



# Project Summary

Texas Department of Transportation

## 0-5748: Water Retention Techniques for Roadside Vegetation Establishment in Arid Regions of Texas

### *Background*

The goal of water harvesting is fundamentally simple: capture as much water as possible before it leaves the site and direct it into the ground for later use by vegetation. As straightforward as the concepts of water harvesting are, the effects of their specific application to roadside vegetation are not well-studied beyond that for some tree plantings.

Roadways contain significant amounts of impervious cover. This cover has the potential to generate large amounts of runoff, as the size of some drainage structures attests. In arid areas of West Texas this runoff could be used to establish and maintain vegetation conditions required by the Texas Commission on Environmental Quality (TCEQ).

Water harvesting may seem at odds with the general philosophy behind roadway drainage, as highways are typically designed for the rapid removal of runoff. However, current literature and practices put forward many instances where water harvesting techniques have increased vegetation establishment in arid areas while maintaining essential safety, maintenance, and aesthetic requirements.

### *What the Researchers Did*

The project used a case-study approach of specific Texas Department of Transportation (TxDOT) roadway sites located in the TxDOT Childress and Amarillo districts. These case studies investigated the potential application and impacts of adapting water harvesting techniques to roadside vegetation establishment and maintenance in a range of climate and soil conditions. The sites were selected based on their major classifications of soil/climate conditions. Sites differed in configuration, size, and watershed properties such as runoff volumes, time of concentration, etc.

The team conducted an adaptation/design analysis of existing water harvesting techniques for each site. These techniques were not limited to techniques found in literature but included new techniques and combinations of techniques identified, investigated, and extrapolated from fundamental technologies of water harvesting. The team explored revegetation techniques currently used in roadside applications, as well as techniques used in agriculture and other international practices.

### *Research Performed by:*

Texas Transportation Institute (TTI),  
The Texas A&M University System

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## What They Found

Water harvesting techniques offer different levels of effectiveness. In analyzing these techniques it was determined that most effective water harvesting techniques accomplish two main goals:

- directing runoff to areas of use, storage, or treatment through the use of berms, basins, contouring, or trenches, and
- increasing soil moisture capacity through the use of surface roughening, scarifying, mulching/composting, and terracing.

The recommended water harvesting techniques for the two sites included:

- application of emulsion which will protect the seed bed, retain soil moisture, and increase the soil temperature,
- soil ripping to decrease the compaction of the soil which will allow better vegetation establishment and seed germination,
- installation of berms to redirect and slow down the stormwater runoff,
- installation of level spreaders to reduce any erosive concentrated flow to a more manageable sheet flow, and
- installation of ringed berms on trees and shrubs to redirect and hold the limited rainfall.

## What This Means

Water harvesting offers potential benefits to the overall highway system in that it helps reduce the environmental impact of the system while improving roadway function. The challenge in arid portions of Texas is to maximize limited periodic and seasonal rainfall by developing cost-effective, site-specific, and integrated implementation strategies to harvest and use water. While there is no single solution when it comes to solving water/irrigation problems in these difficult locations, there are several ‘tried-and-true’ methods available to designers to encourage moisture availability to vegetation.

Since establishing vegetation on construction sites is required by the TCEQ Construction Storm Water General Permit (CGP) the results of this research have far-reaching applicability for TxDOT in maintaining regulatory environmental compliance.

*For More Information:*

0-5748-1 Water Retention Techniques for Vegetation Establishment in TxDOT West Texas Districts

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