Urban Flood Demo Program & Southwest Demo Program

US Army Corps of Engineers®

Las Vegas Wash, Nevada Grade Control Investigation

Products

The investigation resulted in a document that reports on the survey of cross sections and longitudinal profiles, quantification of the existing riprap gradations in six of the loose-rock grade control structures constructed in Las Vegas Wash (Las Vegas, Nevada), and comparison of the results of six published sizing criteria with the riprap gradations used. The surveyed engineered structures in Las Vegas Wash are some of the largest applications of loose-rock grade control structures, and are far beyond the size of stone and discharges used to develop the published criteria based on flume testing. No failures of the engineered structures on Las Vegas Wash have occurred; however, the comparison embodied in the investigation will aid in the design of future similar structures.

Grade control structure, Las Vegas Wash, NV

Benefits

The new document will provide direction and assistance in the design and study of steep, riprap grade control structures, and will provide assistance in the design of new Las Vegas Wash structures.

Issue

Incision caused by modification of hydrology or morphology of a channel is among the top 10 sources for non-point source pollution impacts to rivers. Activities such as land use change, straightening, widening, deepening, and clearing channels of debris generally fall into this category. These activities can severely impact major river projects such as navigation and flood control, as well as alter or reduce the diversity of in-stream and riparian habitats. Grade control structures are primary features to combat channel incision. Guidance for large riprap grade control structures is limited.

Description

The objective of this investigation was to survey cross sections and longitudinal profiles, quantify the existing riprap gradations in six of the loose-rock grade control structures constructed in Las Vegas Wash, NV, and compare the results of six published sizing criteria with the riprap gradations used. Six riprap sizing methods were reviewed. Engineer Manual 1110-2-1601, using the recommended flow concentration factor of 1.25 provides the most conservative recommendation. Based on the initial and comparison of relationships, and data available, Robinson et al. (1998), EM 1110-2-1601 (USACE 1994), Maynord (1994), and Abt and Johnson (1991) are selected for additional investigation. The data indicate that all three of the relationships (Maynord 1994, Abt and Johnson 1991,

and Robinson et al. 1998) provide a conservative estimate of the stone size for either data set or the combined data set. Variation of the predicted D_{50} stone size is within 10 percent in comparison of the three criteria. Standard deviation comparisons indicate that the minimum occurs with the original authors for the two experimental data sets. Maynord (1994) provides the most conservative estimate of D_{50} rock size for the combined data set. The slopes used in testing are in the range of the wash slope; however, unit discharges are much lower and many of the data points are at least an order of magnitude below the wash discharge expectations. In addition, some of the material utilized in the construction of existing structures is made of concrete, and natural stone was utilized in testing. Concrete is lighter than natural stone and while particles may be of the same size as natural rock, the performance of the lighter material has not been tested. Additional investigation and physical modeling is recommended to strengthen the present guidance for large structures. No failures have been observed in the Las Vegas Wash structures.

Sponsor

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