**Investigation Of Remotely-Sensed Geobotanical And
Structural Methods For Hydrocarbon Exploration In
West-central West Virginia**

**Quarterly Report
August - October 1995**

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Work Performed Under Contract No.: DE-FG21-95MC32159

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
West Virginia University
Department of Geology and Geography
Morgantown, WV 26506

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P.O. Box 880
Morgantown, West Virginia 26507-0880

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Quarterly Report to the Department of Energy
Reporting Period: August 1 to October 31

**Integration of remotely-sensed geobotanical and structural methods for
hydrocarbon exploration in West-central West Virginia.**

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1. Satellite Image Acquisition and Rectification

The two USGS EROS Data Center (EDC) images have been purchased (using NRCCE funds, and therefore at no cost to the project). The new scenes were not cloud-free, as was claimed in the USGS catalogues, but are still very useful. The April 10 image was collected just prior to leaf-out in the spring, and the September 20 image just prior to fall leaf color change. This was a bit disappointing, as it was hoped that the fall image might show some early sign of senescence that would be useful for vegetation discrimination. However, unexpectedly, there appears to be a spectral anomaly that is found both over the Volcano field and the Equitrans Lewis County Storage Reservoir. The anomaly (see Figure 1), which is not present in the visible bands, is a significant increase in TM band 4 (0.76 - 0.90 μm , near infrared), and to a lesser extent in TM band 5 (1.55 - 1.75 μm , mid infrared) over the reservoirs. Interestingly enough, the anomaly is not found in the summer imagery discussed in the last quarterly report. It is also not found in the spring imagery, because that imagery was collected prior to leaf-out. Although it is too early to confirm that this is a geobotanical anomaly, this is a very encouraging sign. Furthermore, it points to the value of a multi-temporal collection of imagery.

The Landsat Thematic Mapper overflew West Virginia on October 18 1995, which coincided with a period very close to peak fall colors. Unfortunately there is apparently some cloud in this image. EOSAT had some problem in recovering this scene, but it has been corrected, and the scene is currently being purchased. In addition, arrangements through METC have resulted in the purchase of another scene, collected on April 19, 1987. Consequently the following multi-temporal data has been collected and is in the process of being co-registered to a common format:

Scene	Image Acquisition	Image Rectification
April 10 1984	purchased	started
April 19 1987	should arrive soon	
September 20 1985	purchased	started
October 18 1995	should arrive soon	

2. Spectral Reflectance Measurements.

Coincident with October 18 overpass, spectral reflectance data were collected in the field. Spectra were measure of leaves of selected trees (see Figure 2 for sample spectra.) In addition, spectra were collected of spectrally flat objects, for use in normalization of the images. The spectrally flat objects included the black asphalt parking lot of the mall in Clarksburg, and a gravel parking lot in West Union.

3. Equitrans Storage Reservoir Data Synthesis

One of the advantages in using a storage reservoir as a test site is that the reservoir is comparatively well known. Data is currently being collected on reservoir pressures. Figure 3 is a map of pressure in the Rhodes Reservoir (in Pounds per square inch) in the winter of 1994. As can be seen from the figure, pressures vary widely over the reservoir.

4. Equipment Purchase

A Tektronix Phaser 480 color tabloid size printer has been purchased for \$10,500. The original budget for a color printer was based on a Tektronix Phaser 300I. The 480 is a substantially more useful printer, being dye-sublimation technology that produces near-photo-realistic output. The printer has arrived, and we are currently waiting for Tektronix to install it. This printer will be extremely useful for producing images for analysis and field work.

5. Work for the next quarter

Now that the image purchase has been finalized, this next quarter will focus on completion of the multi-temporal data base with associated image rectification. In addition, the lineament interpretations will be carried out. A digital lineament-generating program, written by Eb Warner of the WVU Department of Geology and Geography, has been obtained, and will be compared to manual interpretations. I will also see if we can obtain more information from Equitrans regarding the reservoir properties of the Lewis County Fields.

Tim Warner
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November 30, 1995

Figure 1. Comparison of spectral reflectance of anomalous and background areas in September 1985 TM imagery.

Figure 2. Pressure in the Rhodes Reservoir

Figure 3. Sample spectra collected on October 18, 1995.