4.0 CONCLUSIONS

This page intentionally left blank.

4.0 CONCLUSIONS

Design and evaluation of stable, reclaimed channels at active and abandoned coal mines in Wyoming and throughout the western U.S. will continue to be a challenging endeavor. While field-based methods of evaluating channel stability are most desirable, the infrequency of channel-modifying events, the remoteness of many reclaimed channel projects, and the cost of field monitoring equipment renders a real-time assessment infeasible.

Channel reclamation design and regulatory evaluation of designs can be improved, in spite of a lack of field data, with knowledge of the premined physical characteristics of the landscape to be mined or slated for reclamation. We have shown that accurate information on drainage basin area allows prediction of channel design parameters of cross sectional flow area, channel topwidth, depth, and slope. Prediction of channel properties is strengthened by including bed sediment grain-size.

Channel slope and flow velocity were previously uncorrelated with independent basin parameters (WWC, 1993). It was not until the data sets were expanded, incorporating basins varying by several log factors in size, that relationships for these parameters became evident. Further work along these lines should include a continuous, wide span of drainage basin sizes.

Channel sediment is an important parameter in the formation of channels. If small geographical areas are used, differences in channel sediments are probably insufficient to detract from the strength of the resulting correlations. However, we suspect that information on **both** bed and bank sediments (bank sediment composition influences meander migration, bank undercutting and sloughing), will add additional strength to the predictive equations and allow the determination of more widely applicable design equations. Further work examining the role of channel sediment in ephemeral channel formation would be a fruitful endeavor.

The relationships derived for the computed hydraulic parameters of flow area, velocity, depth and topwidth assumes the existence of a certain level of consistency in the engineering methods used in reclamation design. In this regard, caution must be exercised. Possible variation in the determination of runoff curve numbers and Manning's 'n' values could be significant. Flood derived by regional analysis should show very little variation as there are

fewer parameters requiring estimation. However, the selection of Manning's 'n' values remains an important parameter.

It is important to ensure that, prior to applying the regression equations and stability evaluations presented herein, the channel to be reclaimed is within the range of data presented. Application of predictive equations to areas outside the geographical areas studied introduces uncertainty.

The one-tailed statistical test accepts shallower channel slopes or larger flow areas than natural channel systems, desirable conditions that minimize flow velocity within a channel and favor more conservative designs. The risk-based approach of selecting acceptable error adds an additional level of flexibility for regulatory design review and channel stability evaluations.

Stability tests, if incorporated into regulatory decisions, can quantify differences between reclaimed channel characteristics and natural, premined areas. A standardized, quantitative approach will help maintain consistency in the design and review process at all levels.

The information presented herein is the largest data set of Wyoming ephemeral channels and allows users to select site specific equations. In the end, sound judgement and appropriate use of existing data will ensure a successful channel design at reclaimed lands in the state of Wyoming.