

Evaluation of Mitigation Measures
For
Existing Ground Fissuring
Within
TIERRA RICA Subdivision

Location

The East line of the Southeast Quarter of Section 30,
Township 5, South, Range 7 East, of the Gila and
Salt River Baseline and Meridian
Pinal County, Arizona

Date

10 May 1999

Prepared for

Coen Engineering
2115 East Evergreen
Mesa, Arizona 85213

Prepared By

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Introduction

Earth fissures are tension cracks that are common in some of Arizona's alluvial basins where ground subsidence has occurred. The subject area has experienced ground subsidence that is attributed to removal of groundwater from the underlying sediments and Earth fissures have developed at the margin of the basin. One of those earth fissures transects the Southeast corner of the proposed subdivision (Encl. # 1) and effects 5 of the lots and the cul-du-sac at the end of the access road.

Purpose

The purpose of this investigation is to evaluate the status of the earth fissure and the proposed mitigation measures. The project included a search of the existing literature describing and evaluating earth fissures and mitigation measures and a field investigation of the subject area.

Geographic Setting and Hydrogeology

The area of this study is at the margin of a large alluvial valley that has experienced a lowering of the groundwater elevation due to groundwater withdrawal by pumping for agricultural purposes (see Encl. # 2 for well locations). The earth fissures in the area are attributed to tension cracks at the basin margin to compensate for ground subsidence within the alluvial basin. This author agrees with the proposed concept for the origin of the subject earth fissure. There is no evidence for subsidence on the subject property or in the area of the earth fissure. These observations would be consistent with a tension crack origin for the earth fissure. Groundwater in the area is estimated to be at approximately 170 feet below the surface (see Encl. # 2 for depth to groundwater).

Previous Studies

Land subsidence and earth fissures have been intensely studied in Arizona. The subject earth fissure was mapped and reported in Arizona Geological Survey Open-file Report 95-6, June, 1995.

Methods

This investigation included a search and review of available literature on earth fissures as related to ground subsidence due to removal of groundwater and a field investigation of the subject property and earth fissure. Particular attention was directed to the life cycle of earth fissures and possible mitigation measures pertaining to the subject earth fissure.

Results

Evaluations and proposals contained in this investigation pertain only to the subject property and the related earth fissure and cannot be extrapolated to any other earth fissure or property. Conditions that affect the mitigation of earth fissure are unique to the section of the fissure in question and are dependent on the materials involved and especially on the cross fissure drainage systems that must be addressed.

There was a decline in the water table in the basin of about 100 feet from 1977 to 1989 that resulted in ground subsidence in the basin. Local sources indicate no knowledge of the subject earth fissure prior to 1968 but it was reported to exist in 1974 so it can be dated as at least 25 years old. Steven Slaff estimated in Arizona Geological Survey Down-to-Earth Series 3, 1993 that the average life span of an Earth fissure is approximately 50 years if there is no rejuvenation of movement in the fissure.

Field investigation revealed no indications of rejuvenation within the earth fissure and it appears to be in a mature and stable configuration. The surface expression varies from three to ten feet wide and between two and eight feet deep. The floor of the fissure is filled with sediment and appears as a wash. However there are some cross fissure drainage's that have been captured and the fissure has been eroded by the discharge from these drainage's.

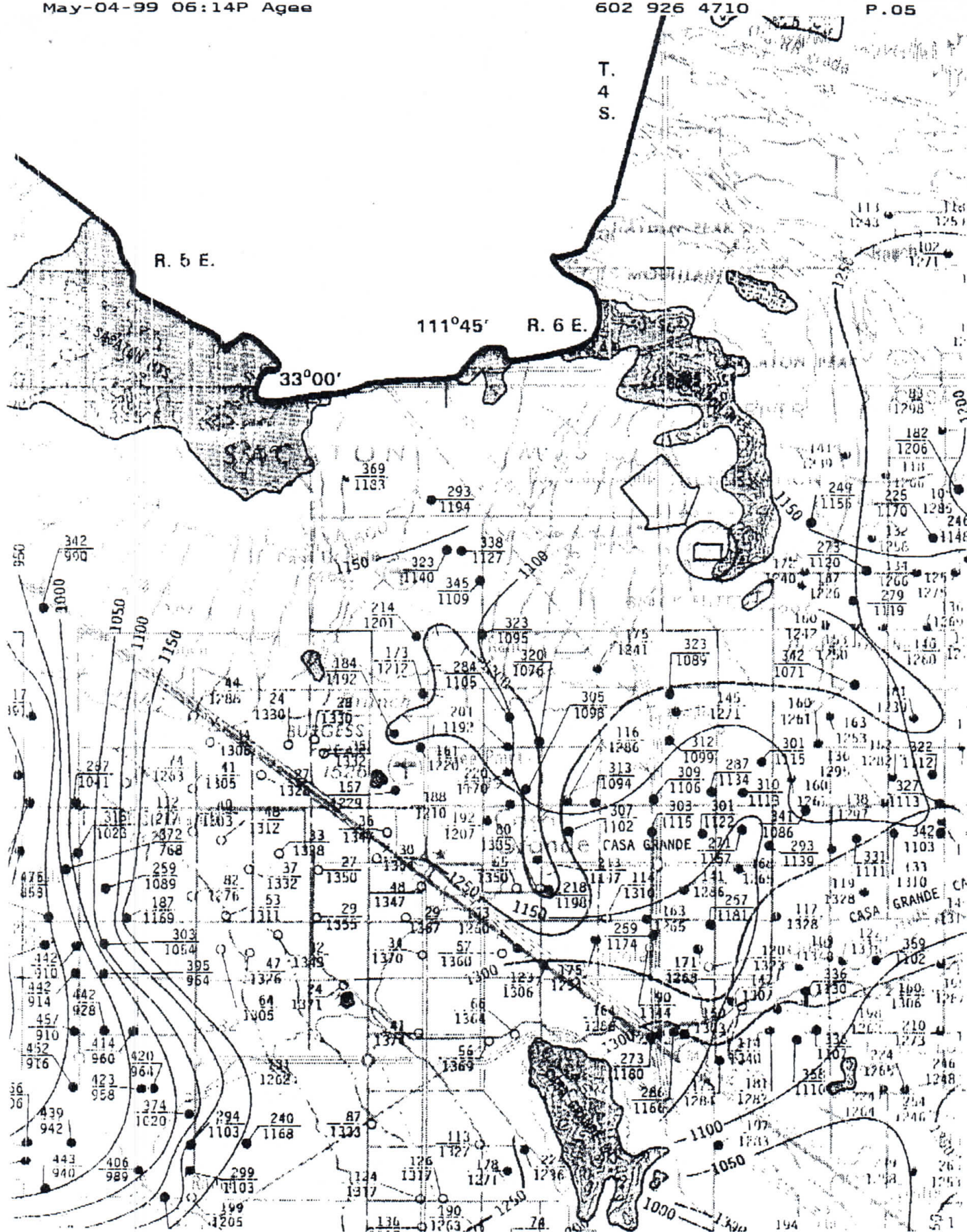
The maximum decrease in the water table in the immediate area of the fissure occurred in 1968 (see Encl. # 3 for hydrograph) and the fissure is thought to have occurred in 1974. The water table has risen between 25 and 50 feet since 1968 (see Encl. # 4). Therefor, the overdraft of groundwater has stopped and the water table has experienced some recharge. Both of these conditions would contribute to the stabilization of the area and tend to prevent any new earth fissures or any rejuvenation of the existing fissure.

It is my Professional Opinion that the subject Earth Fissure is in a mature and stable configuration at the present time and is amenable to standard Engineering solutions to mitigate the surface effects of the feature with three exceptions.

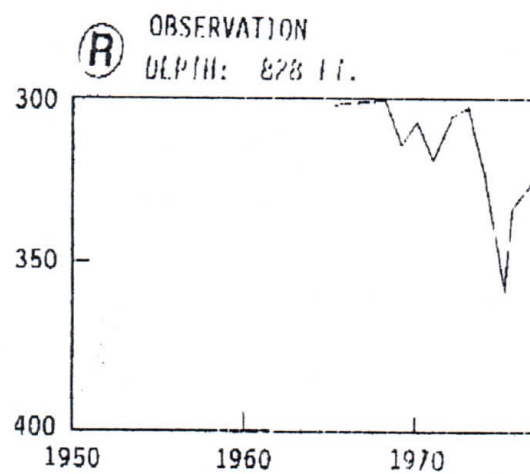
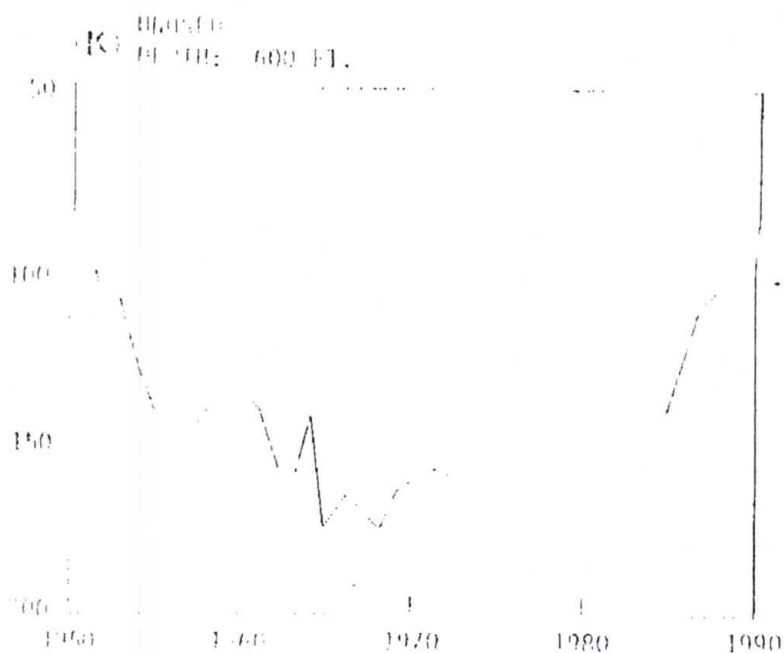
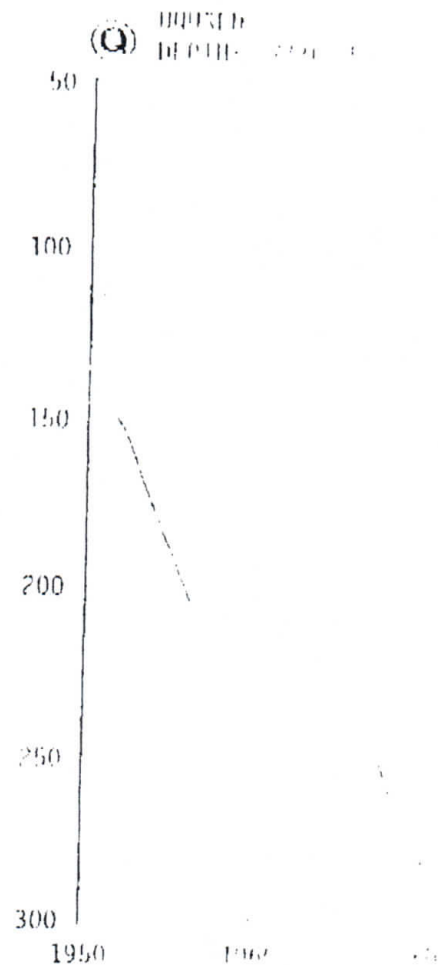
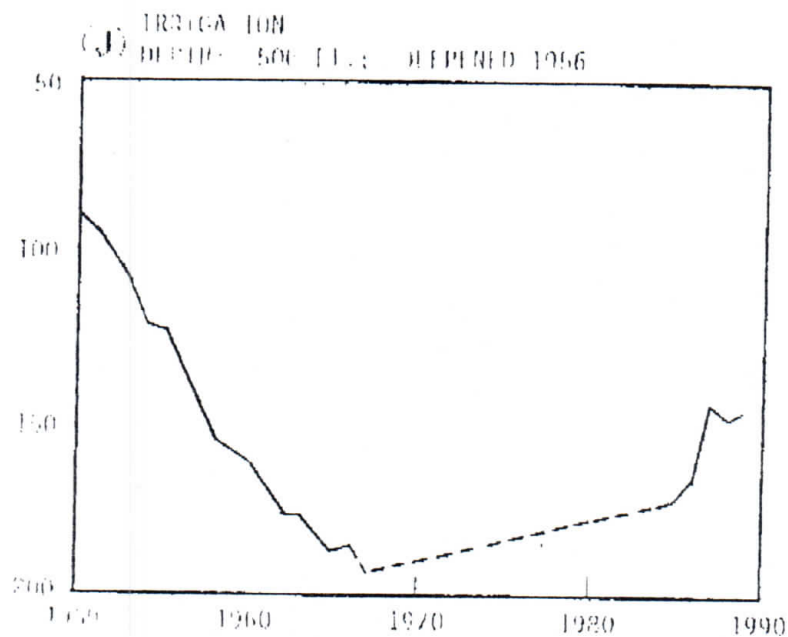
1. There should be a 50 foot setback from the fissure for any construction.
2. There should be a provision to return the cross fissure drainage's to their pre-fissure course and prevent them from discharging into the fissure.
3. No flood type irrigation should be allowed.

Enclosures:

- Encl. # 1 - Earth Fissure Map from Arizona Geological Survey Open File Report 95-6, June, 1995
- Encl. # 2 - Well Location Map from Arizona Department of Water Resources Hydrologic Map Series Report Number 23
- Encl. # 3 - Hydrograph from Arizona Department of Water Resources Hydrologic Map Series Report Number 23
- Encl. # 4 - Changes in Water Level Map from Arizona Department of Water Resources Hydrologic Map Series Number 23
- Encl. # 5 - Current photographs of the fissure

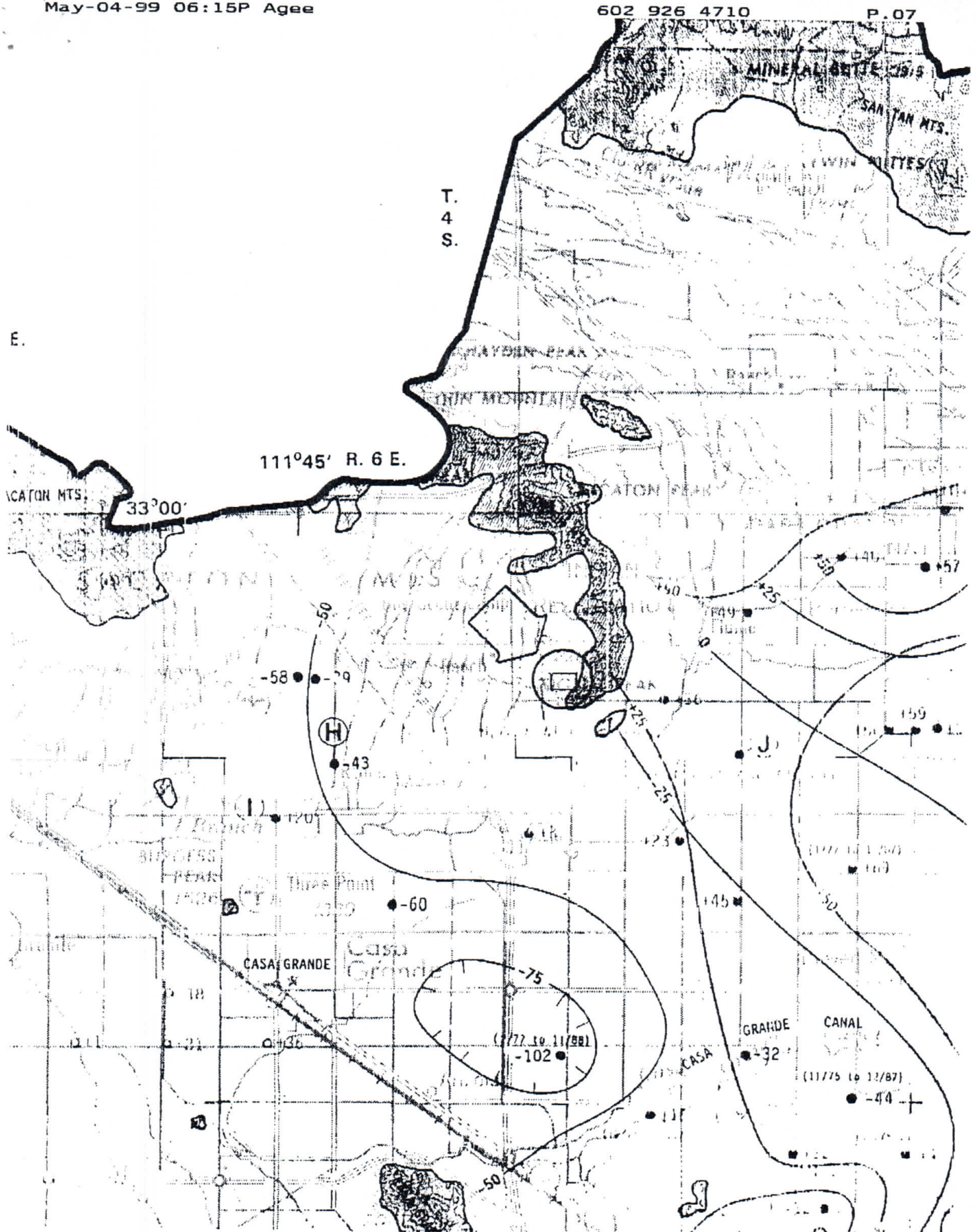


HYDROGRAPHS OF THE WATER LEVEL IN SELECTED WELLS SHOWN ON THE MAP
(Dashed line indicates inferred water level)



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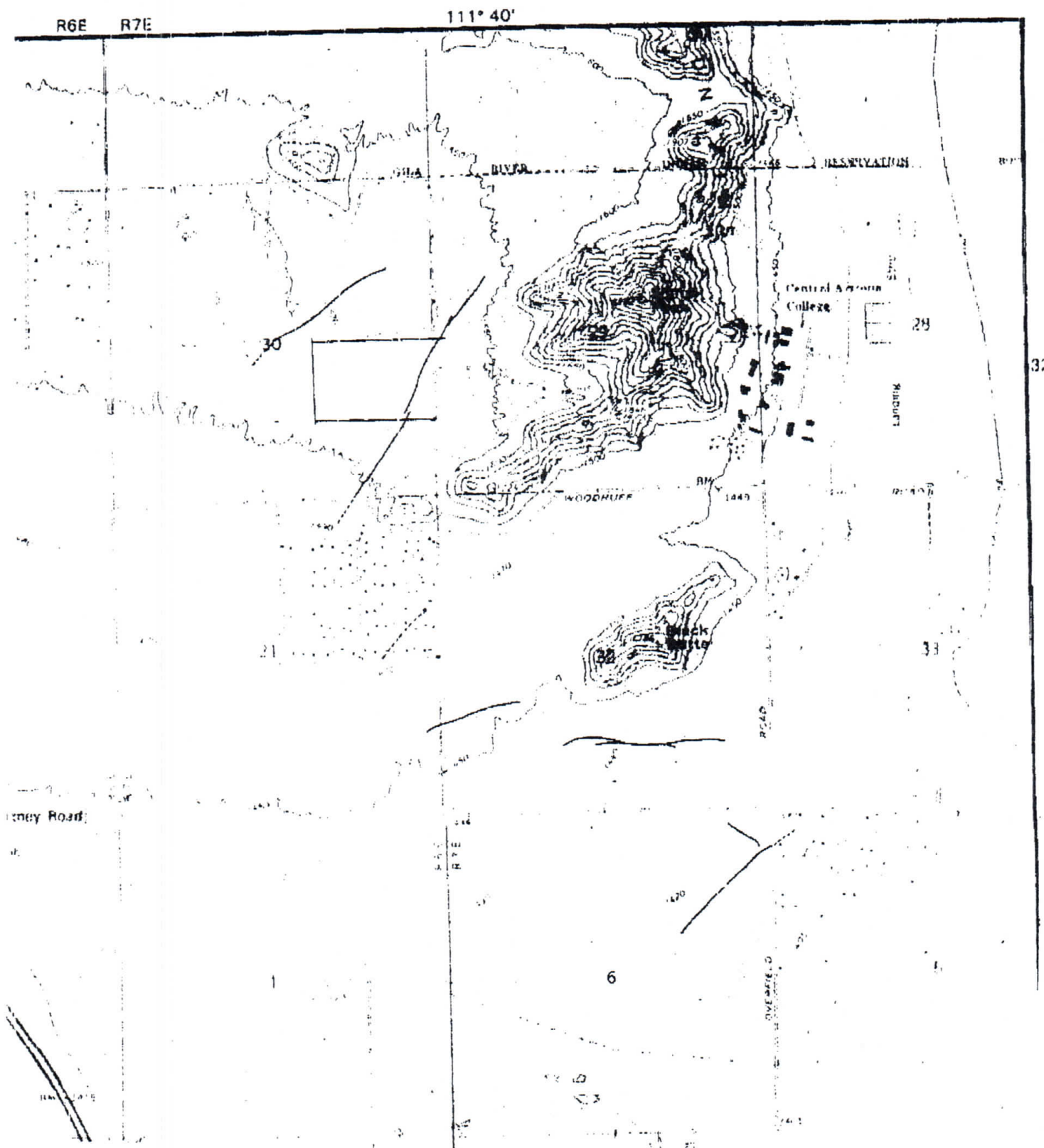
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ENCLOSURE

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FIGURE 4. Earth fissures southeast of Sacaton Mountains





SOUTHWEST GAS CORPORATION

October 2, 2000

Harlyn Griffiths, Trustee
Tierra Rica Development, Inc
P O Box 11313
Casa Grande, AZ 85230-1313

Dear Mr. Griffiths,

RE: Gas Availability

Thank you for inquiring about natural gas availability for Tierra Rica Estates, T-5S, R-7E, and Sec 29 and 30. Natural gas is available per Rule Number 6 of our Tariffs as filed with the Arizona Corporation Commission.

If you have any questions contact me at 520 421-1673.

Sincerely,

Doug Wiltcher
Account Representative
Valley District