
Mining — Vocabulary —

Part 4:

Prospecting and exploration

Exploitation minière — Vocabulaire —

Partie 4: Prospection et exploration

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 82, *Mining*.

A list of all parts in the ISO 22932 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html

Introduction

0.1 General

The ISO 22932 series has been prepared in order to standardize and to coordinate the global use of technical terms and definitions in mining, for the benefit of the experts working on different types of mining activities.

The need for the ISO 22932 series arose from the widely varying interpretation of terms used within the industry and the prevalent use of more than one synonym.

A geological study is generally carried out in the following four main stages: reconnaissance, prospecting, general exploration and detailed exploration (for definition of each stage see below). The purpose of the geological study is to identify mineralization, to establish continuity, quantity, and quality of a mineral deposit, and thereby define an investment opportunity.

0.2 Reconnaissance

A reconnaissance study identifies areas of enhanced mineral potential on a regional scale based primarily on results of regional geological studies, regional geological mapping, airborne and indirect methods, preliminary field inspection, as well as geological inference and extrapolation.

The objective is to identify mineralized areas worthy of further investigation towards deposit identification. Estimates of quantities should only be made if sufficient data are available and when an analogy with known deposit of similar geological character is possible, and then only within an order of magnitude.

0.3 Prospecting

Prospecting is the systematic process of searching for a mineral deposit by narrowing down areas of promising enhanced mineral potential.

The methods utilized are outcrop identification, geological mapping, and indirect methods such as geophysical and geochemical studies. Limited trenching, drilling, and sampling may be carried out.

The objective is to identify a deposit which will be the target for further exploration. Estimates of quantities are inferred, based on interpretation of geological, geophysical and geochemical results.

0.4 General exploration

General exploration involves the initial delineation of an identified deposit. Methods used include surface mapping, widely spaced sampling, trenching and drilling for preliminary evaluation of mineral quantity and quality (including mineralogical tests on laboratory scale if required), and limited interpolation based on indirect methods of investigation.

The objective is to establish the main geological features of a deposit, giving a reasonable indication of continuity and providing an initial estimate of size, shape, structure and grade. The degree of accuracy should be sufficient for deciding whether a prefeasibility study and detailed exploration are warranted.

0.5 Detailed exploration

Detailed exploration involves the detailed three-dimensional delineation of a known deposit achieved through sampling, such as from outcrops, trenches, boreholes, shafts and tunnels.

Sampling grids are closely spaced such that size, shape, structure, grade, and other relevant characteristics of the deposit are established with a high degree of accuracy. Processing tests involving bulk sampling may be required.

A decision whether to conduct a feasibility study can be made from the information provided by detailed exploration.

[SOURCE: Controller General Indian Bureau of Mines]

Mining — Vocabulary —

Part 4: Prospecting and exploration

1 Scope

This document specifies the commonly used terms in mine prospecting and exploration. Only those terms that have a specific meaning in this field are included.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

Prospecting

3.1.1

aeromagnetic prospecting

airborne magnetic prospecting

technique of *geophysical exploration* (3.2.8) of an area using an airborne *magnetometer* (3.1.1.1) to *survey* (3.6) that area

[SOURCE: Reference [1], modified — "airborne magnetic prospecting" has been added as a term.]

3.1.1.1

magnetometer

instrument for measuring magnetic intensity

Note 1 to entry: In ground *magnetic prospecting* (3.1.8.6), magnetometer is an instrument for measuring the vertical magnetic intensity.

Note 2 to entry: In *airborne magnetic prospecting* (3.1.1), magnetometer is an instrument for measuring the total magnetic intensity. Also, an instrument used in magnetic observatories for measuring various components of the magnetic field (3.8.4) of the Earth.

Note 3 to entry: Magnetometer is sensitive instrument for detecting and measuring changes in the Earth's magnetic field, used in *prospecting* (3.1.1.0) to detect *magnetic anomalies* (3.1.2.10) and magnetic gradients in rock formations.

[SOURCE: Reference [1], modified — Notes 1, 2 and 3 to entry were originally part of the definition.]

3.1.2

anomaly

geological feature, especially in the subsurface, distinguished by geological, geophysical, or geochemical means, which is different from the general surroundings and is often of potential economic value

EXAMPLE A *magnetic anomaly* (3.1.2.10).

[SOURCE: Reference [1], modified — EXAMPLE was originally part of the definition.]

3.1.2.1

botanical anomaly

local increase above the normal variation in the chemical composition, distribution, ecological assemblage, or morphology of plants, indicating the possible presence of an *ore deposit* (3.10.31) or anthropomorphic contamination

[SOURCE: Reference [1]]

3.1.2.2

geochemical anomaly

secondary anomaly

concentration of one or more elements in rock, soil, sediment, vegetation, or water that is markedly higher or lower than background

Note 1 to entry: The term may also be applied to hydrocarbon concentrations in soils.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.2.3

gravity anomaly

difference between the observed value of gravity at a point and the theoretically calculated value

Note 1 to entry: It is based on a simple gravity model, usually modified in accordance with some generalized hypothesis of variation in subsurface density as related to surface topography.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.2.4

ground geophysical anomaly

geophysical *anomaly* (3.1.2) that is mapped instrumentally at the surface of the ground

[SOURCE: Reference [1]]

3.1.2.5

hydrochemical anomaly

anomalous patterns of elements contained in ground or surface water

[SOURCE: Reference [1]]

3.1.2.6

hydromorphic anomaly

anomaly (3.1.2) where the dynamic agents are aqueous solutions, which brought the elements to the site of *deposition* (3.10.12)

[SOURCE: Reference [1]]

3.1.2.7

intense anomaly

anomaly (3.1.2) whose elemental values rise sharply to one or more well-defined peaks

[SOURCE: Reference [1]]

3.1.2.8**isanomalic line**

line of equal value of an *anomaly* (3.1.2)

[SOURCE: Reference [1]]

3.1.2.9**isostatic anomaly**

difference between the observed value of gravity at a point after applying to it the isostatic correction and the normal value of gravity at the point

[SOURCE: Reference [1]]

3.1.2.10**magnetic anomaly**

variation of the measured magnetic pattern from a theoretical or empirically smoothed magnetic *field* (3.8.4)

[SOURCE: Reference [1]]

3.1.2.11**nonsignificant anomaly**

DEPRECATED: false anomaly

anomaly (3.1.2) that is superficially similar to a *significant anomaly* (3.1.2.15) but is unrelated to ore

[SOURCE: Reference [1]]

3.1.2.12**optical anomaly**

optical properties apparently at variance with optical rules

EXAMPLE Anisotropy in isotropic minerals, such as birefringent diamond; biaxiality in uniaxial minerals, such as quartz; and erratic variation in birefringence near optical absorption bands, e.g. some epidote minerals.

[SOURCE: Reference [1], modified — EXAMPLE was originally part of the definition.]

3.1.2.13**primary anomaly**

anomaly (3.1.2) formed by primary dispersion

[SOURCE: Reference [1]]

3.1.2.14**regional anomaly**

more localized departures in the Earth's *field* (3.8.4) from the values that would be predicted if the field were to originate with a single magnet oriented along the magnetic axis

[SOURCE: Reference [1]]

3.1.2.15**significant anomaly**

anomaly (3.1.2) that is related to ore and that can be used as a guide in *exploration* (3.2.5)

[SOURCE: Reference [1]]

3.1.3

biochemical prospecting

biogeochemical prospecting

geochemical *exploration* (3.2.5) based on the chemical analysis of systematically sampled plants in a region, to detect biological concentrations of elements that might reflect hidden orebodies

Note 1 to entry: The root systems of trees are powerful *sampling* (3.1.12.6) mechanisms that represent samples of solutions from a large volume of earth. Much of the mineral content from these solutions is found in the leaves. Analysis of leaves may serve as a guide to prospectors

Note 2 to entry: The trace-element content of one or more plant organs is most often measured.

[SOURCE: Reference [1], modified — Notes 1 and 2 to entry were originally part of the definition.]

3.1.4

botanical prospecting

prospecting (3.1.10) in which differences in plant growth or plant family serve as a clue to the presence of metals beneath barren rock or a covering of sand and gravel

[SOURCE: Reference [1]]

3.1.5

electrical prospecting

prospecting (3.1.10) that makes use of three fundamental properties of rocks

Note 1 to entry: Three fundamental properties of rocks are as follow:

- 1) resistivity or inverse conductivity: this governs the amount of current that passes through the rock when a specified potential difference is applied;
- 2) electrochemical activity with respect to electrolytes in the ground;
- 3) dielectric constant: this is the basis of the *self-potential method* (3.2.11).

Note 2 to entry: This gives information on the capacity of a rock material to store electric charge, and it shall be taken into consideration when high-frequency alternating currents are introduced into the earth, as in inductive prospecting techniques. Electrical methods are more frequently used in searching for metals and minerals than in exploring for petroleum, mainly because most of them have proved effective only for shallow *exploration* (3.2.5).

[SOURCE: Reference [1], modified — Notes 1 and 2 to entry were originally part of the definition.]

3.1.5.1

magnetotelluric method

electrical prospecting (3.1.5) technique based on an application of telluric currents in which the magnetic field (3.8.4) induced by the alternations in earth currents would be measured simultaneously with the voltage fluctuations between electrodes at the surface

[SOURCE: Reference [1]]

3.1.6

geobotanical prospecting

visual study of plants, their morphology, and their distribution as indicators of such things as soil composition and depth, bedrock lithology, the possibility of orebodies, and climatic and ground-water conditions

[SOURCE: Reference [1]]

3.1.7**geochemical prospecting**

geochemical exploration

method of mineral *exploration* (3.2.5) based on the systematic measurement of the chemical properties of rocks, soils, river sediments, waters, etc.

[SOURCE: BS 3618-3:1971]

3.1.7.1**readily extractable metal**

content of a metal that can be extracted from weathered rock, overburden, or stream sediment, by weak chemical reagents

[SOURCE: Reference [1]]

3.1.7.2**reliability of method**

probability of obtaining and recognizing indications of an orebody or mineralized district by the method being used

Note 1 to entry: Reliability depends not only on whether a readily detectable target exists and how effective the *exploration* (3.2.5) method is in locating it, but also on the extent to which the *anomaly* (3.1.2) is specifically related to ore and the extent to which it is possible that non-significant anomalies may confuse the interpretation

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8**geophysical prospecting**

making and interpretation of certain physical measurements to obtain information on the subsurface and surface geological structures

3.1.8.1**air shooting**

technique of applying a seismic pulse to the ground by detonating explosive charges in the air, in *seismic prospecting* (3.1.8.14)

[SOURCE: Reference [1]]

3.1.8.2**anodic zone**

zone of electropositive potential, in the electrical *self-potential method* (3.2.11) of *geophysical prospecting* (3.1.8), if the chemical composition of the soil or subsoil is such as to give electrical polarization

[SOURCE: Reference [1]]

3.1.8.3**arc shooting**

method of refraction *seismic prospecting* (3.1.8.14) in which the variation of travel time (velocity) with azimuth from a shot point is used to infer geologic structure

Note 1 to entry: The term also applies to a refraction spread placed on a circle or a circular arc with the centre at the shot point.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.4**Bouguer gravity**

gravity values after latitude, elevation and Bouguer corrections have been applied

Note 1 to entry: Used in the gravitational method of *geophysical prospecting* (3.1.8).

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.5

bursting time

maximum difference in time lag between the bursting of the earliest and latest detonators in a series, in *seismic prospecting* (3.1.8.14)

[SOURCE: Reference [1]]

3.1.8.6

magnetic method

magnetic prospecting

geophysical prospecting (3.1.8) method that maps variations in the magnetic field (3.8.4) of the Earth that are attributable to changes of structure or magnetic susceptibility in certain near surface rocks

Note 1 to entry: Sedimentary rocks generally have a very small susceptibility compared with igneous or metamorphic rocks, and most magnetic surveys (3.6) are designed to map structure on or within the basement, or to detect magnetic minerals directly.

Note 2 to entry: Most magnetic prospecting is now carried on with airborne instruments

[SOURCE: Reference [1], modified — Notes 1 and 2 to entry were originally part of the definition.]

3.1.8.7

noise

<seismic prospecting> all recorded energy not derived from the explosion of the shot

Note 1 to entry: Sometimes loosely used for all recorded energy except events of interest.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.8

normal field

smoothed value of a magnetic field (3.8.4) component as derived from a large-scale survey (3.6), worldwide or of continental scope, in *magnetic prospecting* (3.1.8.6)

Note 1 to entry: The normal field of the Earth varies slowly with time, and maps of it are as of a certain date.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.9

profile

data recorded from one shot point by a number of groups of detectors, in *seismic prospecting* (3.1.8.14)

[SOURCE: Reference [1]]

3.1.8.10

reference seismometer

detector placed to record successive shots under similar conditions, to permit overall time comparisons, in *seismic prospecting* (3.1.8.14)

Note 1 to entry: Used in connection with the shooting of wells for velocity.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.11

reflection

returned energy (in wave form) from a shot that has been reflected from a velocity discontinuity back to a detector; the indication on a record of reflected energy, in *seismic prospecting* (3.1.8.14)

[SOURCE: Reference [1]]

3.1.8.12**refraction method**

seismic method (3.1.8.13) of geophysical prospecting (3.1.8)

[SOURCE: Reference [1]]

3.1.8.13**seismic method**

geophysical prospecting (3.1.8) method based on the fact that the speeds of transmission of shock waves through the Earth vary with the elastic constants and the densities of the rocks through which the waves pass

[SOURCE: Reference [1]]

3.1.8.14**seismic prospecting**

method of geophysical prospecting (3.1.8) in which vibrations are set up by firing small explosive charges in the ground or by other artificial sources

Note 1 to entry: Precise measurements of the resulting waves are taken, from which the nature and extent of underlying strata are revealed.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.8.15**seismic reflection method**

geophysical prospecting (3.1.8) technique in which the structure of subsurface formations is mapped by making use of the times required for a seismic wave (or pulse), generated in the Earth by a near-surface explosion of dynamite or by other artificial sources, to return to the surface after reflection (3.1.8.11) from the formations themselves

[SOURCE: Reference [1]]

3.1.8.16**seismic shooting**

method of geophysical prospecting (3.1.8) in which elastic waves are produced in the Earth by the firing of explosives or by other means

[SOURCE: Reference [1]]

3.1.9**gravity prospecting**

mapping of the force of gravity at different places with a gravimeter (3.1.12.1) (gravity meter) to determine differences in specific gravity of rock masses, and, through this, the distribution of masses of different specific gravity

[SOURCE: Reference [1]]

3.1.9.1**network**

pattern or configuration of stations, often so arranged as to provide a check on the consistency of the measured values, in surveying (3.6) and gravity prospecting (3.1.9)

[SOURCE: Reference [1]]

3.1.9.2**regional**

contributions to the observed anomalies due to density irregularities at much greater depths than those of the possible structures, the location of which was the purpose of the survey (3.6), in gravity prospecting (3.1.9)

[SOURCE: Reference [1]]

3.1.9.3

residual gravity

portion of a gravity effect remaining after removal of some type of *regional* (3.1.9.2) variation; usually the relatively small or local *anomaly* (3.1.2) components of the total or observed gravity *field* (3.8.4), in *gravity prospecting* (3.1.9)

[SOURCE: Reference [1]]

3.1.9.4

noise

<gravity and magnetic prospecting> disturbances in observed data due to more or less random inhomogeneities in surface and near-surface material

[SOURCE: Reference [1]]

3.1.10

prospecting

search for outcrops or surface exposure of *mineral deposit* (3.10.28)

[SOURCE: Reference [1]]

3.1.11

radioactivity prospecting

exploration (3.2.5) for radioactive minerals utilizing various instruments, generally a Geiger counter or scintillation counter, by measuring the natural radioactivity of earth materials

[SOURCE: Reference [1]]

3.1.12

reconnaissance

part of *exploration* (3.2.5) for the purpose of identifying enhanced mineral potential on a regional scale

EXAMPLE An engineering *survey* (3.6) in preparing for triangulation of a region.

Note 1 to entry: Reconnaissance is based on:

- results of regional geological studies, regional geological mapping;
- preliminary field inspection;
- indirect methods such as airborne and others;
- geological interference and extrapolation.

Note 2 to entry: Reconnaissance aims at to identify mineralized areas worthy of further investigation towards mineral deposit.

3.1.12.1

gravimeter

instrument which measures variations in the density of underlying rocks

[SOURCE: BS 3618-3:1971]

3.1.12.2

pilot sampling

reconnaissance sampling

taking of preliminary samples of a *mineral deposit* (3.10.28) to study its mode of occurrence and its detailed structure

[SOURCE: Reference [1]]

3.1.12.3**reconnaissance map**

map incorporating the information obtained in a *reconnaissance* (3.1.12) *survey* (3.6) and data obtained from other sources

[SOURCE: Reference [1]]

3.1.12.4**reconnoiter**

make a *reconnaissance* (3.1.12) of; especially to make a preliminary *survey* (3.6) of an area for military or geologic purposes

[SOURCE: Reference [1]]

3.1.12.5**remote sensing**

acquisition and interpretation of airborne or satellite images of the surface using infrared and visible wavelengths of light

[SOURCE: Reference [1], adapted]

3.1.12.6**sampling**

gathering of specimens of soils, water, sediments, vegetations, ore or wall rock for appraisal of an orebody

Note 1 to entry: Since the average of many samples may be used, representative sampling is crucial. term is usually modified to indicate the mode or locality; e.g. *hand sampling* (3.1.12.6.1), mine sampling, and channel sampling.

[SOURCE: Reference [1], modified — Note 1 to entry was originally part of the definition.]

3.1.12.6.1**hand sampling**

one of the major breakdowns in ore *sampling* (3.1.12.6) that includes grab sampling, trench or channel sampling, fractional selection, coning and quartering, and pipe sampling

Note 1 to entry: These methods are used in sampling small batches of ore, etc.

[SOURCE: Reference [1], modified — Notes 1 and 2 to entry were originally part of the definition.]

3.1.12.7**tectonometer**

apparatus used on the surface to obtain knowledge of the structure of the underlying rocks

[SOURCE: BS 3618-3:1971]

3.2**Exploration****3.2.1****detailed exploration**

final exploration

detailed investigation of a coal or mineral area on which a preliminary report was favourable

Note 1 to entry: The final exploration of an area may involve a costly *boring* (3.3.4) program, *survey* (3.6), and *sampling* (3.1.12.6).

[SOURCE: Reference [1], modified — Notes 1 and 2 to entry were originally part of the definition.]