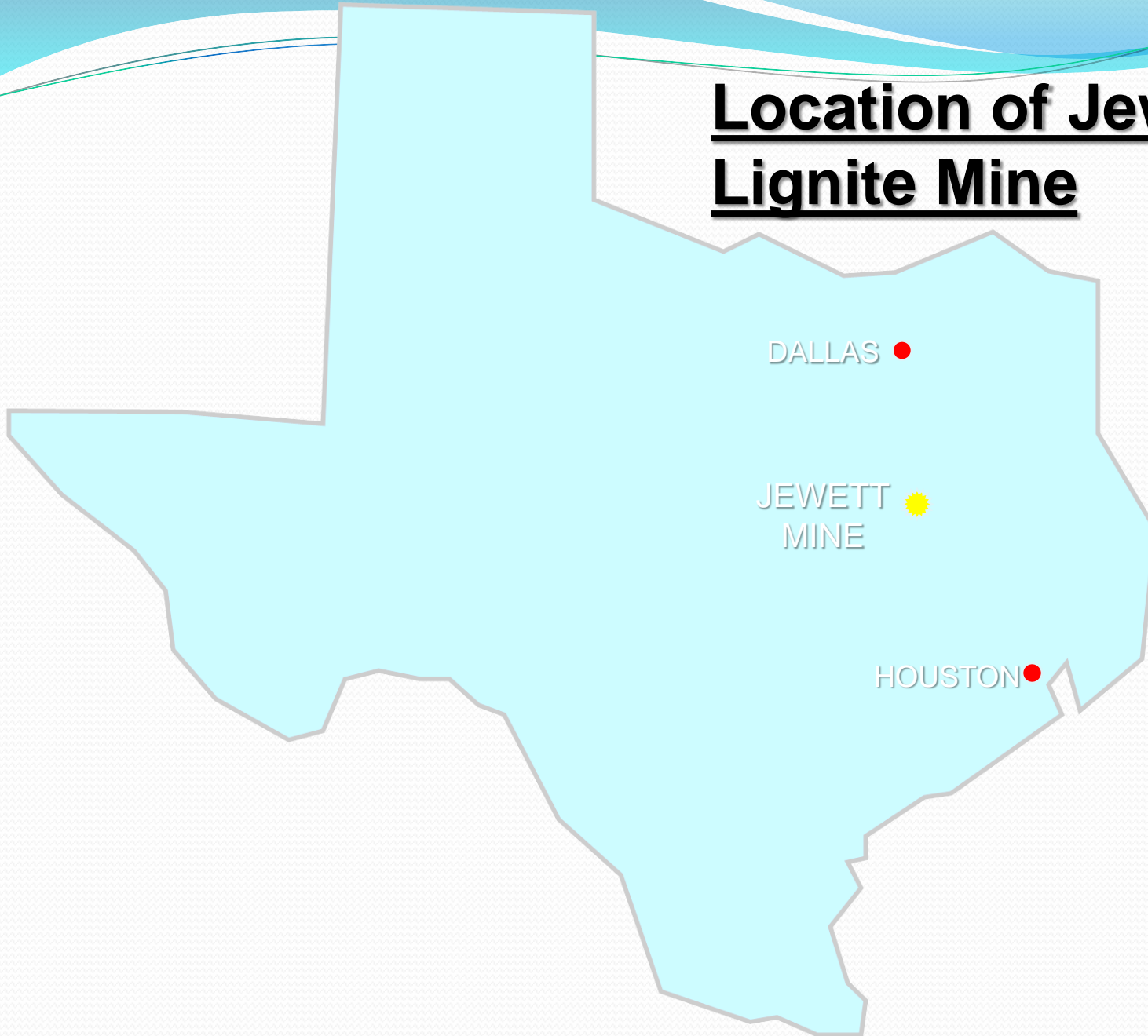


Texas Westmoreland Coal Co.

**SOLAR-POWERED
IRRIGATION PROJECT**

Jewett Lignite Mine

Location of Jewett Lignite Mine



DALLAS ●

JEWETT
MINE ★

HOUSTON ●

Background

- **Founded 1854 Westmoreland Coal Company is the oldest, independent coal company in the country.**
- **Employs over 1,116 people in seven states.**
- **Mine lignite in Texas, Montana and North Dakota, subbituminous coal in Montana and Wyoming.**
- **Jewett Mine began mining in 1985**
- **Mine from 5 to 6 million tons per year**
- **Supply Lignite to NRG Energy, Inc.'s Limestone Electric Generating Station**
- **Two RCT permit areas: 32F and 47A**

Jewett Mine Permit Areas

PERMIT 32F

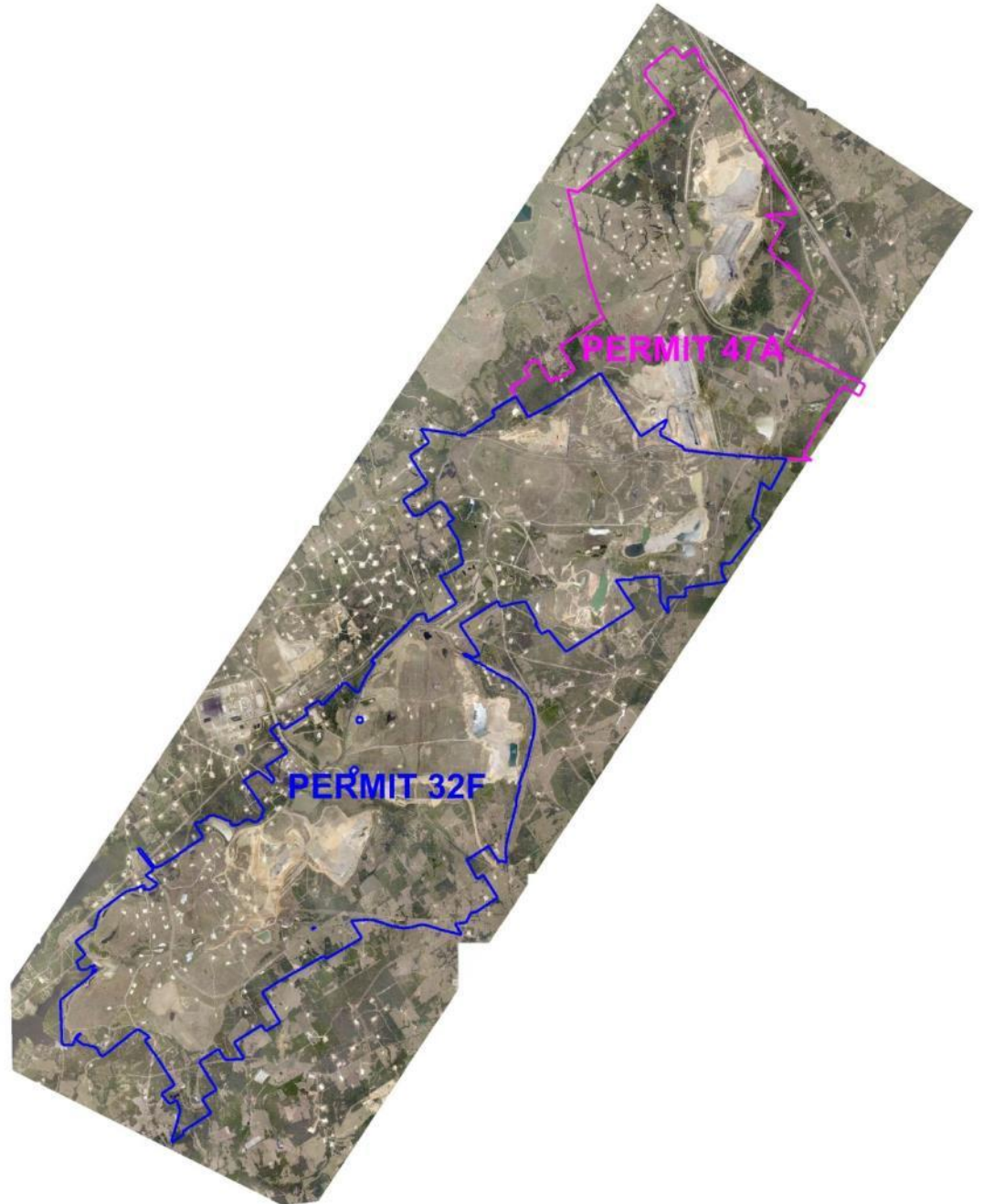
Began mining in 1985

21,503 acres permitted

PERMIT 47A

Began mining in 2005

9,341 acres permitted



The Need for Water

TWCC started an aggressive stream restoration program in 2009 with projects such as:

- Mine Creek
- Wilkerson Branch
- Buffalo Creek
- Western Tributary of Bow Branch



The Need for Water

The stream restoration initiative has resulted in the planting of woody vegetation :

- Most projects incorporate 12-15 different species of hardwood trees
- Sizes upon installation range from liner material to 65 gallon
- Over half of the trees planted receive irrigation for up to two years
- Most projects aren't located in close proximity to a water source



The Need for Water

The stream restoration initiative has resulted in the planting of herbaceous vegetation too :

- Most projects incorporate 8-12 different species of native and annual grasses
- Hydromulching is often utilized because of difficult site conditions
- Hydromulching requires approximately 5000 gallons of water per acre of stream channel planting
- We irrigate herbaceous vegetation for improved establishment



The Big Question...And Answer

How do we resolve getting a well built for watering trees and hydromulching native grasses without a power source nearby?

How about a Solar Powered Reclamation Well



Irrigation Well

Well & Well Pump Specifications

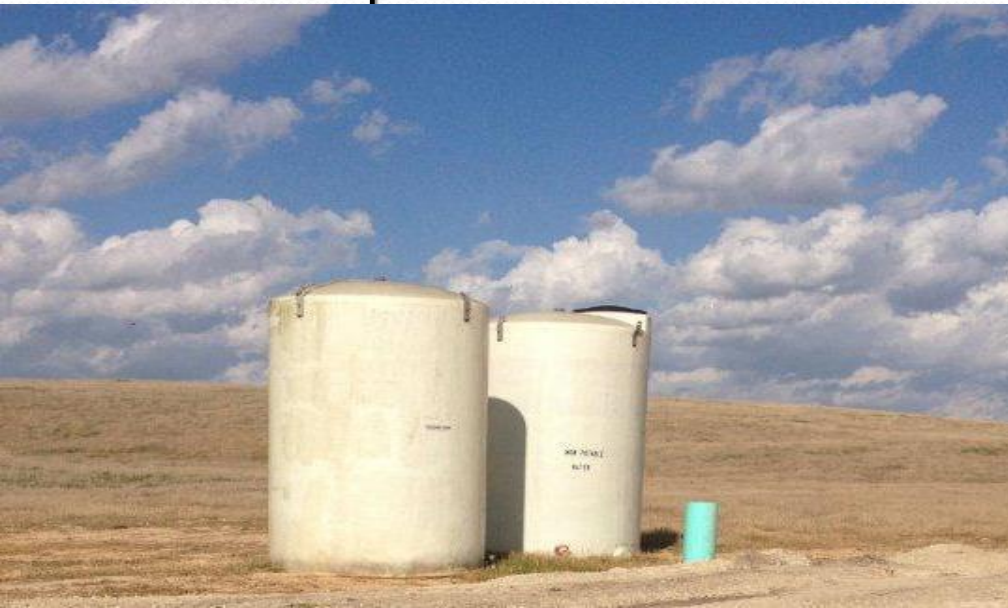
- Drilled to a depth of 255' in the Simsboro Unit
- Cased with 6" Sch 80 PVC
- Screened from 190' to 250'
- 3 HP Franklin Constant-flow Pump
- 2.2KW, 200 volt, 3 phase pump producing 45 gpm



Irrigation Well

Tanks & Pressure Pump Specifications

- Constant pressure pump fills two 5,000 gallon tanks equipped with a shut off float
- On demand pressure pump takes the water from the tanks and supplies water to the desired connection point
- The pressure pump is a 3 HP Franklin Pump
- 2.2KW, 200 volt, 3 phase pump producing 100 gpm at 55psi



Irrigation Well

Photovoltaic Module

LG Mono x Panel

Dimensions

- Solar Unit
 - 33' X 14'
 - Mounted on a metal skid
- Individual Solar Panels - 22
 - 65" x 40" x 1.4"
 - 60 cells per panel
 - 255 watt



Irrigation System

Irrigation Line

- The mainline from the solar pump is a 3" black poly line which runs to each remote control valve
- A 2" Sch.40 PVC line is connected to the bottom of the second 5,000 gallon tank to provide extra water to nurse trailers, hydromulchers, and other equipment requiring water



Irrigation System

Irrigation Line continued...

- A 2" Sch.40 PVC line is connected to the 3" poly line at each location there is a remote control valve
- A 2" Sch.40 PVC manifold is buried 5-6" below grade behind the remote control valve
- $\frac{3}{4}$ " Class 200 PVC lateral lines are stubbed from the manifold and run at grade to each tree



Irrigation System

Valves and bubblers

- 1 ½" Remote Control Valve is installed at the beginning of each zone of trees
- Each valve has a battery operated controller that automatically opens and closes the valves at specified times
- Adjustable bubblers are installed at each tree and release between 0-1 gpm



Irrigation Success

Since 2009:

- TWCC has planted approximately 13,600 containerized hardwoods that were irrigated
- Survivability rates have averaged approximately 80%
- All irrigation up to this point has been with tractors and nurse trailers

BUT.....

With more than 16,000 scheduled trees to be planted in the next two winters, water demand will exceed our nurse trailer capacities.



The Solution

Nurse Trailer vs. Solar Well

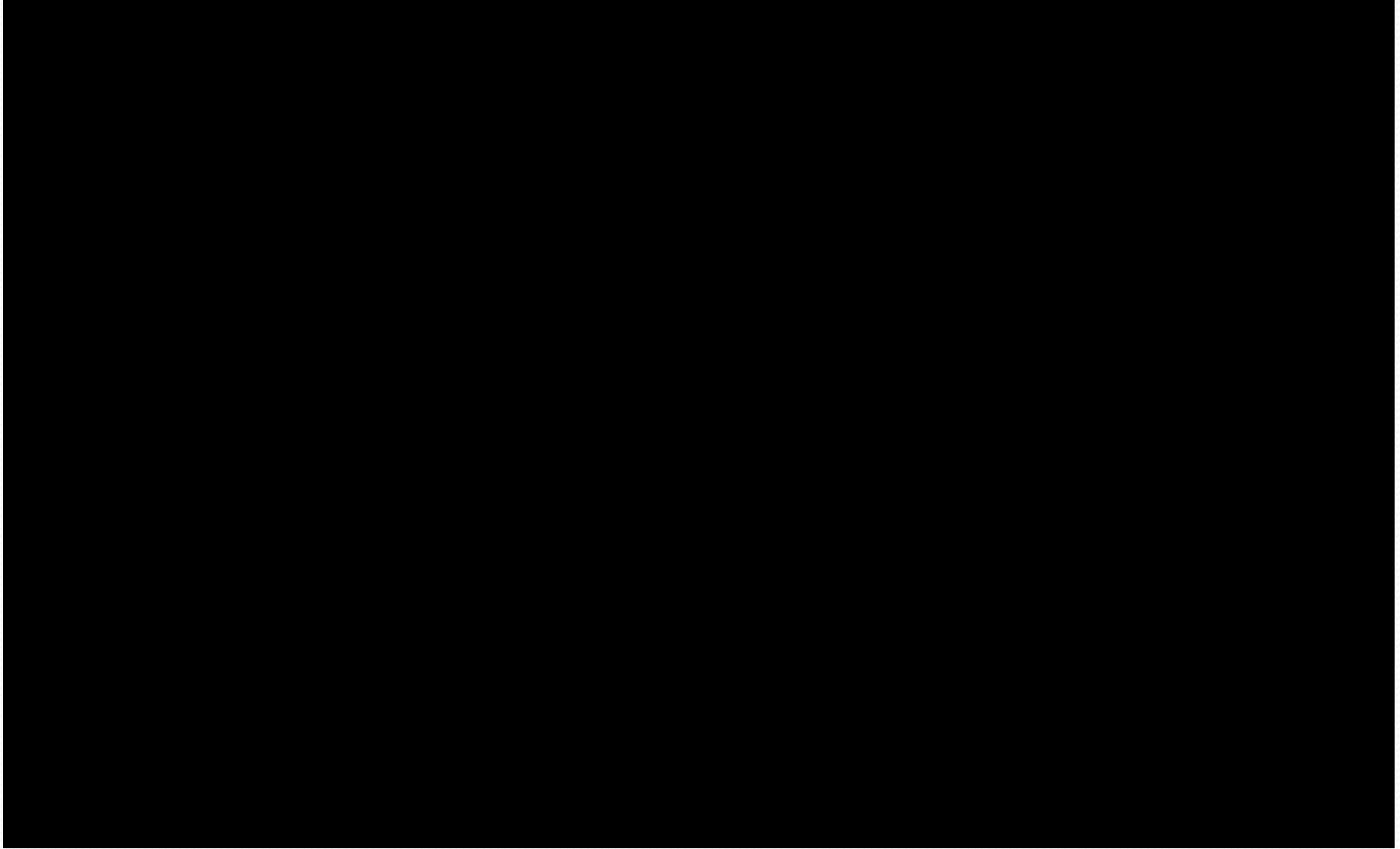
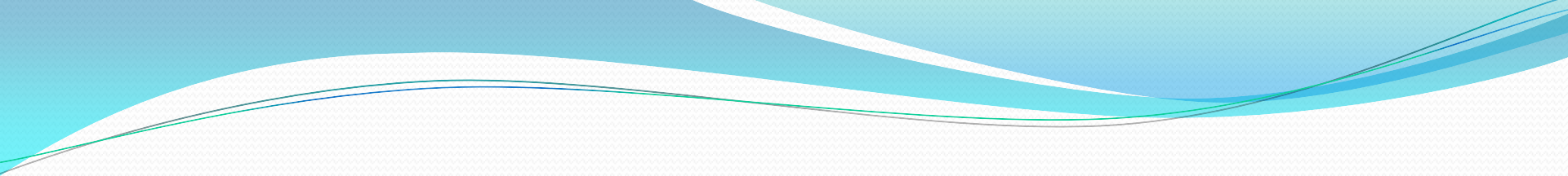
The next two years, we are irrigating approximately 12,000 trees. That equates to between 180,000 and 240,000 gallons of water a week for irrigation.

Nurse Trailer

- Each 1,000 gallon nurse tank can irrigate approximately 10,000 gallons a day.
- That would require 4 tractor + nurse tank rigs working five 10hr days to meet watering needs.

Solar Well

- Our solar well can produce 21,600 gallons a day.
- That would require 1 tractor + nurse tank rig working three 10hr days with the solar well working 7 days a week automatically to meet watering needs.



Questions



TEXAS WESTMORELAND COAL CO. - *Jewett Mine*

A Subsidiary of WESTMORELAND COAL COMPANY



Franklin Electric

THE
TREETOP
STUDIO

