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Management of acid producing materials for the Route 220 Project in Virginia

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Widening and relocation of U.S. Route 220 in western Virginia between 2018 and 2022 presented a significant challenge for management of potentially acid producing materials (APM). Over 700,000 m³ of Devonian black shales were cut and filled, all directly adjacent to and upgradient of a perennial second order stream. Conventional acid-base-accounting (ABA) indicated that >75% could be net acid-forming (NNP < - 5.0 T/1000) and the original VDOT RFP criteria required that virtually all materials would need to be limed and compacted in fills. However, the criteria were complicated by (a) siderite and (b) low native soil/saprolite pH values (< 5.0) that in themselves amplified lime requirement. In cooperation with the successful design/build firm (Jacobs) and contractor (Falconer), we sampled and tested over 300 more ABA samples (corrected for siderite) and developed a revised APM categorization scheme that indicated that approximately ~55 m³ would be strongly acid forming and require liming+isolation, ~90,000 m³ would require liming and compaction in place in fills, while the balance could be managed without liming. The subsequent ABA data were used to pre-designate various cut zones across the project corridor that would need specific identification of the APM as encountered. Critical to this determination was the development of a field screening system based on color, hardness, initial reaction to H₂O₂ and HCl, and the pH_{Fox} test to sort materials. All APM exposed in cuts was immediately surface-treated with 10 T/1000 of CCE limestone and then additional lime was added to cover soils as needed. Baseline water quality was assessed at 12 locations and then at 18 active locations for five years. While Fe, Mn and SC levels increased to a limited extent at several fill underdrains, pH and SC in the receiving stream was unaffected.

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