

DECISION

OF THE GOVERNMENT OF THE REPUBLIC OF ARMENIA

No 661-N of 15 June 2017

ON ESTABLISHING THE PROCEDURE FOR CARRYING OUT MONITORING IN MINING WASTE FACILITIES

Taking point 19 of part 2 of Article 15 of the Subsoil Code of the Republic of Armenia as a basis, the Government of the Republic of Armenia ***decides to:***

1. Establish the procedure for monitoring in mining waste facilities, according to the Annex.
2. This Decision shall enter into force on the tenth day following the day of its official promulgation.

Prime Minister
of the Republic of Armenia

K. Karapetyan

20 June 2017

Yerevan

Annex
to Decision of the Government
of the Republic of Armenia
No 661-N of 15 June 2017

PROCEDURE
FOR CARRYING OUT MONITORING IN MINING WASTE FACILITIES

I. GENERAL PROVISIONS

1. The relations pertaining to implementation of monitoring in mining waste facilities (hereinafter referred to as "the Facility") shall be regulated by this Procedure.
2. The provisions of this Procedure shall extend to subsoil users, as a result of the activity whereof, mining wastes have generated.
3. Monitoring is a system of actions regularly performed (visual observations, including natural studies and instrumental measurements, laboratory studies, information collection, processing, evaluation and maintenance of information bases (database)) against subsoil waste facilities.
4. The purpose of monitoring of facilities shall be:
 - (1) preserving the safety and stability of facilities;
 - (2) identifying and preventing potential risks;
 - (3) the study of the maintenance of facilities and their potential accident patterns;
 - (4) collecting and analysing data for short-term and long-term predictions of the activity of facilities;

- (5) obtaining reference data on the assessment of the degree of the risk level of facilities;
 - (6) collecting, processing, summarising and publishing operational data on facilities on the Internet website of subsoil user;
 - (7) development and implementation of a plan of recommendations and prevention measures based on brief data.
5. The monitoring shall be implemented in relation to the following facilities: tailing dumps, area, place, including any dam or any other construction (hereinafter referred to as "the Heap platform"), heap leaching platforms, as well as in relation to tailings, heap leaching platforms and heap platforms or areas of their environmental impact (hereinafter referred to as "the Impact") — surface and underground waters, atmospheric air, soil, flora and fauna.
6. Monitoring of facilities shall be carried out by the subsoil user:
- (1) for the creation of a baseline environmental background database around the facilities and the areas affected by it during the development phase of the activity;
 - (2) in the operation phase of facilities, at certain intervals to ensure the management of the facility structure in a safe and environmentally sustainable mode, to identify cases of discharge of contaminants into the environment;
 - (3) during and after closure of the facility, to identify that the facility no longer poses a threat for the environment and health of population, and that re-cultivation works have been carried out in the facility.

II. MONITORING OF TAILING DUMPS AND HEAP LEACHING PLATFORMS

7. Monitoring of tailing dumps and heap leaching platforms (hereinafter referred to as "the Constructions") on a permanent basis is necessary to monitor the conditions of the constructions of tailing dumps and their elements, indicating filtration foci, collapses, landfalls, sediments, sedimentations, cracks, places of slurry and sewage leakage.
8. The purpose of monitoring the stability of the Constructions shall be ensuring the stability of the mass of subsoil use waste and the Constructions installed in the Construction, especially reducing the risk of landslides.
9. Control-measuring devices must be placed for qualitative monitoring of the condition of structures of tailing dumps and heap leaching platforms.
10. Regular monitoring of constructions shall be aimed at monitoring the state of integrity of the construction by carrying out monitoring throughout the entire operation thereof. Evaluation of regulation and stability of constructions must be carried out by a person having relevant qualification.
11. Slope failure (accumulations) may be a potential danger for the environment and human health, therefore, the subsoil use wastes placed on slopes must be supervised at regular intervals through monitoring being implemented to make sure that stability thereof has remained acceptable.
12. Structures of tailing dumps in operation for more than 25 years, regardless of their state, must be subjected to comprehensive analysis with an assessment of strength, stability and operational reliability. Based on the actual physical and mechanical characteristics of the materials of the structures and their foundations, where necessary (presence of signs of the pre-accident condition), the structures shall be subjected to a comprehensive state analysis on an extraordinary basis. Indicators of monitoring of accumulation stability must be analysed taking as a basis the data of baseline analysis.

13. It is necessary to carry out monitoring during the operation of tailing dumps:
- (1) over the levels of water in tailing dumps, volume of tailings, velocity of flow of tailings filling the tailing dump, water consumption of the discharge pumps, velocity of leakage, on a daily basis;
 - (2) over exceeding the height of the dam top above the liquid level, on a weekly basis;
 - (3) over the condition of beach slopes on a weekly basis;
 - (4) over baseline data of quality of porewaters of tailing dumps, underground waters and level of contamination, on a monthly basis;
 - (5) over the compliance of the area of tailing dump with the aggradation project;
 - (6) over the mass (volume) of tailing transported to the tailing dump, on a weekly basis;
 - (7) over the velocity of the mass (volume) of extracted ore that is transported to heap leaching platform, on a daily basis;
 - (8) over the system of slurry pipeline and drainage;
 - (9) over the dusting of sludge chambers in the dry period of the year;
 - (10) over the emergence of aggressive waters in waterflows of the area of impact of tailing dump, water intakes of the water supply systems of drinking water and underground waters;
 - (11) over reservoirs of sludge filters and liquid waste;
 - (12) over condition of blocking devices, exceeding height of the top from the liquid level;
 - (13) over the collection and removal system of rainwaters and melting waters;

- (14) over anti-filtering, water-repellent constructions (screens, wedges, barriers);
- (15) over the work of control-measuring equipment monitoring the possibility of leakage of liquid waste from the areas of sludge filtering facilities and storage facilities;
- (16) in the direction of immediate elimination of identified violations of operation and condition of structures, as well as prevention and exclusion thereof in the future;
- (17) over technical reasons of dusting, breakdowns, incidents and accidents, as a result of which, recommendations are presented for elimination of those reasons.

III. MONITORING OF HEAP PLATFORM

14. The design, operation and maintenance of the heap platform must be implemented out in accordance with the construction project of the heap platform.
15. Monitoring shall be carried out in the heap platform:
 - (1) over the implementation of measures preventing creep or collapse of the heap platform placed on slopes, on a daily (weekly) basis;
 - (2) over the implementation of measures aimed at preventing the infiltration of surface or pit waters on the heap platform, on a weekly basis;
 - (3) over the implementation of measures aimed at removal of the ground, gully and rain waters from the heap platform, on a weekly basis;
 - (4) over the level of ground waters of the heap platform, on a weekly basis, over the general water quality criteria on a weekly basis, over general (detailed) criteria of water quality on a monthly basis;

- (5) over the precipitation absorption indicators in the area of the heap platform and the moisture content of subsoil use waste, on a quarterly basis;
 - (6) over the level, volume of waters contained in subsoil use waste, and the volume of empty rocks in subsoil use waste exposed to oxygen, on a monthly basis;
 - (7) over the availability of signs or notes preventing the presence of people in heap platform slopes, near the foundation and sites for discharge of vehicles;
 - (8) over the compliance of staircase landings and height of the rock heaps, angles of cuts and berms, speed of front movement of the heap works with the project;
 - (9) over the implementation of preventive measures aimed at preventing the breakdowns and dangerous incidents in a heap platform that are provided for by the project;
 - (10) over the emergence of aggressive waters in water flows of the area of impact of heap platform, surface and underground waters.
16. Studies of technical reasons of dusting, breakdowns, incidents and accidents shall be conducted, and recommendations for elimination of those reasons shall be presented.

IV. MONITORING OVER UNDERGROUND WATERS OF SUBSOIL USE WASTE FACILITIES AND AREAS OF IMPACT

17. Monitoring of underground waters shall be carried out in waste placement facilities (in tailing dumps, heap platform, heaps formed at heap leaching platforms, slag tanks, etc.) and areas of impact thereof.
18. Monitoring over underground and drainage waters shall be carried out in wells and boreholes, which are installed directly at the facility, and if this is not possible, in the area of impact, within the scope of the predicted contamination zone.

19. Monitoring boreholes should be drilled at an appropriate location and depth to enable:
 - (1) identification of tendencies of improvement of quality of underground waters at facilities;
 - (2) identification of tendencies of deterioration of quality of underground waters at facilities;
 - (3) accurate measurement of levels of underground waters;
 - (4) determination of the direction of movement of underground waters.
20. The number of observation wells and boreholes shall be determined by design documents for a specific facility, taking into account the degree of complexity of the relief and hydrogeological conditions of the area.
21. Boreholes must also be envisaged in observation borehole networks beyond the scope of area of dangerous impact on underground waters, in the upstream and downstream of the movement of natural flow of underground waters. At least one borehole must be placed at the source of water entering the tailing dump and at least two boreholes — in the direction of the flow coming out therefrom.
22. Before the construction of the facility, it is necessary to carry out monitoring of the level and quality of underground waters in order to obtain baseline data, within a year, on a quarterly basis. Monitoring over the level and quality of underground waters shall be required every four months during closure of facility.
23. Placement of control and drainage bareholes in the direction of underground water flow must also be planned during operation of heap leaching platforms.
24. In case of emergency absorbent underground leakage of technological solutions, contaminated water shall be pumped out and returned to the intermediate tanks of wastewater storage of the heap leaching site.

25. The monitoring bareholes and wells in facilities must be technically uninterrupted and in working condition, equipped with measuring and control devices, including with pumping equipment for water pumping and sampling.
26. During underground water sampling, preliminary pumping shall be carried out until suspended materials are removed and the water level in the aquifer is subsequently restored by pumping out at least in the amount of three-fold of the volume of barehole.

V. MONITORING OVER SURFACE WATERS OF SUBSOIL USE WASTE FACILITIES AND AREAS OF IMPACT

27. Monitoring of surface waters shall be aimed at conducting periodic inspections of water quantity and quality and identifying significant negative impacts on surface waters as a result of operation of facility.
28. Monitoring shall be carried out over all the surface waters flowing out of waste placement facilities, as well as in rivers, lakes and artificial reservoirs for discharge thereof.
29. The number of observation points shall be determined by design documents for a specific facility, taking into account the degree of complexity of the relief and hydrological conditions of the area, the characteristics of the river system, water costs, flow characteristics, the mutual connection of underground and surface waters.
30. Points must be created in the network of observation points, which are placed in the upstream and downstream of the movement of natural flow of water flowing out from facilities from the place where the surface waters mix. The following should be considered when choosing a suitable location for observation points:
 - (1) monitoring for river network must be carried out at least in two points, before upstream of each river entering the facility and downstream leaving

- the facility. If the downstream discharges into a nearby river network, the observation point is placed immediately after the confluence;
- (2) in case of flow entering reservoirs (lakes) of sweet-tasting waters from the facility, at least two observation points must be placed, one on the outflow, the other in the reservoir (lake), which is characteristic for the entire reservoir (lake);
 - (3) it is necessary to remove the water collected from the waste facilities and discharge it into the river network;
 - (4) it is necessary to carry out monitoring in water barrier and floodgate sites entering and coming out of waste facility as to assess the effectiveness thereof and identify any potential sources of contamination;
 - (5) all points of effluents flowing out of the facility must be identified and checked before being discharged into the river network.
31. Surface water monitoring points at facilities must be technically uninterrupted and in working condition, equipped with measuring and control devices.
 32. Measurement of water cost, general mineralisation of surface waters shall be carried out and qualitative characteristics shall be determined at observation points of surface waters.
 33. Monitoring shall be carried out in treatment plants of wastewaters flowing out of the facilities both over the waters entering and flowing out of the plant.
 34. The criteria which may become a source of contamination or be exposed to contamination shall also be determined for surface and underground waters for each certain facility. The list of those criteria shall be made by the subsoil user, in advance, during the design phase of the construction of the facility.
 35. Subsoil users shall conduct observations of surface or underground waters in safe heaps once every four months, heaps originated from heap leaching

platforms and tailing dumps once every month, including during maximum and minimum water levels in a borehole or well.

36. Before starting work in the facility, it is necessary to monitor (supervise) any monitoring point of surface waters for obtaining baseline data in the phase of feasibility study on a quarterly basis, at least within a year.
37. In case subsoil users detect significant deviations of any of the background standards of surface and underground waters in each facility, observations shall be carried out through an enhanced regime, the frequency of which shall be determined thereby, but not more than one week.
38. As a result of observation, the subsoil user shall create an information base for each facility - a database, where the observation results shall be regularly recorded. Surface or underground water consumption, level curves and other graphic images shall be drawn up, which reflect the characteristics of changes in criteria unique to the given facility.
39. The criteria indicated in the table should be determined in the samples taken from the underground and surface waters.

Quality criteria for underground and surface waters

Table

Name of the indicator	Content per litre		
	mg/l	mg/eq	mg/eq, %
Sodium, Na ⁺			
Potassium K ⁺			
Ammonium, NH ₄ ⁺			
Calcium, Ca ²⁺			
Magnesium, Mg ⁺⁺			
Iron, Fe ⁺⁺			

Iron, Fe ⁺⁺⁺			
Cadmium, Cd ⁺⁺			
Chromium, Cr ⁺⁺			
Lead, Pb ⁺⁺			
Arsenic As ⁺⁺⁺			
Copper Cu ⁺⁺			
Molybdenum Mo ⁺⁺⁺⁺			
Nickel Ni ⁺⁺			
Zinc Zn ⁺⁺			
Mercury, Hg ⁺⁺			
Total cations			
Sulfate, SO ₄ ^{- -}			
Chloride, Cl ⁻			
Nitrite, NO ₂ ⁻			
Nitrate, NO ₃ ⁻			
Hydrogen carbonate, HCO ₃ ⁻			
Iodine, I ⁻			
Bromine, Br ⁻			
Fluoride, F ⁻			
Hydrosulphite HS ⁻			
Carbonate CO ₃ ^{- -}			
Hydroarsenite H ₂ AsO ₄ ^{- -}			
Total anions			
Total mineralisation			
pH			
Nondissociable molecules			
Metaboric acid HBO ₂			
Hydrogen sulphide total (H ₂ S+HS)			
Silicic acid, H ₂ SiO ₃			
Arsenic acid H ₃ AsO ₃ or H ₃ AsO ₄			
Carbon dioxide CO ₂			
Cyanides			
Physical properties			
Turbidity			
Taste			

Smell			
Colour			
Deposit			

VI. MONITORING OVER THE ATMOSPHERIC AIR OF SUBSOIL USE WASTE FACILITIES

40. Monitoring regarding the emission of substances contaminating the atmospheric air must be carried out in the facilities on a daily basis.
41. Monitoring shall be carried out in relation to all emissions of contaminants into the atmospheric air, wherefor the number of permissible limit density (concentrations - MPC) shall be defined by Decision of the Government of the Republic of Armenia No 160-N of 2 February 2006.
42. Dust emissions from facilities, depending on the size and chemical composition of dust particles, have a great impact on human health and create uncomfortable conditions for vision, therefore, to identify the size and chemical composition of dust, <10 and 2.5 μm sampling of airborne particles and aerosol particles must be carried out and the content of heavy metals in them must be determined.
43. Dust particle control devices must be located around the facility in at least four locations, away from the exposed facility, downwind and upwind. It is also necessary to conduct observation on the facility boundary, near sensitive receptors and possible sources.
44. The duration of vacuuming observation must be thirty days, with a periodicity of three times a year, two of which fall between May and September.
45. Monitoring requirements over suspended particulate matter (PM_{10}) should be determined according to the specific area. In this case, the frequency of monitoring depends on the size and characteristics of the waste facility. It is also necessary to conduct observation on the facility boundary, near sensitive receptors and possible sources.

VII. MONITORING OVER SOILS OF SUBSOIL USE WASTE FACILITIES AND SOILS OF AREAS OF IMPACT

46. The monitoring of soils of subsoil waste facilities and the soils of areas of impact shall be aimed at supervising the fulfilment of the requirements set by the legislation of the Republic of Armenia, standards, permits and design documents.
47. Monitoring shall be carried out for the purpose of preventing potential impacts on the environment as outlined in waste facility management plans and at the sampling sites specified in the plan, according to clearly defined monitoring indicators and monitoring frequency.
48. The criteria for assessment of soil contamination shall be the permissible limit amounts of contaminants, and in absence of such — the background values.
49. Monitoring should be carried out on a unified informational and methodological basis, which will ensure comparability and compliance with the results of observations of other state monitoring systems.
50. As a result of observation, the subsoil user shall create an information base - a database, where the observation results shall be regularly recorded.

VIII. MONITORING OVER FLORA OF AREAS OF IMPACT OF SUBSOIL USE WASTE FACILITIES

51. Monitoring must be carried out in the areas adjacent to the facilities.
52. The monitoring of flora must be aimed at protecting and preventing hazardous effects on the environment and flora of subsoil use waste facilities.
53. Monitoring of flora is permanent and periodic observation of objects of flora based on the phytoindication method, for the assessment of their condition and growth environment, as well as the prediction of development and changes as a consequence of the impact of subsoil use waste facilities.

54. Monitoring of flora in subsoil use waste facilities shall be carried out in the following directions:
- (1) monitoring of mountain vegetation;
 - (2) monitoring of meadow vegetation;
 - (3) monitoring of water vegetation;
 - (4) monitoring of protected species of plants and mushrooms (registered in the Red Book of the Republic of Armenia);
 - (5) monitoring of resource-forming plants (berries and mushrooms);
 - (6) monitoring of forests.
55. Observations over the vegetation in the facility of subsoil users shall be conducted in safe heaps once every four months, in heaps originated from heap leaching platforms and tailing dumps once every month.
56. As a result of monitoring, the subsoil user shall create an information base of flora for each facility — a database, wherein the monitoring results, as well as characteristics of development and change of species of flora specific to the given facility are regularly registered.

IX. MONITORING OVER FAUNA OF AREAS OF IMPACT OF SUBSOIL USE WASTE FACILITIES

57. The following species of wild animals shall be the objects of fauna monitoring — mammals, birds, reptiles, fish, rodents, insects and other animals, which live in rivers (on the surface, in the soil, underground voids), surface waters and in the atmosphere under free natural conditions.
58. Monitoring shall be carried out:
- (1) over the wild animals and living environment thereof registered in the Red Book of the Republic of Armenia;

- (2) over the wild animals that are the object of hunting and the natural environment thereof.
59. As a result of monitoring, information should be obtained on the following:
- (1) distribution area and habitats of wild animals;
 - (2) number of wild animals, including of those registered in the Red Book of the Republic of Armenia;
 - (3) growth dynamics and structure of individual species of wild animals;
 - (4) assessment of animal re-production;
 - (5) physical condition of wild animals.
60. Subsoil users shall conduct observations of the fauna in the facility twice a year.
61. As a result of monitoring, the subsoil user shall create an information base of fauna for each facility — a database, wherein the monitoring results, as well as characteristics of development and change of species of fauna specific to the given facility are regularly registered.

**Chief of Staff of the Government
of the Republic of Armenia**

V. Stepanyan