree of impact, limited – if regulatory requirements and the relevant planned measures are observed. Impact Characteristics: temporary, short-term, but with a cumulative effect in case of regional sensitivity. Reversible.

GROUNDWATER – (radioactive aspect)

The occurrence of impact after the decommissioning is only expected as a result of unforeseen accidents or natural disasters. Impact scope within the territory of the selected site: direct, negative, with a low degree of impact, limited – if regulatory requirements and the relevant planned measures are observed. Impact Characteristics: temporary, short-term, but with a cumulative effect in case of regional sensitivity. Reversible.

3.3 SOILS IN THE AREA OF THE NNU

The data shows that the chernozem soils (carbonate, typical and sandy), some of which eroded to a different degree, are the most widespread soils within the 30 km zone around the Kozloduy NPP. This is also valid for the alluvial-meadow and meadow-marsh soils in the area, but to a lesser degree.

In terms of resistance to contamination, the aforesaid soils belong to classes one and two due to the high quantity of carbonates and the relatively high quantity of humus. The active soil acidity fluctuates within the slightly alkaline spectrum 7.4 – 8.4. The buffering capacity

of the soils is high, and it successfully mitigates an impact such as contamination. The region is characterised by a very strong wind erosion in the "Zlatiyata" geographical area.

3.3.1 IN NON-RADIATION ASPECT

During construction

An impact on soils due to capital construction is expected only within the actual construction site.

During operation

During operation the negative impacts on the land and soils are significantly less than those during the construction stage, and again only on the areas for the construction of the NNU.

During decommissioning

The territorial scope of impact will be limited within the current impact zone. The degree of impact within the area of the NNU is limited.

3.3.2 IN RADIATION ASPECT

Impact during construction

During construction there is no impact of radiation factors related to the investment proposal due to the absence of radioactive sources in this phase.

During operation

During the normal operation of the NNU, and given that all technological and engineering requirements are observed, no significant impact is expected with regard to radioactive soil contamination. The possible pathways of radioactive soil contamination are: airborne contamination via the radioactive component of emissions, or via adsorption of radionuclides from the surface and ground water, contaminated as a result of spills.

In adherence to the statutory requirements on the monitoring and control of contamination around and within industrial enterprises in the country, both own radiation monitoring and control by state authorities are required within a 100 km radius, and more thoroughly – within a 30 km radius around the Kozloduy NPP. A comprehensive programme for the monitoring of radioactive soil contamination was implemented, by four independent institutions – the internal bodies (Environmental Radiological Control Department) of the Kozloduy NPP, the National Radiobiology and Radiation Protection Centre, the subdivisions of the MoEW (RIEW – Vratsa) and the "N. Pushkarov" Institute of Soil Science, Agrotechnology and Plant Protection – during the period 2008 – 2011.

In adherence to international requirements on radiation monitoring, reference and control monitoring checkpoints have been established around the Kozloduy NPP. They were chosen in accordance with the specific meteorological and geographical conditions in the area and are representative sources of accurate and comprehensive information.

The radioecological monitoring of the Kozloduy NPP is fully compliant with the national and European statutory requirements in the field and is consistent with the experience and good practices of the countries with highly developed nuclear power engineering. There is full correspondence with the requirements of Art. 35 of the Euratom Treaty and Recommendation 2000/473/Euratom. The organisation and scope of control encompasses key components that are important for the protection of human health and the environment. The quality of the conducted analyses has been verified via control laboratory analyses at certified national and international laboratories. The results of the conducted monitoring are also verified via independent investigations by the control authorities in the country – the NRRPC/MH, the EEA/MoEW, the "N. Pushkarov" ISSAPP/MAF.

During decommissioning

The difference between the decommissioning of the NNU and that of any other industrial facility lies in the fact that at this stage the risk of radioactive contamination of the land and soils is real – both within the site and over adjacent land and soils. The decommissioning of the NNU must be carried out in strict compliance with the requirements of the Regulation on Safety During Decommissioning of Nuclear Facilities (promulgated in SG No. 73/ 20.08.2004), which ensures a minimum radiological impact on the soils within the sites. The degree of impact on soils will be low to moderate – provided that all requirements for the safe management of radioactive waste are observed. Radiation control and radiological investigation of the soil before, during and after the decommissioning of the NNU is mandatory.

3.4 WASTE

3.4.1 NON-RADIOACTIVE WASTE

The methods specified in the EIAR for the collection, transportation and disposal of waste generated due to the *implementation of the investment proposal* are appropriate and environmentally sound, and therefore no deterioration of the environmental situation in the region is expected.

In compliance with the proposed measures for reduction of the quantities of generated waste to a reasonable minimum, under strict control and effective management, the cumulative impact of the "waste" factor during the construction of the individual sub-sites of the IP, their commissioning, operation and decommissioning is expected to be as follows:

Territorial scope of the impact: Within the boundaries of the respective site for the construction of the NNU, within the area provided for temporary waste storage and disposal, and in accordance with the regulatory requirements.

Mode and level of impact: In compliance with all the measures for effective management of non-radioactive waste, no significant negative impact is expected on the individual components of the environment.

Duration of exposure: Long term, over the entire period of construction, operation and decommissioning, including after the end of the operational period.

Frequency of exposure: Continuous, over the entire period of construction, operation and decommissioning, including after the end of the operational period.

Cumulative impact: Expected increase in specific types of non-radioactive waste:

during construction for a 5-year period. The majority of non-hazardous, non-radioactive waste will be utilised.

during operation – the different types of non-radioactive waste is expected to get an increase till the end of the period of operation of the remaining reactors at the site.

during decommissioning no cumulative impact is expected.

3.4.2 RADIOACTIVE WASTE

Nuclear reactors generate several hundred artificial radionuclides (spontaneously decaying isotopes). Many of them have a short half-life and disintegrate completely or to very low specific activities before entering the waste. The total number of radionuclides that are commonly found in the waste from nuclear power reactors in potentially significant concentrations are about 100.

The EIAR presents detailed and analysed information on radioactive waste. The conclusions of this analysis and the assessment made are presented below:

- Probability for the manifestation of the impact – expected
- Territorial scope – local – the RAW storage facilities.
- Reversibility of the impact – negative, direct, primary,
- Level of the impact – very low to average (on the site area),
- Impact Characteristics: radiation
- Frequency – temporary (till the completion of the stage), permanent from storage and periodic from transportation
- Duration – long-term
- Cumulative impact – yes
- Reversibility of the impact – reversible

3.5 HEAT IMPACT ON THE DANUBE RIVER

3.5.1 TEMPERATURE PROFILE OF DANUBE RIVER

The temperature profile of the Danube River is highly relevant to the assessment of the impact of spent, warmed-up circulatory waters used for the operation of the power plant.

The distribution of the temperature in the water across the river stream depends on the amount of water, the season and the hydraulic characteristics of the river section. The maximum temperature variations measured across the width of the river reach 0.2 – 0.4°C with the highest values occurring early in the morning. During the warm season the cross-section of the river is practically isothermal.

At the depth of the stream, the water temperature, especially in the central part of the river bed, is equal. Infrequent differences in the 0.2 – 0.4°C range are observed in the midstream area. Due to the intensive turbulence-induced displacement and the inertia of the thermal processes in the open streams, in the event of relatively rapid changes of the ambient air temperature, the variations of the water temperature at different depths remain within the 0.2 – 0.4 C range.

The maximum water temperature in January is 6°C and the absolute maximum measured in August is 27.5 °C.

The maximum monthly amplitude of the water temperature is 14.9 °C, occurring in April. An insignificant change in the water temperature from 0.1°C to 0.3°C was observed during the periods 1941-1980 and 1981-1985 in comparison to the previous two periods.

With regard to the maximum monthly temperatures, a more substantial elevation, by about 1.7°C for March and by about 1°C for October, was observed during the periods 1941-1980 and 1981-1985, in comparison to the periods 1941-1970 and 1971-1975.

3.5.2 THERMAL POLLUTION

The change of the river's temperature profile caused by the discharging of warmed-up waters from the Kozloduy NPP is a specific form of pollution. The permissible limit for the temperature rise of the open flow is 3°C for the warmest and 5°C for the coldest month of the year.

Studies on the temperature profile of the water in the section of the Kozloduy NPP have been conducted in connection with the construction of units 5 and 6 in 1991. They also include environmental studies where a temperature profile was created for the water in the Danube River in the section between the discharge of the hot (outlet) channel and the town of Oryahovo. Due to the fact that environmental studies cannot encompass all possible combinations of changes to the factors determining the heat impact of the Kozloduy NPP on the Danube River, the results from the studies have been used to derive semi-empirical dependencies to calculate the size of the heat-influenced area for the Danube River. These include the water quantity of the Danube River before the BPS, the water quantity taken in by the cooling system of the power plant, the temperature difference between the water borrowed and returned to the river, and the geothermal characteristics of the section of the Danube River – average width and depth.

The conducted studies demonstrated that:

- the temperature of the water in the hot (outlet) channel before the discharge into the river follows a natural rise of the water temperature in the Danube River before the BPS on an hourly basis during the day, with a temperature difference of 7.5-8.5°C, during normal operational conditions;
- the heat stratification along the river at the zone of the thermal plume only occurs up to about 700 m after the discharge of the Hot (Outlet) Channel (HC). The maximum stratification in the vertical direction (by about 4°C) is observed at about

200 m after the discharge and at about 80-100 m into the cross-section to the waterway (midstream) of the river;

→ the "thermal pollution" strain in the Danube River (with ΔT = 3°C) is then manifested at about 1700 m after the discharge of the HC, with a maximum width of about 300 m. For example, 80% of relative dispersion of the water temperature in the Danube River after the merger of the HC (with a flow rate of 75 m^3/s) occurs at about 2 km downstream.

The operation of the power plant has been studied when working at 1760 MW and 3760 MW – respectively at a discharge rate from the hot channel amounting to 104 and 180 m3/s. Calculations have been made for two isotherms: +3°C and +5°C. The results obtained show that during the operation of 4 units, with a total quantity of heated waters of 104 m3/s, to a temperature 10°C above the temperature of the Danube River, the heat-influenced area, at a 5 % probability to not exceed the value, and a temperature of + 3°C above the natural one, during the individual months of the year has a length of 2.3 to 10.6 km, i.e. it extends from km684.3 to km676.1, forming near the Bulgarian bank and having a maximum width in the zone from 100 to 185 m.

We can draw the conclusion that after the commissioning of the Kozloduy NPP some extent of thermal load is observed at Oryahovo (^{km}678) compared to Lom (^{km}743.3), which does not exceed the regulatory threshold of 3C.

During construction

During the construction of a new nuclear unit, whatever site is selected, the temperature profile of Danube will not be affected in any way.

During operation

The change of the river's temperature profile caused by the discharging of warmed-up waters from the Kozloduy NPP is a specific form of pollution. According to the norms applicable in Bulgaria, the thermal pollution of open streams should be assessed on the basis of the minimum average monthly water volume (in a year with 95% provision) and the natural temperature of the open stream – based on the average temperature in the warmest and coldest months of the year. The norm does not take into account the probability of combinations with water quantity with 95 % provision and average water temperature for the last 10 years, and whether this temperature is representative of the natural temperature profile of the open stream.

The analysis of the results from previous studies demonstrates that at full capacity of the then operational six units, the expected discharge from the Kozloduy NPP to the Danube River via the existing discharge channel was about 180 m^3/s of warmed-up water with a temperature 10˚C higher than the natural temperature of the river water.

The temperature of the water in the hot (outlet) channel before the discharge into the river follows a natural rise of the water temperature in the Danube River before the BPS on an hourly basis during the day, with a temperature difference of 7.5-8.5°C, during normal operational conditions.

If units 5 and 6 and the NNU are operated at a combined capacity of up to 3200 MW and the corresponding amount of warmed-up water is up to 160 m^3/s, the length of the 3°C heat-influenced area will vary in the different months from 5.0 to 20 km at a maximum width of 250 m. The size of the heat-influenced area typically peaks in October. The studies have established that the thermal plume is directed relatively quickly to the bank, and at about 7-7.5 km after the discharge point the difference between the water temperature and the thermal plume reaches 1.8C (dissipation rate of about 80%). At a temperature difference of 0.2C, the maximum width of the plume from the bank to the waterway reaches 195 m and the length is about 20 m.

Based on the results presented above, we can draw the conclusion that for inflowing water quantities up to Q_T=160 m^3/s the influence of the heat exchange between the heated waters coming from the Kozloduy NPP into the Danube River for the section from kilometre 687 (the point of discharge of the hot channel) to kilometre 678 (the port of Oryahovo) and the environment is negligible and can be ignored. Even after the commissioning of the new unit, the maximum parameters of the plume presented above, based on natural measurements during the operation of the NPP with Q_T=180 m^3/s, will not be reached. After the commissioning of the Kozloduy NPP, some extent of thermal load is observed at Oryahovo (^{km}678) compared to Lom (^{km}743.3), which does not exceed the regulatory threshold of 3C.

During decommissioning

After the decommissioning of the new nuclear unit and the discharge of treated cooling water is discontinued, the thermal profile of the river in the section between the BPS and the Oryahovo WP is expected to recover quickly.

4 DESCRIPTION OF PROTECTED AREAS, HABITATS, SPECIES AND OBJECTIVES FOR THEIR PROTECTION AND THEIR REPORTING DURING PREPARATION OF THE INVESTMENT PROPOSAL

4.1 GENERAL DESCRIPTION OF THE ZLATIYATA PROTECTED AREA WITH CODE BG0002009 UNDER THE BIRDS DIRECTIVE

The Zlatiyata Protected Area is declared by Order no. РД-548/05.09.2008 of the Ministry of Environment and Water and published in SG no. 83/2008.

Zlatiyata PA with code BG0002009 situated at about 1.2 km in a straight line from the NPP Center, having a **total area of:** 43 498.73 ha, comprising of the following municipalities and lands:

District	Municipality	Lands	Unified Classifier of the Administrative-Territorial and Territorial Units (UCATTU)
Vratsa	Kozloduy	Butan	7116
Vratsa	Kozloduy	Glozhene	18505
Vratsa	Kozloduy	Kozloduy	37798
Vratsa	Kozloduy	Kriva bara	39730
Vratsa	Kozloduy	Harlets	77548
Vratsa	Mizia	Sofronievo	68148
Vratsa	Hayredin	Manastirishte	47010
Vratsa	Hayredin	Mihaylovo	48492
Vratsa	Hayredin	Hayredin	77102
Montana	Valchedram	Bazovets	7209
Montana	Valchedram	Valchedram	12543
Montana	Valchedram	Gorni Tsibar	16639
Montana	Valchedram	Zlatiya	31053
Montana	Valchedram	Razgrad	61707
Montana	Valchedram	Septemvriytsi	16184

4.1.1 GENERAL CHARACTERISTICS

The Zlatiyata Protected Area occupies mostly the flat plateau of the same name. It is located in northwestern Bulgaria, in the Danubian Plain between the Danube River and the town of Kozloduy in the north, the road connecting the town of Valchedram and Hayredin to the south, and the river courses and the Tsibritsa and Ogosta rivers from the west and from the east. The Protected Area is located on a flat plateau with open steppic grasslands and arable lands. In some places are situated loess earth walls and low trees and shrubs, mainly from the Common Hawthorn (*Crataegus monogyna*), Dog Rose (*Rosa canina*) and others. In great numbers on earth walls around them is found the Ailanthus (*Ailantis altissima*). On the territory of the Protected Area are located Shishmanov val Dam (Asparuhov val), Buzovets and Hayredin micro-dams and several smaller lakes (Michev & Stoyneva, 2007). On a scattered principle are located pastures, orchards, vineyards, shelterbelts and small groves of deciduous trees and riparian forests along the Ogosta River.

4.1.2 DESIGNATION

According to the Order by the Minister of Environment and Water, the "Zlatiyata" PA is declared Kozloduy NPPprotected with the following objectives:

- Preservation and maintenance of habitats of birds referred to in paragraph 2.1 of the Order and to achieve their favorable conservation status;
- Restoration of habitats of birds referred to in paragraph 2.2 of the Order for which it is necessary to improve the favorable conservation status;

Zlatiyata is not protected under the Protected Areas Act. In 2010, the Asparuhov val Dam and surrounding areas are proposed to be declared as maintained reserve under the Protected Areas Act, but the proposal was not approved.

4.1.3 QUALITY AND RELEVANCE

In the Zlatiyata Protected Area are registered 122 bird species according to the Standard Form, 28 of which are listed in the Red Book of Bulgaria, and 53 species of European conservation concern (SPEC) (BirdLife International, 2004). As globally endangered species under SPEC1 category fall 5 species; as threatened in Europe under SPEC2 category – 15 species; and 36 species under SPEC3. The area is one of the most important areas in the European Union for a group of species, mainly associated with and depending on open spaces – White Stork (*Ciconia ciconia*), Marsh Harrier (*Circus aeruginosus*), Montagu's Harrier (*Circus pygargus*), Levant Sparrowhawk (*Accipiter brevipes*), Red-footed Falcon (*Falco vespertinus*), Tawny Pipit (*Anthus campestris*), Greater Short-toed Lark (*Calandrella brachydactyla*), Ortolan Bunting (*Emberiza hortulana*), etc. In Zlatiyata are found significant populations of European Bee-eater (Merops apiaster), Eurasian Skylark (*Alauda arvensis*) and Common Quail (*Coturnix coturnix*). This is the only place in Bulgaria where in recent years has been reported the Great Bustard (*Otis tarda*). During the winter, in Zlatiyata are encountered and other globally threatened species – Lesser White-fronted Goose (*Anser erythropus*), which uses the fields for feeding together woth flocks of the Greater White-fronted Goose (*Anser albifrons*).

According to the Order for declaring the protected area (SG no. 83/2008), the species under protection within the area are 51. They are distributed as follows:

Thirty-three species under paragraph 2.1 of the Order of the Ministry of Environment and Water

Eurasian Bittern (*Botaurus stellaris*), Little Bittern (*Ixobrychus minutus*), Little Egret (*Egretta garzetta*), Purple Heron (*Ardea purpurea*), White Stork (*Ciconia ciconia*), European Honey Buzzard (*Pernis apivorus*), Black Kite (*Milvus migrans*), Short-toed Eagle (*Circaetus gallicus*), Marsh Harrier (*Circus aeruginosus*), Northern Harrier (*Circus cyaneus*), Pallid Harrier (*Circus macrourus*), Montagu's Harrier (*Circus pygargus*), Levant Sparrowhawk (*Accipiter brevipes*), Long-legged Buzzard (*Buteo rufinus*), Lesser Spotted Eagle (*Aquila pomarina*), Red-footed Falcon (*Falco vespertinus*), Peregrine Falcon (*Falco peregrinus*), Merlin (*Falco columbarius*), Common Crane (*Grus grus*), Great Bustard (*Otis tarda*), European Nightjar (*Caprimulgus europaeus*), Common Kingfisher (*Alcedo atthis*), European Roller (*Coracias garrulus*), Grey-headed Woodpecker (*Picus canus*), Syrian Woodpecker (*Dendrocopos syriacus*), Calandra Lark (*Melanocorypha calandra*), Greater Short-toed Lark (*Calandrella brachydactyla*), Woodlark (*Lullula arborea*), Tawny Pipit (*Anthus campestris*), Barred Warbler (*Sylvia nisoria*), Red-backed Shrike (*Lanius collurio*), Lesser Grey Shrike (*Lanius minor*), Ortolan Bunting (*Emberiza hortulana*).

Eighteen species under paragraph 2.2 of the Order of the Ministry of Environment and Water

Little Grebe (*Tachybaptus ruficollis*), Great Crested Grebe (*Podiceps cristatus*), Black-necked Grebe (*Podiceps nigricollis*), Great Cormorant (*Phalacrocorax carbo*), Grey Heron (*Ardea cinerea*), Mallard (*Anas platyrhynchos*), Garganey (*Anas querquedula*), Eurasian Sparrowhawk (*Accipiter nisus*), Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*), Eurasian Hobby (*Falco subbuteo*), Water Rail (*Rallus aquaticus*), Common Moorhen (*Gallinula chloropus*), Eurasian Coot (*Fulica atra*), Little Ringed Plover (*Charadrius dubius*), Northern Lapwing (*Vanellus vanellus*), European Bee-eater (*Merops apiaster*), Sand Martin (*Riparia riparia*).

Zlatiyata is the most compact uninhabited flat area in the country. It is affected by human activities mainly related to agriculture, forest management and infrastructure development. Intensification of agriculture, use of pesticides and fertilizers, removal of hedges and shrubs are the activities of most serious negative impact on the quality of the habitat.

Clearing of riparian forests and trees in shelter belts lead to a rapid and sharp decline in the population of the Red-footed Falcon, due to the disappearance of nesting grounds. As a potential threat to the habitats and birds in the area is the construction of wind farms.

4.1.4 DESCRIPTION OF SPECIES' HABITATS

The Standard Form of protected area identifies the following habitat types:

Land cover classes	% Coverage
Inland water (standing water, running water)	1
Shrub associations	0
Dry grasslands, steppe	4
Extensive grain crops (including rotational crops with fallow lands)	90
Other arable land	0
Broadleaf deciduous forest	1
Non-forest areas with woody vegetation (trees and vineyards, roadside trees)	1
Inland cliffs, screes, sands, permanent snow and glaciers	0
Other land (including towns, villages, roads, landfills, mines, ind. sites)	3
Total coverage	***100***

4.2 GENERAL DESCRIPTION OF THE OSTROVI KOZLODUY PROTECTED AREA WITH CODE BG0000533 UNDER THE HABITATS DIRECTIVE

The Ostrovi Kozloduy Protected Area with code BG0000533 is defined under Article 6, paragraph 1, items 1 and 2 of the Biological Diversity for conservation of natural habitats and wild flora and fauna. Situated at about 3.03 km in a straight line from the NPP Center, having a total area of 9090.35 dca and consists of the following municipalities and lands:

Area	Community	Lands	UCATTU
Vratsa	Kozloduy	Kozloduy	37798
Vratsa	Kozloduy	Harlets	77548

4.2.1 GENERAL CHARACTERISTICS

The Ostrovi Kozloduy PA, code BG0000533, is of type C under Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora (i.e. no connection with other protected areas under Natura 2000). Total protected area is 9090.35 dca. It is located at an altitude between 20 and 34 m.

4.2.2 DESIGNATION

The area includes three larger islands. About 70% of the Ostrovi Kozloduy are covered by forests. The western part of the Svraka Island is covered with sand deposits.

The main objectives of conservation in the protected area are as follows:

Keeping the area of natural habitats and habitats of species and their populations under protection within the protected area.

The site is of medium to high conservation value. Northern part of the Svraka Island and the gore of Kozloduy Island are relatively unaffected by human activity. Southern part of the Svraka Island and the tail of Kozloduy Island are threatened by intrusion of alien tree and shrub species. In the protected area are preserved natural forests of White Willow (*Salix alba*), Field Elm (*Ulmus minor*) and Black Poplar (*Populus nigra*).

4.2.3 QUALITY AND RELEVANCE

The site is of medium to high conservation value.

According to land cover classes, the PA is divided into the following groups:

Land cover classes	% Coverage
Coastal sand dunes, sandy beaches	9
Inland water (standing water, running water)	33
Swamps, marshes, vegetation along the ponds, swamps	4
Shrub associations	12
Broadleaf deciduous forest	7
Artificial forest monoculture (planting of poplars or single tree specimens)	34
Other land (including towns, villages, roads, landfills, mines, ind. sites)	1
Total coverage	***100***

4.2.4 VEGETATION TYPES AND HABITATS UNDER CONSERVATION WITHIN THE PROTECTED AREA

The following habitats under Annex I to Directive 92/43/EEC are included as objects of protection in the Standard Form of the area:

CODE	BC.	NAME	% Coverage	Rep.	Rel. area	Align. degree	Overall rating
91E0	*	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Pandion, Alnion incanae, Salicion albae*)	21.305	B	C	B	B
3130		Oligotrophic to mesotrophic standing waters with vegetation of *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*	6	B	C	A	A
3270		Rivers with muddy banks with *Chenopodion rubri* and *Bidention pp*	3	B	C	B	B
91F0		Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Fraxinus excelsior* or *Fraxinus angustifolia* along large rivers (*Ulmenion minoris*)	0.0933	D	C		

NB. The "" symbol indicates habitat types of the highest conservation priority.*

In the table of different habitats is given an evaluation according to the indicators:

Representation /gives an indication at what degree the habitat is "typical". The following grading system is used: A – excellent representation; B – good representation; C – considerable representation; D-minor presence;

Relative area /area of the site covered by a habitat referred to the total area of the national territory covered by this habitat/. Used intervals according to classes are as follows: a) 100> = p> 15%; B) 15> = p> 2%; C) 2> = p> 0;

Aligned degree /conservation degree of the structure and functions of a habitat and the recover ability are evaluated/. The following grading system is used: A – excellent conservation; B – good conservation; C – considerable or minor conservation;

Overall rating of the value of the site for conservation of specific habitat type /integrated evaluation of previous criteria, taking into account their different weight of the habitat in consideration. The following grading system is used: A – excellent value; B – good value; C – considerable value.

3130 Oligotrophic to mesotrophic standing water basins with vegetation of *Littoreletea uniflorae, Isoeto-Nanojuncetea* with an area of 36.36 ha.

This habitat is represented by the subtype that is characteristic of the lowlands within the protected area (22.12x22.32 of PAL. CLASS.). In the area are included pioneer communities

of annual hygrophytes developed on drying wet sediments after water withdrawal in the second half of the summer, in the periphery of large shallow lakes and along banks of major rivers. This vegetation is of dynamic nature and short-living. Monodominant cenoses of *Eleocharis acicularis* (*Eleocharidetum acicularis* association) are formed on waterlogged pitches. They generally occupy small areas – up to a few square meters. It develops in the water (about 1 cm deep). With drying of the exposed coastline, the composition of these cenoses begins to vary. On muddy ground are growing cenoses consisting mainly of *Dichostylis michelianus* = *Cyperus michelianus*, Flowering Rush (*Butomus umbellatus*), Brown Galingale (*Cyperus fuscus*), Cockspur Grass (*Echinochloa crus-galli*), Common Spike-rush (*Eleocharis palustris*), Marsh Cudweed (*Gnaphalium uliginosum*), Yellowseed False Pimpernel (*Lindernia dubia*), Pale Smartweed (*Persicaria lapathifolia*), Common Purslane (*Portulaca oleracea*), Creeping Yellowcress (*Rorippa sylvestris*). These communities typically form complexes with ruderal cenoses, and often in their composition are encountered various nitrophilous ruderals – White Pigweed (*Amaranthus albus*), Purple Amaranth (*A. lividus*), Devil's Beggarticks (*Bidens frondosa*), Lamb's Quarters (*Chenopodium album*), Epazote (*C. ambrosioides*), Many-seed Goosefoot (*C. polyspermum*), Italian Cockleburr (*Xanthium italicum*). In coenoses that grow on poorer sandy sediments there are species from the upper group and species that are more specific to sandy substrates – Hungarian Milkvetch (*Astragalus contortuplicatus*), Foxtail Pricklegrass (*Crypsis alopecuroides*), Glomerate Cyperus (*Cyperus glomeratus*), Damascisa (*Glinus lotoides*). At the most elevated part of the coastline the ground is highly compacted and soil salinisation processes are occurring. In this area are developed closed cenoses of (*Pulicario-Menthetum pulegii*), with pronounced halophytic nature that occupy most of the areas. Dominating species are Creeping Bentgrass (*Agrostis stolonifera*), Bermuda Grass (*Cynodon dactylon*), Meadow Fleabane (*Inula britannica*), Purple Loosestrife (*Lythrum salicaria*), European Pennyroyal (*Mentha pulegium*), Common Silverweed (*Potentilla anserina*), Common Fleabane (*Pulicaria dysenterica*), Small Fleabane (*P. vulgaris*), Strawberry Clover (*Trifolium fragiferum subsp. bonannii*). According to syntaxonomical classification, all cenoses in the composition of this habitat belong to the Isoeto-Nanojuncetea class.

Natural habitat has not been confirmed in the protected area during mapping within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, conducted in the period 2011-2012..

3270 Rivers with muddy banks with *Chenopodion rubri* and *Bidention* p.p with an area of 18.18 ha. Based upon mapping within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, conducted in the period 2011-2012, it was found that the habitat has ab area of 8.03 ha and is fairly typical.

The natural habitat is of short presence within the dewatered river banks on alluvial mud deposits. Due to the richness of nitrogen, communities are nitrophilous and represent serial cenoses following the receding water. To this habitat are referred muddy river banks

of major rivers in the lowlands, where annual tall (average 0.50-0.70 m) pioneer nitrophilous (ruderal) plant communities (*Bidention* and *Chenopodion rubri* associations of the *Bidentetea tripartiti* class) are developing. Their communities develop after receding of water over the sludge, which is high in organic matter and nitrogen. Usually appear in the late summer, while the shore still looks muddy and devoid of vegetation that develops later. If the conditions are not favorable, e.g. due to autumn rains and floods and the water level remains high, it is possible that vegetation may be restricted in its development or to be entirely missing within one growing season. Forms mosaic associations with the above-described type of 3130. Typical species are: Sweet Wormwood (*Artemisia annua*), Nodding Beggarticks (Bidens cernua), Devil's Beggarticks (B. frondosa), Three-lobe Beggarticks (*B. tripartita*), Water Whorl-grass (*Catabrosa aquatica*), Epazote (*Chenopodium ambrosioides*), Oak-leaved Goosefoot (*C. glaucum*), Red Goosefoot (*C. rubrum*), False Nutsedge (*Cyperus strigosus*), Cockspur Grass (*Echinochloa crus-galli*), Purple Loosestrife (*Lythrum salicaria*), Giant Chickweed (*Myosoton aquaticum*), Water Pepper (*Persicaria hydropiper*), Pale Persicaria (*P. lapathifolia*), Tasteless Water Pepper (*P. mitis*), Common Knotgrass (*Polygonum aviculare*), Water Chickweed (*Potentilla supina*), Cursed Buttercup (*Ranunculus sceleratus*), Sharp Dock (*Rumex conglomeratus*), Golden Dock dock (*R. maritimus*), Marsh Dock (*R. palustris*), Water Speedwell (*Veronica anagallis-aquatica*), Italian Cockleburr (*Xanthium italicum*).

91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* with an area of 230.97 ha

During mapping within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, conducted in the period 2011-2012, it is ascertained that the habitat has an area of 230.97 ha. This area is larger than the one currently in the standard form. It is described as a typical according to its species structure.

The habitat is formed on the rich alluvial soils periodically flooded with seasonal rise of the Danube River level. In the Ostrovi Kozloduy PA it is represented by subtype 3: Riparian willow-poplar forests. Riparian floodplain forests are dominating primarily species of the White Willow (*Salix alba*), White Poplar (*Populus alba*), Black Poplar (*Populus nigra*) and Crack Willow (*Salix fragilis*). Willow species form the pioneer communities of freed sandy-clay spits and alluvial sediments, which are constantly changing depending on the dynamics of the alluvium of the Danube River. Plant communities belong to the Salicion albae union. In some areas is developed shrub layer consisting of Common Dewberry (*Rubus caesius*), Common Hawthorn (*Crataegus monogyna*), Common Dogwood (*Cornus sanguinea*), European Spindle (*Euonymus europaeus*), Wild Privet (*Ligustrum vulgare*). At many places the primary structure of riparian forests is strongly modified by the mass participation of the invasive American species Desert False Indigo (*Amorpha fruticosa*) in the shrub layer. The prevalence of climbers is typical of this habitat – Old Man's Beard (*Clematis vitalba*), Common Hop (*Humulus lupulus*), Hubei Grape (*Vitis sylvestris*). Floristic structure of the grass layer is diverse and includes mainly hygrophytes, nitrophytes and

many ruderals. Mainly are encountered the Common Marshmallow (*Althaea officinalis*), Devil's Beggarticks (*Bidens frondosa*), Three-lobe Beggarticks (*B. Tripartita*), Larger Bindweed (*Calystegia sepium*), Creeping Thistle (*Cirsium arvense*), Cockspur Grass (*Echinochloa crus-galli*), annual Fleabane (*Erigeron annuus*), Shining Spurge (*Euphorbia lucida*), Bog Spurge (*E. palustris*), Cleavers (*Galium aparine*), Marsh-bedstraw (*G. palustre*), Regaliz Espinoso (*Glycyrrhiza echinata*), Yellow Iris (*Iris pseudacorus*), Summer Snowflake (*Leucojum aestivum*), European Bugleweed (*Lycopus europaeus*), Creeping Jenny (*Lysimachia nummularia*), usually Yellow Loosestrife (*L. vulgaris*), Plain purple loosestrife (*Lythrum salicaria*), Marsh Forget (*Myosotis scorpioides*), Common Reed (*Phragmites australis*) , Amphibious Yellowcress (*Rorippa amphibia*), Bittersweet (*Solanum dulcamara*), Common Comfrey (*Symphytum officinale*), Bulrush (*Typha latifolia*), Common Nettle (*Urtica dioica*), etc.

Although this habitat is typical in species composition, the Kozluduy Islands PA shows lower values of some key indicators used for assessing the conservational status of habitat 91E0 Kozloduy NPP(intensive cultivation of poplar plantations in the vicinity and the introduction of hybrid poplar in its areas, illegal cutting, significant participation of species that are not typical for the local flora).

91F0 Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Fraxinus excelsior* or *Fraxinus angustifolia* along rivers (*Ulmenion minoris*): 3.17 ha

This habitat includes mixed lowland riparian forests that are part of intrazonal vegetation prevalent in river valleys. A special feature is the periodic flooding. The natural habitat in the Ostrovi Kozloduy PA is represented by the 2nd subtype 2, namely: **Humid lowland of oak forests.** These are multilevel forests dominated by the Pedunculate Oak (*Quercus robur*) or Pedunculate Oak (*Quercus pedunculiflora*) and participation of climbing plants, but less than the forests. Grass species diversity is relatively less. It is well-developed in the spring ephemeral synusia. In the recent past they were widespread everywhere in appropriate places in the Danubian Plain and the Ludogorie. The locals called them “Ormani" or “Elii”. The first forest floor is formed by the Caucasian Ash (*Fraxinus oxycarpa*), Wild Pear (*Pyrus pyraster*) and Summer Oak (*Quercus robur*). The Elm (*Ulmus minor*), Tartarian Maple (*Acer tataricum*) and Field Maple (*Acer campestre*) form a lower second forest floor. Shrub layer is formed by the Common Hawthorn (*Crataegus monogyna*), Dogwood (*Cornus mas*), Hazel (*Corylus avellana*), and Wild Privet (*Ligustrum vulgare*). On the ground floor are situated the most common species but in variable numbers: Yellow Anemone (*Anemone ranunculoides*), Cuckoo Pint (*Arum maculatum*), Slender False Brome (*Brachypodium sylvaticum*), Purple Gromwell (*Buglossoides purpurocaerulea*), Spring Fumewort (*Corydalis bulbosa*), Cocksfoot (*Dactylis glomerata*), Gagea minima, Cleavers (*Galium aparine*), Wood Avens (*Geum urbanum*), Isopyrum thalictroides, Chinese-lantern (*Physalis alkekengi*), Broad-leaved Solomon’s seal (*Polygonatum latifolium*), Blue Lungwort (*Pulmonaria officinalis*), Common Dewberry (*Rubus caesius*), Two-leaf Squill (*Scilla bifolia*), Tall Skullcap (*Scutellaria altissima*) and Sweet Violet (*Viola odorata*). There are also several facultative sciophyte anthropophytes such as the Birthwort (*Aristolochia clematitis*),

Morning Glory (*Calystegia sylvatica*), Heracleum sibiricu, Common Nettle (*Urtica dioica*), and others. Often bordering with riparian forests of willows and poplars, but they occupy the drier places.

During mapping within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, conducted in the period 2011-2012, it is ascertained that the habitat is close to the typical according to its species structure, but some key indicators such as the composition and age of the first forest floor, and the presence of invasive species are of lower values. Adverse effects on the habitat's status are exerted also by the planted hybrid poplars and the leaching of river banks by the Danube River.

During field studies, conducted in the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, another habitats of European importance were found in "Ostrovi Kozloduy PA:

3150 Natural eutrophic lakes with vegetation of the *Magnopotamion* or *Hydroharition* communities, having an area of 3.69 ha.

To this habitat in the area are included eutrophic to mesotrophic oxbow lakes and old river beds with muddy water and rich of organic components. Here are included water basins of partially anthropogenic origin (e.g. abandoned flooded ballasts, old river beds), if the typical hydrophilic cenoses are developed in them. Vegetation includes the communities of free-floating plants belonging to the Hydroharition communities; communities of rooted plants with floating leaves – Nymphaeion albae communities; communities of submerged macrophytes from the Potamion communities. Typical plant species: for Hydroharition – Frogbit (*Hydrocharis morsus-ranae*), Gibbous Duckweed (*Lemna gibba*), Common Duckweed (*L. minor*), Star Duckweed (*L. trisulca*), Floating Fern (*Salvinia natans*), Greater Duckweed (*Spirodela polyrhiza*), Water Soldier (*Stratiotes aloides*), Rootless Duckweed (*Wolffia arrhiza*), which form a monodominant or mixed cenoses; for *Nymphaeion alba* – Yellow Water-lily (*Nuphar lutea*), European White Waterlily (*Nymphaea alba*), Fringed Water-lily (*Nymphoides peltata*), Longroot Smartweed (*Persicaria amphibia*), Broad-leaved Pondweed (*Potamogeton natans*), Water Caltrop (*Trapa natans*); for Potamion – Rigid Hornwort (*Ceratophyllum demersum*), Soft Hornwort (*C. submersum*), Pondweed (*Elodea canadensis*), Western Waterweed (*E. nuttallii*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Whorled Water Milfoil (*M. verticillatum*), Spiny Naiad (*Najas marina*), Brittle Naiad (*N. minor*), Curly-leaf Pondweed (*Potamogeton crispus*), Variableleaf Pondweed (*P. gramineus*), Shining Pondweed (*P. lucens*), Clasping-leaf Pondweed (*P. perfoliatus*), Small Pondweed (*P. pusillus*), Hairlike Pondweed (*P. trichoides*), Horned Pondweed (*Zannichellia palustris*). This habitat does not include belts or basins entirely overgrown with reed and rush.

The group "Other significant plant and animal species", which are related to conservation and management of the site, includes two plant species.

Tax. group	NAME (in English) / NAME (in Latin)	Local population	Motivation
P	*Shining Spurge / Euphorbia lucida*	R	D
P	*Summer Snowflake / Leucojum aestivum*	R	D

Where:

Tax. group – taxonomic group of the species is marked according to the following nomenclature: P – plants.

Name – the name of the species.

Local population – Where there is no digital data, the size/density of the population is marked whether species is typical (C), rare (R) or very rare (V). When there is no evidence of any population, it is marked as present (P).

Motivation – the motivation for the inclusion of each species is shown using the following categories: A) National Red Book; B) Endemic; C) International Conventions (including the Bern, Bonn and the Convention on Biological Diversity); D) other reasons.

Shining Spurge (*Euphorbia lucida*) is a species of the Euphorbiaseae family, which has a relatively limited distribution in Bulgaria. Is included in the Red List of vascular plants in Bulgaria (Petrova & Vladimirov, 2009) in the Vulnerable category [VU A2c; B1b (ii,iv)c(ii, iv);C1]. The species is not subject to collection. Its population in the area is in good condition.

Summer Snowflake (*Leucojum aestivum*) belongs to the Amaryllidaceae family and is one of the most popular medicinal plants in Bulgaria. Because of its limited distribution and the fact that it is collected the species is included in Annex no. 4 of Biological Diversity Act, in the Red Book of Bulgaria (Peev, etc., on line) in the Endangered category, and in the IUCN Red List of vascular plants in Bulgaria (Petrova & Vladimirov, 2009) in the Vulnerable category [VU A2abcd; B1ab(ii,iv); D2]. Population of the species in the area is in good condition.

Effects[16]:

Direct disturbance (destruction, damage, fragmentation) of natural habitats or the habitats of plant species. Protected area, natural habitats and the habitats of plant species in it are far enough and shall not suffer direct consequences in this regard. **No direct negative impact on natural habitats and the habitats of plant species within the Ostrovi Kozloduy PA are expected (rating 0).**

4.2.5 ANIMAL SPECIES SUBJECT TO PROTECTION

Animal species in this area subject to protection under the Standard Form are as follows:

4.2.5.1 INVERTEBRATES (INVERTEBRATA)

Thick Shelled River Mussel (*Unio crassus*) – Conservation status: endangered species according to IUCN Red List (2013), Annexes no. 2 and no. 3 of the BDA. The species has an overall rating "A" (excellent) under the standard form of Natura 2000 for the area.

In the Standard Form the species is listed as rare (R). Live specimens and shells of the Thick Shelled River Mussel are found in the area (05.09.2011, data of M. Todorov). There have been 23 live specimens and 131 shells (0,5 specimens/m^2) in three sections of the area: against the front of the island, against the widest section and after the ferry at the beach from the town of Kozloduy.

[16] All effects are assessed in general matrix presented in **Table 4.3** - 1

FIGURE 4.2-1: DISTRIBUTION OF THICK SHELLED RIVER MUSSEL (UNIO CRASSUS) IN THE REGION OF KOZLODUY ISLANDS PA

The Thick Shelled River Mussel (*Unio crassus*) is a burrowing natural water filter that prefers silty-clayey and clayey-sandy beds. The development of the species is by metamorphosis – parasitic larvae (glochidia) that adhere to a variety of fish, e.g. European Chub (*Squalius cephalus*), Common Rudd (*Scardinuis erythrophthalmus*), Three-spined Stickleback (*Gasterosteus aculeatus*), Eurasian Ruffe (*Gymnocephalus cernuus*), European Perch (*Perca fluviatilis*), etc.

The species is particularly sensitive to changes in hydrochemical parameters – concentration of dissolved oxygen and nitrate content. At concentrations above 2.3 mg NO_3-N/l is registered increased mortality of juveniles and above 10 mg NO_3-N/l the reproduction stops.

The main threats to the species are water pollution, hydromorphological changes and changes in the composition of the host fish species. Threat to the species are the invasive mussel species: of the *Dreissena* genus, forming fouling on mussels of the *Unio* genus (e.g. Chinese Pond Mussel, *Anodonta woodiana*), which are competitors in terms of food and shelter; and of the *Corbicula* genus, which high numbers change habitats and reduce the plankton and larvae of other mussel species due to the high rate of filtration. Of the general impacts under the Standard Form that are directly influencing this species could be specified the "invasion of a certain species", as it is negative, and having an area of 50% of the Protected Area. In the Danube River, within the area of consideration, are identified high numbers of the invasive Asian Clam (*Corbicula fluminea*) – 50-100 specimens/m^2 (15.06.2012, 05.08.2012). The Asian Clam (*Corbicula fluminea*) has been registered in a number of localities in the Danube River above and below the area – at Dolni Tsibar (100 specimens/m^2, at Asparuhov val Pumping Station, at Radetzky Port and in the area between Misia and Oryahovo (19.02.2013), at Oryahovo (5-6.09.2012) and in the Hot

Channel of the NPP (18.02.2013). Another invasive mussel species with potentially negative impact is the Chinese Pond Mussel (*Anodonta woodiana*), which is also found in a number of fields above and below the area – at Dolni Tsibar (^{km}718) (05.09.2012), at Asparuhov val Pumping Station (^{km}701) (05.09.2012), Radetzky Port and in the area between Misia and Oryahovo (19.02.2013), at Oryahovo (^{km}678) (06.09.2012) and massively at the Hot Channel of the NPP (18.02.2013). The invasive mussel species of the Dreissena genus have also been encountered in the area – 6-20 specimens/m^2 (15.06.2012, 05.08.2012) and outside the area – in the Danube River at Dolni Tsibar, Asparuhov val Pumping Station, at Oryahovo (5-6.09.2012); at Radetzky Port and in the area between Misia and Oryahovo (19.2.2013), including in the Asparuhov val Dam in 2006, 2009 and on 14.01.2013.

In the region over the area (at Asparuhov val Pumping Station – inoperative) are registered high oxygen levels even in times of low water and high water temperatures (on 05.09.2012) – 7,5 mg.dm-3 and saturation of 91%. Possibly on the account of the natural aeration by rapid river flow and especially due to the development of excessive amounts of water plants – Pondweed (*Potamogeton spp*.), Watermilfoil (*Myriophyllum sp*.), filamentous green algae (*Spyrogira sp*.) provide sufficient oxygen, even in this unfavorable ecological situation. Ecological status according to river bed invertebrates (15.06.2012, 05.08.2012) is defined as "moderate" and the Biotic Index has a value of 3-4.

Stag Beetle (*Lucanus cervus*) – Conservation status: listed in Annexes no. 2 and no. 3 of BDA. The species has an overall rating "C" in the Standard Form for the area under Natura 2000, but the results of the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 1, in the period 2011-2012, the species was not encountered in the area.

During field study were not identified suitable habitats for development of the species. The Stag Beetle (*Lucanus cervus*) is encountered in forests of zonal forest type that are missing in the area. The Broadleaf deciduous forests in the area are represented exclusively by riparian floodplain habitats. During periods of high waters of the Danube River in the spring, the habitats are flooded, which is the main reason for the absence of appropriate conditions for the development of the larval stage of the Stag Beetle, i.e. the area is lacking suitable habitat for the species.

4.2.5.2 VERTEBRATES (VERTEBRATA)

4.2.5.2.1 Pisces

In the area are found a total of 14 target fish species according to the Standard Form and the "Subject and Objectives" (**Table 4.2-1**).

TABLE 4.2-1: TARGET SPECIES IN OSTROVI KOZLODUY PA ACCORDING TO THE STANDARD FORM

Code	Name (in English) / Name (in Latin)	Local population	Population migration			Evaluation			
			breeding	wintering	passing	population	protection	insulation	Overall rating
2491	Pontic Shad (*Alosa pontica*)		C			C	B	C	C
1130	Asp (*Aspius aspius*)	C				B	A	C	A
2533	Balkan Loach (*Cobitis elongata*)	C				B	A	C	A
1149	Spined Loach (*Cobitis taenia*)	R				D			
2484	Ukrainian Brook Lamprey (*Eudontomyzon mariae*)	V				C	A	A	A
1124	White-finned Gudgeon (*Gobio albipinnatus*)	C				C	A	C	A
2555	Balon's Ruffe (*Gymnocephalus baloni*)	C				B	A	C	A
1157	Striped Ruffe (*Gymnocephalus schraetser*)	C				B	A	C	A
2522	Sichel (*Pelecus cultratus*)	P				D			
1134	European Bitterling (*Rhodeus amarus*)	C				C	A	C	A
1159	Common Zingel (*Zingel zingel*)	C				B	A	C	A
1160	Small vretenarka (*Zingel streber*)	R				B	A	C	A
1145	European Weatherfish (*Misgurnus fossilis*)	C				B	A	C	A
1146	Balkan Loach (*Sabanejewia aurata*)	P				D			

Ukrainian Brook Lamprey (*Eudontomyzon mariae*) – Over the past 20 years, the species was once found in the region of the town of Tutrakan. Several specimens were caught during scientific electrical fishing in the central island swamp at the end of the summer season of 2006. Two of the specimens are kept for analysis in scientific collections of the NMNHS. According to verbal notes by fishermen, in the last 5 years the species is captured in several regions of Ruse, Silistra and Belene Island. In the region of the Protected Area the species has not been recorded, but there are suitable habitats for it. In the Form of the area the species is listed as a rare, having a low-density, but in a good conservation status. Biology of the species inhabiting the Danube River is unexplored.

Pontic Shad (*Alosa pontica*) – This species is anadromous and migrates to spawn in the Danube River in May by moving in large schools in the upper layers of the water. In the past it was a valuable commercial species and was widely fished throughout the Bulgarian section of the river. The Regulation to catch this fish species is consistent with its spawning period and catches are now relatively small.

Asp (*Aspius aspius*) – According to the Standard Form the species is relatively rare in the area, having a low density, but in a good conservation status. According to our data, obtained in a survey of catches of fishermen, there were found permanent catches of specimens of different age, demonstrating the steady status of the species.

White-finned Gudgeon (*Gobio albipinnatus*) – The species is listed in the Form as a common species in good conservation status. Found in the Danube River, and also encountered in the lower reaches of some tributaries.

Sichel (*Pelecus cultratus*) – A very rare species for the Danube River. The species was once economically important and now its density has dropped to the brink of survival. According to the Standard Form the species is common, but source of information is unclear. In recent years, only single specimens are caught within the area.

European Bitterling (*Rhodeus amarus*) – Widely spread in all suitable water basins in the area and in the Danube River. The female deposits her eggs inside freshwater mussels of the Unionidae family.

Balkan Loach (*Cobitis elongata*) – The species is registered in the Standard Sorm for the area as very rare. The species was not established in the area during field studies conducted by us.

Spined Loach (*Cobitis taenia*) – In recent years, the populations of this species were divided into separate species. Thus, in Bulgaria and in the Danube River is encountered the species C. elongatoides Bacesku & Maier, 1969. However, the species is registered in the Standard Form under the name Cobitis taenia. A common species in the coastal sand habitats in the area.

Both species, the Balon's Ruffe (*Gymnocephalus baloni*) and **Striped Ruffe (*Gymnocephalus schraetzer*)** are reported as common species with stable conservation statuses. Both species are found in the area, inhabiting river sections with gravel bottom.

The two species, Common Zingel (*Zingel zingel*) and Streber (*Zingel streber*), are registered in the Form as rare, but in a good conservation status. These cold-water species are active during the winter and in the early spring, when they breed. During the rest of the year the species are hiding in the deeper sections and their encountering is difficult and accidental.

European Weatherfish (*Misgurnus fossilis*)

The species is listed in the Standard Form for the area, but is not registered during the field studies.

4.2.5.2.2 Amphibians

According to the Standard Form, within the area are encountered two amphibian species included in Annex II of the Habitats Directive – the Danube Crested Newt (having "D" rating for population size) and the European Fire-bellied Toad (having "D" rating for population size).

Danube Crested Newt (*Triturus dobrogicus)*

On the territory of the country the species is proven only for the Danube River (and one unconfirmed habitat in the north coast of the Black Sea). The species inhabits standing lakes, rivers and canals with slow currents, and their surroundings. According to the model of potential habitat (Naumov, 2013a) the total area of the habitat of the species in the Ostrovi Kozloduy PA is 907.56 ha (over 99% of the area). They are categorized as follows: "poorly suited" – 194.23 ha, "suitable" – 693.12 ha; "optimal" – 20.21 ha. The conservation status of the species in the area has been assessed as "negative" due to a fire with a significant area (Naumov, 2013a).

European Fire-bellied Toad (*Bombina bombina)*

The species is widespread in the Danubian Plain. It is also found at many places in the Thracian Plain. Separate habitats are found along the Black Sea coast. The species inhabits standing and slow current water basins – from small pools to large lakes, and also lives in the Danube River. According to the model of potential habitat (Tsankov, 2013), the total area of habitats in Ostrovi Kozloduy PA is 908.52 ha (over 99% of the area). They are categorized as follows: "poorly suited" – 0.66 ha; "suitable" – 412.08 ha; "optimal" – 495.78 ha. The conservation status of the species in the area has been assessed as "negative" due to a fire with a significant area (Tsankov, 2013a).

4.2.5.2.3 Reptiles – Reptilia

European Pond Turtle (*Emys orbicularis)*

The species is widespread in the country; from the sea level to an altitude of about 1100 m. It is encountered in standing and slow current water basins – ponds, lakes, rivers, canals, etc. According to the model of potential habitat (Tsankov, 2013b), the total area of habitats in Ostrovi Kozloduy PA is 908.12 ha (over 99% of the area). They are categorized as follows: "poorly suited" – 208.89 ha , "suitable" – 224.68 ha; "optimal" – 474.55 ha. The

conservation status of the species in the area has been assessed as "negative" due to a fire with a significant area (Tsankov, 2013b).

4.2.5.2.4 Mammals – Mammalia

European Otter (*Lutra lutra*)

According to the Standard Form, the territory of the Protected Area is inhabited by 3-4 specimens. Data on this species are scarce. The European Otter is found in all parts of the Danube River with preserved natural dense vegetation, and in the Danube marshes, ponds and lakes. Currently there are no detailed data. (Georgiev and Koshev, 2006). Its numbers in the monitoring zone are relatively low. The species is found in artificial water basins in the region of km327 of the Danube River. The European Otter has been observed at the discharge of the Hot Channel of Kozloduy NPP at Bank Pumping Station of the Danube River: 43045' 04.7'' N and 230 51' 41.1''E and Ostrovi Kozloduy PA: 43047' 24.3'' N и 23042' 55.7'' E.

On **Figure 4.2-2** are shown habitats of the European Otter (Lutra lutra) in the area and in the surrounding areas.

FIGURE 4.2-2:. HABITATS OF THE EUROPEAN OTTER (*LUTRA LUTRA*) IN OSTROVI KOZLODUY PA AND THE MOUTH OF THE HOT CHANNEL

Legend: – *encounters of the European Otter;* – *alterantive sites for realization of the new nuclear unit.*

4.3 GENERAL DESCRIPTION OF OGOSTA RIVER PROTECTED AREA, WITH A CODE BG0000614 UNDER THE HABITATS DIRECTIVE

The Ogosta River Protected Area, with a code BG0000614, is defined according to Article 6, paragraph 1, items 1 and 2 of the BDA – SG no. 96/07.12.2010. It is situated at about 6.09 km in a straight line from the NPP Center, having a **total area of** – 13 657.38 dca and comprising of the following municipalities and lands:

District	Municipality	Lands	UCATTU
Vratsa	Kozloduy	Butan	7116
Vratsa	Kozloduy	Glozhene	18505
Vratsa	Kozloduy	Kriva bara	39730
Vratsa	Kozloduy	Harlets	77548
Vratsa	Mizia	Voyvodovo	11853
Vratsa	Mizia	Mizia	48043
Vratsa	Mizia	Saraevo	65396
Vratsa	Mizia	Sofronievo	68148
Vratsa	Oryahovo	Oryahovo	54020

4.3.1 GENERAL CHARACTERISTICS

The Ogosta River Protected Area with code BG0000614 is of type K under Directive 92/43/EEC, protected area under the Habitats Directive, which partly covers protected area under the Birds Directive. The total protected area is 12,532.40 dca. It is located at an altitude between 19 and 183 m. The Protected area is connected to other protected areas under Natura 2000.

4.3.2 DESIGNATION

The main objectives of conservation in the protected area are as follows:

- → Keeping the area of natural habitats and habitats of species and their populations under protection within the protected area.
- → Preserving the natural state of natural habitats and habitats of species subject to protection within the protected area, including the natural species composition and conditions of the environment.
- → Rehabilitation, if necessary, of the size and natural condition of priority habitats and habitats of species and populations of species subject to conservation within the protected area.

In the protected area is included the river valley of the Ogosta River. River banks of the Ogosta River been strengthened, the river bed is filled with lots of sediments and the water is eutrophic, which is the consequence of the influence of the dam next to the town of Montana. Accumulation of sediments and eutrophic water cause the formation of habitats

3260 and 3270, which are of European importance. Near the Kriva bara village is located 5-km old riverbed, which has become an eutrophic lake with macrophytes. On the right bank of the Ogosta River is located the Daneva mogila Protected Area, established by Order no. 413/05.10.1982. The area is characterized by its beautiful scenery and a group of old trees of the Quercus robur. Near the mouth of the Ogosta River is located the "Blatoto" (3150). The last 4-5 km of the river are covered with aquatic vegetation (3260), and are rich in fish. On the slopes of the wetland in the west of the town of Oryahovo is located Panonian loess steppe vegetation* (3260) with diverse flora and fauna.

4.3.3 QUALITY AND RELEVANCE

The site is of medium to high conservation value.

According to land cover classes, the territory of the Protected Area is divided into the following groups:

Land cover classes	% Coverage
Inland water (standing water, running water)	3
Swamps, marshes, vegetation along riverbanks, bogs	7
Dry grasslands communities, steppe	2
Extensive grain crops (including rotational crops with fallow lands)	20
Improved pastures (artificially created from grass mixtures)	56
Broadleaf deciduous forests	2
Artificial forest monoculture (e.g. plantations of poplar or exotic trees)	10
Total coverage	***100***

4.3.4 TYPES OF VEGETATION AND NATURAL HABITATS SUBJECT TO PROTECTION IN THE PROTECTED AREA

The following habitats and flora species have been included in the Standard Form of the area as subjects of protection:

TABLE 4.3-1: TYPES OF HABITATS LISTED IN ANNEX 1 TO DIRECTIVE 92/43/EEC

CODE	BC.	NAME	% Coverage	Rep.	Ref. area	Nature. Senior	Overall rating
91E0	*	Alluvial forests of *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Pandion, Alnion incanae, Salicion albae*)	0.232	A	C	A	A
3150		Natural eutrophic lakes with vegetation of the *Magnopotamion* or *Hydrocharition* type	7.4	A	C	A	A
3260		Lowland and mountain rivers with vegetation of *Ranunculion fluitantis* and *Callitricho-Batrachion*	0.2	A	C	A	A
3270		Rivers with muddy banks with *Chenopodion rubri* and *Bidention p.p.*	0.2	A	C	A	A
6250	*	Pannonian loess steppic grasslands communities	9.553	A	C	A	A
91Z0		Moesian forests of Silver Lime	0.537	D	C		

The group "Other significant plant and animal species", which are associated with protection and management of the site, includes the following plant species:

Taxonomic group	Name (in English) / Name (in Latin)	Local population	Motivation
P	Woundwort /*Stachys arenariaeformis*	P	A
P	Spotless Watermeal /*Wolffia arrhiza*	P	A

3150 Natural eutrophic lakes with vegetation of the type *Magnopotamion* or *Hydroharition*: 2.12 ha

The main features of the habitat are described in the relevant position in the Protected Area Ostrovi Kozloduy with code BG0000533.

The natural habitat is of relatively small area within the protected area, but manifests its main structural features and is of good conservation status.

3260 Lowland and mountain rivers with vegetation of *Ranunculion fluitantis* and *Callitricho-Batrachion*:2.12 ha

As a result of field studies conducted in the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, it was found that the habitat occupies larger area than the one of the Standard Form, namely 62.78 ha.

To this habitat relate river sections in the middle and lower reaches (in plains and lowlands with altitudes from 0 to 1000 m), with accompanying aquatic vegetation, mostly from the Ranunculion fluitantis and Callitricho-Batrachion unions. The river bottom is clayey, silty- loamy or silty-sandy, rarely involving gravel. Water speed is slow, and the river is shallow. The following plant species are characteristic of the area – hydrophytes: *Potamogeton fluitans*, Curly-leaf Pondweed (*P. crispus*), Clasping-leaf Pondweed (*P. perfoliatus*), Horned Pondweed (*Zannichellia palustris*), Threadleaf Crowfoot (*Ranunculus trichophyllus*), Common Water-crowfoot (*R. aquatilis*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Rigid Hornwort (*Ceratophyllum demersum*); hygrophytes: Water Starwort (*Callitriche spp.*), Giant Duckweed (*Spirodela polyrrhiza*), Pondweed (*Elodea canadensis*), Cutleaf Water Parsnip (*Berula erecta*), Water Mint (*Mentha aquatica*), Common Arrowhead (*Sagittaria sagittifolia*), Simplestem Bur-reed (*Sparganium erectum*), Flowering Rush (*Butomus umbellatus*), Common Bulrush (*Typha latifolia*).

The habitat encompasses about 5% of the territory of the area. Its conservation status is favorable.

3270 Rivers with muddy banks with *Chenopodion rubri* and *Bidention pp.*: 17.72 ha. The main features of the habitat are described in the relevant position in the Ostrovi Kozloduy PA with code BG0000533. According to data from the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, habitat 3270 is presented in the Ogosta River PA with an area of 17.72 ha. This is substantially larger area than the one of the Standard Forms. The main features of the habitat are described in the relevant position in Ostrovi Kozloduy PA with code BG0000533. Habitat 3270 in the Ogosta River PA is presented in a relatively small area, but manifests well its main characteristics and is in very good condition.

6250 *Pannonian loess steppic grasslands: 165.86 ha

According to data from the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, habitat 6250* is presented in the Ogosta River PA with a total area of 146.04 ha, i.e. greater than the one of the Standard Form.

The habitat is mostly closed dry grasslands, steppes and pastures that are found only in thick loess deposits (0-50 to 100-120 m) of typical (dust) loess in the riparian part of the Danube River in Northern Bulgaria, mainly in the Danubian Plain. A common habitat of the area is the subtype 2 habitat typical of the western part of the Danubian Plain (near the town of Lom and the NPP), where many of the typical pontic-steppic species disappear. This region is characterized by open grasslands on steep loess outcrops. In the loess cracks are formed large clumps of Big-flower Broom (*Chamaecytisus supinus*), Austrian Broom (*C. austriacus*), Wormwood Sagewort (*Artemisia campestris*), Prostrate Summercypress (*Kochia prostrata*), Syrian Rue (*Peganum harmala*), and Cornflower (*Centaurea rumelica*). On the loess crests at the top of steeps, the cenoses are closing and significant part of the

communities is taken by some grasses species: Bridal Veil (*Stipa capillata*), Crested Wheatgrass (*Agropyron cristatum*). The majority of the steppes on loess plateaus are plowed in the Middle Ages, and very few of them have survived, mainly those that are inappropriate for cultivation.

The natural habitat of the Protected Area is typical and has favorable conservation status.

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*: 6.29 ha.

According to data from the mapping conducted in the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, habitat 91E0* is presented in the Ogosta River PA with a total area of 6.29 ha – i.e. greater than the one of the Standard Form.

The main features of the habitat are described in the relevant position in the Ostrovi Kozloduy PA with code BG0000533.

The habitat in the Protected Area manifests its typical species composition and structure. Main dominant species in the first forest floor is the Black Alder (*Alnus glutinosa*). The estimated average age of the forests is about 80 years. The habitat is in favorable condition.

91Z0 Moesian forests of Silver Lime: 4.24 ha

According to data from the mapping conducted in the period 2011-2012 within the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 6, habitat **91Z0** is presented in the Ogosta River PA with a total area of 7.24 ha.

Natural habitat 91Z0 is distributed primarily in the Fore-Balkan, Danubian Plain and Northeastern Bulgaria (Ludogorie). Consists of xero- to mesophytic forests dominated by the Silver Lime (*Tilia tomentosa*), distributed in the continental regions of Northern Bulgaria, in the range of 50-60 to 800-1000 m. Mainly occupy the north and east slopes, with inclination of 5 to 45°. Soils are *Kastanik chernozems*, *Phaeozems* and *Luvisols*. They have developed a humus horizon and are well moistened. Their high canopy prevents the formation of a rich herbaceous layer. Forests are predominantly monodominant, but besides the main species – the Silver Lime (*Tilia tomentosa*), in the tree layer is often encountered the Field Maple (*Acer campestre*), Manna Ash (*Fraxinus ornus*), Turkey Oak (*Quercus cerris*), English Oak (*Q. Robur*). There is single participation of Norway Maple (*Acer platanoides*), Sycamore Maple (*A. pseudoplatanus*), Tatar Maple (*A. tataricum*), Elderberry (*Sambucus nigra*), Chequer Tree (*Sorbus torminalis*), Small-leaved Lime (*Tilia cordata*). Shrub layer is relatively underdeveloped. More common species in it are Bladdernut (*Staphylea pinnata*), European Barberry (*Berberis vulgaris*), Cornelian Cherry (*Cornus mas*), Common Dogwood (*C. sanguinea*), Common Hazel (*Corylus avellana*), Common Hawthorn (*Crataegus monogyna*), Wild Privet (*Ligustrum vulgare*), Wayfaring Tree (*Viburnum lantana*). Herbaceous layer is not developed, but some facultative sciophyte species: Common Woodland (*Arum maculatum*), Purple Gromwell (*Buglossoides*

purpurocaerulea), Cocksfoot (*Dactylis glomerata*), Ivy (*Hedera helix*), Wood Avens (*Geum urbanum*), Wood Melick (*Melica uniflora*), Bastard Balm (*Melittis melissophyllum*), Butcher's Broom (*Ruscus aculeatus*), Mouse Thorn (*Ruscus hypoglossum*). Very characteristic is the massive development of spring ephemeral species that may form short-term floor covering up to 80% of the area. Such species are Yellow Anemone (*Anemone ranunculoides*), Lily of the Valley (*Convallaria majalis*), Spring Fumewort (*Corydalis bulbosa*), *Corydalis solida*, Lesser Celandine (*Ficaria verna* = *Ranunculus ficaria*), *Gagea minima*, Giant Snowdrop (*Galanthus elwesii*), Fragrant Hellebore (*Helleborus odorus*), *Isopyrum thalictroides*, Yellow Archangel (*Lamiastrum galeobdolon*), Broad-leaved Solomon's Seal (*Polygonatum latifolium*), Blue Lungwort (*Pulmonaria officinalis*), Two-leaf Squill (*Scilla bifolia*), Sweet Violet (*Viola odorata*), Common European Violet (*Viola reichenbachiana*).

Forests in the Protected Area are relatively young (15-20 years), as the first forest floor is almost entirely consisting of the Silver Lime. Old trees, trees at least one class above the average age and accumulation of dead wood are missing, which is reflected in the lower rating of the conservation status. Overall condition of the natural habitat in the Ogosta River PA is very good.

Direct disturbance (destruction, damage, fragmentation) of natural habitats or the habitats of plant species. Protected area, natural habitats and the habitats of plant species in it are far enough and shall not suffer direct consequences in this regard. **No direct negative impact on natural habitats and the habitats of plant species within the Ogosta River PA are expected (rating 0).**

4.3.5 ANIMAL SPECIES SUBJECT TO CONSERVATION

4.3.5.1 INVERTEBRATES

Thick Shelled River Mussel (*Unio crassus*) – Conservation status: endangered species according to IUCN Red List (2013), Annexes no. 2 and no. 3 of the BDA. The species has an overall rating "B" (good) under the Standard Form for the area under Natura 2000.

In Standard Form the species is listed as rare (R). During the study of the section of the Ogosta River in the area conducted on 22-25.07.2012, the species was not reported. Shell s of the species are found above the area – Ogosta River at Portitovtsi and Marchevo villages (28.07.2012); and below the area – in the Danube River in the section between Misia and Oryahovo (19.02.2013) (**Figure 4.3-1**).

FIGURE 4.3-1: DISTRIBUTION OF THICK SHELLED RIVER MUSSEL (*UNIO CRASSUS*) IN THE REGION OF THE OGOSTA RIVER PA

Studies of the ecological status of the Ogosta River conducted on 22-25.07.2012 in the area and in the upper river sections show that it ranges between "moderate" and "good". The BI Kozloduy NPP(Biotic Index) = 4 at stations in Harlets, between Butan and Glozhene villages, and between Sofronievo and Butan villages. Downstream at the river mouth section (with the Danube River) and at the confluence with Skat River, the Biotic Index is slightly lower (BI=3-4). Reducing of these values Kozloduy NPPshows the local load of domestic and agricultural sources in the area. Studies carried out in the system of the Ministry of Environment and Water – Executive Agency on the Environment (2007-2012) show that one of the main pollutants in the upper river sections is the town of Montana. Immediately below the Ogosta Dam, the Biotic Index = 3 (2007, 2011), or BI = 3-4 (2012), which corresponds to a "moderate" environmental condition. After discharge of waste water of the city, the values Kozloduy NPPof the Biotic Index are decreased by half a degree in 2007 and 2010 (from BI=3 to BI=2-3), and in 2012 (by from BI=3-4 to BI=3). The value is decreased by entire degree in 2009 (from BI=3 to BI=2), and changes in 2011 are not reported (BI=3). Self-purification capacity of the river ecosystem are relatively good in the lower river sections, at the area of the Ogosta River PA, the ecological status is improved to "good' (Butan village, 2007 and 2010) or to "moderate" (the river estuary, 2007 and 2009). Additional source of contamination, possibly of municipal nature appears in the town of Misiya. According to the Ministry of Environment and Water (2010-2012) the Skat River, in the area before joining with the Ogosta River (within the Ogosta River PA) is in a degraded state (B =2-3 or 3), while above-lying sections of the river (at Golyamo Peshtene village) have higher BI values Kozloduy NPP (BI=3-4, for the three years). It can be assumed that organic pollution is one of the main factors determining the distribution of the Thick Shelled River Mussel. The species is considered to be beta- oligosaprobic indicator, i.e. the species should be encountered in rivers with at least "good" ecological status. According to data of the Ministry of Environment and Water, those sections are only the lower river sections and not for all periods of study.

Striped Nerite (*Theodoxus transversalis*) – prefers solid substrate – rocky bottom, rarely gravel and water with high oxygen content (5.5-9.5 mg/l), lower flow speeds (0.29-1.01 m/s), water temperature of 9-22 °C and pH from 7.5 to 8.3 (Angelov 2000).

The species is sensitive to pollution. The main threats to the species are habitat loss as a result of domestic and industrial pollution and changes in the hydrological regime of rivers. In the Standard Form for this area are marked the following threats that could have a negative impact on the species: variation in water regime, scraping of gravel and sand from the bottom, adverse succession in the old watercourse, pollution (municipal, fertilizing, applying pesticides).

Earth-boring Dung Beetle (*Bolbelasmus unicornis*) – Conservation status: included in Annex no. 2 of the BDA. The species has an overall rating "B" (satisfactory) in the Standard Form for the area under Natura 2000.

It is a rare species whose populations throughout its natural habitat are in a process of reduction and fragmentation. The Earth-boring Dung Beetle (*Bolbelasmus unicornis*) feeds on the underground fungi (*Ascomycetes*), especially truffles (*Tuberales*). It inhabits only primary plant communities that have never been used for agricultural purposes. It is found in warm and dry outskirts of illuminated oak forests, grassy pastures of extensive type, riverbanks and clearings. Adults are active at dusk or in the early hours of the morning in May and June. The larvae live in the soil where they feed on fungal mycelium, developing on rotting tree roots.

Quality of the species habitat is determined by the presence of old trees, and the negative factor is the use of insecticides, the intensity of fires, construction activities, intensive grazing and mowing and intensive agriculture. The results of the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 1, indicate a lack of suitable habitat for the species. Deciduous forests in the area are of island-type, highly fragmented and under advanced degradation.

The age of the timber is low. Data show that the area is very strongly influenced in an unfavorable aspect; over half of the potential habitat of the species in the area was destroyed by fire. A combination of factors determines rating "C" for the area.

Stag Beetle (*Lucanus cervus*) – Conservation status: listed in Annexes no. 2 and no. 3 of BDA. The species has an overall rating "D" in the Standard Form for the area under Natura 2000.

The Stag Beetle inhabits illuminated deciduous and mixed forests. The larva develops for 5-6 (up to 8) years in rotting wood logs, stumps and roots of the Oak (*Quercus*), Lime-tree (*Tilia*), Beech (*Fagus*), Willow (*Salix*), Poplar (*Populus*) and other deciduous trees. Very rarely is located in conifers. The adult insect (imago) is most commonly observed in early summer and is active at dusk and in the early hours of the morning. In the country the species is found from the sea level to an altitude of 1700 m in the Slavyanka Mountain.

Quality of the habitat of the species is determined by a combination of factors, the main ones being the age of the forest and the amount of dead wood. Negative factor is mainly anthropogenic interference and the use of insecticides, the intensity of fires and construction activities. The results of the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 1, show insufficient suitable habitat for the species in the area. Few available zonal deciduous forests are highly fragmented and surrounded by agricultural land and built-up areas.

The presence of old trees is insufficient, and the amount of dead wood is scarce. There have been considerable burned areas (9.4% of the potential habitat of the species). A combination of factors determines rating "C" for the area.

Morimus asper funereus – Conservation status: listed in Annex no. 2 of the BDA. The species has an overall rating "D" in the Standard Form for the area under Natura 2000.

Morimus asper funereus inhabits mesophyte deciduous and mixed forests at an altitude from 20 to 1600 m. The larva develops several years in dead wood of various species of deciduous trees. Adults were observed for most of the warm period of the year.

The quality of the habitat of the species is determined from a combination of factors. The main factor is the presence of dead wood. Negative factor is mainly anthropogenic interference and the use of insecticides, the intensity of fires and construction activities. The results of the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 1, show insufficient suitable habitat for the species in the area.

The fragmented deciduous forests consist of insufficient number of old trees and dead wood is scarce. There are considerable burned areas. The combination of factors determines rating "C". It is possible that the species is not present in the area.

Rosalia Longicorn (*Rosalia alpina*) – Conservation status: listed in Annexes no. 2 and no. 3 of the BDA. The species has an overall rating "D" in the Standard Form for the area under Natura 2000, but according to the results of the project "Mapping and determination of conservation status of habitats and species – Phase I", of the Ministry of Environment and Water, Lot 1, the species is not encountered in the area.

During field studies no suitable habitats are encountered for development of the species. The majority of the deciduous broadleaf forests in the area are the riparian flood forests, which exclude suitable habitats for the Rosalia Longicorn. The few remaining deciduous habitats of the zonal type are highly fragmented and surrounded by farmlands and other anthropogenically influenced areas and are therefore in the process of advanced degradation. The main reason that the Protected Area is unsuitable for Rosalia Longicorn is the absence of any trophic base for the larvae of the species. The preferred plant for feeding of the larvae is missing – the Beech and other potential host plants.

4.3.5.2 VERTEBRATES

4.3.5.2.1 Pisces

In the area are found a total of 13 target fish species according to the Standard Form and the "Subject and Objectives" (**Table 4.3-2**).

TABLE 4.3-2: TARGET FISH SPECIES IN THE OGOSTA RIVER PA UNDER THE STANDARD FORM

Code	Name (in English) / Name (in Latin)	Local population	Population migration			Evaluation			
			breeding	wintering	passing	population	protection	insulation	Overall rating
1130	Asp (*Aspius aspius*)	C				C	A	B	A
1138	Mediterranean Barbel (*Barbus meridionalis*)	C				C	B	B	B
2533	Balkan Loach (*Cobitis elongata*)	V				C	A	A	A
1149	Spined Loach (*Cobitis taenia*)	C				C	A	C	A
2484	Ukrainian Brook Lamprey (*Eudontomyzon mariae*)	V				D			
1124	White-finned Gudgeon (*Gobio albipinnatus*)	R				C	B	B	B
2555	Balon's Ruffe (*Gymnocephalus baloni*)	R				C	B	B	B
1157	Striped Ruffe (*Gymnocephalus schraetser*)	R				C	A	B	A
1145	European Weatherfish (*Misgurnus fossilis*)	R				C	A	C	A
2522	Sichel (*Pelecus cultratus*)	R				C	B	B	B
1134	European Bitterling (*Rhodeus amarus*)	C				C	A	C	B
1159	Common Zingel (*Zingel zingel*)	R				C	B	B	B
1160	Streber (*Zingel streber*)	R				C	B	B	B

Ukrainian Brook Lamprey (*Eudontomyzon mariae*)

The species is very rare according to the Standard Form, without specifying details of his condition. The species is not encountered during field studies in the area.

Asp (*Aspius aspius*)

The species is rare for the Ogosta River. It occurs in the mouth, and during spawning migration. Not encountered during the field studies.

Mediterranean Barbel (*Barbus meridionalis*)

Although the species has strongly decreased since the construction of the Ogosta Dam, the species still occurs along the river below the dam. During field studies in the area were registered between 80 and 8360 specimens/ha.

White-finned Gudgeon (*Gobio albipinnatus*)

The species is listed in the Standard Form for the area, but we do not encounter the species during field studies. It is found in the Danube River and in the lower reaches of some tributaries.

Sichel (*Pelecus cultratus*)

Probably single specimens are found near the mouth of the river. Is not encountered during field studies.

European Bitterling (*Rhodeus amarus*)

Mass species in the area. Everywhere in the slower sections of the river with a number between 160 and 1600 specimens/ha.

Balkan Loach (*Cobitis elongata*)

Rare species. During field studies in the area their numbers are between 240 and 1240 specimens/ha.

Spined Loach (*Cobitis taenia*)

Mass species in the area. Everywhere in the slower sections of the river with numbers between 120 and 7280 specimens/ha.

European Weatherfish (*Misgurnus fossilis*)

The species is listed in the Standard Form for the area, but we do not encounter the species during field studies.

The four species **Balon's Ruffe (*Gymnocephalus baloni*), Striped Ruffe (*Gymnocephalus scraetzer*), Common Zingel (*Zingel zingel*) and Streber (*Zingel streber*)** are characteristic of the Danube River and entering the Ogosta River only accidentally. Not encountered during field studies in the area.

Balkan Loach (*Sabanejewia aurata*)

The species is not listed in the Standard Form for the area, but it is encountered during field studies. The species is found only in the faster sections of the river with numbers of approximately 1500 specimens/ha.

4.3.5.2.2 Amphibians

According to the Standard Form, on the territory of the area are found 4 amphibian species under Annex II of the Habitats Directive – Danube Crested Newt (having rating "C" for population size), South Crested Newt (having rating "C" for population size), Fire-bellied Toad (having rating "C" for population size) and the Yellow-bellied Toad (having rating "C" for population size).

Danube Crested Newt (*Triturus dobrogicus*)

On the territory of the country the species is proven only for the Danube River (and one unconfirmed habitat in the north coast of the Black Sea). The species inhabits standing lakes, rivers and canals with slow currents, and their surroundings. According to the model of potential habitat (Naumov, 2013b) the total area of the habitats in the Ogosta River PA is 622.59 ha (about 47% of the area). They are categorized as follows: "poorly suited" – 359.35 ha; "suitable" – 169.07 ha; "optimal" – 94.17 ha. The conservation status of the species in the area has been assessed as "negative" due to the many fires (Naumov, 2013b).

Southern Crested Newt (*Triturus karelinii*)

The species is widely distributed in low and middle mountain areas of the country and the Black Sea. In the Thracian and Danubian plains are known single habitats (not proven for the western part of the Danubian Plain). It inhabits various types of ponds with stagnant water – ponds, lakes, large puddles, etc. and their surroundings (terrestrial phase). According to the model of the potential habitat (Stoyanov, 2013a) there are no suitable habitats for the species in the Ogosta River PA.

European Fire-bellied Toad (*Bombina bombina*)

The species is widespread in the Danubian Plain. It is found in a lot of places in the Thracian Plain. There are separate populations along the Black Sea coast. Inhabits standing and low flow water basins – from small pools to large lakes, lives inside the river. According to the model of the potential habitat (Stoyanov, 2013b) the total area of habitats in the Ogosta River PA is 865.56 ha (65% of the area). They are categorized as follows: "poorly suited" – 286.55 ha; "suitable" – 297.89 ha; "optimal" – 281.11 ha. The conservation status of the species in the area has been assessed as "unfavorable" (Stoyanov, 2013b).

Yellow-bellied Toad (*Bombina variegata*)

The species is widely distributed in low and middle mountain areas in most areas of the country. The species is not encountered in the eastern part of the Balkans, Strandzha Mountain, Thracian Plain and the Black Sea. In the Danubian Plain are known few isolated populations, most of them unconfirmed in the last 50 years. According to the model of the potential habitat (Stoyanov, 2013s) the total area of habitats in the Ogosta River PA is 0.11

ha (less than 0.1% of the area). They are categorized in the following way: "poorly suited" – 0.11 ha; "suitable" – 0 ha; "optimal" – 0 ha. The conservation status of the species in the area has been assessed as "negative" due to the complete absence of suitable habitat (Stoyanov, 2013c).

4.3.5.2.3 Reptiles

According to the Standard Form, on the territory of the area are found 3 reptile species under Annex II of the Habitats Directive – Hermann's Tortoise (having rating "D" for population size), European Pond Turtle (having rating "C" for population size) and Eastern Four-lined Snake (having rating "C" for population size).

Hermann's Tortoise (*Testudo hermanni*) – The species is widespread in the country, but in many places its habitat is highly fragmented and populations are low in numbers due to habitat loss and collection by humans. It inhabits deciduous forests, heaths, grasslands, etc. According to the model of the potential habitat (Stoyanov, 2013d) the total area of habitats in the Ogosta River PA is 159.27 ha (about 12% of the area). They are fully qualified as "poorly suited". The conservation status of the species in the area has been assessed as "negative" due to the many fires (Stoyanov, 2013d).

European Pond Turtle (*Emys orbicularis*) – The species is widespread in the country from the sea level to an altitude of about 1100 m. The species is found in standing and slow flowing water basins – ponds, lakes, rivers, canals, etc. According to the model of the potential habitat (Stoyanov, 2013), the total area of habitats in the Ogosta River PA is 734.06 ha (55% of the area). They are categorized as follows: "poorly suited" – 271.25 ha; "suitable" – 265.60 ha; "optimal" – 197.21 ha. The conservation status of the species in the area has been assessed as "unfavorable" (Stoyanov, 2013).

Eastern Four-lined Snake (*Elaphe sauromates*) – This species is found in the Danubian Plain, Thracian Plain, parts of Eastern Rhodopes, Sredna Gora, Sakar and Strandzha mountains and the Black Sea. In most places, the species is very rare and its populations in the Danubian Plain are probably the ones with the lowest numbers. Inhabits both open and wooded areas – pastures, meadows, deciduous forests, shrubs, etc. According to the model of the potential habitat (Stoyanov, 2013f) the total area of habitats in the Ogosta River PA is 1034.41 ha (over 77% of the area). They are categorized as follows: "poorly suited" – 639.15 ha; "suitable" – 219.39 ha; "optimal" – 175.88 ha. The conservation status of the species in the area has been assessed as "unfavorable" (Stoyanov, 2013f).

4.3.5.2.4 Mammals

European Ground Squirrel (*Spermophilus citellus*) – The species inhabits arid lands (brownfield, pastures, meadows, etc.) that are covered by low herbaceous vegetation on homogeneous, low-density permeable soils. The species does not inhabit arable lands, even only for feeding (Stefanov, 2006). In the Standard Form for the PA, the species is listed as rare (R).

Stable local population with high density was found mainly in arid grasslands and steppes that are located mainly the northern part of the territory of the Ogosta River PA and right next to in locations with the following geographical coordinates Figure 4.3-2:

43⁰ 43’ 59.66’’ N and 23⁰ 54’ 41.11’’ E, alt. 140 m
43⁰ 42’ 56.11’’ N and 23⁰ 51’ 55.33’’ E, alt. 45 m
43⁰ 43’ 57.65’’ N and 23⁰ 55’ 45.73’’ E, alt. 153 m
43⁰ 43’ 59.23’’ N and 23⁰ 54’ 47.23’’ E, alt. 131 m
43⁰ 44’ 04.63’’ N and 23⁰ 54’ 06.44’’ E, alt. 135 m

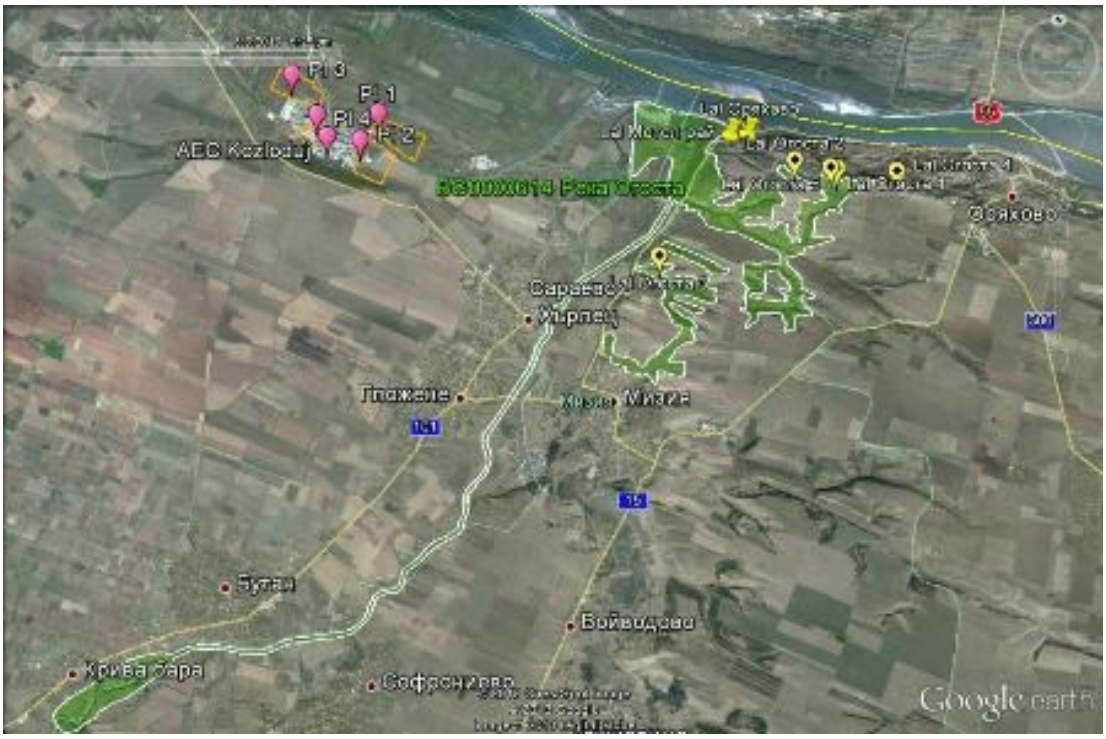

FIGURE 4.3-2: COLONIES OF THE EUROPEAN GROUND SQUIRREL IN THE OGOSTA RIVER PA

Legend: *populations of the European Ground Squirrel:* *- populations of the European Ground Squirrel according to bibliographic data;*
– alternative sites for realization of the new nuclear unit.

Hamster Dobrogean (*Mesocricetus newtoni*) – according to the Standard Form the species is predominantly low in numbers and very rare (V) in the area. This species is encountered in Dobrudzha, middle and eastern part of the Danubian Plain in the west to the Ogosta River (Gradev, 2003). The species inhabits agricultural areas in the lowlands and plains dominated by perennial herbaceous crops on heavy soils, and its numbers in rural areas is higher than in the “wild” grasses. Colonies of Hamster Dobrogean are loose and difficult to find, located mainly in fields whit wheat and alfalfa or adjacent to agricultural crops, which they use for food. The species is very poorly studied on the territory of Bulgaria and all distribution data are random or from pellets of birds of prey. Specimens or traces of the species are found near the Hayredin and Mihaylovo villages.

European Otter (*Lutra lutra*) – The species inhabits natural rivers and enclosed water basins with length of at least 15-20 km: with old river beds and plentiful coastal vegetation – dense forest, alder forests and reeds (foreshore), diverse fish fauna and a minimum mass of at least 40 kg/ha, abundance of crabs, frogs, vertebrates, molluscs (Spassov, Ivanov, unpublished). Habitats are found all along the section of the Ogosta River. According to the Standard Form, the Protected Area is inhabited by 2-3 specimens. Signs of Otter were found near the PA, but on the Skat River (Figure 4.3-3) in close proximity to the town of Misia: 43^0 41' 38.3'' N and 23^0 50' 41.4'' E.

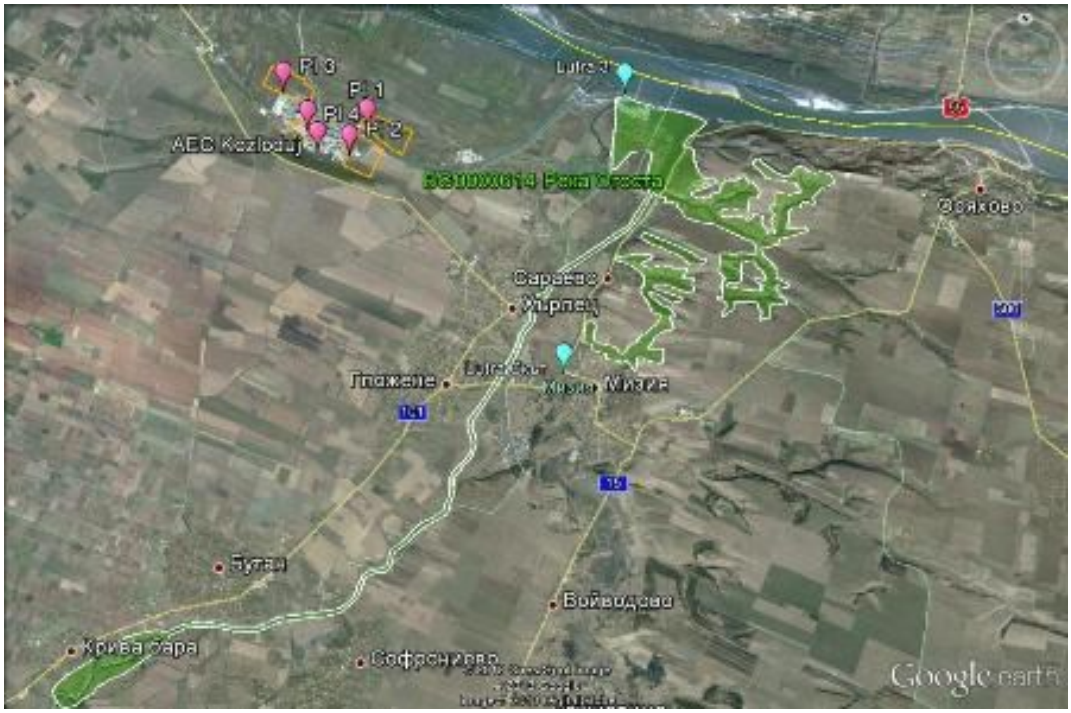

FIGURE 4.3-3: ENCOUNTERS OF THE EUROPEAN OTTER (*LUTRA LUTRA*) IN THE OGOSTA RIVER PA AND THE MOUTH OF THE HOT CHANNEL

Legend: *– Encounters of the European Otter;* *– alterantive sites for realization of the new nuclear unit.*

5 DESCRIPTION AND ANALYSIS OF THE LIKELIHOOD AND EXTENT OF IMPACT OF THE INVESTMENT PROPOSAL ON THE OBJECT AND PURPOSE OF CONSERVATION IN THE PROTECTED AREAS IN QUESTION

The assessment of the likelihood and extent of impact of the Investment Proposal on the object and purpose of protected areas is based on a comparative analysis, anticipated changes, and an expert evaluation of the latter's impact on the existing biodiversity in individual parts of PAs.

The description and analysis of the impact of the Investment Proposal on the types of habitats and species which are the subject of conservation in the protected areas has been carried out sequentially as follows:

In assessing the impact on species and habitats under conservation in the protected areas, this study uses a matrix (matrix principle) to assess the degree of impact on habitat types and species' habitats. **Table 4.3-1** lists the assessment criteria, respectively the degree of impact, using a ten-score scale for the adopted levels of assessment criteria.

TABLE 4.3-1: ASSESSMENT MATRIX FOR THE DEGREE OF IMPACT

SCORE	CRITERIA	DEGREE OF IMPACT (RATING)
0	The activity has no impact	No impact – 0
1	The activity has a very low adverse impact	Low impact which can be avoided *without special measures beyond compliance with best practices and the legal requirements for construction and operation* – from 1 to 3
2	The activity may cause temporary adverse impacts	
3	The activity may cause short-term adverse impacts	
4	The activity may cause secondary adverse impacts	Moderate impact which should be taken into account in combination with other factors and *measures should be recommend to reduce or eliminate impact* – from 4 to 6
5	The activity may cause cumulative adverse impacts	
6	The activity may cause synergistic impacts	
7	The activity may cause secondary, cumulative, synergistic adverse impacts. The impact can be eliminated through mitigation/compensation measures.	Significant impact that needs to be removed by *choosing alternatives or the implementation of mitigation or compensation measures* – from 7 to 9
8	The activity may cause significant secondary, cumulative, synergistic adverse impacts. The impact can be eliminated through mitigation/compensation measures.	
9	The activity will cause significant, medium- or long-term/permanent adverse impacts. The impact can be eliminated through mitigation/compensation measures.	
10	The activity causes a significant and permanent/irreversible adverse impact. The impact cannot be eliminated through mitigation/compensation measures.	Significant impact which cannot be eliminated through mitigation/compensation measures. In case of such a conclusion, the IP cannot be reconciled – rating 10

5.1 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA "ZLATIYATA", CODE BG0002009 UNDER THE BIRDS DIRECTIVE, IN TERMS OF ITS STRUCTURE, FUNCTIONS AND CONSERVATION OBJECTIVES (LOSS OF HABITAT, FRAGMENTATION, DISTURBANCE OF SPECIES, DISRUPTION OF THE SPECIES' COMPOSITION, CHEMICAL, HYDROLOGICAL, AND GEOLOGICAL CHANGES, ETC.). DURING THE IMPLEMENTATION AND OPERATION OF THE INVESTMENT PROPOSAL

The description and analysis of the impact of the Investment Proposal on the types of habitat and species which are the object of conservation in the protected area have been carried out sequentially and separately as follows:

5.1.1 THE BIRD SPECIES SUBJECT TO CONSERVATION

The bird species subject to conservation in the Protected Area "Zlatiyata" are 51 in number (33 under point 2.1, and 18 under point 2.2 of the Order promulgated in the Official Gazette). These will be examined one by one in terms of the adverse impact they may be subjected to:

A. 33 species under point 2.1 of the MinEW Order declaring the protected area:

Great Bittern (*Botaurus stellaris*) – a resident and migrating species listed in the Red Book of Bulgaria. The species is covered by the Birds Directive. According to Yankov (2007), there are 20-70 breeding pairs in Bulgaria. According to the Standard Data Form the species is represented in the protected area by 2 (1-3) breeding pairs and has a "B". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. It is possible, during migrations and milder winters, for individual birds to be spotted along the outlet channel and the area of the former Kozloduy marsh, but the likelihood of negative impact there is negligible. No adverse impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and also due to its remoteness from the protected area (over 1.2 km). The IP will have no cumulative effect or adverse impact on nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Little Bittern (*Ixobrychus minutus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,500-4,500 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 10 (7-13) breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During migration, it is possible for individual birds to be found in the former Kozloduy marsh, but the likelihood of any adverse impact there is negligible. No negative impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and

due to its remoteness from the protected area (over 1.2 km). The IP will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Little Egret (*Egretta garzetta*) – a nesting/migratory and transient, rarely wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 1,400-2,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 13 breeding pairs and has a "B". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During migration, it is possible for individual birds to be found in the former Kozloduy marsh, but the likelihood of any adverse impact there is negligible. No negative impact is expected on the species due to its low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and also due to its remoteness from the protected area (over 1.2 km). The IP will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Purple Heron (*Ardea purpurea*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 150-250 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 5 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites and foraging grounds. During migration, it is possible for individual birds to be found in the former Kozloduy marsh, but the likelihood of a negative impact there is negligible. No adverse impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and due to its remoteness from the protected area (over 1.2 km). The IP will have no cumulative effect or adverse impact on nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

White Stork (*Ciconia ciconia*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 4,956-5,672 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form in the protected area it is represented by 6 breeding pairs and has an "A". At the drainage pumping station (km 687), about 3 km east of the IP, one nest located on a power pole was recorded. The species has not been identified in the four alternative sites as it provides no suitable nesting sites or foraging grounds (including power poles, water sources or extensive farmland). During the spring migration in the western part of Zlatiyata in 2008, 399 individuals were recorded, and 1,106 during the autumn migration (Michev, 2008), and in the autumn of 2011, 7,222 transient birds were recorded; during the autumn migration in 2011near the village of Galiche, Vratsa District, 2,539 birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its low numbers, the absence of additional infrastructure (including power lines), harmful

emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP will have no cumulative effect or adverse impact on nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

European Honey Buzzard/Pern (*Pernis apivorus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 450-550 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 2 breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 1 bird was recorded, while 49 were identified during the autumn migration (Michev, 2008); in the autumn of 2011, 399 transient birds were recorded; during the autumn migration in 2011, 238 birds were recorded near the village of Galiche, Vratsa District, (Mateeva et al., 2012). No adverse impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Black Kite (*Milvus migrans*) – a nesting/migratory, transient and partially wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 140-160 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 1 breeding pair and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 2 individuals were recorded, 3 were identified during the autumn migration (Michev, 2008); in the autumn of 2011, 9 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 17 birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on nesting sites, foraging grounds and the migratory routes of the species **(rating 0).**

Short-toed Snake Eagle (*Circaetus gallicus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 270-320 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 4 breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 4 individuals were recorded; 19 were recorded during

the autumn migration (Michev, 2008), in the autumn of 2011, 29 transient birds were identified; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 28 birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Western Marsh Harrier (*Circus aeruginosus*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 220-240 breeding pairs. According to the Standard Data Form it is represented in the protected area by 8 breeding pairs, 2 wintering and 10 transient birds and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 227 individuals were recorded; 166 were identified during the autumn migration (Michev, 2008); in the autumn of 2011, 16 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 20 birds were recorded (Mateeva et al., 2012). During migration and wintering, it is possible for individual birds to be found in the former Kozloduy marsh, but the likelihood of any adverse impact there is negligible. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Northern Harrier *(Circus cyaneus)* – a transient and wintering species listed in the Red Book of Bulgaria. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 7 wintering and 15 transient birds and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 77 individuals were recorded, 10 individuals were counted during the autumn migration (Michev, 2008); 20 transient birds were recorded in the autumn of 2011; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 18 birds were recorded (Mateeva et al., 2012). During migration and wintering, it is possible for individual birds to be spotted in the former Kozloduy marsh, but the likelihood of any adverse impact there is negligible. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the foraging and wintering grounds or the migratory routes of the species. No adverse impact expected **(rating 0).**

Pallid Harrier *(Circus macrourus*) – a transient and wintering species listed in the Red Book of Bulgaria. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 4 transient birds and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During migration and wintering, it is possible for individual birds to be spotted in the former Kozloduy marsh, but the likelihood of any adverse impact there is negligible. During spring migration in the western part of Zlatiyata, 3 transient birds were recorded; 1 was identified during the autumn migration. During the spring migration in the western part of Zlatiyata in 2008, 3 individuals were recorded, and 1 during the autumn migration (Michev, 2008); in the autumn of 2011, 4 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, no passing birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its relatively very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the foraging and wintering grounds or the migratory routes of the species. No adverse impact expected **(rating 0).**

Montagu's Harrier (*Circus pygargus*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 220-270 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 12 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During migration and wintering, it is possible for individual birds to be spotted in the former Kozloduy marsh; however, the likelihood of any adverse impact there is negligible. During the spring migration in the western part of Zlatiyata in 2008, 127 individuals were recorded; 16 were recorded during the autumn migration (Michev, 2008); in the autumn of 2011, 21 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 38 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Levant Sparrowhawk (*Accipiter brevipes*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 200-340 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 5 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the

western part of Zlatiyata in 2008 no birds of this species were recorded; 16 were recorded during the autumn migration (Michev, 2008); in the autumn of 2011, 21 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 6 birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its relatively low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Long-legged Buzzard (*Buteo rufinus*) – a resident and transient species listed in the Red Book of Bulgaria. According to Yankov (2007), its national population is estimated at 650-750 breeding pairs. According to the Standard Data Form it is represented in the protected area by 6 breeding pairs and has a "B" (according to Kostadinova and Gramatikov, 2007); there are 6 pairs nesting in the Zlatiyata protected area). In 2008, two occupied nests were identified; one was subsequently abandoned. During the spring migration in the western part of Zlatiyata in 2008, 19 individuals were recorded, 27 during the autumn migration (Michev, 2008), in the autumn of 2011, 35 transient birds were recorded; during the autumn migration near the village of Galiche, Vratsa district in 2011, 64 birds were recorded (Mateeva et al., 2012). There has been one single spotting over the nuclear plant site (29.10.2009, one adult bird in flight over the checkpoint in the eastern area the plant, observed by Tanyo Michev). No adverse impact is expected on the species due to its relatively low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Lesser Spotted Eagle (*Ixobrychus minutus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,500-2,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 3 breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 2 individuals were recorded; 18 were recorded during the autumn migration (Michev, 2008); in the autumn of 2011, 3 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 42 birds were recorded (Mateeva et al., 2012). No adverse impact is expected on the species due to its very low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites,

foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Red-footed Falcon (*Falco vespertinus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 50-150 breeding pairs. It is a globally threatened species and is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 20 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 21 individuals were recorded; 28 during the autumn migration (Michev, 2008), 16 transient birds were recorded in the autumn of 2011; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 2 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to its very low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Peregrine Falcon (*Falco peregrinus*) – a resident and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 120-180 breeding pairs. According to the Standard Data Form it is represented in the protected area by 1 breeding pair and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 1 bird was recorded; none were spotted during the autumn migration (Michev, 2008); in the autumn of 2011, 2 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 2 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to its very low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Merlin (*Falco columbarius*) – a transient and wintering species. According to the Standard Data Form it is represented in the protected area by 4 wintering and one transient bird and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. No negative impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the

nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Common Crane (*Grus grus*) – a transient and partially wintering species listed in the Red Book of Bulgaria. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 10 transient birds and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to its very low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory corridors of the species. No adverse impact expected **(rating 0).**

Bustard (*Otis tarda*) – a transient and partially wintering species listed in the Red Book of Bulgaria. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 5 wintering birds and has an "A". It has not been identified in the area of the four alternative sites as these offer no suitable nesting or foraging grounds. It has not been identified in the protected area during the year-round monitoring (Michev, 2008). No negative impact is expected on the species due to the fact that its numbers are possibly zero, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the foraging and wintering grounds or the migratory routes of the species. No adverse impact expected **(rating 0).**

European Nightjar (*Caprimulgus europaeus*) – a nesting/migratory and transient species covered by the Birds Directive, whose national population according to Yankov (2007) is estimated at 7,000-10,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 20 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting sites or foraging grounds. No negative impact is expected on the species due to its very low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Kingfisher (*Alcedo atthis*) – a resident species whose national population according to Yankov (2007) is estimated at 1,000-2,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 20 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During migration, it is possible for individual birds to be spotted in the former Kozloduy marsh, but the likelihood of any negative impact there is negligible. No adverse impact is expected on the

species due to its very low nesting numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

European Roller (*Coracias garrulus*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 2,500-5,500 breeding pairs. It is a globally threatened species and is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 77 (34-130) breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During migration, it is possible for individual birds to be spotted in the former Kozloduy marsh, but the likelihood of any negative impact there is negligible. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Grey-headed Woodpecker (*Picus canus*) – a resident and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,500-2,800 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 14 breeding pairs and has a "B". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Syrian Woodpecker (*Dendrocopos syriacus*) – a resident species whose national population according to Yankov (2007) is estimated at 14,000-25,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 682 breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. There have been sporadic spottings of individual birds in the former Kozloduy marsh, but the likelihood of any negative impact there is negligible. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Calandra Lark (*Melanocorypha calandra*) – a resident species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 3,000-5,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 5 breeding pairs and has a "C". It has

not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Greater Short-toed Lark (*Calandrella brachydactyla*) – a resident species whose national population according to Yankov (2007) is estimated at 1,200-3,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 59 (11-108) breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Wood Lark (*Lullula arborea*) – a resident species whose national population according to Yankov (2007) is estimated at 40,000-80,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 5 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Tawny Pipit (*Anthus campestris*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 1,200-3,500 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form in the protected area it is represented by 84 (38-130) breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting and foraging grounds. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Barred Warbler (*Sylvia nisoria*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 4,000-10,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 59 (11-108) breeding pairs and has a "B". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to its relatively low numbers, the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Red-backed Shrike (*Lanius collurio*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 300,000-700,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 1,600 breeding pairs and has a "B". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. There have been sporadic spottings of individual birds in the former Kozloduy marsh, but the likelihood of any negative impact there is negligible. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Lesser Grey Shrike (*Lanius minor*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 5,000-15,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 100 (95-200) breeding pairs and has an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Ortolan Bunting (*Emberiza hortulana*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 25,000-75,000 breeding pairs. The species is covered by the Birds Directive. According to the Standard Data Form it is represented in the protected area by 950 (95-200) breeding pairs and 10 transient birds, with an "A". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km*)*. No adverse impact expected **(rating 0).**

B. 18 species under point 2.2 of the MinEW Order

Little Grebe (*Tachybaptus ruficollis)* – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 800-1,900 breeding pairs. According to the Standard Data Form it is represented in the protected area by 27 (21-33) breeding pairs and has with a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. It may be spotted in the area of the former Kozloduy marsh during migration and in winter-time. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or

adverse impact on the nesting sites, foraging and wintering areas, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Great Crested Grebe (*Podiceps cristatus*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) amounts to 400-600 breeding pairs. According to the Standard Data Form it is represented in the protected area by 4 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. It may be spotted in the area of the former Kozloduy marsh during migration and in winter-time. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Black-necked Grebe (*Podiceps nigricollis*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 20-60 breeding pairs. According to the Standard Data Form it is represented in the protected area by 6 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. It may be spotted in the area of the former Kozloduy marsh during migration and in winter-time. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Great Cormorant (*Phalacrocorax carbo*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 2,000-2,800 breeding pairs. According to the Standard Data Form it is represented in the protected area by 87 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Grey Heron (*Ardea cinerea*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,000-1,400 breeding pairs. According to the Standard Data Form it is represented in the protected area by 27 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or

foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Mallard (*Anas platyrhynchos*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 2,500-6,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 40 breeding pairs and has a "D". The species is used as hunting game. It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During the mid-winter census (2013), 350 individuals were recorded at Site 2, 4,443 individuals in the aquatory of the Danube River in the protected area "Ostrovi Kozloduy", 310 individuals were recorded at the mouth of the Ogosta River, 950 individuals in the Danube aquatory between the villages of Gorni Tzibar and Dolni Tzibar, and 5,000 individuals in the Asparouhov Val artificial lake (dam). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites or migratory routes of the species. No adverse impact expected **(rating 0).**

Garganey (*Anas querquedula*) – a nesting/migratory and transient species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 150-350 breeding pairs. According to the Standard Data Form it is represented in the protected area by 5 (1-9) breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). 1. The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Eurasian Sparrowhawk (*Accipiter nisus*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,500-2,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 6 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 46 individuals were recorded; 88 during the autumn migration (Michev, 2008); in the autumn of 2011, 70 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 97 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to the absence of additional infrastructure

(including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Common Buzzard (*Buteo buteo*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 2,500-4,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 8 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 82 individuals were recorded, 63 during the autumn migration (Michev, 2008); in the autumn of 2011, 268 transient birds were recorded; during the 2011 autumn migration near the village of Galiche, Vratsa District, 365 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Common Kestrel (*Falco tinnunculus*) – a nesting/migratory, transient and wintering species whose national population according to Yankov (2007) is estimated at 4,000-7,500 breeding pairs. According to the Standard Data Form it is represented in the protected area by 15 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 35 individuals were recorded; 36 during the autumn migration (Michev, 2008); in the autumn of 2011, 44 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 147 birds were recorded (Mateeva et al., 2012). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Eurasian Hobby (*Falco subbuteo*) – a nesting/migratory, transient and wintering species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 600-1,200 breeding pairs. According to the Standard Data Form it is represented in the protected area by 10 (6-14) breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. During the spring migration in the western part of Zlatiyata in 2008, 8 individuals were recorded; 46 individuals were counted during the autumn migration (Michev, 2008); in the autumn of 2011, 53 transient birds were recorded; during the autumn migration in 2011 near the village of Galiche, Vratsa District, 32 birds were

recorded (Mateeva et al., 2012). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, or the migratory routes of the species. No adverse impact expected **(rating 0).**

Water Rail (*Rallus aquaticus*) – a resident species listed in the Red Book of Bulgaria, whose national population according to Yankov (2007) is estimated at 1,000-1,800 breeding pairs. According to the Standard Data Form in the protected area it is represented by 25 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Common Moorhen (*Gallinula chloropus*) – a resident species whose national population according to Yankov (2007) is estimated at 5,000-12,000 breeding pairs. According to the Standard Data Form in the protected area it is represented by 38 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering, and the migratory routes of the species. **(rating 0).**

Eurasian Coot (*Fulica atra*) – a resident species No adverse impact expected **(rating 0),** whose national population according to the Yankov (2007) is estimated at 1,700-3,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 38 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting and foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Little Ringed Plover (*Charadrius dubius*) – a resident species whose national population according to Yankov (2007) is estimated at 1,200-1,800 breeding pairs. According to the Standard Data Form it is represented in the protected area by 5 (1-9) breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to

the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). No adverse impact expected **(rating 0).**

Northern Lapwing (*Vanellus vanellus*) – a resident species whose national population according to Yankov (2007) is estimated at 1,000-1,700 breeding pairs. According to the Standard Data Form it is represented in the protected area by 7 (6-9) breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging and wintering grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

European Bee-eater (*Merops apiaster*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 25,000-50,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 1300 breeding pairs and has a "D". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds, and the migratory routes of the species. No adverse impact expected **(rating 0).**

Sand Martin *(Riparia riparia*) – a nesting/migratory and transient species whose national population according to Yankov (2007) is estimated at 20,000-50,000 breeding pairs. According to the Standard Data Form it is represented in the protected area by 470 breeding pairs and has a "C". It has not been identified in the area of the four alternative sites as they offer no suitable nesting or foraging grounds. No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds or the migratory routes of the species. No adverse impact expected **(rating 0).**

Based on the data above, the following conclusion can be drawn Table 5.1‑1**.**

TABLE 5.1-1: SUMMARY DATA ON THE NUMBER OF BIRD SPECIES SUBJECT TO CONSERVATION IN THE PROTECTED AREA AFFECTED BY VARIOUS NEGATIVE IMPACTS AS A RESULT OF THE IMPLEMENTATION OF THE IP

Negative impact	Species under point 2.1	Species under point 2.2	Total Number of species	% of the total number of species
None	33	18	**51**	**100**
Small	0	0	**0**	**0**
Moderate	0	0	**0**	**0**
Extensive	0	0	**0**	**0**
Total	**33**	**18**	**51**	**100**

As can be seen from the Table, no species will be negatively affected in any degree.

The avifauna of the area includes some species possessing a special status in comparison with others. These are the species of global significance, species exceeding the 1% Ramsar threshold, species listed in the Red Book of Bulgaria, species found only in very few areas in the country, species subject to conservation in the protected area, the most numerous migratory species, the so-called "sensitive species", etc. These will be examined separately:

Lesser White-fronted Goose *(Anser erythropus)* – a rare wintering species in Bulgaria. Ornithological literature contains no data on this globally endangered species in the area concerned but the Standard Data Form of PA Zlatiyata lists single wintering birds. The species was not recorded by the team of experts during the mid-winter census in 2013. The Kozloduy NPP site remains about 3 km east of the roosting grounds (marshes near Bistreț in Romania and the sand strips on the islands) and the foraging grounds (Zlatiyata). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds and the migratory routes of the species **(rating 0).**

Dalmatian Pelican *(Pelecanus crispus)* – a nomadic and wintering globally endangered species that nests only in the Srebarna Reserve. The species is covered by the Birds Directive. During migration it forms large concentrations (between 150 and 252 birds) in the protected area „Island near Gorni Tsibar", code BG0002008, hunts in neighbouring Romanian marshes, a roosts and rests on the sandy strips of adjacent islands (Michev, Kamburova, ed. 2012). Single birds and small flocks have been observed during feeding migrations to the artificial lake near the village of Septemvriytsi, Montana District (about 25 km SW of NPP Kozloduy). Representatives of the species fly over the Kozloduy NPP site only sporadically. During our field surveys in January and March 2013, individuals were spotted resting on the dividing line between the hot and cold channel and to feed at the

mouth of the channel near the River Danube. There is no evidence that the species is disturbed, chased or hunted there. During the mid-winter census (13-15.01.2013) we observed 43 individuals in the aquatory of the Danube between the mouth of the channel (river km 687) and the village of Dolni Tsibar (river km 718). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds and the migratory corridors of the species **(rating 0).**

White-tailed Eagle *(Haliaeetus albicilla)* – a resident, transient and wintering globally endangered species whose breeding population in Bulgaria according to Yankov (2007) is estimated at 0-15 pairs. During the mid-winter census conducted in 2013 by T. Michev and L. Profirov, 4 individuals were observed in the aquatory of the Danube between the mouth of the channel (river km 687) and the village of Dolni Tsibar (river km 718), and 1 adult bird near the village of G. Tsibar on 4 March, 2013 (most probably nesting in the region). No negative impact is expected on the species due to the absence of additional infrastructure (including power lines), harmful emissions and pollution (radiation, noise, soil, ambient air, etc.) from this IP, and its remoteness from the protected area (over 1.2 km). The IP under consideration will have no cumulative effect or adverse impact on the nesting sites, foraging grounds or migratory routes of the species **(rating 0).**

Migratory period

The IP under consideration falls on the border between two migration areas: Via Aristotelis and Via Balcanica (Michev et al., 2012) which are characterized by relatively small migration flows of soaring birds. Migration takes place mainly in the valleys of the Tsibritsa River and the Ogosta River – Jiu River. It is monitored from observation posts at the village of Razgrad and the town of Valchedram, Montana District, the village of Galiche, and the town of Oryahovo, Vratsa District (**Figure 5.1-1**).

FIGURE 5.1‑1: OBSERVATORIES FOR MONITORING MIGRATORY SOARING BIRDS NEAR THE VILLAGE OF RAZGRAD AND THE TOWN OF VALCHEDRAM, MONTANA DISTRICT, THE VILLAGE OF GALICHE AND THE TOWN OF ORYAHOVO (VRATSA DISTRICT)

During migrations, in the region of concern (from the Valchedram observatory in the northwest part of Zlatiyata – **Figure 5.1‑1** 4,382 individuals were recorded, (of these, 1,338 soaring birds) and 25,509 autumn migrants, of which 2,237 soaring birds (Michev, 2008). The most numerous migratory species in spring was the European Golden Plover *(Pluvialis apricaria),* and in autumn – the Common Starling *(Sturnus vulgaris).* Among the 10 most numerous spring and autumn migrants are also species subject to conservation in the protected area (White and Black Stork, Western Marsh Harrier, and Montagu's Harrier). The main direction of bird migration over Zlatiyata, according to Michev (2008) is northwest – southeast (NW – SE). The Kozloduy NPP site remains about 19 km east of the main migration route over Zlatiyata.

As a result of the ornithological monitoring exercise conducted near the town of Oryahovo (**Figure 5.1‑1***)* Voycheva et al. (2009), 1,058 spring and 854 autumn migratory soaring birds were identified.

During field studies carried out by BSPB in the autumn of 2011, near Razgrad and the village of Galiche (**Figure 5.1‑1***)* respectively 8,107 and 3,903 soaring birds were identified (Mateeva et al., 2012).

Based on these results, it can be concluded that no large numbers of migrants pass over the area of the Kozloduy Nuclear Power Plant. No significant migration routes intersect over its territory. As a whole, the migration of soaring birds over Zlatiyata is negligible in comparison with other parts of the country (Michev et al., 2012).

Winter period

There is a relatively large volume of information regarding waterfowl wintering in this particular area. The data has been collected during the annual midwinter censuses since 1977 (Kostadinova, Dereliev, 2001; Michev & Profirov, 2003). It has been established that a large portion of the territory of Zlatiyata – in the absence of snow cover or icing of the Danube and the Asparuhov Val artificial lake – can represent a major foraging area, most of all for the Greater White-fronted Goose *(Anser albifrons)* and the Greylag Goose *(Anser anser).* For the Tsibar-Somovit section of the Danube River, including the Asparuhov Val artificial lake, Michev & Profirov (2003) indicate an average number of 7,680 individuals from 13 species (**Table 5.1-2**):

TABLE 5.1-2: MIDWINTER WATERFOWL NUMBERS IN THE TZIBAR-SOMOVIT SECTION OF THE RIVER DANUBE IN THE PERIOD 1977-2013

Tzibar – Somovit	Average 1977-1999	Max 1977-1999	11.01. 2003	16.01. 2004	13.01. 2007	Average 2003-2007	14-15.01. 2013
Gavia arctica	0	1				0	
Tachybaptus 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
Aythya ferina	9	44				0	0
Aythya nyroca	0	1				0	0
Aythya fuligula	5	28				0	0

Tzibar – Somovit	Average 1977-1999	Max 1977-1999	11.01. 2003	16.01. 2004	13.01. 2007	Average 2003-2007	14-15.01. 2013
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
Others	0	1	1			1	0
Total	**7,676**	**25,820***	**654**	**1,872**	**1,881**	**1,862**	**11,269**
Number of species	**13**	**22**	**20**	**17**	**10**	**16**	**13**

**The number of all species is not a mechanical sum.*

The Tzibar – Somovit section (between 715 km and 607 km with a total length of 108 km) is characterized by 25 islands. The total aquatory of the Bulgarian part of river has an area of about 2,370 ha. In addition, this section also includes the Asparuhov Val artificial lake, which was not reported in the period 1977 -1999 (Michev, Profirov 2003).

The average number of waterfowl during the first period of 22 years (out of which standard censuses were carried out in 13 years) is 7,676 individuals, and the maximum is 25,820 individuals; the species diversity varies between 10 and 22 species. The figures for 2013 are between the average and maximum values for the period 1977-1999. Taking into consideration that the censuses in these periods up to 2013 actually coincide with the operation of NPP Kozloduy, no significant differences were identified in the number of birds and diversity of species.

The table shows that the most numerous wintering waterfowl were the Mallard *(Anas platyrhynchos)* and the Greater White-fronted Goose *(Anser albifrons).*

In the Septemvriytsi Dam (located about 25 km SW of the Zlatiyata Protected Area) Kostadinova and Dereliev (2001) recorded 11 wintering waterfowl (Greater White-fronted Goose *Anser albifrons* -5 individuals, and Common Snipe *Gallinago gallinago* – 6 individuals. There is no evidence of significant concentrations in the area of concern.

Summary of the ornithological situation in the Zlatiyata Protected Area and the negative impacts on bird species subject to protection in it

As a result of the information available, the following picture can be presented in a satellite image from Google Earth ***(*Figure 5.1-2)**

FIGURE 5.1-2: PROTECTED AREAS UNDER THE BIRDS DIRECTIVE IN THE MONITORED ZONE (30 KM RADIUS AROUND NPP KOZLODUY)

It shows that the monitored zone (within a radius of 30 km around NPP Kozloduy) contains an ecological complex of great significance for biodiversity conservation. The area includes several natural habitats of high conservation importance for birds: marshes, dunes, floodplain forests, sand strips, islands, estuaries, steppes, loess walls, etc.

For the preservation of this extraordinary biodiversity around Kozloduy, 13 protected areas under the Birds Directive and the Habitats Directive and one Ramsar site were established on the territory of Bulgaria and Romania **Table 5.1-3**:

TABLE 5.1-3: PROTECTED AREAS AND AREAS UNDER THE BIODIVERSITY ACT AND THE PROTECTED AREAS ACT IN THE VICINITY OF NPP KOZLODUY

Directive Country	Birds Directive	Habitats Directive	Total	Ramsar Convention
Bulgaria	BG0002007 BG0002008 BG0002009 BG0002104	BG0000199 BG0000508 BG0000527 BG0000533 BG0000614 BG0000336	10	Ibisha Maintained Reserve Bistreţ Protected Area
Romania	ROSPA0010 ROSPA0023	ROSCI0045	3	
Total	6	7	13	2

Similar ecological complexes along the Bulgarian part of the Danube banks are only located at Belene-Suhaia and Silistra- Călăraşi.

Adjacent to the Zlatiyata protected area, on both sides of the Danube, there are several significant natural sites (marshes, islands, river estuaries). These mostly include the large and fish-rich marshes near the Romanian village of Bistreţ, the former Tsibar and former Kozloduy marshes, the estuaries of the rivers Jiu, Tsibritsa, Ogosta, and several large Danube islands (Tsibar, Tsibritsa, unnamed island under the village of Gorni Tsibar, Svraka, Kozloduy, Kopanitsa). In the past here, as well as all along the Bulgarian bank of the Danube, the islands (being more inaccessible to humans) were used by birds for nesting sites, and the vast and fish-rich wetlands along the left bank were used as foraging grounds. Therefore the main food migrations of birds from breeding colonies of cormorants and herons are directed to the north of the river Danube. Very few of them fly south to the small artificial lakes located south of Zlatiyata, and along the riverbed of the Danube and adjacent islands (Michev, 2008); unpublished data from observations on 10 and 11 July 2010 on the southern banks of the marshes at Bistreţ – large dune at 43 51 54.2 N and 23 34 07.9 E). Most attractive to some species of birds in the area of concern are agricultural crops in Zlatiyata, wetlands along both banks of the Danube and the sand strips between the islands. The National Action Plan for the conservation of the Dalmatian Pelican in Bulgaria http://www3.moew.government.bg/files/file/Nature/Biodiversity/Valeri/NAP_P_crispus_2013-2022.pdf (Michev, Kamburova, ed. 2012) envisages that a platform should be built on the sand strips between river kilometres 715-712, UTM coordination system GM05, simultaneously with bank protection structures (chevrons and groynes) as part of the hydro engineering project for deepening the river bed of the Danube in certain places that now impede navigation. The platform being designed will be within the protected area "Island near Gorni Tsibar", code BG0002008. At times of low water levels in the river, the sand strips there are regularly used as resting and roosting grounds by between 150 and 250 Dalmatian Pelican, feeding in the adjacent wetlands at the village of Bistreţ, Romania. At times of high water levels, however, the sand strips disappear and pelicans are forced to use other, less safe places to roost and rest).

The Kozloduy NPP site (excluding the channel connecting Kozloduy NPP with the Danube River and the field area of the former Kozloduy marsh), due to the absence of food resources, is not of major significance to birds.

5.1.2 FRAGMENTATION

The Kozloduy NPP site is located approximately 1 km northeast of the protected area. Therefore no fragmentation of the protected area is expected as a result of the implementation of IP. Further fragmentation is not expected.

No impact is expected on species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during the construction, operation, and decommissioning.

5.1.3 IMPACT ON THE SPECIES COMPOSITION

In the area of NPP Kozloduy, probably due to the positive impact of thermal pollution at the mouth of the channel in the Danube on zoo-and phytoplankton and zoo- and phytobenthos, as well as on fish, amphibians and reptiles, there has been **an enrichment of the avifauna in the area** with wintering waterfowl, including Dalmatian Pelican *(Pelecanus crispus)*, Great *(Phalacrocorax carbo)* and Pygmy Cormorant *(Phalacrocorax pygmeus)* and others. The Investment Proposal will have no significant impact.

No impact is expected on species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

5.1.4 DISTURBANCE TO SPECIES

No disturbance to species is expected to affect the species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

5.1.5 CHEMICAL CHANGES

According to the EIA, there is no risk of chemical or radioactive pollution in case of normal operation. In case of accidents and incidents, the extent of such impact is rated as low.

No impact is expected on the species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

5.1.6 HYDROLOGICAL CHANGES

According to the EIA, the extraction of water for cooling purposes for the existing and new units of Kozloduy NPP related to any of the 4 alternatives for the site is not expected to have a lasting, permanent, including cumulative and transboundary impact on the flow regime of the Danube River which is ensured by the use of existing infrastructure – pumping station, cold (intake) and hot (outlet) channels.

No impact is expected on species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

5.1.7 GEOLOGICAL CHANGES

According to EIA, no impact is expected on this environmental component.

No impact is expected on species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

5.1.8 OTHER CHANGES

Radiation

In connection with the drafting of the present Appropriate Assessment reports for the implementation of NCC, observations were carried out on individual environmental factors to determine the current condition of the natural background radiation and radioactivity in the air in a perimeter of 30 km in the monitored area around the NPP Kozloduy before construction commences. The results for the equivalent dose of gamma radiation are within the range of 0.10 to 0.19 μSv/h, i.e. similar to those measured in recent years. This suggests that **the background radiation will remain in the same range during construction, during operation, and during decommissioning.**

No impact is expected from other changes on the species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation or decommissioning.

5.1.9 IMPACTS OF INDIVIDUAL ENVIRONMENTAL COMPONENTS/FACTORS AS A RESULT OF THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA ZLATIYATA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE

The impacts of implementing this IP on the individual environmental components/factors are discussed in detail in the EIAR. The present document lists, in the most general terms, the impact on environmental components /factors that are relevant to assessing the extent of impact of the Investment Proposal on the object and purpose of conservation in the protected area.

5.1.9.1 AMBIENT AIR

As regards the ambient air component, the 4 alternative sites for the location of NCC have almost equal impact significance, which is very low. None of the sites is in potential danger of anthropogenic air pollution by non-radioactive contaminants in the area of the IP. Both the emitted pollutants and the concentrations of pollutants are well below the threshold limits.

Diffuse gas and dust emissions will have no significant effect on ambient air quality during construction. To prevent excessive pollution, a precise schedule of construction work should be followed, taking into account weather conditions, i.e. to make use of the natural self-cleaning capability of the atmosphere.

No impact is expected on the species of birds subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, or on their habitats due to gas and dust emissions into the air during construction, operation, and decommissioning.

5.1.9.2 WATER

The types of possible impact of the IP for a NNU lead to the firm conclusion that the impact of non-radioactive waste water on the receiving Danube River during operation will be local, permanent, reversible, and negligible.

Regarding the Zlatiyata PA, there will be no negative impact, as the protected area is located on a plateau at a higher altitude than that of NPP Kozloduy.

No impact is expected on the species of birds subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, and their habitats, from the pollution of surface waters during construction, operation, and decommissioning.

5.1.9.3 SOILS AND LANDSCAPE

According to the National Environmental Radioactivity Surveillance Network (NERSN) no elevated levels of radioactive substances have been established in plants in the monitored area around NPP Kozloduy. No negative impact was established on the natural and derivative vegetation and agricultural crops within 30 km around the NPP Kozloduy, including the Zlatiyata Protected Area.

During a normal operation regime of the PMF (Plasma Melting Facility), no negative impact is expected on the soil and vegetation in the Kozloduy NPP RAD site and outside it.

No impact is expected on the species of birds subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, and their habitats, from soil pollution and landscape modifications during construction, operation, and decommissioning.

5.1.9.4 NOISE

The expected highest equivalent noise level reaching the border of the protected area (PA) Zlatiyata nearest to the nuclear power plant (1.2 km) during operation of the construction equipment from the borders of Sites 2 and 4 nearest the PA, is about 35 dBA and it decreases with the increasing distance from the machines. At a greater distance into the area (1.9 km), the expected noise level is 30 dBA. These levels are close to the naturally occurring low background noise (no pronounced sounds such as birds singing, the sound of the river, a strong wind, etc.). Construction activities carried out at the remote Sites 1 and 3 will not be the source of noise for PA Zlatiyata because of the large distances and the shielding effect on noise propagation in this direction from existing buildings at the NPP site. Construction activities will not be the source of noise for other protected areas in the region due to the large distances to these (over 3 km); this applies to all four alternatives for the location of the site of the new nuclear unit.

No impact and disturbance is expected on the species of birds subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, or to their habitats from noise pollution during construction, operation, and decommissioning.

5.1.9.5 WASTE

The majority of the waste generated by NPP Kozloduy is collected, transported and disposed of without any additional processing or other treatment.

Since the beginning of 2001, NPP Kozloduy has had its own landfill for non-radioactive municipal and non-recoverable industrial waste (LNRMNRIW). Only waste from the protected area is disposed there, while waste from outside of the protected area are transported to the Regional Landfill in the town of Oryahovo, for which a contract was concluded with the Oryahovo Municipality.

LNRMNRIW meets all modern requirements. It is used for the disposal of non-radioactive solid municipal waste, non-recoverable industrial waste, and small construction debris.

At the stage of implementation of the investment proposal, all safety measures for work with RAW have been taken. The essence of the proposal is related to reducing the volume of RAW for further treatment. Subject to the principles of ALARA and internal company procedures and instructions for handling RAW, no adverse impact on components of the environment is expected from this factor.

Based on the above, it can be concluded with certainty that the implementation of the IP will not adversely affect the species subject to conservation in the protected area Zlatiyata, code BG0002009 under the Birds Directive, during construction, operation, and decommissioning.

The Investment Proposal is not expected to have any impact on the integrity of the protected area Zlatiyata, code BG0002009, in terms of its structure, functions, and conservation purposes. The implementation of the Investment Proposal does not entail reducing the size of the protected area.

5.2 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON „OSTROVI KOZLODUY“ PROTECTED AREA WITH CODE BG0000533 UNDER THE HABITATS DIRECTIVE WITH A VIEW TO ITS STRUCTURE, FUNCTIONS AND ENVIRONMENTAL AIMS (LOSS OF HABITATS, FRAGMENTATION, DISTURBANCE OF SPECIES, DAMAGE OF THE SPECIES COMPOSITION, CHEMICAL, HYDRO GEOLOGICAL AND GEOLOGICAL CHANGES ETC.) DURING THE REALIZATION AS WELL AS DURING OPERATION OF THE INVESTMENT PROPOSAL

5.2.1 IMPACT ON THE VEGETATION AND THE TYPES OF NATURAL HABITATS

5.2.1.1 LOSS OF HABITATS AND SPECIMENS

The protected area is 3.03 km away from the territory of the investment proposal. Therefore, during the particular stages (construction, commissioning, operation,

decommissioning) of the realization of the investment proposal it is expected to have no direct impact (extermination and damage) on the vegetation and the types of natural habitats, which are under protection in the protected area. In the four alternative sites of the IP there are no such habitats and vegetation species as well. Also no negative indirect impact (extermination/damage) is expected, due to the absence of harmful emissions and pollution (radioactive, soil, air etc.) from this IP. To this effect, there will be also no cumulative effect from the realization of this IP compared to the approved, realized or in procedure IP situated within the borders of the protected area due to generation of waste or emissions in the soil, water, air, which are key elements of the zone, incl. under consideration of the infrastructure objects in procedure (2 gas pipelines) in the vicinity and the existing loading of the environment from the Kozloduy NPP **(rating 0).**

5.2.1.2 FRAGMENTATION

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of natural habitats and populations of vegetation species, which are under protection in the zone, is expected **(rating 0).**

5.2.1.3 DAMAGE OF THE SPECIES COMPOSITION

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no negative impact of the vegetation species composition, which is under protection in the zone, is expected due to its remoteness **(rating 0).**

5.2.1.4 CHEMICAL CHANGES

According to EIAR there is no risk of chemical and radiation pollution under normal operation. During faults and incidents the level of this impact is determined as low.

No impact on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.1.5 HYDROLOGICAL CHANGES

According to EIAR, the detracting of water for cooling the existing reactors and the newly added one of the Kozloduy NPP is not expected in any of the 4 site options to have long-term, continuous, incl. cumulative, and cross-border impact on the Danube River runoff, which is ensured by using the existing infrastructure – Bank Pump Station, cold and warm channels.

No impact on the vegetation and the types of natural habitats under protection in the „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.1.6 GEOLOGICAL CHANGES

According to EIAR no geological changes are expected.

No impact on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.1.7 OTHER CHANGES

No impact from other changes on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

Finally, the conclusion can be drawn that there is no direct impact (extermination, damage, fragmentation) of the natural habitats or the vegetation species habitats. The protection zone and the natural habitats and the vegetation species habitats in it are far enough to not undergo direct impact to this effect. **No indirect negative impact on the natural habitats and the vegetation species habitats within the borders of „Ostrovi Kozloduy" PA is expected.**

5.2.2 ON ANIMAL SPECIES

5.2.2.1 LOSS OF HABITATS AND SPECIMENS

5.2.2.1.1 Invertebrate animals

Thick shelled river mussel *(Unio crassus*)

1. Direct damage, deprivation of the species habitats, barrier effect. The protection zone and the species habitats in it are far enough to not undergo direct impact during the construction. During the operation an insignificant impact due to the thermal burden below the discharge of the hot channels is expected. The slightly increased temperature will favour the development of already settled invasive alien aquatic species (mussels, fishes, other invertebrate animals) and increase their negative impact as well as create conditions for the introduction of other alien species in the zone. Due to their impact (increased filtration and foul of the mussels, competition, predation, changes in the species composition of the recipient fishes etc.) the conditions of the environment will change (physicochemical parameters of the water, substrate and others) or the Thick shelled river mussel will be affected directly, which might lead to disturbance of the structure of its population, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**

2. Direct extermination of specimens of the species. The construction activities are far enough from „Ostrovi Kozloduy" PA, so a direct danger of specimen's extermination can not be expected. Even if an occasional pollution (incl. incidents) during the construction and operation of IP is present, it would affect the lower regions of the Danube River, outside of „Ostrovi Kozloduy" PA. Direct extermination mostly of the larvae is expected as a result of

the impact of the invasive species of mussels and fishes or of the adult specimens due to the established foul of invasive sessile mussels. **A slight negative impact is expected during the operation (rating 3).**

3. Disturbance during the construction. The construction activities are far enough to not cause a disturbance for the species and its habitats in PA „Ostrovi Kozloduy". However, a disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**

4. Damage of biological corridors. It is assumed, that a possible pollution of the Danube River with inert materials, other toxic and non-toxic substances, and energy (incl. heat), which might change the structure, characteristics and functioning of the water ecosystems, would have a local effect but would not cause damage of biological corridors in the Danube River as long as the company ecological strategy and the good manufacturing practices during the construction and operation are kept. **No negative impact is expected (rating 0).**

According to the Standard form for the zone among the terrestrial invertebrate animals the **Stag beetle *(Lucanus cervus)*** is present in the territory of "Ostrovi Kozloduy PA. According to last data, this species can not be found in the zone.

***1. Direct damage, deprivation of the species habitats, barrier effect*.** No habitats of the species can be found in the protection zone. **No impact is expected on the habitats or the barrier effect within „Ostrovi Kozloduy" PA (rating 0).**

2. Direct extermination of specimens of the species. No populations of the species can be found in the protection zone. **No negative impact is expected (rating 0).**

3. Disturbance during the construction. No populations of the species can be found in the protection zone. **No negative impact is expected (rating 0)**.

4. Damage of biological corridors. No populations and habitats of the species can be found in the protection zone. **No negative impact is expected (rating 0).**

5.2.2.1.2 Fishes

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no loss of habitats of the particular species is expected. A slight change in the quality of the habitats is anticipated due to the expected small thermal impact resulting from the operation of the new reactor and the respective increase of temperature in the warm channel. Based on the data quoted in the EIAR the conclusion can be drawn that at water inflow rates of up to Q_T=160 m3/s the impact of the heat exchange between the warmed-up waters from Kozloduy NPP to Danube river in the section between km 687 (discharge point of the hot channel) to km 678 (Port of Oryahovo) and the environment is insignificant and can be neglected. Even after the connection of the new unit the warm plume will not reach the maximum parameters cited above and based on measurements in natural conditions when the power plant was operated at Q_T=180

m3/s. After the commissioning of Kozloduy NPP some thermal burden is observed at Oryahovo (^{km}678) compared to Lom (^{km}743.3), but it does not exceed 3°C, which is the regulatory threshold.

However, this insignificant thermal pollution will have a partial impact on the fish habitats in the most eastern part of „Ostrovi Kozloduy" PA.

Ukrainian brook lamprey *(Eudontomyzon mariae)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Ukrainian brook lamprey will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination can be expected as a result of predation of invasive fish species. **A slight negative impact is expected (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected (rating 2-3).**
- Damage of biological corridors **– No impact is expected (rating 0).**

Fishes from the *Alosa* genus

The shad fishes from the *Alosa* genus are anadromous species, which spend most of their lifetime in the Black sea and enter the bigger flowing in rivers, incl. the Danube River, for reproduction. The water temperature is not a basic factor for the reproduction migrations of the *Alosa sp*., and its possible insignificant increase due to the operation of NNU can not have an impact in this regard. The reproduction migrations begin at 3 – 7.5°C (in early autumn), reach their high at 9 – 17°C (April – May) and end at 22 – 26°C (June – July), according to Schmutz (2006)[17] and Nãvodaru (1998)[18]. The over fishing in the lower parts

[17] Schmutz, C. 2006. Assessment of the potential transboundary effects of the construction of the Bystre Deep - Water Navigation Channel on fish and fisheries. Report to the ESPOO Inquiry Commission. Vienna. 56 pp

[18] Nãvodaru. 1998. Pontic Shad: A Short Review of the Species and Its Fishery. Shad Journal. Vol. 3(4) 3 - 5

of the river can be adopted as one of the basic reasons for the decrease in the population density of the *Alosa* species. For example, according to Lenhardt et al (2010)[19] the yearly fishing in the Romanian part of the Danube delta in the period 2002 – 2008 has a mean of 322.1 tons, with a maximum of 549 tons in 2008. In the Ukrainian part of the Danube delta in the period 2002 – 2005 the fishing has a mean of 213.5 tons, with a maximum of 318 tons in 2005. In the countries situated in the upper parts the fishing is many times smaller. In Bulgaria the fishing decreases with 140.8 tons in 2002 down to 29.1 tons in 2008 (the year with the highest fishing quantity in Rumania). According to the fishing analysis until now there is no gathering of specimens in the region of river kilometres 687÷688, where the impact of the discharge of the hot channel coming from NPP "Kozloduy" is mostly noticeable. This is mainly due to the fact that during the reproduction migrations of the regarded species (they settle in the region of Kozloduy in May – June) the water temperature in the Danube river is high enough (around 18-20°C), which reduces the impact of the thermal pollution of the channel. We have all the reasons to anticipate that this situation will not change after the implementation of the new powers of NPP "Kozloduy". Special investigations for possible gathering of larvae from the regarded species until this moment have not been carried out. We recommend a yearly monitoring of the ichthyoplankton drift in the regarded region in the next 10 years.

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Danube shad will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).** At this rating no special alleviating procedures have to be applied except for keeping the best manufacturing practices and requirements during construction and operation. – **Table 4.3-1.**
- Direct extermination of specimens of the species – Direct extermination can be expected as a result of predation of invasive fish species. **A slight negative impact is expected during the operation (rating 2).**

[19] Lenhardt M., Navodaru I., Vassilev M., Visnjic-Jeftic Z., Skoric S., Smederevac-Lalic M. 2010. Status of Pontic shad (Alosa immaculata Bennett 1835) in Lower Danube Region. http://www.lanuv.nrw.de/alosa-alosa/includes/docs/conference2009/oral_abstracts_9_july_09.pdf

- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors – **No impact is expected (rating 0)**

Asp *(Aspius aspius)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Asp will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination can be expected as a result of predation of invasive fish species. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors – **No impact is expected (rating 0)**

White-finned Gudgeon *(Gobio albipinnatus)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the

mussels, competition, predation) the conditions of the environment will change or the White-finned Gudgeon will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**

- Direct extermination of specimens of the species – Direct extermination can be expected as a result of predation of invasive fish species. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0).**

Sabrefish (*Pelecus cultratus)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Sabrefish will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination can be expected as a result of predation of invasive fish species. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0).**

Bitterling (*Rhodeus amarus)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Bitterling will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0).**

Balkan loach (*Cobitis elongata)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Balkan loach will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**

- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – The species can not be found in the region of the IP. **No impact is expected (rating 0).**
- Damage of biological corridors **– No impact is expected (rating 0)**

Spined loach (*Cobitis taenia)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. The thermal burden would have a higher impact on this species compared to the other ones. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Spined Loach will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0).**

The two species **Balon's ruffe (*Gymnocephalus baloni)* and Striped ruffe (*Gymnocephalus schraetzer)***

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other

to an increase of the impact of the invasive aquatic species. The thermal burden would have a higher impact on this species compared to the other ones. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or both kinds of ruffe will be affected directly, which might lead to disturbance of the structure of their populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**

- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0).**

The two species **Common zingel (*Zingel zingel)* and Streber (*Zingel streber)***

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. The thermal burden would have a higher impact on this cryophilic species compared to the other ones. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the zingels will be affected directly, which might lead to disturbance of the structure of their populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**

- Disturbance during the construction – A disturbance due to the increased water traffic, which will serve the NNU construction (transportation of building materials, fuels etc.), is possible. **A slight negative impact is expected during the construction (rating 1).**
- Damage of biological corridors **– No impact is expected (rating 0)**

Weatherfish (*Misgurnus fossilis)*

- Direct damage, deprivation of the species habitats, barrier effect – during the operation a slight impact is expected due to the insignificant thermal pollution, resulting from the operation of the new reactor and the respective increase of the temperature in the region below the discharge of the hot channels. This can, on the one hand, lead to changes in the quality of the habitats in the zone, and on the other to an increase of the impact of the invasive aquatic species. Though insignificantly increased, the higher temperature will favour the development of already settled invasive alien aquatic species (fishes, aquatic invertebrate animals) and can increase their negative impact as well as create conditions for the introduction of new alien species in the zone. Due to their impact (increased filtration of the mussels, competition, predation) the conditions of the environment will change or the Weatherfish will be affected directly, which might lead to disturbance of the structure of its populations, deprivation of the species habitats and possible barrier effect. **A slight negative impact with limited range is expected during the operation (rating 2).**
- Direct extermination of specimens of the species – Direct extermination, mostly of larvae / caviar can be expected due to the predation of the invasive species of invertebrate animals and fishes. **A slight negative impact is expected during the operation (rating 2).**
- Disturbance during the construction – The species can not be found in the region of the IP. **No impact is expected (rating 0).**
- **Damage of biological corridors** – No impact is expected **(rating 0)**.

5.2.2.1.3 Amphibians

Danube crested newt (*Triturus dobrogicus)*

- Loss or quality change of the habitats: The spot of the "heat train" of the Danube River emerges at around 1700 m after the discharge of the warm channel and its maximum width is around 300m. It does not affect the habitats. Noimpact is expected **(rating 0);**
- Direct extermination of specimens: No impact is expected **(rating 0)**;
- Damage of biological corridors, fragmentation and barrier effect: No impact is expected **(rating 0)**;
- Disturbance during the construction: No impact is expected **(rating 0)**.

Fire bellied Toad (*Bombina bombina)*

- Loss or quality change of the habitats: The spot of the "heat train"of the Danube River emerges at around 1700 m after the discharge of the warm channel and its maximum width is around 300m. It does not affect the habitats. No impact is expected **(rating 0)**;
- Direct extermination of specimens: No impact is expected **(rating 0)**;
- Damage of biological corridors, fragmentation and barrier effect: No impact is expected **(rating 0)**;
- Disturbance during the construction: No impact is expected **(rating 0)**.

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no loss of habitats and specimens from the two species of amphibians is expected.

5.2.2.1.4 Reptiles

Pond turtle (*Emys orbicularis)*

- Loss or quality change of the habitats: No impact is expected **(rating 0)**;
- Direct extermination of specimens: No impact is expected **(rating 0)**;
- Damage of biological corridors, fragmentation and barrier effect: No impact is expected **(rating 0)**;
- Disturbance during the construction: No impact is expected **(rating 0)**.

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no loss of habitats and specimens is expected.

5.2.2.1.5 Mammals

European otter *(Lutra lutra)*

- Direct damage, deprivation of the species habitats, barrier effect – The species have no habitats on the territory of the IP. No impact is expected on the habitats or the barrier effect **(rating 0)**.
- Direct extermination of specimens of the species – No impact is expected **(rating 0)**.
- Disturbance during the construction – The species can not be found in the region of the IP. No impact is expected **(rating 0).**
- Damage of biological corridors – There are no determined continuous migration corridors, which can be affected by the investment proposal **(rating 0)**.

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no loss of habitats and specimens is expected.

5.2.2.2 FRAGMENTATION

5.2.2.2.1 Invertebrate animals

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of habitats of the terrestrial and aquatic invertebrate animals is expected **(rating 0).**

5.2.2.2.2 Fishes

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of habitats of the fish species which are under protection in „Ostrovi Kozloduy "PA is expected **(rating 0)**.

5.2.2.2.3 Amphibians

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of their habitats is expected **(rating 0)**.

5.2.2.2.4 Reptiles

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of their habitats is expected **(rating 0).**

5.2.2.2.5 Mammals

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no fragmentation of their habitats is expected **(rating 0)**.

5.2.2.3 DAMAGE OF THE SPECIES COMPOSITION

5.2.2.3.1 Invertebrate animals

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no damage of the species composition is expected on the terrestrial invertebrate animals **(rating 0).**

During the operation it is expected that the though insignificantly increased temperature will favour the development of already settled invasive alien aquatic species (mussels, fishes, other invertebrate animals) and increase their negative impact as well as create conditions for the introduction of other alien species in the zone. Due to their impact (increased filtration and foul of the mussels, competition, predation, changes in the species composition of the recipient fishes etc.) the conditions of the environment will change (physicochemical parameters of the water, substrate and others) or the Thick shelled river mussel will be affected directly, which might lead to displacement of the species **(rating 2).**

5.2.2.3.2 Fishes

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no damage of the species composition is expected for the fish species, which are under protection in PA „Ostrovi Kozloduy".

It is highly possible, that due to the though insignificantly increase of the temperature in the Danube River below the discharge of the hot channel parts of the populations of more cryophilic species like the Common zingel (*Zingel zingel*) and the Streber (*Z. streber*) will be negatively affected.

The increase of the water temperature around the PA can enable the settling of alien invasive species of hydrobionts. Since 2001 some of the most aggressive alien invasive species have intruded into the Danube River – the Quagga mussel (*Dreissena bugensis*), Asian clam (*Corbicula fluminea*), Chinese pond mussel (*Anodonta woodiana*), Chinese mitten crab (*Eriocheir sinensis*), American crayfish (*Orconectes limosus*), American paddlefish (*Polyodon spathula*), Eastern mosquitofish (*Gambusia holbrooki*), Chinese sleeper (*Percottus glenii*) and others. Most of them are thermophilic and the even though insignificantly increased temperature of the water, which is heated in the area of the discharge point for the "Kozloduy" NPP waste water, favours their development – the metabolic processes are activated, the nutrition activity is increased, the growth of the biomass is accelerated and it enlarges, favourable conditions are created and the reproduction processes accelerate. The presence of these species inevitably affects the native ichthyofauna with this impact being mostly negative, connected with competition for nutrition, reproduction habitats, predation, parasite transfer etc. **(rating 2).**

5.2.2.3.3 Amphibians

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no damage of the species composition is expected **(rating 0).**

5.2.2.3.4 Reptiles

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no damage of the species composition is expected **(rating 0).**

5.2.2.3.5 Mammals

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no damage of the species composition is expected **(rating 0).**

5.2.2.4 CHEMICAL CHANGES

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no changes are expected.

No impact on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.2.5 HYDROLOGICAL CHANGES

According to EIAR, the detracting of water for cooling the existing reactors and the newly added one of the Kozloduy NPP is not expected in any of the 4 site options to have long-term, continuous, incl. cumulative, and cross-border impact on the Danube River runoff, which is ensured by using the existing infrastructure – Bank Pump Station, cold and warm channels.

No impact on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.2.6 GEOLOGICAL CHANGES

During the particular stages (construction, commissioning, operation, decommissioning) of the realization of the investment proposal no changes are expected.

No impact on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.2.7 OTHER CHANGES

Background radiation

For the development of these Apropriate Assessments report for the realisation of NNU, monitoring was performed on individual environmental factors to determine the current state of natural background radiation and radioactivity in the air in the region of the 30 km studied area around Kozloduy NPP before commencement of construction. The obtained results for the capacity of the equivalent dose gamma radiation are in the range of 0,10 μSv/h to 0,19 μSv/h, which is similar to the measured in the last years. This anticipates that **this background will remain in the same range during the realization as well as during operation and decommissioning.**

No impact from other changes on the vegetation and the types of natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.3 IMPACT OF PARTICULAR COMPONENTS /FACTORS OF THE ENVIRONMENT AS A RESULT FROM THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON „OSTROVI KOZLODUY" SITE WITH CODE BG0000533 IN THE HABITATS DIRECTIVE

5.2.3.1 AIR

In terms of the component atmospheric air, the 4 alternative sites where the NNU can be located have almost equal significance of impact – very low. None of the sites bears potential danger of anthropogenic air pollution by non-radioactive contaminants in the area of the IP. Both the impact of emissions and concentrations of pollutants are well below the limits of admissible standards.

The gas-dust areal emissions will not have a significant impact on the atmospheric air quality during the construction. For prevention of pollution, which goes beyond the standards, a strict schedule of the construction works according to the meteorological conditions has to be kept i.e. to allow for the natural capabilities of the atmosphere to clean itself.

No impact from gas and dust emissions on the vegetation and the natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.3.2 WATER

Based on the considered impacts of the NNU investment proposal, the imperative conclusion can be drawn that the impact of non-radioactive waste water on the receiving basin – the Danube River – during the operation will be local, continuous, irreversible and negligible.

No impact from pollution of the of the surface water on the vegetation and the natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.3.3 SOIL AND LANDSCAPE

According to data provided by the National Environmental Radioactivity Surveillance Network (NERSN) there is no increase in radioactive substance in plants due to NPP "Kozloduy". No negative impact on natural and industrial vegetation and crops within a radius of up to 30 km around Kozloduy NPP , incl. „Ostrovi Kozloduy" PA.

Under normal technological operation of the Plasma Incineration Facility no negative impact on the soil and vegetation at the Kozloduy NPP site and outside of it is expected.

No impact from soil pollution and changes in the landscape on the vegetation and the natural habitats under protection in „Ostrovi Kozloduy" site with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.3.4 NOISE

The noise level is in the range of 30 dBA corresponding to the naturally-occurring low background noise (without pronounced sounds such as birds singing, the sound of the river, of strong wind, etc.). Construction activities carried out at the remoter Sites 1, 2 and 4 will not be a source of noise for PA „Ostrovi Kozloduy" because of the large distances and the shielding effect on noise propagation in this direction by the existing buildings at the Kozloduy NPP site. In spite of being nearer to the protected area, Site 3 is still far enough and the noise during the construction will not have a negative impact on the target species in the zone. Construction activities will not be a source of noise for the other protected areas in the region due to the large distances to them (over 3 km) for all four alternative locations of the site of the new nuclear unit.

No impact from noise pollution on the vegetation and the natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

5.2.3.5 WASTE

The bigger share of waste generated in NPP "Kozloduy" is collected, transported and disposed at landfill without being additionally processed or otherwise treated.

From the beginning of 2001 Kozloduy NPP EAD has its own Landfill for non-radioactive and industrial waste (LN-RMI). There, only waste from the protection zone is processed. Waste generated by objects outside of it is transported to the Regional landfill in Oryahovo, for which a contract with Oryahovo municipality has been made.

LN-RMI fulfils the modern requirements. In LN-RMI non-radioactive hard residential, not reusable industrial and small construction waste is disposed.

At the stage of implementation of the investment proposal all measures for risk free work with RAW are designated. The main point of the proposal is connected with decreasing the volume of RAW aiming at its further treatment. Keeping the ALARA principle as well as the internal procedures and instructions for RAW treatment, no harmful impact of this factor on the environment components is expected.

No impact on the vegetation and the natural habitats under protection in „Ostrovi Kozloduy" Protected Area with code BG0000533 under the Habitats Directive is expected during the realization as well as during operation and decommissioning.

An impact of the investment proposal **during the construction, operation and during decommissioning** on the integrity of the protected area ***„Ostrovi Kozloduy" with code BG0000533*** with regard to its structure, functionality and environmental objectives is not expected. The implementation of the investment proposal will not cause deprivation of areas. Disturbance of species is not expected because of the remoteness of the PA from the site of IP.

5.3 DESCRIPTION AND ANALYSIS OF THE IMPACT OF THE INVESTMENT PROPOSAL ON "REKA OGOSTA" PROTECTED AREA WITH CODE BG0000614 UNDER THE HABITATS DIRECTIVE IN VIEW OF ITS STRUCTURE, FUNCTION AND CONSERVATION OBJECTIVES (HABITATS LOSS, FRAGMENTATION, DISTURBANCE OF SPECIES, DISRUPTION OF SPECIES COMPOSITION, CHEMICAL, HYDROLOGICAL AND GEOLOGICAL CHANGES, ETC.). BOTH DURING IMPLEMENTATION AND DURING OPERATION OF THE INVESTMENT PROPOSAL

In assessing the impact on species subject to conservation in the protected area the present study uses a matrix (matrix principle) to assess the level of impact on habitat types and habitats of species. **Table 4.3-1** shows the assessment criteria, respectively the level of impact, using the ten-score scale for approved levels of assessment criteria

5.3.1 IMPACT ON VEGETATION AND NATURAL HABITAT TYPES

5.3.1.1 LOSS OF HABITATS AND SPECIES

The protected area is located 6.09 km from the area of the investment proposal, which is why during the various stages (construction, commissioning, operation, decommissioning) of the implementation of the project direct impacts are not expected (damage and destruction) on the vegetation and habitat types, subject to conservation.

Direct violation (destruction, damage, fragmentation) of natural habitats or habitats of plant species. The protected area and the natural habitats in the area and the habitats of plant species are located at a sufficient distance to suffer direct consequences. **Direct negative impact on natural habitats and habitats of plant species within the protected area of Ogosta River is not expected.**

In the four sites of the IP such habitats and plant species are also not found. Negative indirect impact is not expected also (destruction and damage) due to lack of hazardous emissions and pollution (radiactive, soil, or of ambient air etc.) from the present IP. In this respect, there will be no cumulative effect from the implementation of the IP project on the approved, implemented or in process of development PPP / IP, located within the protected area, due to the generation of waste or emissions to soil, water, ambient air, as key elements of the area, including and taking into account the infrastructure projects (2 gas pipeline) in process nearby the site and the existing load on the environment by Kozloduy NPP. **(rating 0).**

5.3.1.2 FRAGMENTATION

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of natural habitats, habitats and populations of plant species is not expected **(rating 0).**

5.3.1.3 DISRUPTION OF SPECIES COMPOSITION

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal negative impact on plant species composition in the area is not expected due to its remoteness **(rating 0).**

5.3.1.4 CHEMICAL CHANGES

As per the EIA report there is no risk of chemical and radioactive contamination during normal operation. In case of accidents and incidents the level of this impact is assessed as low.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive, during construction, operation and decommissioning.

5.3.1.5 HYDROLOGICAL CHANGES

According to the EIA report, the usage of water for cooling of the existing and the new reactor of Kozloduy NPP in neither of the four site alternatives is expected to have a lasting, permanent, cumulative and transboundary impacts on the regime of the flowing waters of the Danube which is ensured by the use of the existing infrastructure – Bank Pump Station, cold and hot channels.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive, during construction, operation and decommissioning.

5.3.1.6 GEOLOGICAL CHANGES

According to EIA report no impact is expected on this component of the environment. Negative impact on the protected area (PA) is not expected.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive, during construction, operation and decommissioning.

5.3.1.7 OTHER CHANGES

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive, during construction, operation and decommissioning.

Finally it can be concluded that direct disturbance (destruction, damage, fragmentation) of natural habitats or the habitats of plant species is not expected. The protected area and the natural habitats in the area and the habitats of plant species are located at a sufficient distance to suffer direct consequences. **Indirect negative impact on natural habitats and habitats of plant species within the protected area of Ogosta River is not expected.**

5.3.2 IMPACT ON ANIMAL SPECIES

5.3.2.1 LOSS OF HABITATS AND SPECIES

5.3.2.1.1 Invertebrates

Thick Shelled River Mussel (*Unio crassu*) 1. *Direct disturbance, withdrawal of habitats of species, barrier effect.* The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of River Ogosta. Although slightly increased the temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration and formation of fouling with mussels, competition, predation, changes in species composition of fish hosts etc..) and as a result of the ecological deterioration the conditions of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the oval river mussel will be directly affected, which can lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect **Low negative limited impact is expected during operation (rating 1).**

2. Direct destruction of specimens of species The construction activities are at a sufficient distance from the protected area of Ogosta River and direct threat for destruction of specimens could not be expected. In case of an eventual pollution (including by incident) during construction and operation of the investment proposal it will have an impact on the lower sections of the Danube and the mouth of the river Ogosta but with due regard for the company environmental strategy and best production practices during construction and operation this could be avoided. Direct destruction mainly of larvae (glochidia) is expected as a result of the impact of invasive species of mussels and fish in combination with deteriorating ecological conditions, or of adult specimens as a result of fouling by the invasive fouling mussels. **Low negative impact is expected during operation (rating 1).**

3. Disturbance during construction Construction activities are at a sufficient distance to cause disturbance on habitats of species in the protected area of Reka Ogosta. **Impact is not expected (rating 0).**

***4. Disturbance of biological corridors (habitat corridors*)** It is assumed that eventual pollution of the Danube River and the mouth of the river Ogosta with inert materials, other non-toxic or toxic substances and energy (including heat) that might change the composition, properties and functioning of the aquatic ecosystems would have local impact but would not cause disruption of biological corridors in the river of Ogosta. **Negative impact is not expected (rating 0).**

Striped Nerite (*Theodoxus transversalis*) *Direct disturbance, withdrawal of habitats of species, barrier effect.* The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, predation) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the striped nerite might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect **Low negative limited impact is expected during operation (rating 1).**

2. Direct destruction of specimens of species The construction activities are at a sufficient distance from the protected area of Reka Ogosta and direct threat for destruction of specimens could not be expected. In case of an eventual pollution (including by incident) during construction and operation of the investment proposal it will have an impact on the lower sections of the Danube and the mouth of the river Ogosta but with due regard for the company environmental strategy and best production practices during construction and operation this could be avoided. Direct destruction as a result of the impact of invasive mussels and fish is of low probability. **Negative impact is not expected (rating 0).**

3. Disturbance during construction Construction activities are at a sufficient distance to cause disturbance on species and habitats of species in the protected area of Reka Ogosta. **Impact is not expected (rating 0).**

4. Disturbance of biological corridors (habitat corridors) It is assumed that eventual pollution of the Danube River and the mouth of the river Ogosta with inert materials, other non-toxic or toxic substances and energy (including heat) that might change the composition, properties and functioning of the aquatic ecosystems would have local impact but would not cause disruption of biological corridors in the river of Ogosta with due regard for the company environmental strategy and best production practices during construction and operation. **Negative impact is not expected (rating 0).**

Bolbelasmus (*Bolbelasmus unicornis*) *1. Direct disturbance, withdrawal of habitats of species, barrier effect.* The protected area and the habitats of species are located at a sufficient distance to be directly affected during the construction phase of the IP and from pollutions as well as indirectly, from changes in the micro-climatic characteristics of the habitats. **Impact is not expected on the habitats nor any barrier effect within the protected area of Reka Ogosta (rating 0).**

2. Direct destruction of specimens of species The construction activities are at a sufficient distance from the protected area of Reka Ogosta and direct threat for destruction of specimens could not be expected. **Negative impact is not expected (rating 0)**

3. Disturbance during construction Construction activities are at a sufficient distance to cause disturbance on species and potential habitats of species in the protected area of Reka Ogosta. Negative impact is not expected (**rating 0**).

4. Disruption of biological corridors (habitat corridor*s) ** Distribution of the species in the country is characterized by significant natural and secondary (mainly as a result of agricultural activities) fragmentation. Optimum habitats of Bolbelasmus (Bolbelasmus unicornis***) are not established in the area while the semi adaptable habitats are considerably far from the IP site and from the road infrastructure which will be used for the IP implementation. Disturbance of the species biological corridors is of very low probability. **Negative impact is not expected (rating 0).**

Stag beetle (*Lucanus cervus*)

1. Direct disturbance, withdrawal of habitats of species, barrier effect. The protected area and the habitats of species are located at a sufficient distance from the IP site to be directly affected during construction and as a result of pollutions or indirectly, from changes in the micro-climatic characteristics of the habitats. Although slightly increased the temperature of the hot channel of Kozloduy NPP creates conditions for increased air humidity in the vicinity under low temperatures in winter. As far as this could affect the habitats of species, in the case of the stag beetle (only this type of potential habitats are available adjacent to the hot channel – at the mouth of River Ogosta) increased humidity in a continental climate and deforestation, typical for the area, may have an indirect slightly favorable impact on habitats of species. **Impact is not expected on the habitats nor any barrier effect within the protected area of Reka Ogosta (rating 0).**

2. Direct destruction of specimens of species The construction activities are at a sufficient distance from the protected area of Reka Ogosta and direct threat for destruction of specimens could not be expected. **Negative impact is not expected (rating 0).**

3. Disturbance during construction Construction activities are at a sufficient distance to cause disturbance on species in the potential habitats in the protected area of Reka Ogosta. Impact of noise, light pollution and dust is not expected. These insects inhabit the forest or semi-open habitats where vegetation is an additional barrier to indirect effects such as those mentioned. **Negative impact is not expected (rating 0).**

***4. Disruption of biological corridors (habitat corridor*s)** Stag beetle habitats in the area are highly fragmented and considerably far from the IP site and from the road infrastructure which will be used for the project implementation. That is why disturbance of the species biological corridors is of very low probability. **Negative impact is not expected (rating 0).**

Long-horned beetle (*Morimus asper funereus*)

1. Direct disturbance, withdrawal of habitats of species, barrier effect. Potential habitats of species are found at the far northeast end of the IP site. This is the reason for low probability of direct impact from construction activities and pollution during implementation of the IP as well as of indirect impact from changes in the micro-climatic characteristics of the habitats. Potential impact of the outflow channel of Kozloduy NPP in terms of increased air humidity in the vicinity of the channel is also minimal and does not cause significant differences in temperature and humidity conditions in riparian forests northeast of the city of Mizia. **Impact is not expected on the habitats nor any barrier effect (rating 0).**

2. Direct destruction of specimens of species The construction activities are at a sufficient distance from the protected area of Reka Ogosta and direct threat for destruction of specimens could not be expected. **Negative impact is not expected (rating 0)**

3. Disturbance during construction Construction activities are at a sufficient distance to cause disturbance on species in the potential habitats in the protected area of Reka Ogosta. Impact of noise, light pollution and dust is not expected. These insects inhabit the forest or semi-open habitats where vegetation is an additional barrier to indirect effects such as those mentioned. **Negative impact is not expected (rating 0).**

4. Disruption of biological corridors (habitat corridor*s)** Long-horned beetle (Morimus asper funereus***) habitats in the area are highly fragmented and considerably far from the IP site and from the road infrastructure which will be used for the project implementation. That is why disturbance of the species biological corridors is of very low probability. **Negative impact is not expected (rating 0).**

Rosalia longicorn (*Rosalia alpina*)

1. Direct disturbance, withdrawal of habitats of species, barrier effect. There are no habitats of species in the protected area. **Impact is not expected on the habitats nor any barrier effect within the protected area of Reka Ogosta (rating 0).**

2. Direct destruction of specimens of species In the protected area there are no populations of the species **Negative impact is not expected (rating 0).**

3. Disturbance during construction In the protected area there are no populations of the species **Negative impact is not expected (rating 0).**

***4. Disruption of biological corridors (habitat corridor*s)** In the protected area there are no populations of the species **Negative impact is not expected (rating 0).**

The territory of the area is not directly affected by the investment proposal. No direct impacts, leading to loss of natural habitats, habitat of species and specimens of species of the three protected in the area terrestrial invertebrates, Bolbelasmus (Bolbelasmus unicornis), stag beetle (Lucanus cervus) and long-horned beetle (Morimus asper funereus) are expected (as per the most recent data Rosalia longihorn (Rosalia alpina) is not present here). Impact of noise, light pollution and dust is not expected. These insects inhabit the forest or semi-open habitats where vegetation is an additional barrier to indirect effects such as those mentioned. Micro-habitat characteristics in these habitats are also

substantially more stable than, for example in open agricultural fields. Although slightly increased the temperature of the hot channel of Kozloduy NPP creates conditions for increased air humidity in the vicinity under low temperatures in winter. As far as this could affect the habitats of the species, in the case of the stag beetle (*Lucanus cervus*) (potential habitats only of this types are available adjacent to the hot channel – at the mouth of River Ogosta) increased humidity in a continental climate and deforestation, typical for the area, may have an indirect slightly favorable impact on habitats of species.

Impact is not expected on the habitats nor any barrier effect nor destruction of species (rating 0).

Aquatic invertebrates referred to Reka Ogosta PA are striped nerite (*Theodoxus transversalis*) and thick shelled river mussel *(Unio crassu*). Striped nerite has not been found during the study while shells of the thick shelled river mussel have been found upstream River Ogosta as well as in the Danube River downstream the protected area.

During construction, commissioning and decommissioning of NNU, withdrawals of habitats and species are not expected. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration and formation of fouling with mussels, competition, predation, changes in species composition of fish hosts etc..) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the thick shelled river mussel and the striped nerite might be directly affected, which could lead to loss of habitats and species.

5.3.2.1.2 Fish

Ukrainian brook lamprey (*Eudontomyzon mariae)*

1. Direct disturbance, withdrawal of habitats of species, barrier effect. The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact

(increased filtration with mussels, competition, fish predation) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the Ukrainian brook lamprey might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**

- ***Direct destruction of specimens of species*** The construction activities are at a sufficient distance from the protected area of River Ogosta and direct threat for destruction of specimens could not be expected. In case of an eventual pollution (including by incident) during construction and operation of the Investment Proposal it will have an impact on the lower sections of the Danube and the mouth of the river Ogosta but with due regard for the company environmental strategy and best production practices during construction and operation this could be avoided. Direct destruction might be expected only as a result of the impact of invasive fish species. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0)**

Asp (*Aspius aspius)*

Impact:

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the asp might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative impact is expected during operation (rating 1)**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**

- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0)**

Mediterranean Barbel (*Barbus meridionalis)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the Mediterranean barbel might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- ***Disturbance during construction*** – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- ***Disturbance of the species biological corridors*** – **Impact is not expected (rating 0)**

White-finned gudgeon (*Gobio albipinnatus)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with

mussels, competition, fish predation) and in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the white-finned gudgeon might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**

- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0)**

Sichel (*Pelecus cultratus)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the sichel might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0).**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0).**

European bitterling (*Rhodeus amarus)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the European bitterling might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0).**
- Disturbance of the species biological corridor – **Impact is not expected (rating 0).**

Balkan loach (*Cobitis elongata)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the Balkan loach might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**

- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0).**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0).**

Spined loach (*Cobitis taenia)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the spined loach might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0)**

European weather loach (*Misgurnus fossils*)

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established

invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the European weather loach might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**

- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridor – **Impact is not expected (rating 0)**

The four types **balon`s ruffe (*Gymnocephalus baloni)*, striped ruffe (*Gymnocephalus scraetzer)*, common zingel (*Zingel zingel)* and streber (*Zingel streber)***

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the species from the Percidae family might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridor – **Impact is not expected (rating 0)**

Ray-finned fish (*Sabanejewia aurata)*

- ***Direct disturbance, withdrawal of habitats of species, barrier effect.*** The protected area and the habitats of species are located at a sufficient distance to be directly affected during construction. During operation of the power plant, the conducted observations and studies show that at water flow rate of up to 180 m^3 / s from the hot channel the thermal plume of the Danube River will stretch near the Bulgarian bank with temperature differences of about 1.8°C at a distance of 7-7.5 km and certainly will have an impact on the mouth of the river Ogosta. Although slightly increased, temperature will favor the development of already established invasive alien aquatic species (fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration with mussels, competition, fish predation) in combination with deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the ray-finned fish might be directly affected, which could lead to distortion of the structure of its populations, withdrawal of habitats of species and a possible barrier effect. **Low negative limited impact is expected during operation (rating 1).**
- ***Direct destruction of specimens of species*** Direct destruction mainly of larvae/roe can be expected due to predation of the invasive invertebrate species and fish. **Low negative impact is expected during operation (rating 1).**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of the species biological corridors – **Impact is not expected (rating 0)**

5.3.2.1.3 Amphibians

Danube crested newt (*Triturus dobrogicus)*

- Loss or changes in habitat quality. The spot of the "heat train" of the Danube River emerges at around 1700 m after the discharge of the warm channel and its maximum width is around 300m. It does not affect the habitats. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected **(rating 0)**
- Disturbance during construction Impact is not expected **(rating 0)**

Southern crested newt (*Triturus karelinii)*

- Loss or changes in habitat quality. The spot of the "heat train" of the Danube River emerges at around 1700 m after the discharge of the warm channel and its

maximum width is around 300m. It does not affect the habitats. Impact is not expected **(rating 0)**

- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected **(rating 0)**
- Disturbance during construction Impact is not expected **(rating 0)**

European Fire-bellied Toad (*Bombina bombina)*

- Loss or changes in habitat quality. The spot of the "heat train" of the Danube River emerges at around 1700 m after the discharge of the warm channel and its maximum width is around 300m. It does not affect the habitats. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected (**rating 0**)
- Disturbance during construction Impact is not expected **(rating 0)**

Yellow-bellied toad (*Bombina variegata)*

- Loss or changes in habitat quality. The spot of the "heat train" of the Danube River emerges at around 1700 m after the discharge of the warm channel and its maximum width is around 300m. It does not affect the habitats. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected (**rating 0**)
- Disturbance during construction: Impact is not expected **(rating 0)**

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal loss of habitats of the four types of amphibians is not expected **(rating 0)**.

5.3.2.1.4 Reptiles

Hermann's tortoise (*Testudo hermanni*)

- Loss or changes in habitat quality. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected **(rating 0)**
- Disturbance during construction: Impact is not expected **(rating 0)**

European pond turtle (*Emys orbicularis*)

- Loss or changes in habitat quality. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected **(rating 0)**
- Disturbance during construction: Impact is not expected **(rating 0)**

Blotched snake (*Elaphe sauromates)*

- Loss or changes in habitat quality. Impact is not expected **(rating 0)**
- Direct destruction of specimens of species Impact is not expected **(rating 0)**
- Disturbance of the biological corridors, fragmentation and barrier effect; Impact is not expected **(rating 0)**
- Disturbance during construction: Impact is not expected **(rating 0)**

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal loss of habitats and specimens of the three types of reptiles is not expected.

5.3.2.1.5 Mammals

European ground squirrel (*Spermophilus citellus*)

- Direct disturbance, withdrawal of habitats, barrier effect – There is no habitat of the species on the IP site. **Impact is not expected on the habitats nor any barrier effect (rating 0).**
- Direct destruction of specimens of species – **Impact is not expected (rating 0)**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of biological corridors – There are no permanent migration corridors established to be affected by the investment proposal (**rating 0**)

Romanian (Dobrudja) hamster (*Mesocricetus newtoni*)

- Direct disturbance, loss of habitats of species, barrier effect – Based on the current study this type of species is not found. Given the preferred habitat and biology (dwells in wheat fields, new lands and eats seeds and green parts of herbaceous plants) Dobrudja hamster does not have habitats on the IP site. **Impact is not expected on the habitats nor any barrier effect (rating 0).**
- Direct destruction of specimens of species – **Impact is not expected (rating 0)**
- Disturbance during construction – the species do not occur in the area of the IP. **Impact is not expected (rating 0)**
- Disturbance of biological corridors – **Permanent migration corridors are not established as to be affected by the investment proposal** (**rating 0)**

European otter (*Lutra lutra*)

- Direct disturbance, withdrawal of habitats, barrier effect – There is no species habitat on the IP site. **Impact is not expected on the habitats nor any barrier effect (rating 0).**
- Direct destruction of specimens of species – **Impact is not expected (rating 0)**
- Disturbance during construction -**The species do not occur in the area of the IP. Impact is not expected (rating 0)**
- Disturbance of biological corridors – **Permanent migration corridors are not established to be affected by the investment proposal (rating 0)**

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal loss of habitats and specimens of the three types of mammals is not expected.

5.3.2.2 FRAGMENTATION

5.3.2.2.1 Invertebrates

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of natural habitats of the terrestrial and aquatic invertebrates, subject to conservation is not expected **(rating 0).**

5.3.2.2.2 Fish

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of natural habitats of the different species in PA Reka Ogosta is not expected **(rating 0).**

5.3.2.2.3 Amphibians

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of their natural habitats is not expected **(rating 0).**

5.3.2.2.4 Reptiles

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of their natural habitats is not expected **(rating 0).**

5.3.2.2.5 Mammals

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal fragmentation of their natural habitats is not expected **(rating 0).**

5.3.2.3 VIOLATION OF SPECIES COMPOSITION

5.3.2.3.1 Invertebrates

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal violation of species composition of terrestrial invertebrates as a result of direct or indirect impact is not expected **(rating 0)**.

During operation, although slightly increased, the temperature will favor the development of already established invasive alien aquatic species (mussels, fish, other invertebrates) and will lead to an increase in their negative impact, and will pave the way for the entry of new alien species upstream of River Ogosta. As a result of their impact (increased filtration and formation of fouling with mussels, competition, predation, changes in species composition of fish hosts etc..) and as a result of the deteriorated ecological conditions in the river, the properties of the environment will change (physical and-chemical parameters of the water, the substrate and others.) or the thick shelled river mussel and the striped nerite might be directly affected, which could lead to displacement of species and violation of their composition **(rating 1)**.

5.3.2.3.2 Fish

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal violation of the species composition of fish types subject to conservation in PA Reka Ogosta is not expected. Although insignificant, the increase of water temperature in the Danube nearby the mouth of the river Ogosta may favor the occurrence and increase of the populations of invasive types of fish like the eastern mosquitofish (*Gambusia holbrooki*), the pumpkinseed sunfish (*Lepomis gibbosus*), the topmouth gudgeon (*Pseudorasbora parva*) and others and their impact combined with the deteriorated ecological condition of the river will lead to some changes in the entire ichtiocenosis **(rating 1)**.

5.3.2.3.3 Amphibians

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal violation of species composition is not expected **(rating 0)**.

5.3.2.3.4 Reptiles

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal violation of species composition is not expected **(rating 0)**.

5.3.2.3.5 Mammals

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal violation of species composition is not expected **(rating 0)**.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive during construction, operation and decommissioning.

5.3.2.4 CHEMICAL CHANGES

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal changes are not expected.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive during construction, operation and decommissioning.

5.3.2.5 HYDROLOGICAL CHANGES

According to the EIA report, the usage of water for cooling of the existing and the new reactor of Kozloduy NPP in neither of the four site alternatives is expected to have a lasting, permanent, cumulative and transboundary impacts on the mode of the flowing water quantities of the Danube which is ensured by the use of the existing infrastructure – Bank Pump Station, cold and hot channels.

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive during construction, operation and decommissioning.

5.3.2.6 GEOLOGICAL CHANGES

During the various stages (construction, commissioning, operation and decommissioning) of the investment proposal changes are not expected (rating 0).

No impact is expected on vegetation and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive during construction, commissioning and operation and decommissioning.

5.3.2.7 OTHER CHANGES

Background radiation

For the development of the present Apropriate Assessments report regarding the implementation of NNU, monitoring was performed on individual environmental factors to determine the current state of natural background radiation and air radioactivity in the region of the 30 km studied area around Kozloduy NPP before commencement of construction. The obtained results for the equivalent dose of gamma radiation are within the range from 0.10 to 0.19 Sv/h, which are similar to the ones measured in recent years This suggests that **the background radiation will be maintained in the same range during construction, during operation and during decommissioning**.

5.3.3 IMPACT OF THE ENVIRONMENTAL MEDIA/FACTORS AS A RESULT OF THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL ON THE PROTECTED AREA OF OGOSTA RIVER, CODE BG0000614 UNDER THE HABITATS DIRECTIVE

5.3.3.1 AMBIENT AIR

In terms of the component ambient air, the 4 alternative sites for the NNU have almost equal significance of impact – very low. None of the sites is of potential danger of anthropogenic air pollution by non-radioactive pollutants in the area of the IP. Both the impact of emissions and concentration of pollutants are well below the limits of admissible standards.

Gaseous and dust emissions will not impact significantly the ambient air quality during construction. To prevent from pollution above the standards a strict construction schedule should be followed appropriate to the weather conditions i.e. to allow natural cleaning of the atmosphere.

No impact is expected on species and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive from the gaseous and dust emissions in the air during construction, operation and decommissioning.

5.3.3.2 WATER

On the grounds of the considered impacts of the NNU investment proposal, an imperative conclusion can be made that the impact of non-radioactive wastewater on the receiving basin – the Danube River – during the operation will be local, continuous, reversible, but negligible.

No impact is expected on species and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive from the pollution of surface water during construction, operation and decommissioning.

5.3.3.3 SOIL AND LANDSCAPE

Based on the data from the National Environmental Radioactivity Surveillance Network (NERSN) as a result of the impact of Kozloduy NPP increased levels of radioactive substances in plants are not found until now. Negative impact on natural and derived vegetation and agricultural crops within a radius of up to 30 km around Kozloduy NPP, including PA Reka Ogosta is not found out.

At normal technological mode of operation of the Plasma Melting Facility negative impact on soil and vegetation at the Kozloduy NPP site and outside it is not expected.

No impact is expected on species and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive from pollution of soil and changes in the landscape during construction, operation and decommissioning.

5.3.3.4 NOISE

The noise levels are within 30 dBA which is within the range of naturally-occurring low background noise (without pronounced sounds such as birds singing, the sound of the river, of strong wind, etc.). Construction activities carried out at the remoter Sites 1, 2 and 4 will not be a source of noise for Reka Ogosta PA because of the large distances and the shielding effect on noise propagation in this direction by the existing buildings at the Kozloduy NPP site. Irrespective of its proximity to the protected area, Site 3 is located at a sufficient distance so that the construction noise will not impact negatively the target species in the area. Construction activities will not be a source of noise for the other protected areas in the region due to the large distances to them (over 3 km) for all four alternative locations of the site of the new nuclear unit.

No impact is expected on species and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive from noise pollution during construction, operation and decommissioning.

5.3.3.5 WASTE

The greater part of the waste in Kozloduy NPP is collected and transported to landfills without additional processing or any other treatment.

Since the beginning of 2001, Kozloduy NPP has its own landfill for non-radioactive municipal and industrial wastes (LNMIW). It is used for disposal of waste from the protected area while the waste from outside the area is transported to the Regional landfill of the city of Oryahovo as per the signed contract with Municipality of Oryahovo.

LNMIW is in compliance with contemporary requirements. Non-radioactive solid municipal , industrial and small construction waste is disposed to LNMIW.

During implementation of the investment proposal all safety measures are provided for safety RAW operation. The essence of the proposal is related to reduction of the volume of RAW aiming at its further treatment. Subject to compliance with ALARA principles and the internal procedures and instructions for operation with RAW negative impact on the environmental media is not expected.

No impact is expected on species and types of natural habitats subject to conservation in the protected area of Ogosta River, code BG0000614 under the Habitats Directive during construction, operation and decommissioning.

Impact of the investment proposal **during construction, operation and decommissioning** on the integrity of the protected area Reka Ogosta, code BG0000614 under the Habitats Directive in view of its structure, functions and conservation objectives is not expected. The implementation of the investment proposal is not related to protected area withdrawal. Disturbance of species is not expected due to the significant distance of the protected area from the investment proposal site.

6 PROPOSALS FOR MITIGATION MEASURES ENVISAGED TO PREVENT, REDUCE AND POSSIBLY ELIMINATE THE ADVERSE EFFECTS OF THE INVESTMENT PROPOSAL ON PROTECTED AREAS AND DETERMINE THE LEVEL OF THEIR IMPACT ON THE SUBJECT AND OBJECTIVES OF CONSERVATION OF PROTECTED AREAS AS A RESULT OF THE IMPLEMENTATION OF THE PROPOSED MITIGATION MEASURES

6.1 "ZLATIYATA" PROTECTED AREA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE

During the various stages of the implementation of the investment proposal (construction, commissioning and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected both on species subject to conservation as well as to the integrity, objectives and coherence of the protected area.

6.2 "OSTROVI KOZLODUY" PROTECTED AREA, CODE BG0000533 UNDER THE HABITATS DIRECTIVE

6.2.1 TYPES OF HABITATS AND PLANT HABITATS

Such measures are not proposed as the implementation of the investment proposal will not impact directly or indirectly (destruction, damage, fragmentation) the types of natural habitats and plant habitats subject to conservation in the protected area.

6.2.2 ANIMAL SPECIES

6.2.2.1 INVERTEBRATES

Based on the latest data there are no terrestrial invertebrates subject to conservation in the protected area.

The implementation of the investment proposal will have indirect impact on the aquatic invertebrates in the protected area of Ostrovi Kozloduy as a result of navigation, thermal load and invasive aquatic species.

In order to prevent and mitigate the impact of navigation and the invasive aquatic species during construction it is necessary to monitor the invasive aquatic species in the area of the port of Kozloduy.

In order to prevent and mitigate the impact of the thermal load and the invasive aquatic species during operation a regular monitoring of the ecological condition of the Danube River should be implemented upstream and downstream Kozloduy NPP and within the area of the hot (outlet) channels;

- Implementation of regular monitoring of the invasive aquatic species within the area of the hot channels and upstream and downstream Kozloduy NPP;

- → Regular mechanical cleaning of the hot channels especially in the event of blossoming, fouling formation; mussel clusters, etc.
- → Ensure that the fuel vessels are cleaned before they enter the area of the port – clean the foul, use anti-fouling coating and ensure that bilge waters are discharged in dedicated containers and never in Danube river or in the channels.

6.2.2.2 FISH

The investment proposal will be implemented at one of the four alternative sites on the territory of Kozloduy NPP and it will not have a direct impact on the territory of the islands of Kozloduy. Nevertheless, indirect impact is expected that could be reduced by compliance with the following measures:

- → Do not allow municipal waste disposal.

Expected effect: Prevention of water pollution in PA;

- → Do not allow spills of fuel and lubricants from the construction machines and equipment. Complete ban on repairs and maintenance of transport equipment, construction equipment and personal vehicles near the protected area.

Expected effect: Prevention of water pollution within the protected area and the related deterioration of the habitats quality subject to conservation;

- → Strict compliance with the legal requirements for collection, transportation and disposal of all types of waste.

Expected effect: Prevention of water pollution within the protected area and the related deterioration of the habitats quality subject to conservation;

- → Do not allow extraction of inert construction materials from the riverbed near the protected area.

Expected effect: Preserve the natural properties of the habitats of the species subject to conservation in the area.

- → Do not allow discharge of waste water from construction and operation of the IP near the protected area and the waste water should be disposed in compliance with the respective requirements.

Expected effect: The negative impact on the target species will be reduce to the minimum.

- → To monitor regularly the ecological condition of the Danube River upstream and downstream Kozloduy NPP during operation of NNU.

Expected effect: To analyze and assess the changes in the water quality and its ecological status.

- → To monitor the invasive alien aquatic species in the Kozloduy NPP port area during construction of the NNU.

Expected effect: To reduce the risk from introducing new alien species.

→ To monitor the invasive alien aquatic species in the Kozloduy NPP area during operation of the NNU.

Expected effect: To reduce the risk from introducing new alien species and reduce the impact of those already established in the area.

6.2.2.3 AMPHIBIANS

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

6.2.2.4 REPTILES

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

6.2.2.5 MAMMALS

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

6.3 "REKA OGOSTA" PROTECTED AREA, CODE BG0000614 UNDER THE HABITATS DIRECTIVE

6.3.1 TYPES OF HABITATS AND PLANT HABITATS

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected (destruction, damage, fragmentation) on the types of natural habitats subject to conservation in the protected area and the plant habitats.

6.3.2 ANIMAL SPECIES

6.3.2.1 INVERTEBRATES

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected on the terrestrial invertebrates.

The implementation of the investment proposal will have low indirect impact on the aquatic invertebrates in the protected area of Reka Ogosta as a result of the thermal load and invasive aquatic species.

In order to prevent and mitigate this impact during operation the following should be applied:

- Regular monitoring of the ecological conditions of the Danube upstream and downstream Kozloduy NPP.
- Regular monitoring of the invasive aquatic species upstream and downstream Kozloduy NPP.

6.3.2.2 FISH

The investment proposal will be implemented at one of the four alternative sites on the territory of Kozloduy NPP and it will not have a direct impact on the territory of the protected area of Reka Ogosta. Nevertheless, indirect impact is expected on the area that could be reduced by compliance with the following measures:

- Do not allow municipal waste disposal.

Expected effect: Prevention of water pollution in PA;

- Do not allow spills of fuel and lubricants from the construction machines and equipment. Complete ban on repairs and maintenance of transport equipment, construction equipment and personal vehicles near the protected area.

Expected effect: Prevention of water pollution within the protected area and the related deterioration of the habitats quality subject to conservation;

- Strict compliance with the legal requirements for collection, transportation and disposal of all types of waste.

Expected effect: Prevention of water pollution within the protected area and the related deterioration of the habitats quality subject to conservation;

The legislative provisions on digging of deposits for construction purposes from the river beds and water bodies, given in the PPA, BDA and WA *Expected effect:* Preserve the natural properties of the habitats of the species subject to conservation in the area.

- Strict adherence to the determined discharge points for waste water during construction and operation of IP according to the permit and the individual emission limits (IEL) defined in the WA..

Expected effect: The negative impact on the target species will be reduced to the minimum.

- Regular monitoring of the ecological condition of the water upstream and downstream Kozloduy NPP during the operation of NNU.

Expected effect: To analyze and assess the changes in the water quality and its ecological status.

- To monitor regularly the invasive alien fish upstream and downstream Kozloduy NPP area during operation of the NNU.

Expected effect: To reduce the risk from introducing new alien species and reduce the impact of those already established in the area.

6.3.2.3 AMPHIBIANS

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

6.3.2.4 REPTILES

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

6.3.2.5 MAMMALS

During the various stages of the implementation of the investment proposal (construction, commissioning, operation and decommissioning) it is not necessary to apply mitigation measures to prevent or reduce the negative impact as such impact is not expected.

7 EXAMINATION OF ALTERNATIVE SOLUTIONS AND ASSESSMENT OF THEIR IMPACT ON THE PROTECTED AREAS, INCLUDING ZERO ALTERNATIVE

7.1 ZERO ALTERNATIVE

The "zero alternative" describes the current status and its effects if the investment proposal is not implemented. In this specific case, if the zero alternative is implemented, the current status and parameters of the components of the environment will be sustained.

In accordance with subparagraph 8 of the supplementary provisions of the regulation on the assessment of the compatibility of plans and programmes with the objectives for protected areas conservation, "the zero alternative" describes the current status and its effects if the applied investment intentions cannot be implemented.

In case of a "zero alternative" the natural developments in the habitats and species in the area are expected to remain unchanged. As they are at significant distance from the Protected Areas and the potential sites envisaged for the construction of the NNU do not have unique characteristics, they are not significant in terms of habitats and protected species habitats. For the vertebrate fauna and birds in particular, the zero alternative will have a positive impact, given the limited human presence and absent irritants like noise, light, etc. Agricultural practices will continue to be implemented, and arable and uncultivated land will not be subject to change of usage.

7.2 SITE ALTERNATIVES

The 4 alternative sites determined for the NNU accommodation have been selected in advance in accordance with criteria, excluding legally prohibited territories or territories not complying with the environmental protection legislation.

The sites for the NNU implementation have been selected after a survey of the area. Taken into account is the location of each site and the existence of habitats and habitats of species of higher conservation importance.

SITE 1 – 55 ha

There are open main drainage channels in the area of the site, which should be reconstructed. Part of the site is used for cultivation of agricultural crops. The site is located on the territory of the former Kozloduy swamp.

Three of the species: Blackthorn (*Prunus spinosa)*; Common Wormwood *(Artemisia vulgaris)* and Yellow Star-thistle *(Centaurea solstitialis),* included in the Medicinal Plants Act, are found at Site 1.

Suitable habitats and appropriate food base exist at the site for mesophile and hygrophile specimens of terrestrial invertebrates. There is a permanently settled population or passing specimens of Cenagrion species (*Coenagrion ornatum*). The place is the habitat of many mollusca and hydrophilic insects, such as dragonflies, grasshoppers, beetles and other invertebrates.

There are appropriate habitats for *Misgurnus fossilis*.

The area of the site is permanently inhabited with small rodents of the *Microtus* and *Apodemus* types, and by predatory animals protected under the Biodiversity Act – Fox (*Vulpes vulpes*), Jackal (*Canis aureus*), Beech marten (*Martes foina*).

The existing drainage channels are a temporary or permanent habitat of all types of amphibians and reptiles related to existing water, including species of the highest conservation status. Temporary stay of some aquatic invertebrates, e.g. Narrow-clawed crayfish (*Astacus leptodactylus*) is possible. Some unprotected aquatic invertebrate species with fast cycle of development (some aquatic-aerial insects) could be seen.

Excessively wet habitats, overgrown with hygrophytic vegetation, comprise damp areas which are highly important for the maintenance and protection of biodiversity and which provide conditions for existence of diverse and faunistic cohabitants.

Low level of impact on the floristic and faunistic diversity is anticipated during the implementation of the NNU at SITE 1.

SITE 2 – 55 ha

A former farm yard is located at the site. The remaining area is used for growing of agricultural crops.

The habitats are characterized with a diverse anthropogenic activity, resulting in rederalisation and droughts of habitats and widely spread species of generalists. On the area of the site there are no habitats allowing development of aquatic invertebrates. There are no water basins at the site, which basically precludes the possibility of its being inhabited by water-related amphibians and reptiles. On the territory of Site 2, envisaged for the construction of the NNU, there are no habitats of rare or endangered animal species.

The main part of the territory comprises arable land which can be assessed as inappropriate for habitation of most biological species.

Very low level of impact on the floristic and faunistic diversity is anticipated during the implementation of the NNU at SITE 2.

SITE 3 – 53 ha

Within the site there are open drainage channels, deserted and arable lands, pastures with bushes and lowering of the terrain (probably parts of the former Kozloduy swamp) with swamp vegetation.

Six of the established plant species: *Artemisia vulgaris*; *Cichorium inthybus*; *Sambucus ebulus*; *Crataegus monogyna*; *Prunus spinosa* and *Typha angustifolia*, included in the Medicinal Plants Act, can be found at Site 3.

The site is characterised by a great diversity of micro habitats and of great importance is the wet area in the lowering terrain located at the embankment in the south-east part of the site. It is possible to have a permanent population of Coenagrion dragonflies: *Coenagrion ornatum*, *Libellula depressa*, *Orthetrum brunneum*, etc. The arable areas and ecotones verging on bushes and trees maintain the anthropogenically influenced species, but in general the variety of semi-natural and anthropogenically influenced habitats contributes to the great diversity of the specifies at the site.

The channel system is not a suitable habitat for aquatic invertebrates. It could be only if sufficient and permanent water level (throughout the year) is maintained. Temporary habitation of some of these species is possible, e.g. Narrow-clawed crayfish (*Astacus leptodactylus*).

The existing drainage channels comprise a temporary or permanent habitat of all kinds of amphibians and water-related reptiles, including those with the highest conservation status.

The terrain provides good conditions for hunting to migrating bats. The following predatory mammals are found here: European polecat (*Mustela putorius*), Wild-Boar (*Sus scrofa*), Fox (*Vulpes vulpes*), Jackal (*Canis aureus*), Beech marten (*Martes foina*). Six bird species protected under the Biodiversity Act inhabit the site.

Low level of impact on the floristic and faunistic diversity is anticipated during the implementation of the NNU at SITE 3.

SITE 4 – 21 ha

The site falls within the boundaries of the alienated areas of Kozloduy NPP.

There are no habitats of biological species within this area.To utilise site 4 reconstruction and shifting of major NPP underground communication systems are envisaged, in combination with vacation and relocation of the systems. It is also required to construct additional network of overhead power lines, as well as dig and construct new connections of the warm and cold water supply channels. All these construction works would contribute to additional negative impact on habitats and species habitats for reaching the site area.

No impact on the floristic and faunistic diversity is anticipated during the implementation of the NNU at SITE 4, owing to its highly urbanised nature.

CONCLUSION

Table 7.2-1 shows comparative analysis of the auxiliary infrastructure needed during construction and operation for each site. The analysis is made in the EIAR for connection of the generated electric power to the national electric power supply system, technical water supply; construction of auxiliary facilities, access etc.

TABLE 7.2-1: ANALYSIS OF THE SITES

	Site 1	Site 2	Site 3	Site 4
Arrangement of the lines between the site and the switchgear	The connection to the outdoor switchgear is difficult as the site is located at the back and it will be required to construct a route for the incoming overground lines and the switchgear area, opposite to the access fields, or it is possible to claim for changes in the outdoor switchgear, for example installation of new fields in order to have better access to the 400 kV busbar.	The connection to the outdoor switchgear is easier and shorter than at Sites 1 and 3, with less conflicts with the infrastructure. The electric connection to the outdoor switchgear is easy due to the short distance and front location, therefore there is no need for changes in the fields of the outdoor switchgear.	This is the most difficult access to the outdoor switchgear by overhead power lines, as there will be conflict with the overhead lines of Units 5 and 6. The connection to the outdoor switchgear is difficult since the site is located at the back and therefore it is required to construct a route for incoming overhead lines and the outdoor switchgear area, opposite to the access fields, or it is possible to claim for changes in the outdoor switchgear, for example installation of new fields in order to have better access to the 400 kV busbar.	The connection to the outdoor switchgear is easier and shorter than at Sites 1 and 3. The electric connection to the outdoor switchgear is easy due to the short distance and front location, therefore there is no need for changes in the fields of the outdoor switchgear.
Overhead lines at the site	There are less conflicts at this site. There are no overhead lines at the site.	There are two 110 kV overhead lines and one 20 kV overhead line	Five 400 kV lines and one 220 kV line are crossing the site	There are no overhead lines at this site.
Connection to the old warm channel	The connection to the warm channel is difficult since the pressure pipelines shall pass through the cold channel. The distance to the warm channel is around 120 m.	The discharge in the warm channel is not difficult since the warm channel is at the north boundary of the Site 2	A new pipeline/channel from Site 3 to the open part of the old warm channel shall be constructed, because it is recommendable to avoid any connection through the underground part of the warm channel.	Although the underground part of the warm channel is at the north corner of the site, it is recommendable to avoid any connection through the underground part of the warm channel, that is why the discharge shall be in the open warm channel..
Connection to the new warm channel	Since the new warm channel is used only for Units 5 and 6, it has not been considered for being used at the new nuclear unit.	Since the new warm channel is used only for Units 5 and 6, it has not been considered for being used at the new nuclear unit.	Since the new warm channel is used only for Units 5 and 6, it has not been considered for being used at the new nuclear unit.	Since the new warm channel is used only for Units 5 and 6, it has not been considered for being used at the new nuclear unit.

Connection to the existing cold channel	The site is close to the cold channel and therefore the access to it is easy. A new avant-chamber for the circulating water shall be constructed.	The circulating water supply may be provided by repeated use of the existing structure of the Circulation Pump Stations (CPS) for Units 1 and 2. In this case the new pipelines from the cold channel shall pass above the underground warm channel.	A new Circulating Pump Station shall be constructed at the end of the cold channel, thus extending the cycle with new water supply. This will not influence the normal operation of the existing units.	The circulating water supply may be provided by the supply for Units 3 and 4. The pipes from the cold channel shall be constructed above the underground warm channel, which is at the north corner of the site.
Distance to the cold channel	60 m	75 m	235 m	75 m
Topography	The site is even. The average level is around 26 m in the north half of the site, the rest is inclined to maximum 30 m in the south corner. Significant earth fill will be required to reach a level above the maximum water level.	The site is quite even with average level of 36 m. The south part of the site is a little bit more elevated than the rest and its maximum level is around 46 m. Minor earthwork may be required (excavation and fill).	The site is very uneven in comparison to the other sites with average level of around 30 m, however the site is crossed northeast by a river bed with levels of around 27 m. Significant earth fill will be required to reach a level above the maximum water level.	The site is even with average level of around 37 m in the north corner and around 39 m in the south corner. Minor earthwork may be required (excavation and fill).
Location of the sites in terms of the flooding area of the Danube River	This is the first flooded terrace of the Danube River.	This is the first non-flooded terrace of the Danuber River.	This is the first flooded terrace of the Danube River.	This is the first non-flooded terrace of the Danuber River.
Destruction of existing buildings and other structures	There are no buildings. Possible presence of fire safety pipelines at the site.	There are sevetal small buildings in the west corner of the site.	There are no buildings and no other conflicts except for the overhead communication.	There are many buildings and overhead (bridge) cranes. Possible presence of some underground pipelines at the site. The ventilation pipe of 150 m height for Units 3 and 4 shall be classified in terms of seismity. This shall be checked otherwise the effect on the site in case of collapse will be outcast.
Land property and areas of controlled space	Part 1 – area of 52.53 ha for agricultural use, state public property or state private property. Part 2 – area of 2.47 ha classified as urbanized area, property of Kozloduy NPP EAD.	Part 1 – area of 16.29 ha classified as urbanized area, property of Kozloduy NPP EAD. Part 2 – area of 3.98 ha classified as urbanized area, property of Kozloduy NPP EAD. Part 3 – area of 6.86 ha classified as urbanized area, property of GBS-ECM. Part 4 – area of 27.87 ha for	Part 1 – area of 6.65 ha classified as urbanized area, Kozloduy NPP property. Part 2 – area of 46.35 ha for agricultural use, private property.	Part 1 - area of 16.1 ha classified as urbanized area, Kozloduy NPP property. Part 2 – area of 4.9 ha classified as urbanized area, ENEMONA property.

		agricultural use, private property.		
Transportation of heavy equipment	There is access road to the site, suitable for transportation of heavy machinery from the river port, as well as from the ring road of Kozloduy NPP. The existing road is parallel to the cold channel and therefore overhead lines 400, 220 and 100 kV pass above it north to the outdoor switchgear. There is a possible or easy to construct alternative access through the main road of the power plant.	There is access road to the site, suitable for transportation of heavy machinery from the river port, as well as from the ring road of Kozloduy NPP. The existing road is parallel to the cold channel and therefore overhead lines 400, 220 and 100 kV pass above it north to the outdoor switchgear. There is a possible or easy to construct alternative access through the main road of the power plant. It is possible to construct a new road from the riveer port to the site in order to avoid detour of the whole Kozloduy NPP site.	There is access road to the site, suitable for transportation of heavy machinery from the river port, as well as from the ring road of Kozloduy NPP. The existing road is parallel to the cold channel and therefore overhead lines 400, 220 and 100 kV pass above it north to the outdoor switchgear. There is a possible or easy to construct alternative access through the main road of the power plant.	There is access road to the site, suitable for transportation of heavy machinery from the river port, as well as from the ring road of Kozloduy NPP. The existing road is parallel to the cold channel and therefore overhead lines 400, 220 and 100 kV pass above it north to the outdoor switchgear. There is a possible or easy to construct alternative access through the main road of the power plant.
Distance to the access from Kozloduy: from Harlets:	 3.65 km 3.60 km	 3.95 km 3.00 km	 2.00 km 5.00 km	 2.65 km 4.25 km

The assessment of the described alternative sites in the EIAR shows that the second site has the least impact on the environmental components and factors.

Based on the analysis in terms of flora and fauna diversity, performed above, SITE 2 has also the greatest advantage as it has the lowest level of impact and it is proposed as an option for the accommodation of the NNU.

7.3 ALTERNATIVES FOR TECHNOLOGICAL OPTIONS IN THE CONSTRUCTION OF THE NEW NUCLEAR UNIT

According to the Terms of References of the Contracting authority for the implementation of IP there are two possible options for construction of the new nuclear unit up to 1200 MW with a reactor of the latest generation (III or III+ generation):

- **A-1**: (Hybride) Maximum use of the equipment from the nuclear island, ordered for Belene NPP and turbine island by another supplier.
- **A-2**: Completely new project – two models of reactors: AES-2006 and AP-1000.

Not all environmental components and factors are affected by the type of equipment, as all three options meet the requirements of the European operating organizations for LWR NPP. The factors with expected qualitative impact are presented in **Table 7.3-1**.

TABLE 7.3-1: ASSESSMENT OF THE EQUIPMENT OPTIONS

Type of reactor	STAGE	Water required	Polluting load	Management of Radioactive Waste	Radiation risk
		Non-radioation aspect		Radiation aspect	
AES-92	Operation				
	Decommissioning				
AP-1000	Operation				
	Decommissioning				
AES-2006	Operation				
	Decommissioning				

In non-radiation aspect two criteria are assessed: required water for process needs (for the condensators of the turbines and for the process needs at Chemical water treatment (CWT) and polluting load (B.O.D.5, not dissolved substances, chemical oxygen consumption, other

chemical substances), in radiation aspect – management of RW and radiation risk after impact modeling for each reactor option for gaseous-aerosol and liquid release.

The cell is light green when the reactor option shows the lowest value for the indicator (better than the others), the cell is dark green – when the value of the indicator is higher.

Based on the table we may conclude that:

1. **In non-radiation aspect** for the component surface water all three reactors do not exceed the permitted fresh water taking. After Units 1-4 stopped operating the quantity of extra fresh water is much than enough for NNU regardless the type of equipment. AP-1000 is more sparing as the required quantity of fresh water for cooling and technical water supply from the Danube River is less. Any destruction of IEL is not expected at the discharged waste water for all three reactors.
2. **In radiation aspect:**
   a. Regarding the gaseous–aerosol release AES-92 and AES-2006 have lower design values than AP-1000, but this may be due to the highly conservative approach of Westinghouse in their determination. The modeling shows that the share of the individual effective dose from gaseous-aerosol release in the environment from NNU for the model AP-1000 is much less than the administrative quote 0.05 mSv, determined by NRA (letter No 47-00-171/12.02.2013), namely 1.198 %. For AES-92 and AES-2006 the share of the individual effective dose from gaseous-aerosol release in the environment is 0.0358 %. Therefore all three models reactors meet the legislative requirements.
   b. Regarding the liquid release the modeling shows that the maximum individual effective dose in the 30 km zone from the design liquid release of AP-1000 under all operational modes is just 14 % of the administrative quote of NRA - 0.05 mSv. (NRA guidelines given with letter No 47-00-171/12.02.2013). Regarding the EUR limit for design liquid release, the modeling shows that under all operational modes of the new unit the maximum dose is around 5 % of the administrative quote. As reactors AES-92 and AES-2006 entirely meet the EUR requirements, it means that they meet also the legislative requirements.

Therefore regarding the **environmental protection (ecological aspect)** all three models reactors are suitable for the new nuclear unit implementation.

The technological alternative in terms of the impact of the individual models of nuclear units and the impact they would have on the fauna, flora and ecosystems in the described in the assessment Natura 2000 sites may be considered insignificant.

7.4 CONCLUSIONS

The EIAR describes and assesses the impact of the NNU on the environment and human health.

The Report includes a detailed analysis, a forecast and assessment of the impacts on all components and factors of the environment, as well as health and hygiene aspects during the construction, operation and decommissioning of an **Investment Proposal for "Building a new nuclear power unit of the latest generation at the Kozloduy NPP site".**

The Report has been prepared in line with the requirements of the then effective legislation framework. Specific measures are proposed for the reduction, prevention and maximum elimination of identified impacts on the environment and human health, taking into account the synergy effects of the radiation background.

The main conclusions of the EIAR, which are relevant to the assessment of the level of impact of the investment proposal and the subject and objectives for protected areas conservation are as follows:

During NNU construction

- ✓ The existing NPP "Kozloduy" infrastructure contributes to the safety of the staff during construction;
- ✓ Wastewater generated during construction will not deteriorate the quality of water in the Danube River;
- ✓ Subsurface layers will not be affected substantially by the implementation of the investment proposal;
- ✓ No impact is expected on the land use, mineral diversity, cultural heritage and protected natural areas;
- ✓ Deterioration of the landscape structure is negligible;
- ✓ No impact is expected on the biological diversity and on the areas inhabited by protected, significant and sensitive flora and fauna species;
- ✓ Noise and vibrations are restricted only within the territory of the NNU construction site and have no impact on the environment;
- ✓ No impact due to radiation factors related to the investment proposal during construction is expected as there are no significant, constant and non-regulated radioactive sources at that phase. The tools for non-destructive testing used in compliance with the safety measures shall not be considered as factor for radiation pollution of the working environment during construction of the new nuclear unit;

During NNU operation

- ✓ The existing NPP Kozloduy infrastructure and the extensive experience and expertise in the operation of the power plant contribute to the safety both of the population and of the staff in the NNU operation;
- ✓ The potential radiation impact on the staff operating NNU is expected to be within the limits of the design requirements laid down in the Investment Proposal;

- ✓ In non-radiation aspect, the NNU operation throughout its 60-year lifetime will not have negative impact on the population within the 30 and 100-kilometer zone around the power plant;
- ✓ The health risk for the closest residential area for all the four alternatives sites proposed is insignificant;
- ✓ The gaseous and aerosol releases will not have any significant impact on the health status of the population within the 30-kilometer zone around NPP Kozloduy;
- ✓ Gas emissions from internal combustion engines of the special vehicles and trucks in the NNU area will be negligible;
- ✓ Accounting for the provided quantity of drinking water for NPP Kozloduy and the available reserve in the plant consumption that will be used by NNU, the impact on the total water consumption of NPP Kozloduy will be insignificant;
- ✓ Faecal, industrial and spent cooling wastewater will not affect the ecological status of the water in the Danube River;
- ✓ Non-radiation impact on the environmental components and factors is not expected;
- ✓ Radiation impacts are not expected to occur on waters, land and soil, geological environment, subsoil, land use, mineral diversity, biological diversity, ecology and cultural resources; areas inhabited by protected, significant and sensitive flora and fauna species; scenic countryside; historic and cultural sites, sites protected by virtue of international or national law, or on the health of staff and population;
- ✓ No negative impact is expected from radioactive waste (RAW) if observing the decommissioning plans of the nuclear facility and all applicable Bulgarian and international legislative requirements and practices;
- ✓ The NNU contribution to the background gamma radiation in the area of the town of Kozloduy due to external radiation exposure is negligible even in cumulation with the existing nuclear facilities of the NPP Kozloduy site. The cumulative impact on the environment in radiation aspect is qualified as insignificant; no cumulative impact in non-radiation aspect is expected;
- ✓ Transboundary impact is not expected.

During decommissioning:

- ✓ No negative impact is expected to ensue on the population beyond the 2-kilometer zone during NNU decommissioning;
- ✓ Non-radiation impact on the environmental components and factors is not expected;
- ✓ No radiation impacts are expected on waters, land and soil, geological environment, subsoil, land use, mineral diversity, biological diversity, ecology and cultural resources; areas inhabited by protected, significant and sensitive flora and fauna

species; scenic countryside; historic and cultural sites, sites protected by virtue of international or national law, or on the health of staff and population;

- ✓ During decommissioning no cumulative impact due to non-radiation factors is expected;
- ✓ No negative impact is expected from RAW if observing the decommissioning plans of the nuclear facility and all applicable Bulgarian and international legislative requirements and practices;

8 MAP MATERIAL

FIGURE 8-1: LOCATION OF THE NNU SITE ALTERNATIVES ON THE TERRITORY OF KOZLODUY NPP

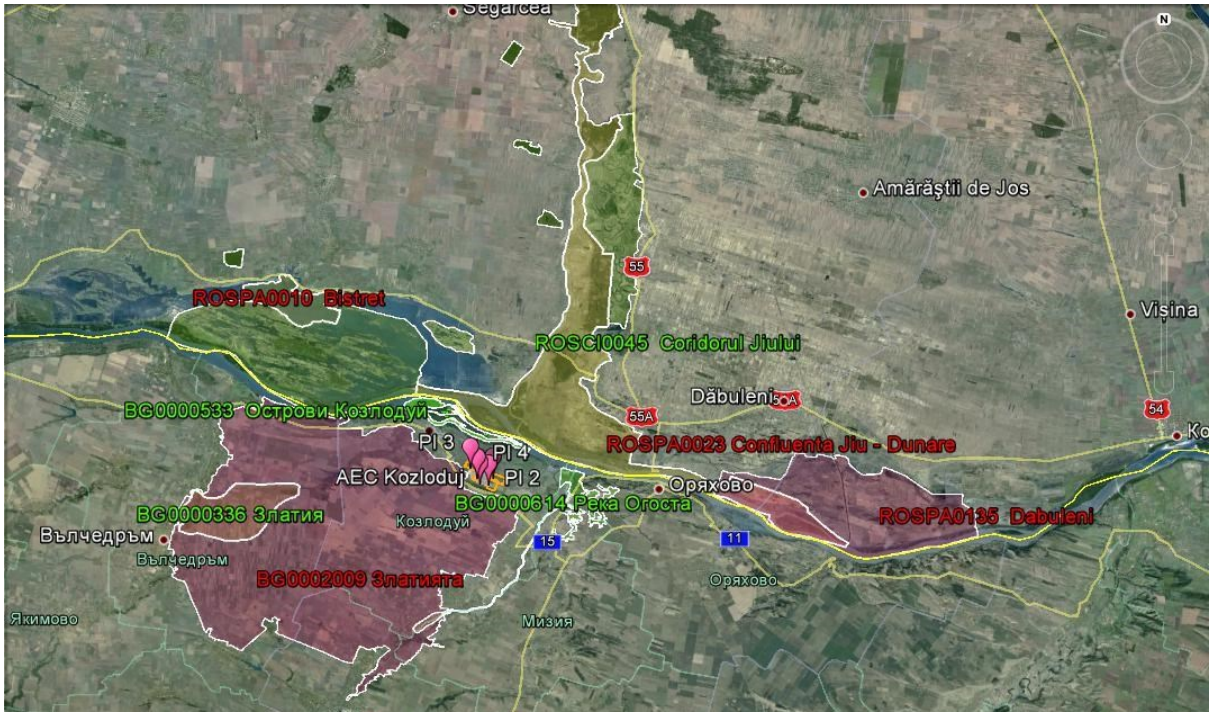

FIGURE 8-2: AREA OF THE NNU SITE ALTERNATIVES INCLUDING SITES OF THE EUROPEAN ENVIRONMENTAL NETWORK NATURA 2000 ON THE TERRITORY OF BULGARIA AND ROMANIA.

Legend: *– according to the Birds Directive; – according to the Habitats Directive; – NNU site alternatives.*

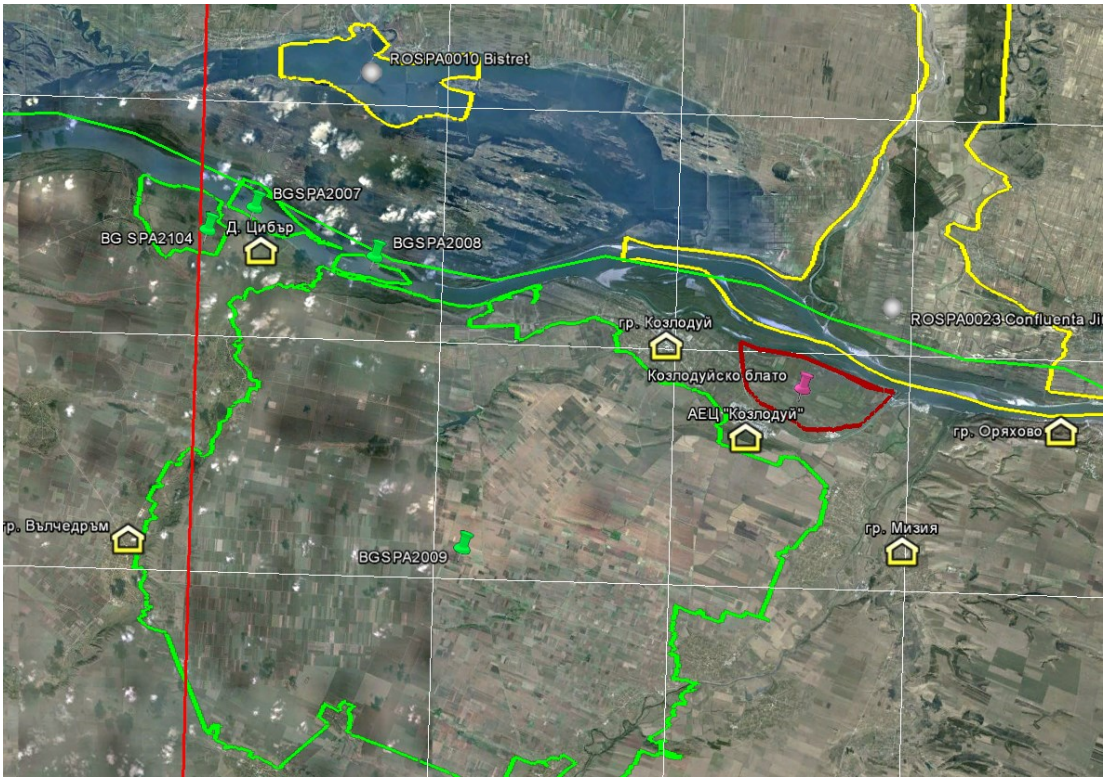

FIGURE 8-3: LOCATION OF THE FORMER KOZLODUY SWAMP (IN RED)

FIGURE 8-4: MAP OF PA "ZLATIYATA" CODE BG0002009 FOR BIRDS FROM NATURA 2000

Legend: – *site alternatives for NNU implementation.*

FIGURE 8-5: PROTECTED AREA "OSTROVI KOZLODUY" CODE BG0000533 ACCORDING TO HABITATS DIRECTIVE

Legend: – *site alternatives for NNU implementation.*

FIGURE 8-6: PROTECTED AREA "OGOSTA RIVER" CODE BG 0000614 ACCORDING TO HABITATS DIRECTIVE

Legend: – *site alternatives for NNU implementation*

9 CONCLUSION ON THE TYPE AND LEVEL OF NEGATIVE IMPACT ACCORDING TO THE CRITERIA SET OUT IN ARTICLE 22

9.1 REGARDING INDIVIDUAL PROTECTED AREAS

9.1.1 "ZLATIYATA" PROTECTED AREA, CODE BG0002009 UNDER THE BIRDS DIRECTIVE

The Investment Proposal "BUILDING A NEW NUCLEAR UNIT OF THE LATEST GENERATION AT THE KOZLODUY NPP SITE" is in conformity with the objectives and subject for conservation of "Zlatiyata" Protected Area, code BG0002009 under the Birds Directive. The IP may be implemented as it is considered it will not have significant negative impacts on the bird species subject to protection therein and on their habitats.

9.1.2 "OSTROVI KOZLODUY" PROTECTED AREA, CODE BG0000533 UNDER THE HABITATS DIRECTIVE

9.1.2.1 TYPES OF HABITATS ANDPLANT HABITATS

The IP implementation is not expected to have a negative impact on the protected types of natural habitats and conservation-significant plant species in the area due to its remoteness from the territory of the IP.

9.1.2.2 ANIMAL SPECIES

9.1.2.2.1 Invertebrate animals

No impact is expected on invertebrate animals as there are no protected invertebrate species there.

Based on the criteria applied and the relevant findings made on aquatic invertebrates, a conclusion can be drawn that the design of the IP in its different stages (construction, commissioning, operation, decommissioning) is in conformity and will not have a significant adverse impact on the structural and functional integrity of the population of the thick shelled river mussel (*Unio crassus*), as well as on the subject and objectives for conservation of the species in "Ostrovi Kozloduy" PA, provided that the mitigating measures proposed in this assessment are fulfilled.

9.1.2.2.2 Fishes

Based on the criteria applied and the relevant findings made on aquatic invertebrates, a conclusion can be drawn that the design of the IP in its different stages (construction, commissioning, operation, decommissioning) is in conformity and will not have a significant adverse impact on the structural and functional integrity, as well as on the subject and objectives for conservation of the species in the area, provided that the mitigating measures proposed in this assessment are fulfilled.

The analysis shows that in general the NNU implementation will not be in conflict with the subject and objectives for conservation of significant species and habitats in "Ostrovi Kozloduy" PA.

9.1.2.2.3 Amphibians

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

9.1.2.2.4 Reptiles

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

9.1.2.2.5 Mammals

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

The Investment Proposal "BUILDING A NEW NUCLEAR UNIT OF THE LATEST GENERATION AT THE KOZLODUY NPP SITE" is in conformity with the objectives and subject for conservation of "Ostrovi Kozloduy" Protected Area, code BG0000533 under the Habitats Directive. The IP may be implemented as it is considered it will not have significant negative impacts on the bird species subject to protection therein and on their habitats, provided that the above mitigating measures are fulfilled.

9.1.3 "OGOSTA RIVER" PROTECTED AREA, CODE BG0000614 UNDER THE HABITATS DIRECTIVE

9.1.3.1 TYPES OF HABITATS AND PLANT HABITATS

The IP implementation is not expected to have a negative impact on the protected types of natural habitats and conservation-significant plant species in the area due to its remoteness from the IP site.

9.1.3.2 ANIMAL SPECIES

9.1.3.2.1 Invertebrate animals

During the different stages (construction, commissioning, operation, decommissioning) of the implementation of the investment proposal no negative impacts on terrestrial invertebrate species are expected.

Based on the criteria applied and the relevant findings made on aquatic invertebrates, a conclusion can be drawn that the design of the IP in its different stages (construction, commissioning, operation, decommissioning) is in conformity and will not have a significant adverse impact on the structural and functional integrity of the populations of the thick shelled river mussel (*Unio crassus*) and the Striped nerite (*Theodoxus trnsversalis)* , as well as on the subject and objectives for conservation of the species in "Ogosta River" PA, provided that the mitigating measures proposed in this assessment are fulfilled.

9.1.3.2.2 Fishes

Based on the criteria applied and the relevant findings made on aquatic invertebrates, a conclusion can be drawn that the design of the IP in its different stages (construction, commissioning, operation, decommissioning) is in conformity and will not have a significant adverse impact on the structural and functional integrity, as well as on the subject and objectives for conservation of the species in the area, provided that the mitigating measures proposed in this assessment are fulfilled.

The analysis shows that in general the NNU implementation will not be in conflict with the subject and objectives for conservation of conservation-significant species and habitats in "Ogosta River" PA.

9.1.3.2.3 Amphibians

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

9.1.3.2.4 Reptiles

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

9.1.3.2.5 Mammals

During the different stages (construction, commissioning, operation, decommissioning) of IP implementation no negative impacts on the target species are expected.

The Investment Proposal "BUILDING A NEW NUCLEAR UNIT OF THE LATEST GENERATION AT THE KOZLODUY NPP SITE" is in conformity with the objectives and subject for conservation of "Ogosta River" Protected Area, code BG0000614 under the Habitats Directive. The IP may be implemented and it is considered it will not have significant negative impacts on the bird species subject to protection therein and on their habitats, provided that the above mitigating measures are fulfilled.

9.2 GENERAL CONCLUSION

The Investment Proposal "BUILDING A NEW NUCLEAR UNIT OF THE LATEST GENERATION AT THE KOZLODUY NPP SITE" is in conformity with the objectives and subject for conservation of the protected areas "Zlatiyata", code BG0002009 under the Birds Directive, "Ostrovi Kozloduy", code BG0000533 under the Habitats Directive, and "Ogosta River", code BG0000614 under the Habitats Directive. The IP may be implemented and it is considered it will not have significant negative impacts on the subject and objectives for protection therein.

Based on the analyses and impact assessment of all environmental components and factors, including protection of biodiversity in relation to implementation of the investment proposal *"Building a New Nuclear Unit of the Latest Generation at the Kozloduy NPP Site"*, **the priority choice for building a new nuclear unit (NNU) is Site 2.** *In regard to the reactor type option, no definite model can be identified because the three technical solutions are options for implementation of the investment intention.*

Taking into account the measures proposed by the experts and stipulated in detail in item 6 of this report on IP conformity with the subject and objectives for conservation of protected areas, we propose that approval is granted for the implementation of the investment proposal for building a **New Nuclear Unit of the Latest Generation at the Kozloduy NPP Site at Site 2.**

10 PRESENCE OF THE CIRCUMSTANCES UNDER ARTICLE 33 OF THE BDA WHEN THE CONCLUSION UNDER ITEM 9 IS THAT THE SUBJECT OF CONSERVATION OF THE RESPECTIVE PROTECTED AREA WILL BE SIGNIFICANTLY AFFECTED BY THE IMPLEMENATTION AND OPERATION OF THE INVESTMENT PROPOSAL AND NO OTHER ALTERNATIVE SOLUTION IS AVAILABLE

None.

11 DETAILS ON RESEARCH METHODS USED, INCLUDING DURATION AND PERIOD OF FIELD STUDIES, FORECASTING AND IMPACT ASSESSMENT METHODS, SOURCES OF INFORMATION, DIFFICULTIES IN GATHERING THE NECESSARY INFORMATION

11.1 RESEARCH METHODS, FORECASTING AND IIMPACT ASSESSMENT METHODS USED IN RESPECT OF PROTECTED AREAS UNDER THE BIRDS DIRECTIVE

To assess the status within the 30-km range of monitoring, field studies of the 4 sites envisaged for building and their adjacent areas within the required range, including "Zlatiyata" Protected Area, were carried out in the period January-March 2013. Routing and semi-stationary research methods were employed. The results of the field studies in the nearest protected areas of the Natura 2000 network were also used, taken from the conducted studies of migrating bird species routes in 2011 and 2012 seasons, within the framework of the project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 7, and consultations with experts, NGOs and accessible database.

The assessment of the level of impact is made in accordance with the legal framework of the Bulgarian environmental legislation, aligned with the European one, the Biodiversity Act, the Regulation on Conformity Assessment, the Habitats Directive, and the Birds Directive. Used are "The Red Book of Bulgaria", "Ornithologically Significant Habitats in Bulgaria and Natura 2000", "Atlas of Breeding Birds in Bulgaria", academic papers on ornitho-fauna of the Danube coastline of Bulgaria and Romania, etc.

Standard methods were utilised to determine the bird species composition and assess their number and density. An original methodology was applied for quantitative assessment of the negative impact on bird species subject to conservation in the protected areas of the Natura 2000 network. The methodology is developed as a result of many years of practical experience accumulated in the course of examination and monitoring of wetlands, protected territories, and rare and endangered bird species in the country.

To determine the level of the negative impact on different bird species subject to conservation in the protected area, a Matrix for Evaluation of the Impact Level (**Table 4.3-1**) has been used.

11.2 RESEARCH METHODS, FORECASTING AND IIMPACT ASSESSMENT METHODS USED IN RESPECT OF PROTECTED AREAS UNDER THE HABITATS DIRECTIVE

11.2.1 METHODS USED FOR RESEARCH, FORECASTING AND ASSESSMENT OF THE IMPACT ON PLANT SPECIES AND TYPES OF HABITATS IN THE PROTECTED AREAS UNDER THE HABITATS DIRECTIVE

PRELIMINARY WORK

- Review of the Standard Forms of the two protected areas in the area – "Ostrovi Kozloduy" and "Ogosta River" and extraction and processing of environmental information on the target species and natural habitats;
- Review and gathering of scientific information on the protected areas and parts thereof, falling within the territory of the studied site.
- Review of existing information on the Protected Areas and parts thereof, falling within the territory of the study.
- Review of available literature and reference information on the species and natural habitats subject to conservation in the protected areas;
- Review and processing of existing AARs and EIARs regarding the territory of the studied site.

To assess the status within the 30-km range of monitoring, field studies of the 4 sites envisaged for building and their adjacent areas within the required range, including the protected areas "Ostrovi Kozloduy" and "Ogosta River", were carried out in the period January-March 2013. Routing and semi-stationary research methods were used. The results of the field studies in the nearest protected areas of the environmental network Natura 2000 were also used, taken from the conducted studies of migrating bird species routes in 2011 and 2012 seasons, within the framework of the project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I", of the Ministry of Environment and Water, lot 6, and consultations with experts, NGOs and accessible database.

For the analysis and assessment of the impact on habitats and plant species subject to conservation in the nearest protected areas under the Habitats Directive the "Guidance on assessment of the good conservation status of natural habitats and species under Natura 2000 in Bulgaria" (Zingstra at al., 2009) was used, in combination with the methodologies for good conservation status of natural habitats and species under Natura 2000 in Bulgaria, also developed within the context of the quoted project.

Reference is made to the available literature (Peev et al. On-line; Biserkov et al. On-line; Bondev, 1999, 1997, 2002, Velchev 1982-1989; 1997, 2002, Delipavlov 2003; Yordanov, 1963-1979; Kozhuharov, 1995; Petrova & Vladimirov 2009; 2010; Walter & Gillett 1998), the accessible database on the status of the flora and habitats on the territory of the subject of impact by the IP.

To determine the level of the negative impact on different species and natural habitats subject to conservation in the protected area, a Matrix for Evaluation of the Impact Level (**Table 4.3-1**) was used.

11.2.2 METHODS USED FOR RESEARCH, FORECASTING AND ASSESSMENT OF THE IMPACT ON TARGET ANIMAL SPECIES IN THE PROTECTED AREAS UNDER THE HABITATS DIRECTIVE

PRELIMINARY WORK

- Review of the Standard Forms of the three protected areas in the area – "Ostrovi Kozloduy", "Zlatiyata" and "Ogosta River" and extraction and processing of environmental information on the target species;
- Review and gathering of scientific information on the protected areas and parts thereof, falling within the territory of the studied site.
- Review of existing information on the Protected Territories and parts thereof, falling within the territory of the study.
- Review of available literature and reference information on the species subject to conservation in the protected areas;
- Review and processing of existing AARs and EIARs regarding the territory of the studied site.

11.2.2.1 INVERTEBRATE ANIMALS

Aquatic invertebrate animals

Data on the distrubtion of aquatic invertebrate animals in the area of Kozloduy NPP, Danube River below and above PA "Ostrovi Kozloduy" and Ogosta River within the territory of PA "Ogosta River" were gathered during the field study in the period January-March 2013.

In addition, used were hydrochemical and biological data from previous field studies of L. Kenderov and T. Trichkova – 01-10.09.2012 Danube Expedition, and studies of "Asparuhov Val" dam in 2006, 2009; as well as data on benthic invertebrate animals and biotic index, gathered on the project: "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 1, and data on biotic index from MEW- EEA (2007-2011).

Aquatic invertebrate organisms were collected using the following methods and tools:

- ***Visual search and manual collection***. It is applied for surveying the coastline to find mollusc and snail shells washed out at a lower water level. A hydrobiological sieve is used to sieve bottom sediments. The samples are reported only in qualitative terms.
- ***Triangular light dredge***. It is used for sample taking from softer bottom sediments, searching for invertebrates buried in the substrate. A qualitative and quantitative report is used. It is in line with standard ISO 9391:1993.
- ***Triangular malacological dredge.*** It is used for catching large molluscs from slimy and sand substrates. It is used for quantitative reporting of large mollusc shells.
- **Square heavy dredge**. It is applied on all types of bottom substrate for quantitative reporting of large mollusc shells.

- ***Manual square frame.*** It is used for quantitative and qualitative reporting of bottom invertebrates from the shallow (up to 0.5 m) lithoral area, incl. stony substrate. It is in line with standard ISO 7828:1985.

The field processing of collected materials includes: transfer to a bank fixed with 70% ethanol (rarely with 4% formalin) and labelling. Additionally collected information on: characteristics of the water catchment area and the water system, basic hydrochemical and sedimentological features of the water basin. The measurements of the basic physical and hydrochemical parameters of the water are made by means of oximeter, conductometer, and pH-meter, made by the German WTW. Collected are samples or described are typical features, incl. invasive species of other aquatic cohabitants: water vegetation, macrozoobenthos and ichtyofauna.

Terrestrial invertebrate animals

Data on the distribution of terrestrial invertebrate animals in the area of Kozloduy NPP, Danube River below and in "Ostrovi Kozloduy" PA and "Ogosta River" PA are based on data gathered on the project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 1. An inspection was also made of habitats of terrestrial invertebrates in the area of Kozloduy NPP, Danube River below and above "Ostrovi Kozloduy" PA and within the borders of "Ogosta River" PA.

11.2.2.2 FISHES

Conducting field studies of fish species subject to conservation in the affected protected areas and protected territories within the studied site and the buffer area as defined.

For inventory taking of the ichthyological diversity in the examined river sections a tool for electronarcosis (electrofisher) has been used. Samples are taken in accordance with the standardised procedure EN 14011 European Standard; Water Analysis – Sampling of fish with electricity (CEN, 2003).

Different sample-taking stations were selected in accordance with the following principle: to be representative places of the river section within the boundaries of the IP, to be part of the Natura 2000 area and to contain all its typical habitats – swift currents, pools, sections with different bottom substrates and suitable hiding places, etc.

Samples are taken during daylight, using a "wading" strategy. For each separate station a transect 50 m long and 2.5 m wide is put in place near one of the watersides, and samples are taken against the river stream.

After being caught, the fish is put for temporary storage in plastic containers filled with water. All specimens are defined on the spot, and the weight and length of those belonging to the so-called "target species" are measured. After being subject to electronarcosis, fishes are brought back into the river – in deep calm-stream sections.

Data about the distribution of target fish species in the protected areas are also based on data gathered in the period 2011-2012 on the project "Mapping and Identification of the

Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 2.

11.2.2.3 AMPHIBIANS

On-the-spot survey was made of the 4 sites envisaged for building and adjacent areas. Standard methods for identification of the fauna species and assessment of their number were applied. In addition, data gathered in the period 2011 – 2012 on project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 3, were used. The forecast and assessment of the impact on the target species are also based on an expert opinion.

11.2.2.4 REPTILES

On-the-spot survey was made of the 4 sites envisaged for building and adjacent areas. Standard methods for identification of the fauna species and assessment of their number were applied. In addition, data gathered in the period 2011 – 2012 on project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 3, were used. The forecast and assessment of the impact on the target species are also based on an expert opinion.

11.2.2.5 MAMMALS

On-the-spot survey was made of the 4 sites envisaged for building and adjacent areas. Standard methods for identification of the fauna species and assessment of their number were applied. Analysed were published materials on the state of the fauna in the territory subject to impact from the investment proposal and field studies for assessment of the status in critical sections.

In addition, data gathered in the period 2011 – 2012 on project "Mapping and Identification of the Environmental Protection Status of Natural Habitats and Species – Phase I" of the Ministry of Environment and Water, lot 4, were used. The forecast and assessment of the impact on the target species are also based on an expert opinion.

11.3 SOURCES OF INFORMATION

11.3.1 ON THE BIRDS DIRECTIVE

***. (In Bulgarian) Guideline on assessment of protected areas under Article 7, paragraph 3 in connection with Article 6, paragraph 1, subparagraphs 3 and 4 of the Biodiversity Act, including habitats of bird species.

***. (In Bulgarian) Municipal development plan for the period 2007 – 2013. Kozloduy Municipality.

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12 CONSULTATIONS

No	Consultations held (municipality, department, regulatory body, other	Description of expressed opinions / recommendations / observations	Adopted/ Not adopted	Reasons
1.	**Ministry of Environment and Water (MoEW), outgoing reference No.OBOC-220 of 05.07.2012**	Conduct of the Environmental Impact Assessment (EIA) procedures, assessment of the conformity with the subject and objectives of the protected areas conservation and the requirements of the Convention on Environmental Impact Assessment in a Transboundary Context.	Adopted	The said letter is a mandatory element of the procedure and all recommendations and requirements will be fully consistent with the EIA
2.	**MoEW, outgoing reference No.OBOC-220 of 09.01.2013**	Consultations on determining the scope of EIA, specific recommendations expressed such as differentiation of independent points "Transboundary Impact Assessment" and "Cumulative Effect". It was recommended to expand the list of addressees for consultation.	Adopted	Recommendations are according to the AAR
3.	**Ministry of Environment and Forestry (MoEF) (Republic of Romania) with outgoing reference No.3672 RP of 18.10.2012**	As regards the content of the EIAR, to be produced by the Contracting Authority (through the Contractor) as an official document required for the analysis and evaluation of the environmental impact in a Transboundary context, the Romanian authorities consider that it is important and special attention should be paid to the following environmental aspects of nuclear safety and security. **Main requirements:** 1. The EIAR should also include: • Information on the characteristics of the site that may be relevant to nuclear safety; • Information analysis of accidents, including major accidents especially the possibility of radiological consequences on Romanian territory. It is necessary to specify the acceptable dose for every possible emergency scenario in the atmosphere and in the water of the Danube river; • Information on emissions in the ambient air and water of the Danube river during normal operation of the new power unit. 2. On both banks of the Danube River, near the town of Kozloduy, there are NATURA 2000 sites. On the Romanian coast there are the following NATURA 2000 sites protected respectively by the Habitats Directive and the Birds Directive:	Partially adopted	Analysis and assessment of the transboundary impact of the construction of the new nuclear unit in Kozloduy NPP will comply with the requirements as defined in the Letter of the Ministry of Environment and Forests of Romania with Outgoing reference No. 3672/RP/18.10.2012, as to the specific technical requirements it will take into account all the information available at this early stage of project development (prefeasibility study). It should be clarified that it does not include the full volume of data required in terms of assessment in the context of specific technical requirements put forward by the Republic of Romania – they will be made available at a later stage, when the specific reactor model is selected and when the relevant documents relating to the licensing of the project are issued according to the

		• ROSPA0010 Bistretriver; • ROSPA0023 Jiuriver-DanubeRiverConfluences; • ROSCI0045 Corridor of JiuRiver; • ROSPA00135 Sands from Dabuleni. It is imperative to conduct a proper evaluation study of the natural capital in accordance with Article 63 of Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora 3. The EIAR should include the following topics: • The impact on the flora and fauna on both banks of the Danube River in the investment project area located within and outside protected areas; • The cumulative impact in combination with other projects implemented at the proposed site and its surrounding areas, which can be harmful to the natural capital of both countries; • Measures to reduce the impact on biodiversity and the impact of residual effects after implementation thereof. 4. It is required that names of geographical locations on maps are written in Latin letters and maps should contain the Romanian sites included in the assessment. 5. It should take into account the fact that the area of impact (30km around the Kozloduy NPP in Romania) has a population of 77,197 inhabitants in 18 settlements in the districts of Dolj and Olt, it is necessary that the environmental impact assessment includes an assessment of the radiological impact on human health. 6. It is required that the impact assessment for human health should assess the additional risk generated by the normal operation of the new nuclear unit, as well as in case of incidents, based on the recommendations of the International Commission on Radiological Protection (ICRP 103/2007) regarding diseases of exposure to ionizing radiation (morbidity and mortality rates from cancer, birth defects, developmental defects). These assessments should include both the situation in normal operation of the facilities and in case of nuclear accidents. 7. Taking into account the pollution levels of the environmental elements (air emissions, groundwater, surface water), it is necessary to perform studies on the health impact of their synergistic effect on the local		harmonized legislation in the field of the safe use of atomic energy for peaceful purposes. These documents include the Safety Analysis Report (SAR), Probabilistic Safety Analysis (PSA) and Technical Specifications (TS), and the same will be prepared at the technical design project for the specific model PWR of the latest generation consistent with the particular conditions at the Kozloduy NPP site. In this regard, it will be stated that despite the limited volume of information available at this stage of the project implementation, it is sufficient to prepare the evaluation of the Transboundary impact of the cumulative effect from the operations of nuclear facilities at the Kozloduy NPP site.

		population, both during the construction of power unit and during its operation. 8. In addition, the health impact research of the Romanian population in the area of Kozloduy NPP should take into account the existence, on the same site, of the old units 1-4 of the Kozloduy nuclear power plant, currently undergoing decommissioning, which will generate nuclear waste in the future. It means that it is necessary to examine the cumulative effect on the Romanian population living in the area of the impact. 9. It is necessary to calculate the cumulative increase in risk to human health from the operation of these systems. **Specific technical requirements:** 1) Introduction of new technologies used in the new nuclear unit at Kozloduy NPP, comparing them with the new nuclear safety requirements after the Fukushima accident, and the essential differences with the current technology, resulting in entitling the project "nuclear reactor of NEXT GENERATION". 2) Presentation of the design and objectives of nuclear safety, which form and define the structural framework integrated in the new nuclear unit on a site containing several capacities (for example, safety concept and principles, key safety features, regulatory requirements,integrated management); 3) Presentation of protective and auxiliary systems, including administrative measures designed to ensure the safety and security of the nuclear reactor, including the justification of specific nuclear safety requirements; 4) Presentation of the technical specifications (known as Limiting Conditions for Operation – LCOs), highlighting their importance as supporting documentation for licensing and during the operational modes of the nuclear unit; 5) Brief but comprehensive presentation of the relationship between the essential requirements of European treaties or other international recommendations (for example, IAEA, US-NRC), ratified by the Bulgarian state, in the field of nuclear safety, safe management of radioactive waste and spent nuclear fuel, environmental assessments in a Transboundary context		

		information on public participation in decisions, etc., and their coverage by the Bulgarian laws, rules and standards; 6) Identification and presentation of the radioactive waste management, including information on spent nuclear fuel, classification of its details on where and how it was transported, and the characteristics of transport containers; 7) Identification and specification details related to the processes and the nuclear and radiological characteristics in terms of plant safety, in the context of the implementation of the Integrated Management System (safety management, quality management, safeguards and security, environmental protection environment, health and safety at the workplace, financial agreement); 8) Discussion of the results of the impact assessment of the operation of new nuclear power unit on existing and operational capacities (and vice versa) and on the nuclear power plant in general; 9) Presentation of the main aspects of the environment monitoring system in this context to ensure compliance with the regulatory requirements; 10) Drafting of a detailed list of possible emergency scenarios, including design basis accidents (Design Basis Accidents – DBA) and beyond design basis accidents (Beyond Design Basis Accidents – BDBA plus major accidents); 11) Discussion of the main results of the probabilistic assessment of nuclear safety, putting the emphasis on Beyond Design Basis Accidents (BDBA), postulated commissioning events and major accidents; 12) Discussion of the main results of the hazard analysis of events such as earthquakes, floods, fires, explosions, extreme weather, missile, plane crashes, human activities in the vicinity of the plant, etc. 13) Presentation of the limits and restrictions of doses and the derived emission limits for radioactive contamination release in the waste air and waste water during normal operation and in case of accidents; comparing these values with European levels, taking into account the effect on the environment and on the Romanian population. Explaining the considerations used to calculate various assumptions, clarifying the method of calculating the derived emission limits and determination of critical groups, scenarios and directions of irradiation are key aspects of such a report;		

		14) Identification, presentation and analysis of the development of environmental factors affected by the construction of the new nuclear unit; 15) Summary (list) of the basic computer code / programs used in the safety analysis (deterministic and probabilistic) and references to the methodologies and criteria for acceptance of the results of the accidents analysis; 16) Brief presentation of information on the use and management of toxic and radioactive chemicals in the plant and details of how the requirements will be met, as regards the currently effective environmental effects; 17) Presentation of the considerations on the assessment of cumulative impacts of the plant on the environment in the short, medium and long term, and on the establishment of emergency planning areas and the inclusion of Romanian territories therein; 18) Description of the results of the radiological impact on the Romanian territory, both during normal operation and in emergency procedures, and during emergency conditions (design basis accidents and beyond design basis accidents), including in case of major accidents; 19) Details of technical, procedural and administrative measures designed to reduce Transboundary impacts, both during construction works and during operations of the nuclear power unit; 20) Taking into account the potential Transboundary impacts we require a dispersion modeling study of the ambient air pollutants (Dispersion modeling study for air pollutants) under adverse conditions and their effect on Romanian territory (considering all the weather factors).		
4.	**Kozloduy Municipality, outgoing reference No.73-00-128/1/03.01.2013**	1. The description and the manner of treatment by type and quantity of expected waste streams should be strictly in line with the new Waste Management Act and relevant regulations. 2. At the construction stage of the unit it may become necessary to clear trees and shrubs from the site. It is therefore necessary to pay attention to how bio-waste and composting is being treated. 3. Taking into account the fact that the investment project will be implemented near protected sites under NATURA 2000, it is recommended that individual elements (flora and fauna) be studied	Adopted	All recommendations and considerations brought to the attention of the municipal government are used to develop the Terms of Teference and will be reviewed and evaluated in the EIA.

		separately. 4. The section related to the description of quality characteristics of ground and surface water should present the impact on ground water and options for drinking water supply to production facilities, scheduled for construction under the investment project. 5. To examine the effect and impact of investment project on the current communication and transport infrastructure of the town of Kozloduy in view of the fact that the ring road is not completed yet, which would otherwise reduce traffic congestion in the town and directly and indirectly affect the cleanliness of the local ambient air.		
5.	**Bulgarian Society for the Protection of Birds, outgoing reference** **No.5/09.01.2013**	Detailed information was provided on the subject and availability of protected areas within the investment project area and the subject and purpose of protecting them. They expressed specific requirements and recommendations to the EIAR and the Appropriate Assessment Report (AAR) on Natura 2000 sites, for example analysis of the risk of mortality of large birds due to collision with electrical wiring; likely deterioration of the food base, etc.	Adopted	This opinion will be considered and taken into account when developing the AAR
6.	**Ministry of Environemnt and Water (MoEW), Regional Inspectorate of Environment and Waters – Vratsa, outgoing reference** **No. B2975/10.01.2013**	I. The structure of the Terms of Reference in general (ToR) generally follows the requirements of Article 10, paragraph 3 of the Regulation on the terms and procedures for assessing the environmental impact (Regulation on Environmental Impact Assessment (EIA)). II. In preparing the EIA Report it shall use actual data, scientific knowledge and methods of assessment, in accordance with Article 11, paragraph 1 of the Regulation on EIA. III. Comply with Article 14, paragraph 1, subparagraph 5 – "Plan for implementation of measures..." it shall be developed in tabular form, under Appendix № 2a of the Regulation on EIA. IV. It should address the requirements of Article 95, paragraph 3 of the Environmental Protection Act /EPA/ – to be consulted with the affected community and the results will be reflected in the EIAR. To notify Kozloduy Municipality of the investment project and take their standpoint into consideration. V. The report should examine the evaluated alternatives pursuant to Article 96, Paragraph 1, subparagraph 2 of the EPA. VI. According to Article 9, paragraph 5 of the Regulation on EIA it should produce and enclose a reference statement of the consultations	Adopted	Recommendations (I-VII) have been incorporated in the Terms of Reference (ToR) and will be subject to the EIAR Recommendation VIII-p. 5 is incorporated in the Terms of Reference (ToR) – the topsoil compartment and will be subject to the EIAR. Recommendation p.3 -Waters is incorporated in the Terms of Reference (ToR) and will be taken into account in the EIAR.

carried out and the reasons for any adopted and rejected comments and recommendations, as well as evidence of their conduct.

VII. In the EIA Report you must comply with the following recommendations:

1. Protected Areas: the investment project does not affect protected areas under the Protected Areas Act. The nearest protected area is Protected Area "Kozloduy" – about 10 km from the site. It should provide information on the impact of the implementation and operations of your investment project, including the cumulative effect on the protected area.
2. Natura 2000: As regards the Appropriate Assessment Report (AAR), which is enclosed as an annex to the EIA Report:

   The nearest protected areas to the site of the nuclear power plant are: BG0002009 "Zlatiyata" – located about 500 m from the site, BG0000614 "Ogosta River" – about 7,00 km and BG0000533 "Ostrovi Kozloduy" – about 3,00 km from the site of the investment project implementation. The Appropriate Assessment Report (AAR) should take into account the vicinity of these areas, particularly the area for the conservation of wild birds BG0002009 "Zlatiyata" in assessing the impact of the investment project on natural habitats and habitats of species subject to protection therein. When preparing the AAR, it should meet the requirements of the Regulation on the terms and procedures for assessing the compatibility of plans, programs, projects and investment projects with the subject and objectives of the protected areas conservation /Regulation on the environment/ (promulgated in State Gazette, issue 73 of 2007) on the structure and content thereof.
   It should pay particular attention to the cumulative impact on the said protected areas, which will occur in the realization of this investment project, combined with the impact of other investment projects at the existing Kozloduy NPP site , and near it.
3. Component – **Water:**
   - Water supply fr the needs of the technological processes – cooling, fire water, spray ponds, etc., and household water supply.

		• Estimated volume of waste water – cooling, industrial and residential. • Methods of treatment / waste water treatment, depending on its specifics. • Options for use of the main drainage channel for discharge of the newly generated waste streams. • Option to use the existing sewerage system of the nuclear power plant site and options for building a new system as part of the existing one or as standalone. • Option to use the existing waste water treatment plant to the EP-2 and option with the construction of a standalone waste water treatment plant at the new site for a nuclear reactor. • Program for carrying out own radiation and non-radiation emission control of waste water. • Systems for management of waste water leakages in case of potential emergencies, radioactivity (primary circuit) and non-radioactive area (secondary circuit). • Please note that licenses issued (water abstraction and discharge) so far by the River Basin Management Directorate – Pleven are in favour of the permit holder Kozloduy NPP EAD whereas the new entity Kozloduy New Build EAD has no such rights. 4. **Waste**: For each piece of waste generated during construction works and operations of the site, including industrial, hazardous, municipal and construction waste, the type should be indicated, as well as quantity, method of storage and disposal in accordance with the applicable regulations. Provisions should be in place to identify ways to reduce or eliminate the negative impact of waste on the environment. 5. **Topsoil**: provide information on the monitoring of topsoil, which will be carried out following the introduction of new facilities in operation. II. To be included in the EIAR: • Description, analysis and evaluation of the likely relevant effects on the population and the environment as a result of the investment project implementation	Not adopted	Nuclear power plants do not fall within the scope of the developed reference manuals for best available techniques (BAT) by the European Commission (Institute for Prospective Technological Studies – Seville, Spain) "Integrated Prevention and Pollution Control" (IPPC). Requirements for compliance with the so-called best available techniques (BAT) in this case can be replaced with the recommendations of the International

		• Measures envisaged to prevent, reduce and as fully as possible offset any adverse effects of the investment project implementation on the environment • Evaluate the application of best available techniques /BAT/		Atomic Energy Agency (IAEA – Vienna) and EURATOM, and with the national law standards in this field.
7.	**MEW, EEA, with outgoing reference No. 26-00-8 of 14.01.2013**	Due to the specifics of the investment project, the emphasis in the development of the EIAR should be placed on: • radiation effects playing a dominant role in the assessment of risk to the environment and the population in the area of Kozloduy NPP; • assessment of cumulative impacts from the operation of the new nuclear unit while using actual data; • modification of climate areas with special status around the nuclear power unit; • measures to prevent or reduce significant radiation effects due to operation; • detailed and reasoned consideration of anticipated operational conditions and design basis accidents in the facility. These four sites subject to the investment project do not fall within protected areas under the Protected Areas Act (PAA) or within protected sites of NATURA 2000, under the Biodiversity Act. The 30-kilometer area around the investment project has the following *protected arreas* – Ibisha reserve and protected areas of Kozloduy, Daneva Mogila, Tsibar Island, Koritata, monastic city of Topolite, Kochumina and Gola Bara and *protected areas* designated under the Directive on the conservation of habitats and of wild fauna and fauna – Zlatiya BG0000336, Tsibar BG0000199, Skat River BG0000508 and Kozloduy BG0000527; *protected areas* designated under the Directive on the conservation of wild birds – Ibisha Island BG0002007 and Island to Gorni Tsibar BG0002008. The investment project is subject to a conformity assessment procedure with the subject and purpose of conservation of protected areas cited above. It is necessary that the Appropriate Assessment Report (AAR) assess the impacts of the investment project on the aforementioned protected areas.	Adopted	
8.	**MoEW, with outgoing reference No. 26-00-1035/09.04.2013**	The presented terms of reference have been prepared in accordance with the environmental legal requirements and they are compliant with the instructions given to you in a letter with outgoing reference № OBOC-220/09.01.2013 of the MoEW. In this regard, we confirm the	Adopted	The preparation of the EIAR will take account of the recommendations given in the letter – points 1, 2 and 3 in particular.

		recommendations given in the above-mentioned letter regarding the conduct of consultations on the terms of reference with other specialized public institutions and stakeholders. In regard to the above and in view of Romania's stated interest in participating in the EIA procedure in a transboundary context and the request by Austria for notification, we expect you to submit to the MoEW the consulted terms of reference for the scope of EIA in English, in order to send them to Romania as affected party and to Austria as interested party in accordance with the Convention on Environmental Impact Assessment in a transboundary context. In case Romania **expresses an opinion including additional comments and/or recommendations** on the terms of reference for the scope of the assessment, these comments shall be reflected in the final version of the EIA terms of reference and shall be taken into account in the preparation of the EIA Report. In consideration of the above, we hereby inform you that the next steps you should take in regard to the EIA procedure are as follows: 1. You should assign the preparation of the EIA Report to a team of experts with a head, which team should have master's academic-qualification degree and meet the requirements of Article 83 of the Environmental Protection Act (EPA) and Article 11, paragraph 3 and following of the EIA Regulation. Preparation of the EIA Report should be in accordance with the consulted terms of reference under Article 10, paragraph 3 of the EIA Regulation and the provisions of Article 96, paragraph 1 of the EPA. 2. The EIA Report should be compiled as a single document in accordance with the provisions of Article 12 of the EIA Regulation. 3. The prepared EIA Report and all its appendices, including the AAR, should be submitted to the MoEW for evaluation of its quality in line with the provision of Article 13 of the EIA Regulation.		
9.	**Regional Inspectorate of Environment and Waters – Vratsa, outgoing reference No. B-**	1. The prepared terms of reference meet the requirements of the EIA Regulation and the Environmental Protection Act (EPA) for the scope and content of EIAR;	Adopted	The recommendations are taken into account.

	825/10.04.2013, Engineer Hristo Hristov – Director of KPD Directorate	2. Incorporated in the Terms of Reference are the recommendations (such recommendations to be reflected in the EIAR) given to you with a letter of the inspectorate with outgoing reference № B-2975/10.01.2013 (regarding the consultations under Article 10, paragraph 3 of the EIA Regulation); 3. The Appropriate Assessment Report (AAR) is envisaged to be prepared as an appendix to the EIAR.		
10.	**Basin Directorate "Danube Region", Pleven – outgoing reference** **No.3804/12.04.2013, Rumen Penkov – Director of Basin Directorate for Water Management**	The Directorate expresses a positive opinion on the prepared terms of reference. Incorporated are all recommendations made and contained in the opinion of the Basin Directorate for Water Management Danube Region on the terms of reference for determination of the scope and content of EIAR of the IP "Building a new nuclear unit of the latest generation at the Kozloduy NPP site" (a letter with our outgoing reference 3804/08.01.2013)	Adopted	No comments
11.	**Environment Executive Agency (EEA) with outgoing reference No. 26-00-8/18.04.2013, Vania Grigorova, Executive Director**	1. With regard to the radiation aspect of the impact – the proposals made for the scope and content of the EIAR are accepted and taken into account in the Terms of Reference. We recommend the use of up-to-date data from different sources when making the impact assessments. 2. With regard to biodiversity: **3.6.1.1** Flora. Some of the species are medicinal plants whose management is set out in the Medicinal Plants Act. To make assessment of the impact of the investment proposal on the status and development of medicinal plants. **3.6.3** Protected areas. Within the 30-kilometer zone around the investment proposal there are two more protected areas – protected area "Daneva mogila" and protected area "Tsibar Island". To assess the impact of the investment proposal on the protected territories-protected areas "Daneva mogila" and "Tsibar Island". **3.6.4** NATURA 2000 areas.	Adopted	Incorporated in EIAR

		Within the 30-kilometer zone around the investment proposal there is one more protected area declared under the Directive on the conservation of natural habitats and of wild fauna and flora – "Zlatiya" BG0000336. In table 3.6-1 should be added the protected area "Zlatiya" БG0000336 declared under the Directive on the conservation of natural habitats and of wild fauna and flora, which is different from the protected area "Zlatiya" BG0002009 declared under the Directive on the conservation of wild birds. The investment proposal is subject to a procedure for evaluation of its conformity with the subject and objectives for conservation of all protected areas falling within the 30-kilometer zone.		
12.	**National Electricity Company EAD, with outgoing reference No.73-01-55 of 26.04.2013,Krum Atanasov, Executive Director**	After a review of the documents attached to the above letter, we have the following general comments and remarks: 1. The remarks of NEC EAD (a letter with our outgoing reference №73-01-7/16.01.2013) have not been taken into account and the specific information necessary for the evaluation of the document regarding the investment proposal is missing. 2. In consideration of the above the following is required: ✓ presentation of specific information required within the meaning of the Convention on environmental impact assessment in a transboundary context; ✓ presentation of specific information at an early stage in accordance with Chapter II, Article 4, paragraph 3 of the Regulation on the terms and procedure for environmental impact assessment. ✓ Pursuant to Article 93, paragraph 2 of the EPA, the procedure for identification of the need of EIA is mandatory for investment proposals included in Appendix No. 1 to Article 92 of the EPA, and pursuant to Article 93, paragraph 4 of the EPA presentation of the following information necessary for taking an informed decision is mandatory: • details about the contracting authority; • summary of the proposal, incl. description of the main processes, power, total used area; • whether the investment proposal is a standalone proposal or if it is an extension of an existing production activity; • whether there is a need of other activities related to the main	Adopted	The remarks made by NEC concern procedural steps, which are mandatory according to the requirements of the legal framework on EIA, including in a transboundary context. At the current stage of the EIA procedure for this IP all procedural requirements have been fulfilled.

subject of activity and/or ancillary and/or supporting activities, facilities and buildings;
- relation to other existing activities or activities approved with a development or another plan falling within the scope of impact of the object of the investment proposal;
- location of the site – population centre, municipality, quarter, land property, ownership, proximity to or impact on protected areas, anticipated transboundary impact, a scheme of a new or change of existing road infrastructure;
- natural resources to be used during construction and operation;
- anticipated waste generation and plans for its treatment.
- characteristics of the proposed construction, activities and technologies: volume, productivity, scale, relationship and accumulation with other proposals, usage of natural resources, generated waste, environmental pollution and discomfort, and risk of accidents;
- location, including sensitivity to the environment, existing land usage, relative availability of suitable territories, quality and regeneration capacity of natural resources in the area;
- capacity for assimilation of the eco system in the natural environment of:
  * the legally protected areas and habitats;
  * the mountainous and forest areas;
  * the wet and coastline areas;
  * the areas with breached environmental quality norms;
  * the highly urbanised areas;
  * the protected areas with single and group cultural values defined under the Cultural Heritage Act;
  * the areas and/or zones and objects with a special sanitary status or subject to health protection;
- characteristics of the potential impacts – territorial scope, affected population, including transboundary impacts, content, size, complexity, probability, duration, frequency and reversibility;
- public interest in the construction proposal, activities, technologies.

✓ compliance with the provisions of Chapter II, Article 9, paragraphs 1 to 13 of Regulation No. 4 of 21.05.2001 on the scope and content of investment projects;

- ✓ description of the electrical part of the NPP in connection with Regulation No. 4 of 21.05.2001 on the scope and content of investment projects and Article 2, paragraph 1, subparagraph 1 of Regulation No. 6 of 9.06.2004 on the connection of electricity producers and consumers to the electricity transfer and distribution networks;
- ✓ description of the infrastructure of the outlined sites in accordance with the Regulation on the terms and procedure for environmental impact assessment (Title amended, State Gazette, No 3/2006);
- ✓ compliance with the provisions of the Rules for the management of the energy system, issued on the grounds of Article 21, paragraph 1, subparagraph 7 of the Energy Act by the Chairperson of the State Energy and Water Regulatory Commission, Appendix to point 1 of Decision № П-5 of 18.06.2007, promulgated in the State Gazette, No. 68/21.08.2007;
- ✓ compliance with the provisions of all effective and applicable statutory directives in the Republic of Bulgaria, the directives of the European Commission, the international conventions to which the Republic of Bulgaria is a signatory, and the requirements in the field of nuclear power of the International Atomic Energy Agency (IAEA). These should be presented in the terms of reference as a list of applicable Bulgarian and international codes and standards in the field of atomic energy use, and a requirement should be set for preparation of an analysis on the compliance of the investment proposal therewith;
- ✓ providing reference to own and foreign official sources of information used during the preparation of the terms of reference.

3. It is necessary to identify in advance and clearly in the presented terms of reference the basic input data for the EIAR preparation as follows:
   - ✓ -number of nuclear facilities at the site (“one or two units”)
   - ✓ -electrical and thermal power (“installed electric power of about 1200 MW).

Specifying and highlighting these parameters in the terms of reference is necessary for the proper determination of the quantitative characteristics of the sources of risk and the relevant forecasts and significance of the anticipated impacts on the environment from the activity causing them.

4. The presented EIA terms of reference give a description of the site of

		Kozloduy NPP EAD and the currently existing infrastructure there, located in close proximity to the designated areas for a new nuclear unit. A description of the characteristics of the real sites designated for building of a new nuclear unit for "Kozloduy NPP – New Build" EAD should be provided, combined with a demonstration of their compliance with the requirements set out in Chapter III of the Regulation on ensuring the safety of nuclear power plants and generally presented infrastructure to be built at these sites. The areas shown on fig. 1.6-1 №№1, 2 and 3 fall outside the borders of the approved site operated by Kozlody NPP EAD (according to fig. 1.2-1) and they comprise separate and standalone potential sites, subject to approval by the IAEA upon compliance with the requirements of the Safe Use of Nuclear Energy Act, the Regulation on ensuring the safety of nuclear power plants, the Regulation for the procedure for issuing licenses and permits for safe use of nuclear energy, the Spatial Development Act and Regulation No. 4 on the scope and content of investment projects. Only site No. 4 falls within the borders of the approved site of the existing Kozloduy NPP EAD, but given the currently effective legislation in the Republic of Bulgaria it is subject to a licensing procedure for issuing a separate license for determination of the location of the nuclear unit (selection of a site) and subsequent issue of an order for approval of the selected site upon compliance with the statutory provisions. 5. The terms of reference should specify the concrete characteristics of each of the sites designated for building a new nuclear unit and should define respectively their impact on the environment throughout the plant's life cycle. In the course of EIAR preparation, all forecasts should be based on quantitative and qualitative data derived from a relevant benchmark plant to the envisaged for building plant. In addition, for each of the potential sites the cumulative impact from all nuclear facilities located at the site of the new unit and at the adjacent site of Kozloduy NPP should be determined, including storage facilities for RAW and spent nuclear fuel and decommissioned nuclear facilities in whose spent bundles ponds (SBP) spent nuclear fuel is stored (SBP of 3, 4, 5, 6 units; reactors of 5 and 6 units; spent fuel storage facility; dry spent fuel storage facility, national storage facility for RAW, plasma burning facility and others, if any), taking into account the programme for		

extension of the term of operation of units 5 and 6.

6. For each of the proposed sites there should be a clear definition of the influence of the necessary preliminary demolishing works and the new construction works for relocated buildings and facilities to additional sites, which are not specified herein.
7. According to section 2.3 "Based on the interim results from the TIP for the NNU below are presented two 2 options for reactors, which will be assessed in the EIA Report – AP-1000 and AES-2006. The two options meet the requirements of Bulgarian legislation in the field of atomic energy use, the requirements of the IAEA, and the European safety requirements described in the European Utility Requirements (EUR, Revision D) for LWR Nuclear Power Plants", and pursuant to section 1.7 "The design of the nuclear unit shall comply with the European requirements set out in the European Utility Requirements for LWR Nuclear Power Plants" (EUR). The statements in section 2.3 and section 1.7 are incorrect. The selected and assessed in the terms of reference two potential types of reactors for the new unit have not been subject to evaluation of their compliance with the Bulgarian legislation and at present they do not have certificates of compliance with the European requirements described in the EUR.
8. Point 1.8.presents the effective classification of all types of waste in the Republic of Bulgaria. In the process of EIAR preparation the maximum expected quantities of all types of waste shall be defined and a plan for waste management shall be presented for the whole life cycle of the new plant.
9. Point 2. "Alternatives for implementation of the investment proposal" presents alternatives of its location and according to the EIA Directive alternatives of the polluting technology shall be presented or the absence of such alternatives shall be justified. Within the meaning of Article 5 of the EIA Convention in a transboundary context there should be presented "the potential alternatives of the proposed activity, including the alternative of not taking any actions".
10. Section 3.7.1.2 "Radioactive waste" deals with the characteristics of the RAW storage facilities, envisaged for the capacity of units 1 through 4 in Kozloduy NPP, including facilities for waste processing in State Enterprise "Radioactive Waste". Described in the section

should be the envisaged storage and management facilities for RAW, to be generated by the new unit in accordance with its capacity for the whole term of commissioning, operation, and decommissioning of the unit (one or two units cumulatively). If the building of the new unit envisages the usage of the existing storage facilities for 1 through 4 units, the EIAR should include a description of the routes, methods and modes of transport of such waste and in particular the liquid waste, by types according to the classification in the REGULATION for safe radioactive waste management to the Safe Use of Atomic Energy Act, taking into account their activity and potential impact on the environment, including in emergency situations, given the remoteness of the sites from such existing facilities, subject to the provisions of the Regulation on the conditions and procedure of transport of radioactive material. In preparing that part of the EIAR, account should be taken of both the insufficient capacity of the existing storage facilities for units 1 through 4 and their completion as a result of the started decommissioning of these units from State Enterprise "Radioactive Waste", as well as the stage of implementation of the national storage facility for RAW, paying attention to its maximum capacity of 138 200 m3. The presented terms of reference should have a requirement for compliance with Bulgarian legislation regarding RAW management and in particular the REGULATION for safe radioactive waste management to the Safe Use of Atomic Energy Act, which in accordance with Article 1, paragraph 2 „...determines the safety requirements, norms and rules for selection of a site, design, construction, commissioning, operation, and decommissioning, closing respectively, of RAW management facilities". In preparing EIAR, account should be taken of the requirements of Article 4 of the quoted regulation, namely "In carrying out activities for RAW management the potential impact on the environment and the health of the personnel and people, which is not related to its radiation characteristics, should be taken into account".

11. It is demonstrated in the presented document that "The generated waste will continue to be deposited in the Landfill for non-radioactive municipal and industrial waste (LNRMIW) of Kozloduy NPP", but pursuant to section 3.7 the project capacity of the 45 000 m3 landfill

is 85% utilized (38 250 m3) and it will be exhausted only from units 1 through 6 in 2016 at a 9% rate of increase and annual average generation of approximately 5000 m3

12. In section 3.9.1. "Noise" the impact on ornithofauna in the area of the four potential sites should be assessed, particularly during construction, when a maximum noise level is expected.
13. In section 3.9.4. "Thermal impact of Danube River" the impact of the new unit on thermal pollution should be assessed both on a standalone basis and cumulatively, i.e. to aggregate the pollution generated by the NNU with the pollution generated by the operation of Kozloduy NPP and the influence of the higher temperature of Danube River water on the flora and fauna.
14. In section 3.10. "Health-hygiene aspects of the environment" 2 areas are postulated: Zone of Preventive Protective Measures (ZPPM) – 2 km, and Zone of Immediate Protective Measures (ZIPM) – 30 km. Pursuant to Article 4 of the Regulation on emergency planning and emergency preparedness in case of nuclear and radiological emergencies of ANR, the zones with special status are defined after making calculations, taking into account the specific characteristics of the concrete site on the basis of a developed technical design.
15. In section 6 "Characteristics of environmental risks from potential accidents and incidents" requirements are set for compliance with the ENSREG Declaration for comprehensive and transparent risk assessment ("stress tests") in regard to the Fukushima accident. Although the building of a new unit is at its earliest stage, risks like Loss of power, Loss of final heat absorber and a combination of the two must be examined at any cost. Moreover, the long-term behaviour and stability of the two reactor models should be convincingly demonstrated and in particular those of AP-1000, given the lack of a facility for catching and cooling the melted active zone in case of major accidents. In addition, the risk for the environment from sabotage should be considered and stability of the containments of the two selected reactors AP-1000 and AES-2006 to such impacts should be assessed and highlighted, including the impact of a big commercial aircraft.
16. In section 8.1. "Preliminary assessment of potential transboundary impacts" the anticipated impact of the new nuclear unit should be assessed in combination with the impact of the existing nuclear

facilities. „...this chapter presents data and information about the operation of the facilities at the Kozloduy NPP site" "in order to provide the necessary information to the competent authority about the expected transboundary impact of the Investment Proposal on the environment, this chapter presents data and information about the operation of the facilities at the Kozloduy NPP site". Data from the monitoring of Kozloduy NPP for past periods should be taken as a base to be used in the calculation of the expected total impacts after a clear definition of the future technology, including the additionally needed infrastructure facilities to be built at the new site. The conclusions in the document are based entirely on data about the operating Kozloduy NPP EAD but for the EIA purposes there should be data from a benchmark plant to the new plant envisaged to be built by the company "Kozloduy NPP – New builds" EAD.

17. Point 9 defines the structure and content of the EIAR. Point 2 should be brought in compliance with Article 5 of the Convention on EIA in a transboundary context. Pursuant to point 9 (point 15) and point 12 of the terms of reference, the Contractor itself will determine the legal framework, the methods and input data to be used. These frameworks should be determined in advance by the Contracting Authority "Kozloduy NPP – New Build" EAD in view of setting clear criteria, high-quality performance of EIAR and ex-post control over the implementation. Moreover, included in the list of statutory documents shall be both Bulgarian and applicable international norms, which are specific in the field of atomic energy use for peaceful purposes, taking account of best international practices.
18. The terms of reference should specify the intentions of "Kozloduy NPP – New Build" EAD for use of the existing infrastructure of Kozloduy NPP EAD in the context of EIA in order to review and assess all potential environmental risks.

This letter is in the context of the conducted consultation procedure under Article 95, paragraph 3 of the Environmental Protection Act (Article 9 of the Regulation on the terms and procedure for environmental impact assessment).

Pursuant to your outgoing reference № 181/20.02.2013 "Kozloduy NPP – New Build" EAD has fulfilled the provisions of Article 4 of the Regulation on the terms and procedure for EIA and the information required herein has already been provided in accordance with paragraph 3 of Article 4 of

		the above regulation. The above statements are based on past experience and steps taken by the Investor NEC EAD for obtaining an EIA Decision for Belene NPP from the Minister of Environment and Water. In our view, every Investor makes its own decisions on the steps, methods and approaches to implementation of its licensing plan for the purposes of its investment proposal.		
13.	**Ministry of Environment and Climate Change (Republic of Romania) with outgoing reference No. 3072/RP/06.08.2013**	The Terms of Reference were circulated to the competent Romanian authorities and the latter requested the document to be complemented with the following information, given the fact that both Danube River banks near the town of Kozloduy include Natura 2000 areas and other protected areas: 1. Assessment of the impact of high-temperature water discharged in Danube River by types of fish under legal protection, with a focus on the *Alosa Sp* species. Special technical measures should be applied by the Bulgarian side as these fish species should not be endangered by the hot stream of the discharged water. The same issue raised in regard to Cherna Voda NPP has been addressed by means of technical measures as well. 2. In addition, it is necessary to assess the stage of development and expansion of the population of foreign invasive species (e.g. *Corbicula fulminea*) and the potential impact they may have on biodiversity. 3. Assessment of the impact on the flora and fauna in the area of the project, on both sides of Danube River, located inside and outside the protected areas. 4. Assessment of the impact of the project on biodiversity in each alternative, including "zero alternative" – when the project will not be implemented. 5. Assessment of the cumulative impact in combination with other projects developed at the proposed site and the areas around it that could harm the natural capital of Romania and Bulgaria. 6. What measures for reducing the impact on biodiversity will be taken and data about residual effects, upon application thereof. 7. Programme for monitoring of biodiversity, including invasive species. Taking into account the interest of the Romanian population living in the 30-km area, we consider it essential to discuss the measures for elimination of these impacts of the project in the EIA Report.	Adopted	Reflected in the AAR

13 DOCUMENTS UNDER ARTICLE 9, PARAGRAPHS 2 AND 3 OF THE REGULATION ON THE TERMS AND PROCEDURE FOR EVALUATION OF THE COMPATIBILITY OF PLANS, PROGRAMMES, DESIGNS AND INVESTMENT PROPOSALS WITH THE SUBJECT AND OBJECTIVES FOR CONSERVATION OF PROTECTED AREAS

14 DOCUMENTS OF EXPERTS OF THE AUTHOR'S TEAM