

**Enhanced Access Penetration System**

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**Abstract**

A major limitation and recurring issue at many DOE facilities is the cost of installing equipment in the subsurface, particularly at depth and in certain geologies. It is not uncommon for drilling costs to represent a major portion of the project budget for large characterization efforts or installation of remediation systems. For these reasons, Applied Research Associates, Inc. (ARA) will develop a cone penetrometer-based Enhanced Access Penetration System (EAPS) that can be used to extend the depth and geology range over which cone penetrometer technology (CPT) can be utilized. Using ARA's highly successful Wireline CPT system as the base platform, the final EAPS will have two possible modes of operation - either direct penetration and ODEX drilling (rotary percussion) or direct penetration and laser drilling. Use of the Wireline CPT platform permits the application of the slower, more expensive depth enhancing drilling techniques only at the depths that are necessary.

ODEX drilling uses a percussion hammer combined with a rotary under-reaming feature to install 3.5-inch OD casing through difficult layers that are encountered after the initial Wireline CPT penetration. The casing eliminates sidewall friction, allowing for extremely deep penetration. For laser drilling, a wireline compatible end effector will be used to direct high power laser energy ahead of the probe to ablate materials ahead of the probe.

Additionally, two sampling tools will be developed to allow sampling of soil gas and groundwater at the increased depths. Each tool will use the wireline technology to allow multiple samples within one penetration. Samples will be analyzed at the ground surface and the results will be logged during the penetration allowing a depth profile of the results.

The EAPS will ultimately enable CPT to penetrate deeper as well as penetrate difficult geologic materials such as cemented caliche and cobbles. Furthermore, integration with the wireline CPT platform enables a variety of characterization sensors to be deployed with the drilling techniques, so that plumes of carbon tetrachloride and other contaminants can be delineated in the subsurface. Benefits of CPT such as lower cost, higher production rates, and less waste are in large measure preserved with the new system.