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Problems of developing remedial strategy for the uranium ore processing legacy site Pridneprovsky Chemical Plant Site (Dneprodzerginsk, Ukraine)

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In this paper we present results of works and studies carried out in the frame of ongoing national and international projects aimed at developing the remedial strategy for the Soviet era legacy uranium production site Pridneprovsky Chemical Plant, Dneprodzerginsk, Ukraine. The site includes several uranium mill tailings, contaminated buildings, ore storage grounds and other contaminated facilities.

Taking into account the necessity to implement provisions of the new IAEA standards (Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, No. GSR Part 3 (Interim) and others) as well as the provisions of the ICRP 103 publication, SNRIU developed the draft of the new licensing requirements for activities of uranium ores processing.

These requirements include provisions for radiation safety for decommissioning of uranium facilities (including legacy sites).

These new requirements take into account achievements of best practices, include: requirements to provide comprehensive safety analysis for designing, realization of rehabilitation measures, as well as requirement to produce the complete and adequate assessment of the risks for humans and the environment after completion of rehabilitation works.

The possibility of using these licensing requirements by Central Asian countries for support of the rehabilitation of the legacy uranium sites is considered.

One other subject is characterization of contamination of environment by radionuclides and toxic substances at the legacy cite. For this purpose the waste material, soil, groundwater and surface water samples were collected and systematically analyzed for radionuclides of U-238 decay series, toxic metals and major ions in 2012-13. An important focus of the study was chemo-toxic substances and their potential impact on population and environment. Special attention was paid to QA/QC issues.

Monitoring data show that the most mobile radioactive contaminant in groundwater is uranium. Uranium mobility in groundwater is supposedly promoted by oxidizing conditions and complexation with hydrocarbonate. The key toxic contaminants of concern for groundwater and surface water are Mn, Pb, Ni, Cd, Co and As. In addition, groundwater has elevated concentrations of ammonia, potassium, sodium, sulphate, chlorine and other ions. The radionuclide and chemical pollution is related to technological process (uranium ore leaching by nitric and sulphuric acid, neutralization by lime and ammonia, radiochemical effluents, etc.) and to composition of uranium ore rock minerals.

The problem is complicated by the fact that apart from the uranium mill tailings, there are multiple industrial sources of atmospheric pollution and wastewater releases (metallurgical, chemical industry) in the vicinity of the study site.

Our results indicate that comprehensive risk assessment of the uranium legacy site with respect to both radionuclides and toxic chemicals is needed to develop the remedial strategy. Cross-influences from industrial sources and background chemical pollution in the study region also need to be taken into account for developing rational remedial objectives and clean-up criteria for the legacy site.

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