

Undertaking #11

To provide references for the levels of residual ammonia resulting from modern blasting techniques

Bilcon has been aware of the concern for potential for ammonia residuals from blasting and investigated the issue in context of the EA for the Whites Point Quarry.

Although reference is made to ammonia residuals from the application of ANFO for quarrying purposes in some technical literature, no sources have been identified to date that define typical levels of residues in percent of explosives used in quarrying

A publication by Gordon R. Revey proposes practical methods to reduce ammonia and nitrate levels in mine water (Gordon R. Revey, 1996). This publication has been included in EIS Appendix Volume III file Blasting Protocol 9C and is provided again as attachment to this Undertaking. In consultation with DFO, Bilcon has agreed to incorporate the Revey protocols regarding AN residue into its blasting protocol.

Bilcon's discussion of the issue of AN residue with DFO has been documented in the minutes of the meeting between DFO representatives and Bilcon staff of (7 February, 2005). A copy of the minutes are included in EIS Appendix Volume III file Blasting Protocol 9D. A copy of the text has also been attached to this undertaking.

DFO advised Bilcon that, if the Revey recommendations were incorporated in its blasting protocol "there will be little in the way of residual impacts accruing from this aspect of the protocol" (DFO Minutes of Meeting, 7 February, 2005).

Through written communication, the author Gordon R. Revey stated that "The percentage ammonia nitrate residue would not be measurable if best practices are used" (e-mail Gordon R. Revey to John Wall, 19 June 2007). This confirms the personal experience of Bilcon's professional blasting expert. John Melick has experience with managing the detonation of more than 400 million pounds of ammonium nitrate based explosives.

It is in Bilcon's interest to achieve maximum blast efficiency from both an environmental and economic perspective. Bilcon's goal is to have 0% Ammonia residue from blasting. To achieve this objective, Bilcon's blasting protocol incorporates the following best practices:

- Multiple priming with a TNT cast booster of a dia. $\geq 1/3$ hole dia.
- Confirmation of detonation velocity by means of a VODR (velocity of detonation recorder) which will indicate extinction.
- Borehole diameters > 3 " diameter (ANFO has a "critical diameter" of approximately 2". In small dia. boreholes (< 3 " dia.), ANFO is susceptible to low order or incomplete detonation. A 4.5" dia. borehole has 5 times the borehole area of a 2" hole, and a 6.5" borehole has more than 10 times the borehole area of a 2" hole.)
- Acknowledgement of existing borehole water conditions as borehole loading is undertaken (most important practice to adhere to).

Bilcon will development and implementation a training program for the blast crew to promote blasting competency and environmental awareness. In addition, appropriate materials handling and spill response procedures specific to ANFO will also be developed and implemented. These training programs will be documented.

As a precautionary and confirmatory measure Bilcon intends to undertake periodic monitoring of NO₃/NH₄ concentrations of the process water (settling pond) and the discharge from the detention ponds. Monitoring frequency and a regulatory discharge criterion will be established in consultation with DFO and NSDEL. If required, risk-based criteria will be established.

Source:

Revey, G. F. 1996. Practical methods to control explosives losses and reduce ammonia and nitrate levels in mine water. *Mining Engineering*, 48(7): 61-64.