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**INTERNATIONAL LAND RECLAMATION
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AND

**THIRD INTERNATIONAL CONFERENCE
ON THE ABATEMENT OF
ACIDIC DRAINAGE**

Volume 2 of 4: Mine Drainage

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Copies of this and the three companion volumes can be obtained by through NTIS.

Volume 1: Mine Drainage - SP 06A-94

Volume 2: Mine Drainage - SP 06B-94

Volume 3: Reclamation and Revegetation - SP 06C-94

Volume 4: Abandoned Mine Lands and Topical Issues - SP 06D-94

PREDICTION OF MINEWATER CHEMISTRY FROM AVAILABLE MONITORING DATA, NORANDA MINERALS' BELL MINE, BRITISH COLUMBIA

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Mining companies annually collect and analyze numerous water samples to ensure the local environment is protected and regulatory permit requirements are fulfilled. After several years the total number of water-chemistry analyses in a mine's database can be in the thousands. This database has a commonly unrecognized use in providing predictions of future water chemistry. The predictions are based on the basic philosophy that, if a trend can be recognized through the years of past chemistry, then the trend should point to future water chemistry. This philosophy holds unless an important factor, such as a major earthquake, occurs in the future, but did not occur during the past monitoring period.

The statistical assessment of a water-chemistry database is based on means and standard deviations, which can be calculated by most spreadsheet packages on the market. If the data display statistically normal trends, then the statistical parameters can be calculated directly from the database. Otherwise, the data must be adjusted or filtered, such as through logarithms which are also in spreadsheet packages, in order to first obtain a normal trend. The statistical relationships are then compiled into an "empirical water-chemistry model". This model is similar to hydrology models in that it predicts, for example, a peak annual concentration of one-hour duration.

A minesite's empirical water-chemistry model can then be used for various purposes, including (1) estimating future water-treatment costs, (2) refining water-retention times in ponds in order to obtain a particular range of metal concentrations, (3) determining the acceptable degree of failure in water-quality control technologies such as clay covers, and (4) negotiating closure bonds with regulatory agencies. Noranda Minerals' Bell Mine, in British Columbia, is used to demonstrate the approach and application of an empirical water-chemistry model.

THE MANAGEMENT AND TREATMENT OF ACID MINE DRAINAGE, PELTON COLLIERY, CESSNOCK, NEW SOUTH WALES, AUSTRALIA.

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Pelton Colliery is an abandoned Colliery located 7 km south west of Cessnock, within the Hunter Valley of New South Wales. The site serves as a coal handling and processing facility for Ellalong Colliery, which is operated by the Newcastle Wallsend Coal Company. The coal has a high sulphur content (pyritic) and when weathered produces an acidic leachate. Runoff from the waste products - coarse washery reject and tailings are acidic (pH 2.5 - 4 range). Existing surface soils and certain rock strata are also acidic. An existing water management system was in place, but proved to be inadequate during extended periods of heavy rainfall, which occurred in 1991. Discharges of acidic runoff occurred on a number of occasions, into the main watercourse, Black Creek and resulted in a number of complaints from downstream water users. An upgraded water management system was designed and implemented during 1992, at a cost of almost \$1 million. The design catered for a lag effect whereby acidic leachate would be generated some 24 to 48 hours after the storm event.

- A series of new storage dams and enlargement of existing dams to cater for the design storm (10% AEP), followed by a 1% AEP storm within 24 hours of the design storm. Each storage dam is fitted with a combination of self siphoning pipes to maintain adequate storage capacity and pumps.
- Augmentation of the existing lime treatment plant to double its throughput to 4,000m³/day. This raises the pH of water from 2.5 to 7.6.
- A series of high capacity pumps, to supply water to the lime treatment plant and the Process Dam.
- An emergency pump is diesel-operated, in case of power blackouts during storms, and is designed to pump large quantities of water into abandoned underground workings.
- An upgraded environmental monitoring program was implemented to ensure that the system is checked regularly. At the same time, a Site Environmental Procedures Manual was prepared and implemented to ensure that the system is operated and maintained correctly.

Since finalisation of the water management system, the site has withstood a number of storm events discharge of acidic water off-site.