INLET PROTECTION INSTALLATION IMPROVEMENTS USING LARGE SCALE TESTING TECHNIQUES

International Erosion Control Association

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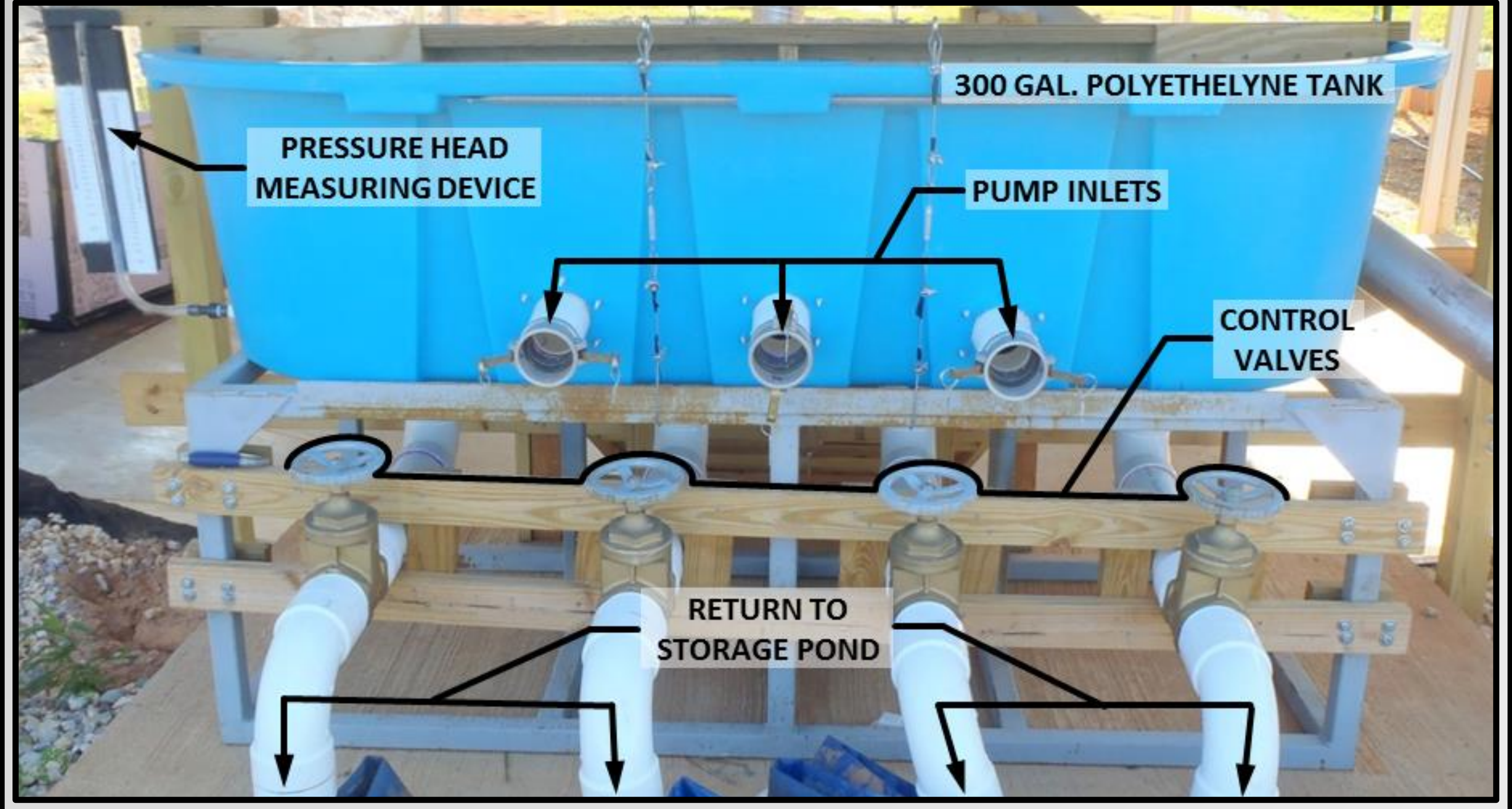
INLET PROTECTION

Stormdrain inlet protection is a key component of a Stormwater Pollution Prevention Plan, as unprotected inlets become a point source for contaminants and sediments to be released into the stormwater conveyance system. Inlet protection can act as a "last chance" defense against discharging eroded sediments into receiving waterways from construction sites. It is generally more cost efficient to prevent pollution from entering a waterway and a strong, effective, inlet protection plan will minimize sediment deposition into aquatic ecosystems by controlling the direct input source. Inlet protection is intended to reduce sediment discharge and typically consists of a sediment filter installed around a storm drain drop inlet or curb inlet. This approach prevents sediments from entering drainage systems during construction and pre-stabilization phases.

WATER INTRODUCTION

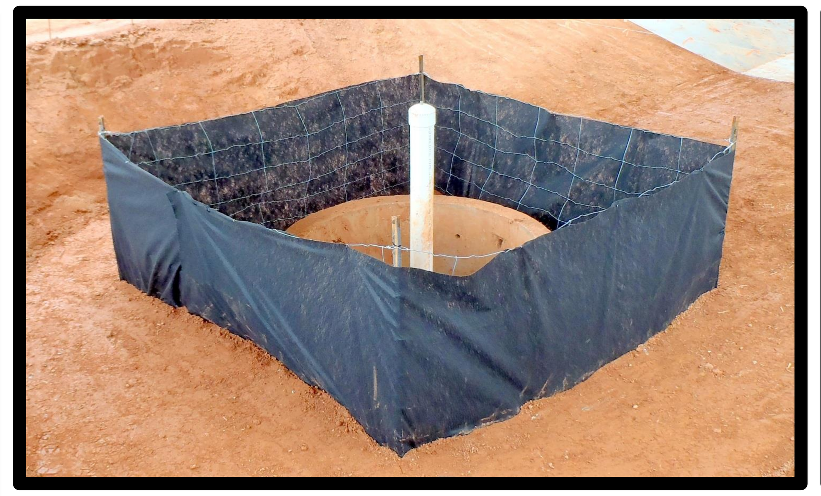
Water introduction rates for testing were designed to mimic the expected in-situ conditions for roadway median storm drain inlets. Runoff emanating from the Alabama average 2-yr, 24-hr storm (4.43 in.) was selected to meet the effluent discharge requirements of the EPA Construction General Permit. The TR-55 method was applied to a 1-acre drainage basin representative of typical ALDOT roadway median cross-sections with a state-wide average hydrologic soil curve number for developing urban areas (88.5). The 90-min. peak of the resulting runoff hydrograph was used to derive a testing flow rate of 1.25 ft^3/min.

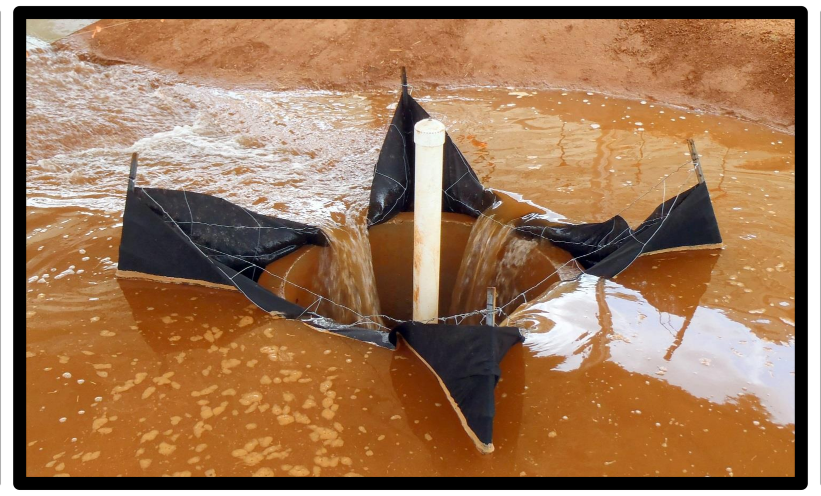


Water introduction is achieved using three semi-trash pumps. Flows are regulated using a weir plate emanating from the above tank system.

PROJECT PROGRESS

Currently, researchers have completed installation improvement testing all identified practices (i.e., Aggregate, Fabric, Sandbag, and Wattle Barriers). Performance and Longevity analysis are underway.



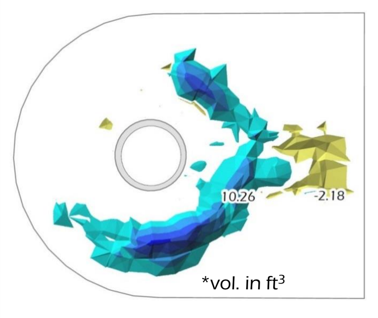


IMPROVED PRACTICE: SILT FENCE / FABRIC BARRIERS

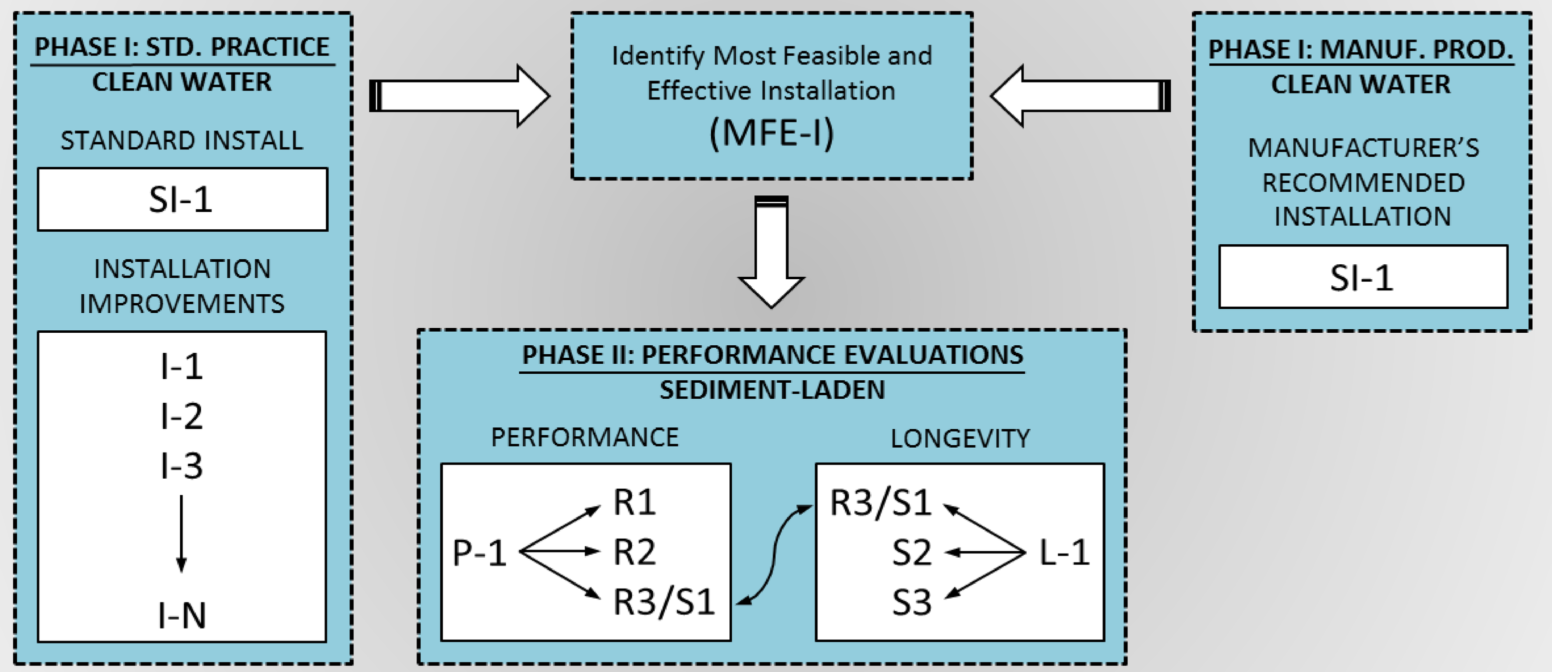
The tested standard practices was a 32-in. high wire backed 3.5 oz. silt fence with a 6x6-in. trench along the toe of the fence. T-posts were driven 24-in. into the ground at the four corners of the installation. Flow overtopped the installation 2.5-mins into testing as a result of the imposed hydrostatic pressure. Improvements were made through Phase I procedures to develop the MFE-I. The improved installation provided t-post staking at 30-in. spacing along with 2x4-in. lumber lateral and cross bracing to provide a stable frame for the silt fence barrier. To combat long dewatering times, a dewatering mechanism was developed to allow the barrier to efficiently drain without impounding large volumes of water for an extended period of time. Complete dewatering of the improved installation took 90 mins.

DATA COLLECTION & ANALYSIS

- Pre- and post-test test channel surveys are conducted using a robotic total station. Erosion and deposition volumes are quantified using GIS tools.
- Ponding depths and flow through rates are recorded to evaluate the impoundment capabilities and dewatering rate of practices.
- Grab samples are taken during sediment-laden tests both up and downstream of the inlet protection and analyzed for Total Suspended Solids (TSS) and Turbidity analyses.



TESTING REGIME



IMPROVED PRACTICE: AGGREGATE BARRIERS

Aggregate barrier testing began with the evaluation of the ALDOT standard installation. The standard install calls for barrier of #4 stone placed around a 2x6-in. lumber frame. The installation provided minimal impoundment due to the high flow-through rate and low barrier height. Improvement testing focused on providing a more impermeable barrier with greater height. The developed MFE-I a wrapped block and gravel barrier. The installation consists of standard masonry block stacked two rows high. The blocks are wrapped in 8 oz. filter fabric and backfilled with #4 aggregate. Dewatering was provided by turning a block on its side, and restricting the open space to a 2x4-in. void. This improvement provided full impoundment and a controlled dewatering rate.

RESEARCH OBJECTIVES

The Auburn University Erosion and Sediment Control Facility (AU-ESCTF) is currently assessing the performance of drop inlet protection standards developed by the Alabama Department of Transportation (ALDOT).

The intent of this study is to:

- Evaluate the performance of current inlet protection practices
- Provide recommendations & improvements on current practices
- Establish testing protocols and thresholds for future product approval
- Provide training for designers, installers, and inspectors

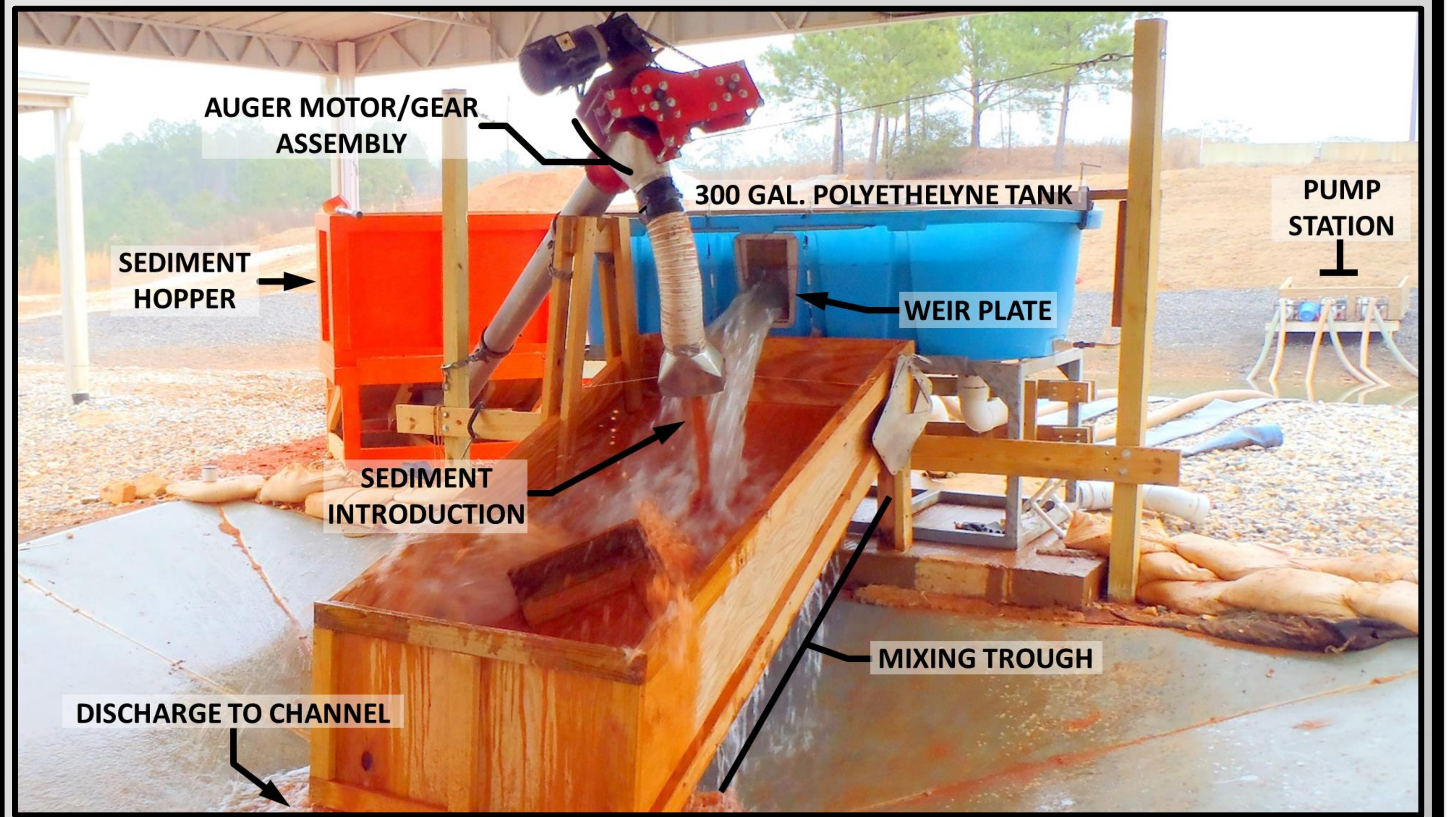
SEDIMENT INTRODUCTION

The Modified Universal Soil Loss Equation (MUSLE) was used to model the expected soil erosion volume from the design storm event and 1-acre roadway median drainage basin. MUSLE given by the equation below, estimates sediment yields based on individual storm events.

$$S = 95(Q * p_p)^{0.56} * K * LS * C * P$$

S = sediment yield (T)
Q = 30-min. runoff volume (ac-ft)
p_p = event peak discharge (ft^3/s)
K, LS, C, P = USLE parameters

The sediment yield prescribed for testing results to 1,402 lbs. or, 46.7 lb/min



Sediment introduction is conducted using a modified grain auger. Introduction rates are regulated by controlling the auger turn velocity using a sprocket and roller chain system.

ACKNOWLEDGEMENTS

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