



## Copper and Gold Mine Tailings Surveying in North America

*The CEE-USV™ is an ideal unmanned surveying solution for safe bathymetry studies of mine tailings impoundments, because of its industry-leading simplicity of operation for a professional grade USV. Mine surveyors do not have the time or resources for extended troubleshooting or mobilization headaches made more likely using low grade USVs. In the USA and Canada, CEE-USVs have been acquired for newly instituted tailings monitoring programs or to replace older USV technology already on site. The tailings environment is ideal for the CEE-PILOT™ robotic autopilot; with users able to set standardized line plans and maximize survey quality.*

Mine engineers monitor tailings impoundment water volumes for mine site water balance calculations, tailings deposition monitoring, and mandatory state reporting obligations. Using an unmanned boat has significant safety advantages and offers potential time and manpower savings versus a manned boat survey. Mine sites are often located in regions of temperature extremes and mine roads can be a severe vibration test for any equipment, so survey tools must be robust and easy to set up and operate. Cost cutting when starting a USV program can lead to frustration and abandonment. The CEE-USV™ was designed with these challenges in mind and CEE has been

helping mine sites across North America with new tailings survey programs.



*Operator-controlled CEE-USV™ surveying in NM, USA.*

The CEE-USV offers real time telemetry to a shore PC and over 1000m (3300ft) range. The operator can drive the boat while looking at the shore display, to ensure consistent coverage of the TSF. Often, users will start by driving the boat along the 1ft – 2ft depth contour along the full extent of the beach, marking the edge of the survey. Then, the main body of the TSF is surveyed using parallel lines of 100-300ft spacing.



*Large gold mine TSF survey – Western Canada.*

Particularly for large TSF impoundments, the robotic CEE-PILOT™ autopilot is useful to ensure efficient use of survey time by maintaining exact line spacing. Large areas can be surveyed without the operator in direct control, except to supervise the data.



*CEE-USV™ with autopilot and long-range antennae.*

Even with the autopilot available, a hybrid approach of manual and robotic control is usually required, as the exact position of the safe depth is not known at the perimeter of the impoundment.



*TSF approx. 2000ft across to beach, AZ USA.*

The integration of the autopilot manager entirely within Hydromagic software – the acquisition package used by almost all mine sites for bathymetry surveys – maintains simplicity in the CEE-USV program, even when using an advanced autopilot.



*Look no hands – CEE-USV™ autopilot control.*