



# **NATIONAL MONITORING PROGRAMME**

**State Office for Nuclear Safety**  
**Radiation Situation Monitoring on the Territory of the  
Czech Republic**

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Ing. Dana Drábová, Ph.D.  
Chairperson of the State Office for Nuclear Safety

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## **1 INTRODUCTION**

The National Monitoring Programme (hereinafter also referred to as the “NMP”) is the document binding on persons involved in radiation situation monitoring on the territory of the Czech Republic.

The purpose of the National Monitoring Programme is to determine the extent of radiation situation monitoring on the territory of the Czech Republic and clarify the requirements for the transfer of data to the Data Centre of the State Office for Nuclear Safety including data formats and data interfaces.

In accordance with Section 209 a) of Act No. 263/2016 Coll., Atomic Act, the State Office for Nuclear Safety shall draw up the National Monitoring Programme and, after it has been approved, forward it to the persons referred to in Section 149(2) a) of the Atomic Act. Under Section 234 of the Atomic Act, the State Office for Nuclear Safety shall issue the National Monitoring Programme within two years of the entry into force of this Act, i.e. before 31 December 2018. In addition, in accordance with Section 12(3) a) of Decree No. 360/2016 Coll., on radiation situation monitoring, the State Office for Nuclear Safety shall provide the licensee with data formats for data transmission.

The National Monitoring Programme shall enter into force on the date of issue. The State Office for Nuclear Safety shall assess the up-to-date nature of the National Monitoring Programme every five years and review the National Monitoring Programme on the basis of new knowledge and practical experience.

## 2 GENERAL PART

Under the NMP, monitoring shall be carried out by the SÚJB, administrative authorities referred to in Section 149(2) a) of the Atomic Act and other persons referred to in Chapter 3.1 of the NMP.

In addition to the above mentioned persons, holders of a licence as specified in Section 150 of the Atomic Act shall transmit data from the monitoring to the Data Centre of the Office, who carry out monitoring in accordance with their approved monitoring programmes, but shall transmit data from the monitoring to the SÚJB in the data format and with the data interface as specified in the NMP.

### 2.1 MAIN OBJECTIVES OF MONITORING AND THE MEANS TO ACHIEVE THEM

The main objectives of radiation situation monitoring are to ensure:

- radiation situation monitoring on the territory of the Czech Republic for all exposure situations,
- collection and management of data from radiation situation monitoring and related information (including historical data), evaluation and publication of data about the radiation situation.

Data from radiation situation monitoring is used to evaluate the exposure of the population and in an emergency exposure situation, is used to specify the radiation situation in the affected area and subsequently implement, clarify or cancel protective measures. The SÚJB shall inform the Government of the Czech Republic, the European Commission and the general public about the results of monitoring.

In order to achieve the main objectives of radiation situation monitoring, it is particularly needed to:

- determine the sufficient number of monitoring sites on the territory of the Czech Republic,
- use appropriate measurement procedures for obtaining comprehensive data on radiation situation,
- keep measuring and sampling devices within individual monitoring networks in good technical condition and plan the renewal of these devices,
- maintain knowledge of persons carrying out radiation situation monitoring at the current level of scientific knowledge,
- maintain and develop systems and means of the Data Centre of the Office so as to be able to perform the tasks related to collection, processing, publication and transmission of data from monitoring,
- maintain the readiness of persons and devices for monitoring in an emergency exposure situation, conduct emergency exercises, drills, and comparative measurements.

### 2.2 FORMS OF MONITORING

**Radiation situation monitoring** is carried out in all exposure situations, i.e. in planned exposure situation, emergency exposure situation and existing exposure situation.

Monitoring in a planned exposure situation and existing exposure situation is carried out **in the form of normal monitoring**; normal monitoring includes monitoring in emergency exercise, drill and comparative measurement.

The purpose of radiation situation monitoring in the form of normal monitoring is to:

- monitor radiation situation on the territory of the Czech Republic in a planned exposure situation or existing exposure situation,
- keep all the systems in good technical condition, test the stability of the parameters of measuring and sampling devices,
- maintain practical habits and skills of persons involved in monitoring,
- get ready for emergency monitoring in the framework of emergency exercises, drills and comparative measurements,
- check the comparability of the measurement results obtained by specified persons or check the applicability of new procedures within the emergency exercises, drills and comparative measurements.

The requirements for measuring and sampling in normal monitoring are specified in Tables 2, 3, 4 and 8 in Annex 3 to Decree No. 360/2016 Coll. The requirements for comparative measurements are shown in Annex 7 to Decree No. 360/2016 Coll.

The requirements for emergency exercises and drills conducted by licence holders are governed by Decree No. 359/2016 Coll. Within these drills and emergency exercises, radiation situation monitoring is also carried out in accordance with the monitoring programmes (emergency section) of licence holders approved or assessed by the SÚJB and in connection with on-site emergency plans and intervention instructions. According to Section 18(1) a) of Decree No. 359/2016 Coll., the efficiency and consistency of emergency plans (on-site, off-site and national radiation plans) shall be checked in the emergency planning zone every four years. This is the “ZÓNA” type emergency exercises, which are organised by the Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic in cooperation with the SÚJB, or other governmental institutions. Monitoring that is managed under these emergency exercises by SÚJB Crisis Staff shall be carried out by licence holders and persons under the NMP.

In addition to emergency exercises and drills under Decree No. 359/2016 Coll., persons involved in radiation situation monitoring shall carry out drills under the NMP. The objective of these drills is to verify the knowledge and skills of persons who are expected to be involved in emergency monitoring in the affected area. The drills for emergency monitoring activities shall be carried out by persons and entities involved in monitoring under the NMP during training, education or preparation of their employees as needed, but at least once a year. These are mainly the drills conducted by mobile groups. The SÚJB organises the drills for mobile groups aimed at selected emergency monitoring procedures every two years. An overview of practised procedures and frequency of drills are shown in Table D\_2 in Annex 1 to the NMP and involvement of specified persons in emergency exercises, drills and comparative measurements is shown in I-series tables in Annex 1 to the NMP.

Monitoring in an emergency exposure situation is carried out **in the form of emergency monitoring**.

The purpose of radiation situation monitoring in the form of emergency monitoring is to:

- confirm and clarify of the rate of leakage,
- map quickly the radiation situation for the needs of implementing urgent protective actions,
- detect the current radiation situation for clarification or cancellation of urgent protective actions or for implementation, clarification or cancellation of follow-up protective actions.

The requirements for measuring and sampling in emergency monitoring are specified in Tables 5, 6 and 7 in Annex 3 to Decree No. 360/2016 Coll. In accordance with Section 149(3)

of the Atomic Act<sup>1</sup>, the SÚJB may determine the monitoring sites, extent or frequency of monitoring or specify them depending on the development of radiation extraordinary event or on the basis of the needs for implementation, specification or cancellation of urgent or follow-up protective actions.

In accordance with the purpose of the monitoring carried out, a distinction shall be made between the following phases of emergency exposure situation:

- initial phase of emergency exposure situation (phase I) when it is necessary to confirm or clarify leakage mostly by means of stationary measuring devices that provide data on an on-line basis; monitoring takes place at the permanent monitoring sites but the frequency of measurements and sampling can be reduced on the basis of needs and at the instructions of the SÚJB,
- middle phase of emergency exposure situation (phase II) when after termination of leakage, the radiation situation in the affected area shall be quickly mapped; monitoring is carried out by means of portable measuring devices, the network of monitoring routes is particularly used; the SÚJB may determine additional monitoring sites for clarification of the radiation situation, the frequency of sampling and measurements at permanent monitoring sites can be specified,
- late phase of emergency exposure situation (phase III) when the radiation situation both in the affected area and across the Czech Republic shall be clarified and in addition to on-site measurement by means of portable instruments, sampling is carried out for subsequent measurement in the measurement laboratory; monitoring is carried out mainly in the network of environment and food chain sampling or in the network of human body measurement, is used to specify the received doses and possibly regulate the consumption of food produced in the affected area and water from local sources. This monitoring may take place in an existing exposure situation, but the number of monitoring sites and the frequency of sampling and measurement do not necessarily correspond to normal monitoring.

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<sup>1</sup> The SÚJB may specify the monitoring sites, extent or frequency of monitoring also for licence holder within its emergency planning zone in accordance with Section 157(2) j) of the Atomic Act.

### **3 NATIONAL MONITORING PROGRAMME**

The requirements of Section 16 of Decree No. 360/2016 Coll., for the content of the NMP are elaborated in the following chapters, taking into account the form of normal and emergency monitoring.

#### **3.1 PERSONS WHO ENSURE THE MONITORING**

The persons referred to in the Atomic Act and the persons whose activities fall within the department of the persons referred to in the Atomic Act and who are regarded as entities hereinafter or in Annexes to the NMP are involved in radiation situation monitoring. For persons and entities who are involved in the operations of the various monitoring networks, the organisational units that ensure the operation are provided hereinafter and in A-series tables or F-series tables in Annex 1 to the NMP (in accordance with the organisational structure of persons and entities). Roles of the persons involved in radiation situation monitoring are given in Table A\_0 in Annex 1 to the NMP.

##### **3.1.1 Persons who ensure the normal monitoring**

The SÚJB manages and carries out radiation situation monitoring on the territory of the Czech Republic in the form of normal monitoring in planned exposure situation and existing exposure situation, including monitoring in emergency exercise, drill and comparative measurement if SÚJB is the organiser of these exercises, drills or measurements. Within the scope of its responsibility, the SÚJB is involved in or notified of emergency exercises organised by other persons. Monitoring under emergency exercises conducted by the licence holders in accordance with the requirements of Decree No. 359/2016 Coll., is governed by emergency section of the monitoring programme of the licence holder.

The SÚJB ensures monitoring through its regional centres and the organisations established by the SÚJB, i.e. National Radiation Protection Institute and National Institute for Nuclear, Chemical and Biological Protection.

The following institutes are involved in radiation situation monitoring on the territory of the Czech Republic:

- Ministry of Defence through the Armed Forces of the Czech Republic,
- Ministry of Agriculture through the State Veterinary Institute, the Central Institute for Supervising and Testing in Agriculture, and the Forestry and Game Management Research Institute,
- Ministry of the Environment through the Czech Hydrometeorological Institute and the T. G. Masaryk Water Research Institute,
- Fire Rescue Service of the Czech Republic,
- Police of the Czech Republic,
- Customs Authorities of the Czech Republic through customs offices,
- Czech Agricultural and Food Inspection Authority,
- DIAMO s. p., which performs the monitoring of old loads after the extraction and processing of uranium (heaps, waste ponds, etc.) through its branches.

Other persons, who may be included in the NMP by the SÚJB according to the criteria specified in Section 15 of Decree No. 360/2016 Coll., may also be involved in the monitoring.

An overview of persons involved in the monitoring including monitoring network, in operation of which the person is involved, is given in Table A\_1 in Annex 1 to the NMP.

Contact information for the representatives responsible for monitoring is given in Table A\_2<sup>2</sup> in Annex 1 to the NMP.

### 3.1.2 Persons who ensure the emergency monitoring

The SÚJB manages and carries out radiation situation monitoring on the territory of the Czech Republic in the form of emergency monitoring in an emergency exposure situation. The same persons as in the planned exposure situation and existing exposure situation are involved in radiation situation monitoring on the territory of the Czech Republic in the emergency exposure situation (see Table A\_1, Annex 1 to the NMP).

In the context of the management of radiation situation monitoring in an emergency exposure situation, the SÚJB shall commence emergency monitoring and according to the extent of emergency exposure situation and in accordance with the NMP, the Office can determine the extent and way of involvement of the specified persons referred to in Section 149(2) a) of the Atomic Act in the emergency monitoring. The holders of a licence referred to in Section 150 of the Atomic Act shall carry out the emergency monitoring under the monitoring programmes approved or reviewed by the SÚJB or at the instructions of the SÚJB under Section 157(2) j) of the Atomic Act.

## 3.2 MONITORING NETWORKS AND MONITORING SITES

Radiation situation monitoring on the territory of the Czech Republic is carried out by means of monitoring networks.

Under Section 4(2) of Decree No. 360/2016 Coll., the monitoring networks are divided by territory into the sparse and dense networks. The dense network is subdivided into territorial network (which covers the entire territory of the Czech Republic), local network (which covers the selected area and is intentionally concentrated thereon), and border network (which covers the border of demarcated or enclosed area). For details on the monitoring networks division see Tables 1 and 2 in Annex 1 to Decree No. 360/2016 Coll.

Depending on the purpose of monitoring network, the network is divided into the network for external exposure, the network for external and internal exposure, and the network for internal exposure.

Depending on the method of measurement or sampling, the network for **external** exposure is subdivided into

- Early Warning Network,
- network of integral measurement,
- network of monitoring routes,
- network of instantaneous measurement,
- network of spectrometry measurement,
- network of closures;

the network for **external and internal** exposure is the

- network of environmental sampling, including discharges;

and the network for **internal** exposure is subdivided into

- network of food chain sampling,
- network of human body measurement.

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<sup>2</sup> The annex is non-public.

The monitoring networks consist of a system of permanent and non-permanent monitoring sites. The monitoring sites are divided into measuring, sampling and collection sites. The general requirements for the monitoring sites are set out in Section 5 of Decree No. 360/2016 Coll. Measurement at the measuring sites is carried out within the networks for external exposure; environmental or food chain sampling at the sampling points is carried out within the networks for external and internal or for internal exposure. The collection sites are part of the network of human body measurement and in the emergency exposure situation, they can be used in the networks of environmental and food chain sampling for collection and subsequent transportation of samples to the measurement laboratory.

The sparse network of the Czech Republic is composed of the sampling sites for specified monitored items in Table 1 in Annex 3 to Decree No. 360/2016 Coll. Other details on the sparse network including interconnection to the operator of the sampling site, frequency of sampling and measurement method are presented in Table C\_2 in Annex 1 to the NMP.

The dense network of the Czech Republic has set the requirements for the minimum number of monitoring sites for specified monitored items in Tables 2 to 8 in Annex 3 to Decree No. 360/2016 Coll.

The requirements for dense network and the details on its divisions are elaborated in B- and C-series tables in Annex 1 to the NMP. Subdivision of the dense network by purpose, method of measuring or sampling and territorial division are described in Tables B\_0 and C\_0, which are based on Annex 1 to Decree No. 360/2016 Coll. Other B-series tables in Annex 1 to the NMP also show the linking of the individual networks to the monitored item, as well as persons and entities who carry out the monitoring in the network, the monitoring level, the measurement method and the device used. Other C-series tables in Annex 1 to the NMP also show a detailed division of monitored items, the linking to the determination of specific radionuclides in individual monitored items, the measurement method and the device used, as well as to the operators of sampling sites and frequency of sampling.

An overview of permanent measuring sites including mandatory information under Section 5(2) of Decree No. 360/2016 Coll., is provided in B-series tables in Annex 1 to the NMP; an overview of permanent sampling sites including mandatory information under Section 5(2) of Decree No. 360/2016 Coll., is provided in C-series tables in Annex 1 to the NMP. The collection sites in the network of human body measurement are set in places where the regional centres of the SÚJB and the branches of the National Radiation Protection Institute (SÚRO) are situated. Overviews of permanent monitoring sites are also provided in I-series tables in Annex 1 to the NMP for specified persons (data suppliers or samplers).

The non-permanent monitoring sites are not determined in advance; they are the measuring sites in the network of monitoring routes, sampling sites for food chain samples from producers or self-collection, sampling sites in the framework of drills and emergency exercises, and the monitoring sites set in the course of emergency exposure situation. Non-permanent monitoring sites including mandatory information under Section 5(2) of Decree No. 360/2016 Coll., are stored in the code list (database) of the Data Centre. If necessary, the Data Centre provides retrospectively information on monitoring sites to data supplier.

### 3.2.1 Monitoring networks and monitoring sites for normal monitoring

Basic information on individual monitoring networks and the activities carried out in the normal monitoring:

#### *Early Warning Network, including Teledosimetry System (TDS)*

Continuous measurements of ambient dose equivalent rate (PPDE) are carried out at permanent measuring sites; the measured values are transmitted to the Data Centre of the SÚJB to be stored as ten-minute averages of PPDE. A total of 71 measuring sites is operated in the territorial network and 98 measuring sites are operated in the local networks operated by the holders of a licence.

#### *Network of integral measurement*

A total of 180 permanent measuring sites is operated in the territorial network and 123 permanent measuring sites are operated in the local networks within the emergency planning zones of nuclear installations. Thermoluminescent dosimeters are placed at the measuring site for a period of three months and then they are evaluated in the measurement laboratory. The measured quantity is the dose for a specific period, the result is converted into an average PPDE. Data is transmitted to the Data Centre after evaluation on a quarterly basis.

#### *Network of monitoring routes*

There are 25 mobile groups for ground monitoring and 2 air groups for aerial monitoring involved in the network. The mobile groups transmit data to the Data Centre from the monitoring routes of ground monitoring once a month in the form of the file to be uploaded by the mobile groups through the web interface in the specified format. The air group performs a drill twice a year and transmits data in the agreed form. The measured quantity is PPDE (mostly average value taken in 10 seconds) at the place specified by coordinates.

#### *Network of instantaneous measurement*

Measurements are carried out as operation drill for the emergency exposure situation once a month at permanent sampling sites. The measured quantity is the dose rate at the measuring site. Data is transmitted to the Data Centre immediately after measurement.

#### *Network of spectrometry measurement*

Measurements are carried out as operation drill for the emergency exposure situation once a month at permanent sampling sites. Data in the form of file, where each spectral channel is assigned the number of measured pulses, is transmitted to the Data Centre immediately after measurement.

#### *Network of closures (border networks)*

The measurement of dose rate and surface contamination is carried out as drill of the activities for the emergency exposure situation once a year in the framework of emergency exercises according to the instructions of the organiser of the exercise. The outputs of measurements are the analogue forms specified in the procedures to be practised; the results are evaluated by the organiser of exercises and are not forwarded to the Data Centre.

#### *Network of human body measurement*

The measurements are carried out once a year as a survey of the radionuclide content in the whole body by means of the direct method in the measurement laboratory on the whole-body counter or the indirect method by laboratory determination of the radionuclide content in samples of urine. The collection points for the collection of urine are determined at individual regional centres of the SÚJB or branches of the SÚRO. The measured quantity is the concentration of  $^{137}\text{Cs}$  in the human body or in a whole-day sample of urine. Data is

transmitted to the Data Centre once a year without the personal data of measured persons subject to the GDPR<sup>3</sup>.

#### *Network of environmental and food chain sampling*

Sampling of the environment including discharges and food chain, and measurements of the samples take place in accordance with the tables in Annex 3 to Decree No. 360/2016 Coll. The monitored items, permanent sampling sites or the numbers of collections, and the frequency of activities are intended for each data supplier and sampler in I-series tables in Annex 1 to the NMP. The individual data suppliers transmit data to the Data Centre immediately after such data is obtained.

Details for the individual monitoring networks in the normal monitoring are presented in B- and C-series tables in Annex 1 to the NMP. Details with the list of permanent measuring sites for external exposure are presented in Tables B\_1, B\_2, B\_3, B\_4 and B\_5 in Annex 1 to the NMP. Details with the links to the monitored items are given for the networks for external and internal exposure in Tables C\_3 in Annex 1 to the NMP and for the networks for internal exposure in Tables C\_4 in Annex 1 to the NMP. The permanent sampling sites in the networks of environmental and food chain sampling are shown in Tables C\_3.1 to C\_3.5 and C\_4.1 to C\_4.3 in Annex 1 to the NMP.

The permanent measuring sites for the network for external exposure are plotted in the map shown in B-series figures in Annex 2 to the NMP. The permanent sampling sites for the monitored item from the network of environmental sampling or the network of food chain sampling are plotted in the map shown in C-series figures in Annex 2 to the NMP. The digitised form of the monitoring sites is displayed in the Internet application “Radiation Situation Monitoring (MonRaS)” operated by the Data Centre of the SÚJB and available at: <https://www.sujb.cz/aplikace/monras/>.

### **3.2.2 Monitoring networks and monitoring sites for emergency monitoring**

For emergency exposure situation, the monitoring is carried out in all monitoring networks operated under normal monitoring in the affected area. In addition, the monitoring in the border networks is activated, which serves to define the affected area and to sort the persons and objects by contamination. The monitoring in the network of instantaneous measurement and network of human body measurement is used to detect contamination. If the emergency exposure situation is identified in the restricted area, monitoring in the local and border networks is mainly used. If the whole territory of the Czech Republic is affected, other monitoring sites are set out in the territorial network in addition to the permanent sites operated under normal monitoring. During the emergency exposure situation, the collection sites are also used to gather persons for measurements and samples for further transport to the measurement laboratories. The SÚJB may set additional monitoring sites in the individual networks, may change the frequency of the various activities, and determine the monitoring levels or other parameters of sampling and measurement in line with the development of emergency exposure situation.

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<sup>3</sup> General Data Protection Regulation (GDPR), Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC.

Details on the emergency monitoring or changes compared to the normal monitoring, in individual networks:

*Early Warning Network, including Teledosimetry System (TDS)*

Measurements continue at the permanent measuring sites and at the same or shorter time intervals as under normal monitoring. The SÚJB shall use the monitoring levels to assess the radiation situation as specified in Table J\_1 in Annex 1 to the NMP or the levels derived from the specific radiation situation at the various measuring sites depending on the development of emergency exposure situation.

*Network of integral measurement*

At the permanent measuring sites, after termination of the leakage and passage of the radioactive cloud, TLD will be replaced: in phase II of emergency exposure situation, the SÚJB may set additional measuring sites and reduce the length of the monitoring period of TLD at the permanent and other measuring sites according to the size, nature of leakage and the spread of radioactive substances. Measurement and evaluation will be carried out by the measurement laboratory immediately after replacement and receipt of the TLD from the measuring site; data is transmitted to the Data Centre immediately after the evaluation.

*Network of monitoring routes*

Mobile and air groups are deployed by the SÚJB Crisis Staff during the monitoring in emergency exposure situation as necessary for implementation, clarification or cancellation of urgent protective actions. Rapid mapping of the radiation situation is carried out by air group, more detailed information from the available infrastructure is provided by mobile groups.

*Network of instantaneous measurement*

The measurement is used to confirm the duration or termination of leakage in phase I of emergency exposure situation and to define the area affected with radioactive fallout in phase II of emergency exposure situation. The measuring sites are operatively determined by the SÚJB depending on the size of the affected area and emergency exposure situation development as well as the frequency of measurement.

*Network of spectrometry measurement*

The measurement is used in all phases of emergency exposure situation to control and specify the radionuclide composition of leakage and contamination. The measuring sites and the frequency of measurements are set by the SÚJB depending on the affected area and the development of emergency exposure situation.

*Network of closures (border networks)*

Measurements are intended for the rapid sorting of persons, vehicles and objects leaving the enclosed area affected by emergency exposure situation on the basis of the measurements of dose rates and surface contamination. The measurement of surface contamination of the body of persons is carried out as rapid indicative measurement to determine the need for decontamination and then the effectiveness of decontamination is tested. The sites for measurement and decontamination are referred to in the off-site emergency plan for emergency planning zone or are set in cooperation with the Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic and the SÚJB with other persons depending on the affected area and emergency exposure situation development.

*Network of human body measurement*

The measurements are intended to determine the radionuclide content in the thyroid gland and in the whole body by means of the direct method using portable devices or in the measurement laboratory on the whole-body counter or the indirect method by laboratory determination of the radionuclide content in samples of excreta. The collection sites are

operatively determined by the SÚJB depending on the size of the affected area and emergency exposure situation development or directly in measurement laboratories where persons or samples are transported.

#### *Network of environmental and food chain sampling*

Regular sampling of air at the permanent sampling sites shall be terminated before leakage if allowed by the development of emergency exposure situation or as soon as possible after termination of leakage and sampling shall immediately begin in emergency monitoring. The frequency of air sampling at the permanent sampling sites in phase II of emergency exposure situation is reduced from one week to 24 hours in accordance with Table 5 in Annex 3 to Decree No. 360/2016 Coll. The SÚJB may, if necessary, change the interval or may require the implementation of short-term air sampling by means of portable sampling devices at the non-permanent sampling sites set by the SÚJB. In phase III of emergency exposure situation, sampling may continue at the reduced time interval at the permanent sampling sites until further notice at the instruction of the SÚJB.

In phase III of emergency exposure situation, sampling of other monitored items is carried out on the basis of the instruction of the SÚJB in the network of environmental sampling and in the network of food chain sampling according to the specific conditions (notably those growing and breeding conditions) in the affected area.

### 3.3 MONITORED ITEMS AND MEASURED PHYSICAL QUANTITIES

External exposure may be caused by radionuclides in the environment, which are present in the atmosphere, hydrosphere and pedosphere. Internal exposure may be caused by radionuclides that get into the human body by inhalation or ingestion or penetration through the skin. The monitored items are generally divided into five levels, are associated with the code list of monitored items in the IRIX format v. 1.0. The division of monitored items up to level 3 is shown in Annex 2 to Decree No. 360/2016 Coll.

For the needs of monitoring the content of radionuclides in the samples of environment, food chain and in the human body, the monitored items are subdivided into additional levels shown in Table C\_1 in Annex 1 to the NMP.

Measurement of physical values for the network is external radiation PPDE or dose rate, or quantities derived therefrom. Measurement of physical quantities for network internal radiation activity is intended radionuclides and quantities derived from it - the volume, mass, or surface activity.

Table C\_2 in Annex 1 to the NMP provides details on the sparse network. Tables C\_3 and C\_4 in Annex 1 to the NMP provide details for the network of sampling of the monitored items of the environment and food chain. Among other things, territorial division of the networks into territorial and local networks is taken into account. In addition, sampling of discharges is described in the network of environmental sampling within the local networks.

The division of monitored items and measured physical quantities is the same for both normal and emergency monitoring. They differ only in the listing of the monitored items measured in normal monitoring and the listing of the monitored items measured in emergency monitoring where certain monitored items are preferably measured in various phases of emergency exposure situation or other normally not measured monitored items are introduced at the instruction of the SÚJB. These differences are reflected in Table C\_1 in Annex 1 to the NMP.

### 3.4 PROCEDURES UNDER WHICH ACTIVITIES ARE CARRIED OUT IN MONITORING

For the needs of the NMP, procedure means a certified methodology, internal regulation, methodological instruction, accredited procedure or procedure according to the ČSN.

Certified methodologies were developed in the context of security research and are intended for persons involved in the monitoring. Certified methodologies are made available on the SÚJB website: <https://www.sujb.cz/dokumenty-a-publikace/certifikovane-metodiky/>.

The procedures used by specified persons within a specific monitoring network for the same activities must achieve results comparable with each other and must comply with the requirements for the measurement range or achieving of the lowest detectable value of the measured physical quantity indicated in Tables in Annex 3 to Decree No. 360/2016 Coll.

The procedures for radiation situation monitoring cover the following basic areas:

- sampling,
- sample processing,
- sample measurements,
- human body measurement,
- direct measurement,
- mobile measurement,
- evaluation of results,
- data transmission,
- retention, archiving and destruction of samples.

In addition to these basic areas, unclassified procedures can be used for specific activities in the emergency exposure situation, which must comply with the above requirements of Annex 3 to Decree No. 360/2016 Coll.

For the procedures used, compliance with the given requirements must be verified in practice. New procedures are introduced by the SÚJB after verification of compliance with these requirements in the context of the comparative measurements or drills.

The extent and frequency of activities during the sampling and measurement are given in Tables in Annex 3 to Decree No. 360/2016 Coll. In Table D\_0 in Annex 1 to the NMP, the areas of the procedures used are assigned to individual networks. Table D\_1 in Annex 1 to the NMP provides an overview of certified methodologies applicable in radiation situation monitoring.

#### **3.4.1 Procedures under which activities are carried out in normal monitoring**

The procedures for individual areas used in radiation situation monitoring are set out in Table D\_2 in Annex 1 to the NMP. The frequency of individual activities under the procedures used in emergency exercises<sup>4</sup> and drills is shown in Table D\_2 in Annex 1 to the NMP. Persons who use the given procedure are listed in the table as additional information. Table D\_3 in Annex 1 to the NMP provides the procedures which are practised in the context of the comparative measurements according to Annex 7 to Decree No. 360/2016 Coll.

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<sup>4</sup> If SÚJB provides and conducts emergency exercise by practising scenarios according to Section 18(1) a) of Decree No. 359/2016 Coll., in any of the set emergency planning zones of nuclear installations or category IV workplace, then it also involves the activities referred to in selected intervention instructions according to Section 12(3) of Decree No. 359/2016 Coll.

### 3.4.2 Procedures under which activities are carried out in emergency monitoring

Most of the procedures used for normal monitoring are also used for emergency monitoring. For emergency monitoring, a number of other specific procedures is introduced in addition to the procedures for normal monitoring, which must be practised in the framework of normal monitoring. In emergency monitoring, the procedures put the emphasis on the possibility of determining rapid estimates of the values of measured quantities. The procedures for sorting or preliminary sorting by contamination are used, while considering the need for measuring plenty of samples, which places increased demands on the capacity of the measurement laboratory. The procedures for sample processing are simplified. It is important to introduce procedures for destruction of samples depending on their contamination, quantity, durability, etc.

The SÚJB may modify certain procedures in connection with the development of emergency exposure situation, e.g. procedure for destruction of contaminated samples. The SÚJB shall submit the modified procedures to the persons concerned in the form of instruction.

### 3.5 MEASURING AND SAMPLING DEVICES

The measuring and sampling devices that are used in radiation situation monitoring on the territory of the Czech Republic must meet the general requirements pursuant to Section 8 of Decree No. 360/2016 Coll. In addition, the essential requirements are specified below for the devices used in the individual monitoring networks.

The measuring and sampling devices used for both normal and emergency monitoring are identical. All measuring and sampling devices must be kept in good technical condition, tested for the stability of their parameters and calibrated so as to meet the requirements for lowest detectable value or measurement range set out in Tables in Annex 3 to Decree No. 360/2016 Coll., and to ensure that all devices normally used only for drills are also fully usable and functional for emergency monitoring.

An overview of the types of devices of individual data suppliers is presented in I-series tables in Annex 1 to the NMP.

#### *Early Warning Network*

In the Early Warning Network, the stationary measuring devices are used that enable continuous measurement of ambient dose equivalent rate in the range of tens of nSv/h (natural background) to units of Sv/h (values for emergency monitoring). The measuring device consists of detection and control units. The detection unit has to be placed at the permanent measuring site so that the geometric centre of the measuring volume of the detector is at a height of 1 m above the ground in the open air with natural surface, at a sufficient distance from buildings, trees, and similar structures, whose shielding could affect measurement quality. The control unit controls the measurement of the probe, stores the measured values and ensures their transmission together with other required data to the Data Centre of the SÚJB. The measuring devices of the Early Warning Network are calibrated at least once a year, the stability of measuring parameters is checked continuously.

#### *Network of integral measurement*

In the network of integral measurement, the measuring device is that enables to determine the average values of PPDE on the basis of the measurement of the value of PDE and knowledge of the integration time. The PDE is measured by means of integral dosimeters (most often TLD) and the appropriate laboratory evaluation devices (TLD readers). The dosimeters are in the form of the cartridges fitted with several filters and passive detectors to comply with the conditions for PDE measurement. The dosimeters are placed at the permanent measuring sites

usually at a height of 1 m above ground, where they are left for a period of three months in the normal monitoring. The evaluation of dosimeters immediately after this period of time is performed in the measurement laboratory. The result is the value of PDE for the measurement period, which is then converted to an average value of PPDE. Calibration of the measuring system is carried out quarterly.

#### *Network of instantaneous measurement*

In the network of instantaneous measurement, the portable measuring device is used that enables measurements of gamma radiation together with beta radiation in the range from tens of nGy/h to tens of mGy/h. The measuring device includes a removable screen which enables the shielding of beta radiation. The output of the measurement includes four values of dose rate in different positions of the detector with open and closed screen. In the network of instantaneous measurements, other portable measuring devices are used for single measurements of dose rate in the range from tens of nSv/h to tenths to units of Sv/h. The stability of the parameters of measuring devices is tested once a month.

#### *Network of spectrometry measurement*

In the network of spectrometry measurement, the portable measuring device is used that enables the measurement of the energy spectrum of gamma radiation at the measuring site at a selected time interval in the range from 100 to 3000 keV. The stability of parameters is tested once a month.

#### *Network of monitoring routes*

In the network of monitoring routes, the measuring device placed in a (land or air) vehicle is used that enables during the movement (drive or flight) along the monitoring route to record dose rate, coordinates of measurement, date and time of measurement at the selected time interval. The output of the measuring device for monitoring by means of a land vehicle is the file in the specified format, which is further processed in the Data Centre of the SÚJB. The stability of parameters is tested at least once a month for monitoring by means of a land vehicle. The output of the measuring device for monitoring by means of an air vehicle is the file in the form of map with measured values of dose rate or the file with data in the specified format, which is further processed in the Data Centre of the SÚJB. The stability of the parameters of measuring device for monitoring by means of an air vehicle is tested twice a year.

#### *Network of closures*

In the network of closures, the portable measuring devices (or mobile portal detectors) are mostly used for measuring surface contamination and dose rate. Specified persons for measurements or sampling shall use the measuring and sampling devices to be specified by the SÚJB depending on the specific situation and needs (e.g. in-site dose rate measurement sampling, measurement of the body surface of human beings, animals, etc.). They are the portable devices suitable for such measurements, which are used regularly for practising activities in the normal monitoring and which must have a sufficiently fast response. The measurement is aimed at sorting by the specified levels of the values of measured physical quantity. The stability of the parameters of these devices is tested in their regular use in the framework of drills for emergency monitoring activities.

#### *Networks of food chain and environmental sampling, including discharges*

The stationary sampling devices placed at the permanent sampling sites are used for continuous sampling of air from the environment and for sampling of discharges from nuclear installations. These sampling devices must allow determination of flow or volume of the sample taken. The stability of their parameters is tested continuously under sampling. The

devices designed for sampling of discharges and for balancing of discharges are regularly calibrated or verified in accordance with the monitoring programmes of licence holders.

Other sampling, mostly point sampling, of the environment is carried out by means of portable devices that must allow the sampling of sufficient quantity even for a potential repeated measurement. The samples taken are placed in such containers to avoid degradation of the sample during transport to the measurement laboratory or cross contamination of the samples in emergency monitoring. The samples of food chain are mostly taken without sampling devices. Specific sampling conditions and specifications of the sampling devices used are described in the procedures shown in D-series tables in Annex 1 to the NMP.

Measurements of the samples taken in the network of environmental and food chain sampling are carried out in the measurement laboratories equipped with measuring devices with such parameters to meet the requirements for lowest detectable value in accordance with Tables in Annex 3 to Decree No. 360/2016 Coll.

The stability of the parameters of measuring devices is periodically tested by the measurement laboratory for each evaluation of the results and whenever the measuring device is replaced or repaired. The energy calibration of measuring devices for the determination of radionuclide content in the samples of the environment including discharges and in the samples of food chains using the gamma-ray spectrometry method is usually performed once a week; the efficiency calibration is checked once a year or after repair of the measuring device. The measuring devices used for the determination by radiometry are calibrated within the verification under the terms specified in the verification sheets but usually every two years. The energy calibration of the spectra of the samples analysed by alpha-particle spectrometry using semiconductor detectors is performed as needed; the stability of the parameters of measuring devices is tested periodically for each evaluation of the results; for the quantitative evaluation of the activity of the analysed radionuclides, a commercially produced isotopic tracer is added to the samples at the stage of radiochemical preparation.

#### *Network of human body measurement*

In the network of human body measurement, the measurements of radionuclide content in the human body are carried out using the gamma-ray spectrometry routes with such parameters to meet the requirements for lowest detectable activities in accordance with Tables in Annex 3 to Decree No. 360/2016 Coll. The stability of the parameters of measuring devices is tested periodically for each evaluation of the results. The energy and efficiency calibration of measuring devices for the determination of radionuclide content in the human body using the gamma-ray spectrometry method is carried out every three months.

Table E in Annex 1 to the NMP provides an overview of measuring and sampling devices including the frequency of stability test of parameters and calibrations.

### 3.6 MEASUREMENT LABORATORIES

The requirements for the measurement laboratories involved in radiation situation monitoring under the NMP are set out in Section 10 of Decree No. 360/2016 Coll. Table F<sup>2</sup> in Annex 1 to the NMP provides a list of measurement laboratories including a person or an entity for whom they perform the measurements, and a list of the measurements performed by the laboratory. The obligation to transmit the results of the monitoring into the Data Centre of the SÚJB in the format described in the NMP have all measurement laboratories, including laboratories of the holders of licence or laboratories which carry out the measurements for the holders of licence under a contract and, therefore, they are included in the above list of the laboratories.

The measurement laboratories involved in normal and emergency monitoring are identical, only the extent of their involvement may change in the emergency exposure situation on the basis of the request of the SÚJB.

### 3.7 DATA FORMATS, DATA TRANSMISSION AND DATA INTERFACES

All data suppliers, i.e. persons or entities referred to in Chapter 3.1 or measurement laboratories referred to in Chapter 3.6 or the holder of a licence pursuant to Section 149(2) of the Atomic Act, shall transmit the monitoring data to the Data Centre of the SÚJB, without delay after such data have been obtained, remotely in accordance with Section 11 of Decree No 360/2016 Coll.

The monitoring data contain, in addition to the results of the measurement, the date, time data, and coordinates, or other details of the monitoring site, the sampling and measurement that are specific to a certain monitoring network. The data supplier shall prepare the monitoring data for transmission to the Data Centre in a data file and in the appropriate data format.

An overview of networks and appropriate data formats is given in Table G\_1 in Annex 1 to the NMP. Table G\_2 in Annex 1 to the NMP gives a general example of the file format IRIX v. 1.0. Specific data formats for individual monitoring networks including the type file in the format IRIX v. 1.0 for the monitoring network are provided in Tables<sup>2</sup> G\_3 to G\_10 in Annex 1 to the NMP.

The Data Centre of the SÚJB receives the data transmitted by remote access using either a fully automated transmission using the web services or manual entry of data files through the web interface. The procedure to register and issue a certificate for entering data using web services is presented in Table G\_12<sup>2</sup> in Annex 1 to the NMP.

The Data Centre of the SÚJB allows data suppliers whose systems are directly linked to the SÚJB systems to enter data directly into the appropriate databases. Table G\_1 in Annex 1 to the NMP specifies data suppliers who may be allowed to use this procedure.

If remote access is not working or data transmission via remote access is not possible in an emergency exposure situation, it is permitted to transfer data in analogue form or on other digital data carriers approved by the Data Centre of the Office, which shall give its consent, among others, while considering the current requirements to ensure its cyber security. The requirements for the analogue form of transmitted data are set out in Table G\_11 in Annex 1 to the NMP.

The procedure for data transmission is the same for both normal and emergency monitoring. The aforementioned data formats, data interfaces and data transmission method under the NMP must be, in accordance with Section 234(1) of the Atomic Act, implemented and used by individual data suppliers no later than from 1 January 2021.

### 3.8 SAMPLES, FOR WHICH REPEATED MEASUREMENT MAY BE REQUIRED

The Data Centre of the SÚJB may require repeated measurements of samples. The requirements for the repeated measurements of samples are set out according to the type of the sample taken, type of sampling, durability of the sample taken, and the possibility of its retention, or according to the needs for sample processing. The list of samples for the required repeated measurements including the predicted retention time of the sample is given in Table H in Annex 1 to the NMP.

In an emergency monitoring, the SÚJB may modify the list of samples for which it may be required to repeat the measurement. The SÚJB shall submit the modified requirements for repeated measurement to the persons concerned in the form of instruction.

### 3.9 ACTIVITIES OF SPECIFIED PERSONS

The persons and entities involved in radiation situation monitoring on the territory of the Czech Republic are referred to in Section 3.1. The obligations of specified persons are generally set out by the Atomic Act. The SÚJB concluded contracts with some persons and entities for the activities in monitoring, which provide details and conditions of the activities carried out. Table A\_1 in Annex 1 to the NMP identifies persons and entities with whom the SÚJB concluded such contracts.

An overview of specific activities under the NMP and details for each person or entity from the list in Chapter 3.1 are provided in I<sup>2</sup>-series tables in Annex 1 to the NMP. I-series tables in Annex 1 to the NMP for the data supplier include an overview of networks in which the person is involved, the number of monitoring sites, and interconnection of the monitoring sites to the monitored item, measured quantity or radionuclide, and the frequency of each activity. The specific permanent monitoring sites operated by the individual or entity are presented including information provided by the Data Centre to the data supplier. For the data supplier, there is also specified the data format and data interface for the data transmitted by the data supplier to the Data Centre of the Office. I-series tables in Annex 1 to the NMP specify the normal monitoring and provide an expected involvement in the emergency monitoring.

### 3.10 MONITORING LEVELS

In accordance with Section 68 of Decree No. 422/2016 Coll., the monitoring levels are divided into recording, investigation and intervention levels. In generally, the *recording levels* are set at the level of the lowest detectable value of the measured quantity and the *investigation levels* are set as the upper limits of normally occurring values of the measured quantity. The *intervention levels* for monitoring the surrounding area of the workplace, from which radioactive substances are released, must be set out in accordance with the requirements for optimisation of public exposure. The intervention levels may be graded and can have several different values for different interventions.

When the recording level is reached or exceeded, the data is recorded and stored; when the investigation level is exceeded, an investigation of the causes and consequences of the fluctuation of the monitored quantity is conducted; when the intervention level is exceeded, the predefined measures are implemented to remedy the situation and prevent unwanted development of the situation.

#### 3.10.1 Monitoring levels for normal monitoring

In normal monitoring, all measurement results are recorded, i.e. measured values or lowest detectable values for the measurement set out in accordance with Tables in Annex 3 to Decree No. 360/2016 Coll.

The *investigation level* in the **networks for external exposure** is set close to the value of 250 nSv/h under the conditions at the measuring site. The value of 500 nSv/h is used as the *intervention level*, which does not pose a risk in terms of external exposure, but if it occurs at multiple measuring sites at the same time interval, it could be indicative of incipient release or another non-standard condition, which could lead to radiation incident or accident.

For the needs of the NMP, the *investigation levels* for planned exposure situation and existing exposure situation in the **networks for internal exposure** or external and internal exposure (i.e. networks of environmental and food chain sampling and networks of human body measurements) are determined twice the upper limit of normal values. The *intervention levels*

for artificial radionuclides are mostly determined as ten times the investigation level or the values pursuant to Council Directive 2013/51/Euratom<sup>5</sup> are used. For monitored items of food chain, which are not staple food according to the consumer basket (e.g. mushrooms, game) and for which higher values of the activity of <sup>137</sup>Cs are still measurable as a result of the Chernobyl accident, the values pursuant to Council Regulation 2016/52/Euratom<sup>6</sup> are used as the intervention levels. For monitoring under the existing exposure situation following potential future radiation accident, the values<sup>6</sup> for all monitored items would be used as intervention levels or lower levels would have been set in accordance with specific emergency exposure situation.

The monitoring levels are presented in J-series tables in Annex 1 to the NMP and B-series tables related to a specific measuring site or Table C\_1 related to a specific monitored item.

The procedures for exceeding the investigation level in the normal monitoring are as follows:

- elimination of measurement error,
- identification of the causes and, if possible, their elimination.

The procedures for exceeding the intervention level in the normal monitoring are as follows:

- making sure that it is not the development of a radiation incident or radiation accident,
- performing repeated measurement or repeated sampling and new measurement,
- performing other, additional measurements,
- initiating emergency monitoring in the case of confirmed release.

### 3.10.2 Monitoring levels for emergency monitoring

The monitoring levels in an emergency exposure situation are set so as not to exceed the reference level of 100 mSv for the exposure of an individual in an emergency exposure situation set out in Section 106 of Decree No. 422/2016 Coll.

The operational intervention levels for the implementation of urgent protective actions are set out in Annex 9 to Decree No. 359/2016 Coll. In accordance with Section 107(2) of Decree No. 422/2016 Coll., urgent protective actions shall be always implemented if the dose absorbed in organs could exceed the levels specified in Annex 29 to Decree No. 422/2016 Coll. A justified implementation or cancellation of protective measure is set out in Section 107 of Decree No. 422/2016 Coll. The reference level for management of lasting exposure resulting from an emergency exposure situation is given in Section 110(2) of Decree No. 422/2016 Coll.

The numerical values of monitoring levels may differ depending on the phase of emergency exposure situation and on the type of radiation extraordinary event.

The *investigation level* in the **networks for external exposure** is set to 0.5 µSv/h and the value of 5 µSv/h is used as the first *intervention level*. For other values of monitoring levels see J-series tables in Annex 1 to the NMP.

For emergency exposure situation in the **networks for internal exposure**, the monitoring levels are determined as set out in J-series tables in Annex 1 to the NMP.

These monitoring levels are based on the values of operational intervention levels (OIL) set by the IAEA. Since the composition of the mixture of released radionuclides is not known in

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<sup>5</sup> Council Directive 2013/51/Euratom laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption

<sup>6</sup> Council Regulation 2016/52/Euratom laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency

advance, the operational intervention levels for two most significant radionuclides  $^{131}\text{I}$  and  $^{137}\text{Cs}$  are used as indicators to determine the degree of hazard of ingestion of contaminated food, milk or drinking water. In this case, the value of operational intervention level is used as the *intervention level* in case of a radiation accident in a nuclear power plant in the Czech Republic.

The procedures for exceeding the investigation level in the emergency monitoring are as follows:

- investigation of causes,
- trend tracking.

The procedures for exceeding the intervention level in the emergency monitoring are closely linked to the implementation of protective measures depending on the development of emergency exposure situation:

- confirmed ongoing release - sheltering and iodine prophylaxis (the measure also applies to intervention persons including persons involved in the monitoring),
- terminated release - clarification of the area for possible evacuation; monitoring is carried out; persons who are involved in monitoring shall use personal protective equipment,
- after termination of emergency exposure situation - clarification of the possibility of consuming food and water from local sources; under the NMP, only monitoring and information about the radiation situation are provided; the intervention is carried out, for example, by the State Veterinary Administration, Agricultural and Food Inspection Authority, regional health inspector, etc., by issuing a prohibition on the use of local food, feed and water; the procedures for the implementation of follow-up protective actions are described in the off-site emergency plan for the emergency planning zone or in the National Radiation Emergency Plan for the territory of the Czech Republic.

## ABBREVIATIONS

AČR	Armed Forces of the Czech Republic
AZ	Act No. 263/2016 Coll., Atomic Act
CÚ	customs office
CHMI	Czech Hydrometeorological Institute
CR	Czech Republic
DP	dose rate
EES	existing exposure situation
EOAR	radon equivalent equilibrium concentration (radon EEC)
HZS ČR	Fire Rescue Service of the Czech Republic
IAEA	International Atomic Energy Agency
LeS	air group
MM	measuring site
MP	monitored item
MS	mobile group
MÚ	monitoring level
MV-GŘ HZS ČR	Ministry of Interior – General Directorate of Fire Rescue Service of the Czech Republic
NES	emergency exposure situation
NDH	lowest detectable value
NMP	National Monitoring Programme
OIL	operational intervention levels
OM	sampling site
PČR	Police of the Czech Republic
PES	planned exposure situation
PDE	ambient dose equivalent
PPDE/PFDE	ambient/photon dose equivalent rate
PŘ	food chain
RC	regional centre
SOV	sampling network
SVÚ	State Veterinary Institute
SVZ	Early Warning System
SÚJB	State Office for Nuclear Safety (herein also referred to as the “Office”)
SÚJCHBO	National Institute for Nuclear, Chemical and Biological Protection
SÚRO	National Radiation Protection Institute
SZPI	Czech Agricultural and Food Inspection Authority
TDS	Teledosimetric system
ÚKZÚZ	Central Institute for Supervising and Testing in Agriculture
V359	Decree No. 359/2016 Coll., on details of ensuring radiation extraordinary event management
V360	Decree No. 360/2016 Coll., on radiation situation monitoring
V422	Decree No. 422/2016 Coll., on radiation protection and security of a radioactive source
VÚ	investigation level
VÚLHM	Forestry and Game Management Research Institute
VÚV	T. G. Masaryk Water Research Institute
ZÚ	intervention level

## TERMS

**“Radiation situation monitoring”** - monitoring carried out by the persons pursuant to Section 149(2) of the Atomic Act;

**“Data from radiation situation monitoring”**- data obtained in the course of radiation situation monitoring and transmitted in the agreed manner to the Data Centre of the Office; hereinafter also referred to as **“data”**;

**“Data Centre of the Office”** - technical (HW and SW) and staffing system of the Office to handle the monitoring data;

**“Data interface”** - a set of technical measures for the transmission of monitoring data to the Data Centre;

**“Sparse monitoring network”** - a monitoring network, which is, for the region of the Czech Republic, composed of at least one representative sampling site for the specified monitored item of the environment or food chain, from which the sample is taken. The samples taken at these sites should undergo highly sensitive measurements, which give an overview of the actual levels and trends of the levels of radionuclide content in the monitored item;

**“Dense monitoring network”** - a monitoring network composed of sampling sites of the network of sampling of the monitored items of the environment and food chain, and measuring sites of the networks for external exposure distributed throughout the Czech Republic to allow the calculation of regional average levels of external exposure or radionuclide content for the monitored item;

**“Exposure situation”** - all circumstances taken into account that lead to exposure of an individual or the environment to ionising radiation; the exposure situation refers to:

- planned exposure situation that is associated with the intentional use of ionising radiation source,
- emergency exposure situation that may occur during the planned exposure situation or be induced by an arbitrary act and requires urgent measures to avert or limit the consequences,
- existing exposure situation that already exists at the time when decisions are made about its control including long-lasting consequence of the emergency exposure situation or terminated operations in the planned exposure situation;

**“Phases of emergency exposure situation”** - a period of time after radiation accident when it is necessary to use different procedures and means for radiation situation monitoring in relation to the needs for implementation, clarification or cancellation of protective measures for the population.

## ANNEXES

### ANNEX 1 TABLES

#### A-series tables

A\_0: Roles of persons under the NMP

A\_1: List of persons involved in radiation situation monitoring on the territory of the Czech Republic under the NMP

A\_2<sup>7</sup>: Persons and contact information for the representatives responsible for monitoring

#### B-series tables

B\_0: Details on the division of the dense network (by purpose, method of measurement, territory and monitored item)

B\_1.a: Details on the division of the dense network – Early Warning Network, territorial network, monitored item – atmosphere/air, planned exposure situation

B\_2.a: Details on the division of the dense network – Network of Integral Measurement (TLD), territorial network, monitored item – air, planned exposure situation

B\_2.b: Details on the division of the dense network – Network of Integral Measurement (TLD), local network, monitored item – air, planned exposure situation

B\_3.a: Details on the division of the dense network – Network of Instantaneous Measurement, territorial network, monitored item – air, planned exposure situation

B\_3.b: Details on the division of the dense network – Network of Instantaneous Measurement, local network, monitored item – air, planned exposure situation

B\_4.a: Details on the division of the dense network – Network of Spectrometry Measurement, territorial network, monitored item – air, planned exposure situation

B\_5: Details on the division of the dense network – Network of Monitoring Routes, monitored item – air, planned exposure situation, territorial and local network

#### C-series tables

C\_0: Details on the division of the dense network with respect to the monitored item

C\_1: Details on the division of the monitored items for planned exposure situation and emergency exposure situation

C\_2: Details on the monitored items in the sparse network

C\_3.1: Details on monitored item: atmosphere/air – network for external and internal exposure (network of environmental sampling including discharges)

C\_3.1a: Monitored item: atmosphere/air – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network

C\_3.1b: Monitored item: atmosphere/air – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network

C\_3.2: Details on monitored item: pedosphere/soil – network for external and internal exposure (network of environmental sampling)

C\_3.2b: Monitored item: pedosphere/soil – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network

C\_3.3: Details on monitored item: hydrosphere/water – network for external and internal exposure (network of environmental sampling including discharges)

C\_3.3a: Monitored item: hydrosphere/water – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network

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<sup>7</sup> Non-public annex

- C\_3.3b: Monitored item: hydrosphere/water – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.4: Details on monitored item: hydrosphere/sludge – network for external and internal exposure (network of environmental sampling)
- C\_3.4a: Monitored item: hydrosphere/sludge – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
- C\_3.4b: Monitored item: hydrosphere/sludge – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.5: Details on monitored item: hydrosphere/sediments – network for external and internal exposure (network of environmental sampling)
- C\_3.5a: Monitored item: hydrosphere/sediments – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
- C\_3.5b: Monitored item: hydrosphere/sediments – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.6: Details on monitored item: flora/indicator plants – network for external and internal exposure (network of environmental sampling), emergency monitoring
- C\_4.1: Details on monitored item: food chain/milk, dairy produce – network for internal exposure (network of food chain sampling)
- C\_4.1a: Monitored item: food chain/milk – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial network
- C\_4.1b: Monitored item: food chain/milk – permanent sampling sites – network for internal exposure (network of food chain sampling), local network
- C\_4.2: Details on monitored item: food chain/mixed diet – network for internal exposure (network of food chain sampling)
- C\_4.2a: Monitored item: food chain/mixed – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial network
- C\_4.3: Details on monitored item: food chain/mixed diet items – network for internal exposure (network of food chain sampling)
- C\_4.3a: Monitored item: food chain/mixed diet items – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial
- C\_4.3b: Monitored item: food chain/mixed diet items – permanent sampling sites – network for internal exposure (network of food chain sampling), local
- C\_4.4: Details on monitored item: food chain/medications – network for internal exposure (network of food chain sampling),
- C\_4.5: Details on monitored item: food chain/feed – network for internal exposure (network of food chain sampling),
- C\_4.5a: Monitored item: food chain/feed – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial
- C\_4.5b: Monitored item: food chain/feed – permanent sampling sites – network for internal exposure (network of food chain sampling), local
- C\_5: Human body for internal exposure; values of the monitoring levels linked to the monitored item and radionuclides whose content in the monitored item is determined

#### **D-series tables**

- D\_0: Overview of networks and respective areas of procedures
- D\_1: Overview of certified methodologies applicable to radiation situation monitoring
- D\_2: Overview of the procedures used in radiation situation monitoring under the NMP including frequency of practising procedures in the framework of drills

D\_3: Overview of the procedures practised under comparative measurements in accordance with Annex 7 to Decree No. 360/2016 Coll.

#### **E-series tables**

E: Measuring and sampling devices and the frequency of stability tests of their parameters, and calibration

#### **F-series tables<sup>8</sup>**

F: Measurement laboratories

#### **G-series tables<sup>8</sup>**

G\_1: Overview of networks and the relevant data formats and the form of data transmission

G\_2: General example of file format IRIX v. 1.0

G\_3: Data transmission from the Early Warning Network including teledosimetric system

G\_4: Data transmission from the network of integral measurement (TLD)

G\_5: Data transmission from the network of instantaneous measurement

G\_6: Data transmission from the network of spectrometry measurement

G\_7: Data transmission from the network of monitoring routes

G\_8: Data transmission from the network of closures

G\_9: Data transmission from the network of environmental sampling including discharges and from the network of food chain sampling

G\_10: Data transmission from the network of human body measurement

G\_11: Requirements for data transmission in analogue form or on other digital data carriers

G\_12: Procedure to register and issue a certificate for entering data using web services

#### **H-series tables**

H: Overview of samples for repeated measurements

#### **I-series tables<sup>8</sup>**

I\_1: Specific activities and the means used in monitoring under the NMP of the data supplier - Armed Forces of the Czech Republic

I\_2: Specific activities and the means used in monitoring under the NMP of the data supplier - customs authorities of the Czech Republic

I\_3: Specific activities and the means used in monitoring under the NMP of the data supplier - Czech Hydrometeorological Institute

I\_4.a: Specific activities and the means used in monitoring under the NMP of the data supplier - DIAMO – TÚU

I\_4.b: Specific activities and the means used in monitoring under the NMP of the data supplier - DIAMO – SUL

I\_4.c: Specific activities and the means used in monitoring under the NMP of the data supplier - DIAMO – GEAM

I\_5: Specific activities and the means used in monitoring under the NMP of the data supplier - Fire Rescue Service of the Czech Republic

I\_6: Specific activities and the means used in monitoring under the NMP of the data supplier - Police of the Czech Republic

I\_7: Specific activities and the means used in monitoring under the NMP of the data supplier - State Office for Nuclear Safety

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<sup>8</sup> Non-public annex

- I\_8: Specific activities and the means used in monitoring under the NMP of the data supplier - National Radiation Protection Institute
- I\_9: Specific activities and the means used in monitoring under the NMP of the data supplier - State Veterinary Institute
- I\_10: Specific activities and the means used in monitoring under the NMP of the data supplier - T. G. Masaryk Water Research Institute
- I\_11: Specific activities and the means used in monitoring under the NMP of the sampler - Agricultural and Food Inspection Authority
- I\_12: Specific activities and the means used in monitoring under the NMP of the sampler - Central Institute for Supervising and Testing in Agriculture
- I\_13: Specific activities and the means used in monitoring under the NMP of the sampler - Forestry and Game Management Research Institute

**J-series tables**

- J\_0: Overview of reference levels for determining the monitoring levels
- J\_1: Monitoring levels for the Early Warning Network, territorial network, monitored item – air
- J\_2: Monitoring levels for the network of integral measurement, local and territorial network, monitored item – air
- J\_3: Monitoring levels for the network of instantaneous measurement, territorial network, monitored item – air
- J\_4: Monitoring levels for the network of monitoring routes, monitored item – air
- J\_5: Monitoring levels for the network of food chain sampling – planned exposure situation
- J\_6: Derived activity concentrations of selected radionuclides in water intended for human consumption (according to EURATOM 2013/51)
- J\_7: Monitoring levels for the network of food chain sampling – emergency exposure situation
- J\_8: Maximum permitted levels of radioactive contamination of food (according to EURATOM 2016/52)
- J\_9: Monitoring levels for the network of environmental sampling; air
- J\_10: Monitoring levels for the network of environmental sampling; water
- J\_11: Monitoring levels for the network of environmental sampling; soil
- J\_12: Monitoring levels for the network of human body measurement (except professionals working with unsealed sources)
- J\_13: The activity concentration of  $^{131}\text{I}$  in air corresponding to the equivalent dose in the thyroid gland  $H_{\text{sz}} = 100 \text{ mSv}$
- J\_14: Reference values for sorting by surface contamination (according to the IAEA document)
- J\_15: Release levels of surface activity for the surface contamination of objects (according to Decree No. 422/2016 Coll.)

## ANNEX 2 MAPS SHOWING PERMANENT MEASURING SITES AND SAMPLING SITES

Annex 2 serves only as an illustration of permanent measuring sites and sampling sites. The digitised format of the monitoring sites is displayed in the Internet application “Radiation Situation Monitoring (MonRaS)” operated by the Data Centre of the SÚJB and available at: <https://www.sujb.cz/aplikace/monras/>.

- B\_1.1: Measuring site, Early Warning Network, territorial network
- B\_1.2a: Measuring site, thermoluminescent dosimeter, territorial network
- B\_1.2b: Measuring site, thermoluminescent dosimeter, local network of the area surrounding the Dukovany NPP
- B\_1.2c: Measuring site, thermoluminescent dosimeter, local network of the area surrounding the Temelín NPP
- B\_1.3: Measuring site, network of spectrometry and instantaneous measurement
  
- C\_3.1a: Monitored item: atmosphere/air – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
- C\_3.1b: Monitored item: atmosphere/air – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.2b: Monitored item: pedosphere/soil – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.3a: Monitored item: hydrosphere/water – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
- C\_3.3b: Monitored item: hydrosphere/water – permanent sampling sites – network for external and internal exposure (network of environmental sampling), local network
- C\_3.4a: Monitored item: hydrosphere/sludge – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
- C\_3.5a: Monitored item: hydrosphere/sediments – permanent sampling sites – network for external and internal exposure (network of environmental sampling), territorial network
  
- C\_4.1a: Monitored item: food chain/milk – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial network
- C\_4.1b: Monitored item: food chain/milk – permanent sampling sites – network for internal exposure (network of food chain sampling), local network
- C\_4.2a: Monitored item: food chain/mixed – permanent sampling sites – network for internal exposure (network of food chain sampling), territorial network

**CHANGE HISTORY**

Version	Date	Description of change