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529 Joslin Ave.
Gallatin, Tenn. 37066
Nov. 9, 2002

Rules and Directives
Branch
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Mr. Micheal Lesar
Chief Rules and Directive Branch
Division of Administration
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

11/9/02
6778661932
342

RE: LES "white papers"

The NRC has been unfair to the people affected by the proposed uranium enrichment plant which Louisiana Energy Services wishes to build.

The dealings between the NRC and LES about this plant prior to the naming of a location can be compared to court hearings. It would be unfair for a judge to meet with a plaintiff, discuss the case and partly rule before the case was filed and the defendant notified.

From October 2 to November 13 was inadequate time given for the public to comment on the "white papers". We didn't know what the white papers were, and by the time we learned, there was not time to locate a copy to read. They were not easily accessible to the public. I do not have internet connections, and they were not accessible on the local library computers.

We should have been given three months to comment. A copy of the white papers should have been placed in area libraries and the public should have been told where they could be found.

The NRC should then have conducted meetings and given the public the opportunity to orally comment with informed, researched defensive comments.

I attended two meetings at which the NRC was present, but were not conducted by the NRC. At the first meeting, planned by a Mrs. White from the chamber of commerce (made up business people from town), one person for the plant and one person against the plant were given twenty minutes each to speak. This was unequal representation because most people in attendance were against the plant. Some written questions were answered. At the meeting with the Troudale County Commission, the public was allowed to ask a few questions, but not allowed to comment.

Template = ADM - 013

E-RTDS = ADM - 03
Add = T. Johnson (TJS)

-2-

I was not allowed to comment before the NRC, but at the break at the first meeting, I did give a copy of the research on a recent earthquake in the area to the NRC staff.

I have not seen a copy of the LES white papers. The NRC News released Oct. 25, 2002 listed six issues contained in the white papers. I will comment without having read the white papers.

Yours truly,



Jean Heidel
ph. 615-451-9761

COMMENTS ABOUT LES WHITE PAPER ISSUES
by: Jean Heidel

1. Analysis of Need for the Facility:

- A. Only the NRC would be in a position to know if the plant is needed.
- B. Is not the Kentucky uranium enrichment plant operating at only 50% of its capacity? If there was a need, would not the existing plant be producing at its full capacity?
- C. It appears to me that nuclear power is on its way to becoming a thing of the past. There has been no way found to dispose of the accumulated wastes. In all the years, no container has been found that will last as long as radioactive wastes, and none is likely to be found. These facts should force the development of safer sources of energy.
- D. What is LES going to do with the Hartsville plant if its uranium is not needed? Its a "for profit" company. Will the company dissolve, file bankruptcy and move off leaving the area with a dangerous plant?

2. Environmental Justice - Addressing Disproportionately High and Adverse Human Health or Environmental Effects of the Proposed Facility on Minority Populations and Low-Income Populations in the Area:

- A. I do not know the percentage, but I do know there is a greater percentage of blacks in Hartsville than in most small towns its size in Tennessee. I believe this can be verified. I have lived in several small middle and east Tenn. towns including Hartsville. The black people who live there can trace their history back to slavery when the rich river bottom land was owned by wealthy people.
- B. Today, there are a great number of low-income people living in Hartsville. The clothing factories moved out after the U.S. enacted NAFTA. A good many families were affected.
- C. I believe LES is taking advantage of people who lack the education necessary to protect themselves. Most of the people in Hartsville do not have a high school education. They have limited understanding of nuclear topics. The speed with which this plant is being push through has not allowed affected surrounding area people (who may have more education) to come to thier aid.
- D. I am concerned about enviornmental issues. My family has already been affected by the uranium enrichment plants at Oak Ridge. My late husband was born at the time the bomb was being developed. He was born with a genetic defect of no nerves in one ear. So forever, my decendants will

carry a gene for deafness because he was born near Oak Ridge.

My husband had never been fishing, because no fish (or any other life) lived in the streams near his home. I do not want that to happen here.

The Cumberland River provides the drinking water for Carthage, Hartsville, Gallatin, Nashville, and other places. This plant has the potential to poison and destroy our water supply. Uranium hexafluoride chemically reacts with water to form a deadly poison, so there is a possibility for chemical and radiation contamination. This would be a catastrophic disaster.

There is the possibility of an earthquake. TVA chose to ignore reports of faultlines in the area. It was thought they had not been active in modern times. The May 19, 2002 earthquake at Beersheba Springs, Tenn. shows there are active earthquakes in the area. This shows the Hartsville site is not safe for an uranium enrichment plant. The Beersheba Springs fault could damage the the aging dams that are above the Hartsville site and cause flooding. Tennessee has a lot of earthquakes. Out of the 80 which took place in Central U.S. in the previous 6 months before Oct. 12, most of them were in Tennessee. The worst earthquake in U.S. history took place in Tenn.. Reelfoot Lake was caused by an earthquake. The transport of radioactive materials would travel over faults both east and west of the plant.

I am concerned about accidents on the road. I read there had not been a great number of accidents, but of the ones which did happen, 30% involved the release of radiation into the air.

I am concerned about the new threat of terrorist. I do not believe this threat has been studied sufficiently to adequately prepare.

Farming is the main business which surrounds the planned site. An uranium enrichment plant is not compatible with farming. The planned release plus the possibility of accidental release of radiation could put the farmers out of business. It could impact the farmer by getting into the milk of the dairy cattle, etc. and making it impossible to sell farm products. Radioactive waste has gotten into the ground water at almost every place it has been stored. The farm animal drink the ground water.

This plant can destroy our water, increase our chances for cancer, birth defects, lung and kidney damage and death.

Environmental Justice cont.

Where is the justice in taking someones' land and then giving it to another? TVA insisted it needed that site to build a nuclear power plant, so it took land which the owners did not want to sell. When the TVA got approval to build, didn't the NRC agree there was a "need". Then after investing a lot of money in construction, TVA decides it doesn't need the plant after all and pulls out of town. Now LES (a private owned company) plans to locate a hazzardous plant on the site. Shouldn't the land rightfully be given back to its former owners who were forced to give it up?

When LES decided on this site, it was zoned for agricultural use. How did LES know it would be rezoned? Recently, the Trousdale County Planning Commission was told by the state to change their zoning to include a zone for the enrichment plant. I understood them to say the county could not exclude a use. I did not believe the state planner, because most counties would not have such a use in its zoning.

3. Financial Qualifications:

I would not know LES' financial qualifications. Are the companies which make up LES financially sound? Has LES proven itself, and will these companies stick together. How will it affect LES when some of the companies go under? Will this group fall apart? How will the enrichment plant be affected when some of the companies go bankrupt? It appears to me that LES may not be stable.

4. Antitrust Review:

I do not know the antitrust laws and have not had time to look them up. Will not this group of companies under LES form a monopoly? Will it not control prices charged public nuclear plants? Is not this the reason AT&T was split or Microsoft was sued? How can the NRC agree to this?

5. Foreign Ownership:

If the foreign company owns over 50% of LES, then foreign powers have control of the operation. Who knows who the stockholders with controlling interests are? Who will they sell the enriched uranium to? How do you know this plant will not be converted to weapons grade uranium and shipped to places which then send it to places like North Korea, Iran Pakistan, etc..

6. Disposition of Depleted Uranium:

I believe Mr. Dials said at the Hartsville meeting, LES would store the waste at the site as long as possible.

Depleted Waste Cont.

When an MRS was proposed for the Hartsville site a few years ago, the Tennessee legislature went on record by voting against it. We do not want depleted waste store on that site.

Wastes stored on the uranium enrichment plant site in Kentucky has leaked into the groundwater. Oak Ridge is a mess because of enrichment plants. You can never change the situation when it leaks into the ground water no matter how much cleanup work is done.

There is no way to depose of the waste.

Haven't the citizens of Tennessee suffered enought because of nuclear energy. Will the NRC allow the rest of the state to also be poisoned. There has been a disproportionate burden placed on this state. If there has to be a plant in the U.S., then let some other state carry its share of the burden. Let LES build this plant in Europe where the majority of its stockholder reside. Let the stockholders health be put "at risk" for thier profits instead of the residents of Tennessee.

Conclusion:

Our country has changed since Sept. 11,2001. What was once safe, no longer is. The threat of terrorist will be with us for a long time. I don't believe the nuclear industry has had time to address issues like sabotage. Just last week, someone tried to derail a train carrying 400 passengers in Smith County. The NRC cannot protect this plant or the people near it from terrorists.

We do not want this plant or the problems which go with it. Please do not allow this plant to be built in our state.

Thank you,


Jean Heidel

Enclosure:

1. Adams
2. Earthquake maps
3. Map of Hartsville vivinity (from TVA)
4. Geo. study (TVA)
5. Final impact stat. (TVA)
6. Article -train derail

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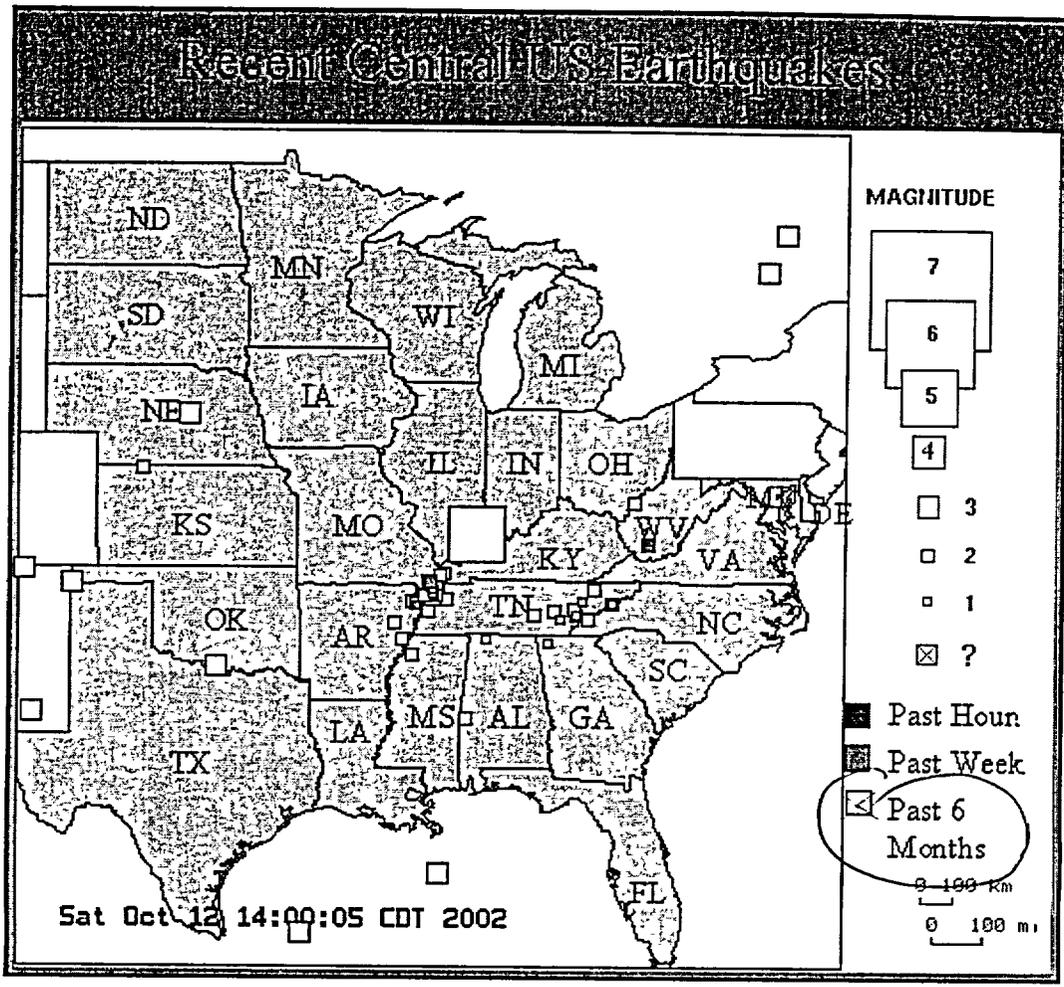
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Last revised Wednesday, November 06, 2002

(2)

Recent Earthquakes in Central US



There are 80 earthquakes on this map.

Did you feel it? - Please fill out a felt report (even if you didn't feel it).

For Other earthquakes: USGS

Click on an earthquake on the above map for a zoomed-in view.

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Earthquake lists: big earthquakes || all earthquakes

Magnitude = ? for new earthquakes until a magnitude is determined (takes 4-5 minutes).

Maps are updated within 1-5 minutes of an earthquake or once an hour.

(Smaller earthquakes are added after

human processing, which may take several hours.)

Map need updating? Try reloading the page to your browser.

Brown lines are known hazardous faults and fault zones.

Other Information:

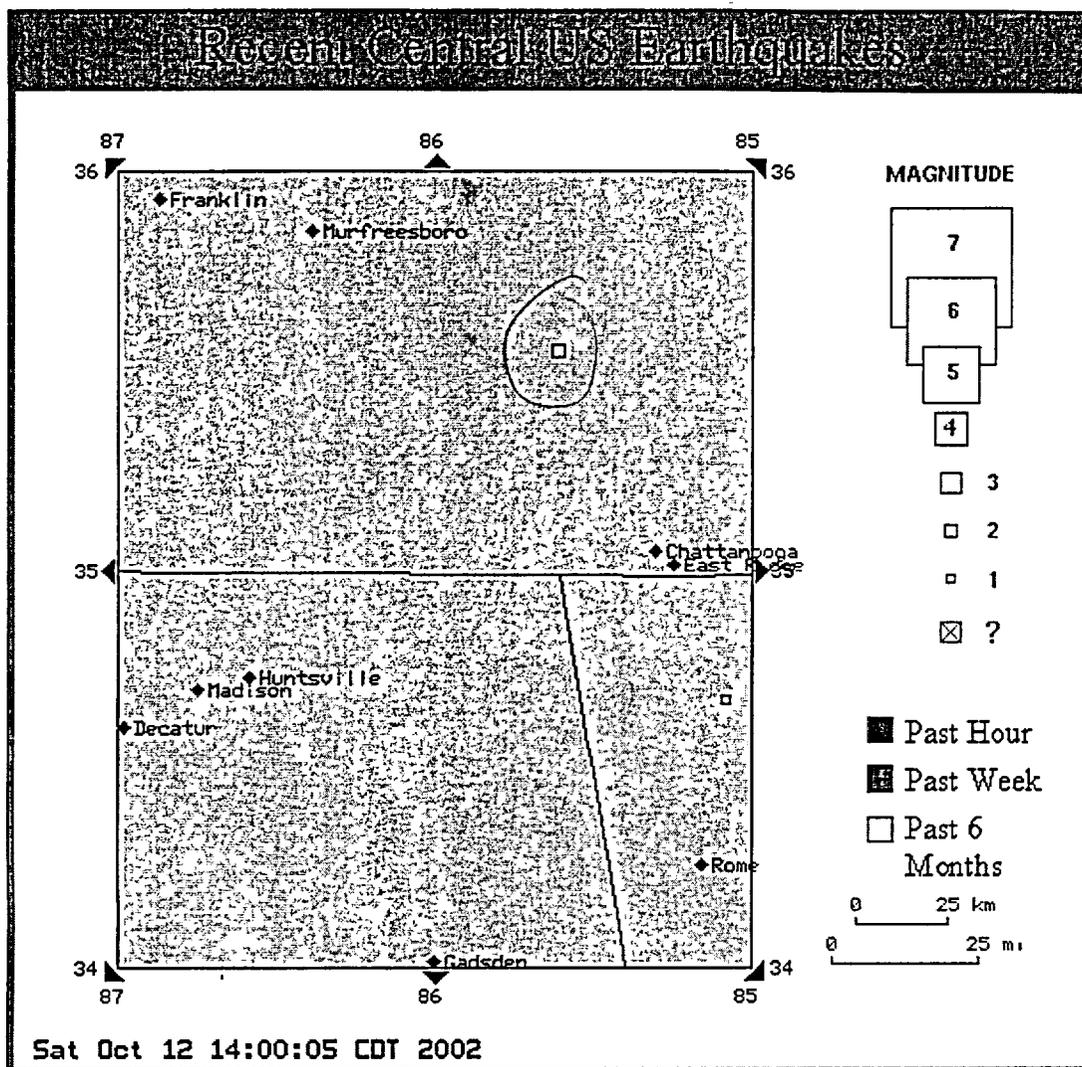
How do earthquakes get on these maps? || FAQ's || Disclaimer

Earthquakes elsewhere in the U.S. and around the world

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- Central U.S. - Cooperative Central and Southeast U.S. Seismic Network CER/SLU/VPI/USC = Center for Earthquake Research and Information
- Northern California - USGS = U.S. Geological Survey, Menlo Park
- Northern California - UCB = University of California, Berkeley
- Southern California - USGS = U.S. Geological Survey, Pasadena
- Southern California - Caltech = California Institute of Technology
- Southern California - UCSD = University of California, San Diego
- Nevada - UNR = University of Nevada, Reno
- US and World - USGS/NEIC = National Earthquake Information Center
- ...all members of the Council of the National Seismic System (CNSS)



There are 2 earthquakes on this map.

Click on an earthquake on the above map for more information.
 Click on an arrow at edge or corner of above map to go to an adjacent map.
 Click here to go to [index map](#) || [big earthquake list](#) || [all earthquakes list](#)
 Special maps: **Not Implemented**
 Map need updating? Try reloading the page to your browser.
 Maps are updated within about 5 minutes of an earthquake or once an hour.
 Brown lines represent known hazardous faults or fault zones. White lines are roads.
What happens when I click on an earthquake?

Update time = Sat Oct 12 14:00:05 CDT 2002

Here are the earthquakes appearing on this map, most recent at top ...

<u>MAG</u>	<u>DATE</u> y/m/d	<u>LOCAL-TIME</u> h:m:s	<u>LAT</u> deg	<u>LON</u> deg	<u>DEPTH</u> km	<u>LOCATION</u>
2.4	2002/05/19	23:08:15	35.545N	85.606W	4.0	10 km (6 mi) NNE of Beersheba Springs, TN
1.8	2002/04/17	18:36:32	34.674N	85.079W	2.7	15 km (9 mi) SW of Dalton, GA

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Data Sources

 **Recent Earthquakes in Central US****== PRELIMINARY EARTHQUAKE REPORT ==**
Southeast U S Seismic Networks

Version #A: This report supersedes any earlier reports of this event.
This event has been reviewed by a seismologist.

A micro earthquake occurred at 11:08:15 PM (CDT) on Sunday, May 19, 2002 .
The magnitude 2.4 event occurred 10 km (6 miles) NNE (26 degrees) of 71 Beersheba Springs, TN.
The hypocentral depth is 4 km (2 miles).

Magnitude 2.4 - body magnitude (Mb)

Time Sunday, May 19, 2002 at 11:08:15 PM (CDT)
Monday, May 20, 2002 at 4:08:15 (UTC)

Distance from 71 Beersheba Springs, TN - 10 km (6 miles) NNE (26 degrees)
40 Altamont, TN - 17 km (10 miles) NE (39 degrees)
19 Gruetli-Laager, TN - 19 km (12 miles) N (3 degrees)
59 Chattanooga, TN - 62 km (38 miles) NNW (334 degrees)

Coordinates 35 deg. 32.7 min. N (35 545N), 85 deg. 36 4 min. W (85.606W)

Depth 4 km (2.5 miles)

Quality Poor

Location Quality Parameters Nst= 12, Nph= 22. Dmin=47 km, Rmss=0.46 sec, Erho=0 5 km, Erzz=1 km. Gp=90 degrees

Event ID# se02052004

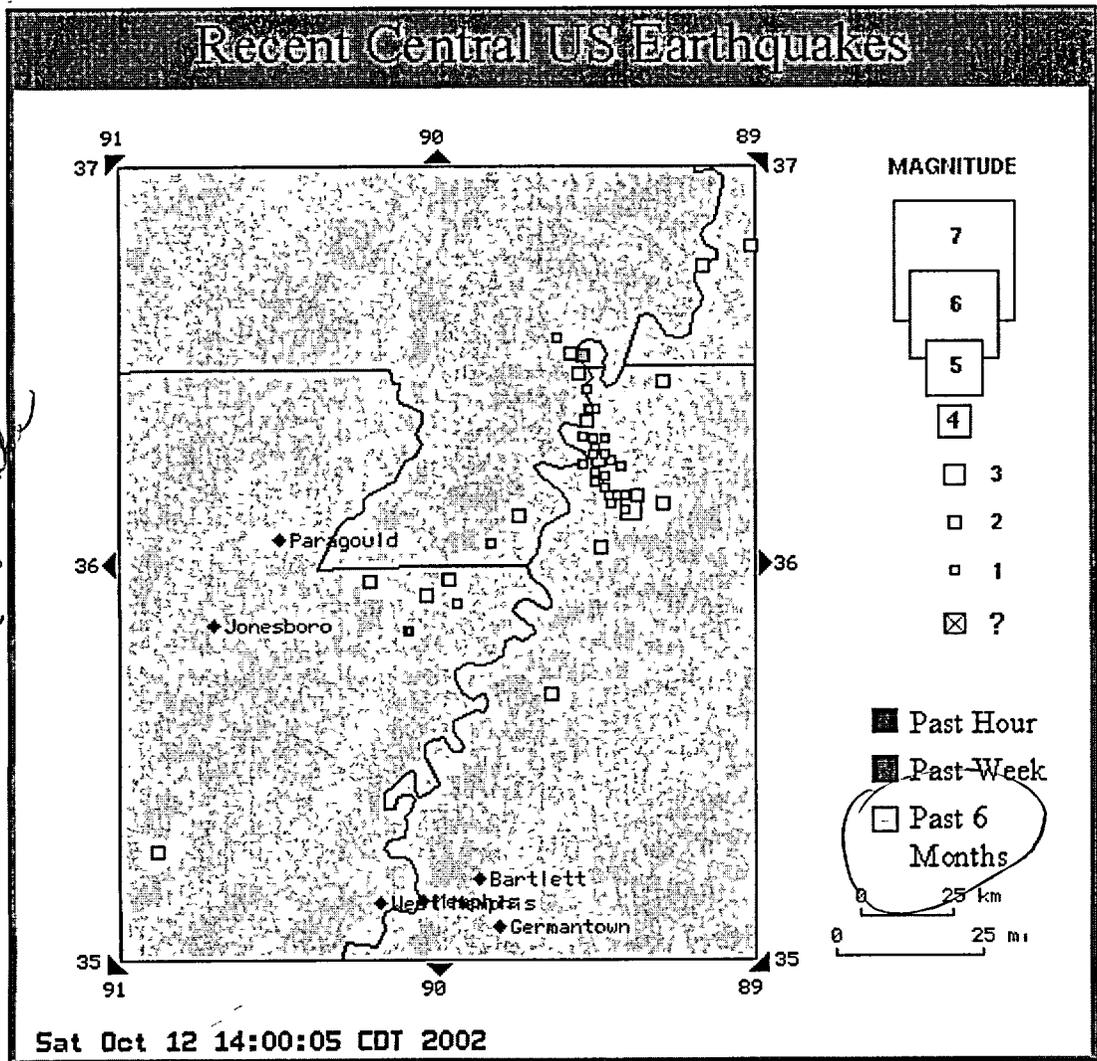
Additional Information [map](#)

For more information, see [http //www.geol vt edu/outreach/vtso/seussn html](http://www.geol.vt.edu/outreach/vtso/seussn.html)

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Recent Earthquakes in Central US

Close up of earthquakes in this area



There are 47 earthquakes on this map.

Click on an earthquake on the above map for more information.
 Click on an arrow at edge or corner of above map to go to an adjacent map.
 Click here to go to [index map](#) || [big earthquake list](#) || [all earthquakes list](#)
 Special maps: **Not Implemented**
 Map need updating? Try reloading the page to your browser.
 Maps are updated within about 5 minutes of an earthquake or once an hour.
 Brown lines represent known hazardous faults or fault zones. White lines are roads.
[What happens when I click on an earthquake?](#)

Update time = Sat Oct 12 14:00:05 CDT 2002
 Here are the 30 most recent earthquakes and all M>3 earthquakes on this map...

MAG	DATE	LOCAL-TIME	LAT	LON	DEPTH	LOCATION
	y/m/d	h:m:s	deg	deg	km	
2.0	2002/10/10	02:13:23	36.520N	89.540W	5.0	7 km (5 mi) S of New Madrid, MO
1.3	2002/10/09	01:56:59	36.310N	89.470W	5.9	5 km (3 mi) NNE of Ridgely, TN
1.5	2002/10/08	00:42:22	36.390N	89.520W	9.3	4 km (3 mi) WNW of Tiptonville, TN
1.6	2002/10/06	01:58:22	35.830N	90.090W	6.3	5 km (3 mi) WSW of Dell, AR
1.8	2002/10/04	04:26:37	36.200N	89.500W	5.4	7 km (4 mi) S of Ridgely, TN
1.5	2002/10/03	02:36:20	36.170N	89.460W	10.3	11 km (7 mi) SSE of Ridgely, TN
1.6	2002/09/22	19:56:24	36.230N	89.500W	9.1	4 km (2 mi) SSW of Ridgely, TN
2.0	2002/09/21	19:46:45	36.120N	89.740W	11.6	11 km (7 mi) SW of Caruthersville, MO
1.6	2002/09/21	13:17:33	36.220N	89.470W	5.9	5 km (3 mi) SSE of Ridgely, TN
1.6	2002/09/08	23:59:59	36.250N	89.540W	5.8	5 km (3 mi) WSW of Ridgely, TN
2.7	2002/09/08	04:03:24	35.670N	89.640W	6.3	6 km (4 mi) W of Henning, TN
1.6	2002/08/20	05:01:20	36.310N	89.510W	8.1	6 km (3 mi) NNW of Ridgely, TN
1.2	2002/08/14	00:05:50	36.170N	89.410W	7.5	13 km (8 mi) SE of Ridgely, TN
1.7	2002/08/11	03:22:33	36.130N	89.410W	9.3	11 km (7 mi) NNW of Dyersburg, TN
1.2	2002/08/06	00:33:05	36.270N	89.470W	4.8	2 km (1 mi) ENE of Ridgely, TN

1.7	2002/08/05 05:53:32 36.440N 89.530W 8.8	9 km (5 mi)	NW of Tiptonville, TN
1.6	2002/08/02 23:58:24 36.170N 89.430W 8.3	12 km (7 mi)	SSE of Ridgely, TN
1.6	2002/07/29 22:24:43 36.240N 89.420W 6.5	7 km (4 mi)	ESE of Ridgely, TN
2.7	2002/07/29 06:28:07 35.920N 90.030W 8.0	7 km (4 mi)	SW of Gosnell, AR
1.7	2002/07/28 00:09:50 36.570N 89.620W 5.6	8 km (5 mi)	WSW of New Madrid, MO
2.0	2002/07/26 00:11:01 36.480N 89.550W 9.1	12 km (7 mi)	S of New Madrid, MO
1.5	2002/07/24 23:37:59 36.320N 89.540W 9.1	8 km (5 mi)	NW of Ridgely, TN
1.5	2002/07/24 05:02:53 36.260N 89.450W 5.6	3 km (2 mi)	E of Ridgely, TN
1.8	2002/07/23 13:23:37 35.900N 89.940W 11.0	4 km (2 mi)	SSW of Blytheville, AR
2.2	2002/07/22 04:53:26 35.270N 90.880W 16.6	10 km (6 mi)	WNW of Wynne, AR
1.6	2002/07/21 13:09:48 36.270N 89.470W 6.0	2 km (1 mi)	ENE of Ridgely, TN
1.6	2002/07/21 04:05:31 36.150N 89.450W 10.8	13 km (8 mi)	SSE of Ridgely, TN
1.5	2002/07/17 14:01:17 36.270N 89.470W 6.5	2 km (1 mi)	ENE of Ridgely, TN
1.7	2002/07/11 12:08:06 36.270N 89.510W 8.1	2 km (1 mi)	WNW of Ridgely, TN
3.0	2002/04/20 15:00:00 36.130N 89.390W 6.8	11 km (7 mi)	N of Dyersburg, TN

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Data Sources

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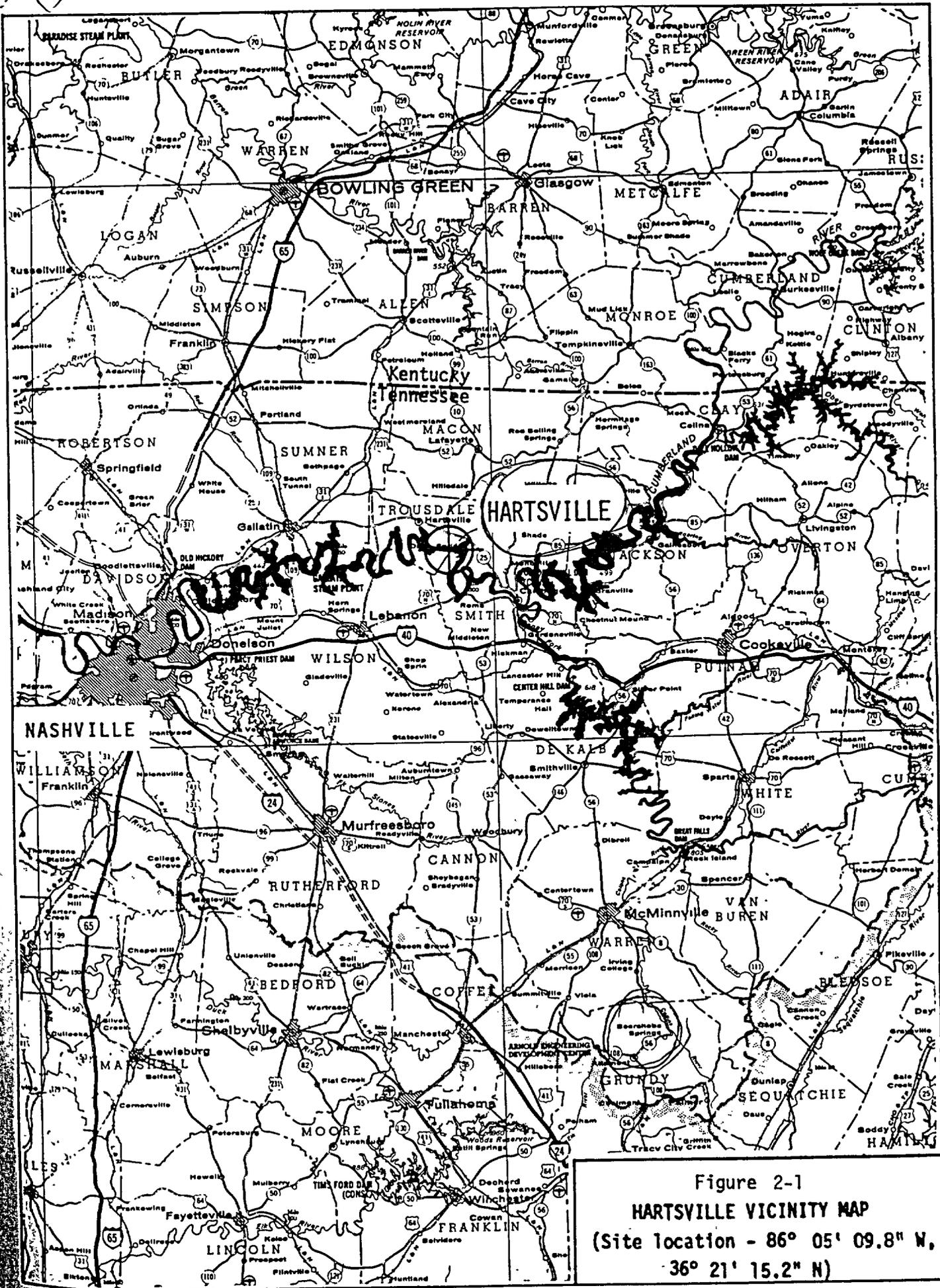


Figure 2-1
HARTSVILLE VICINITY MAP
(Site location - 86° 05' 09.8" W,
36° 21' 15.2" N)

11.00

(4)

The University of Tennessee Space Institute
Office of the Dean for Research and Development
 B. H. Goethert Parkway
 Tullahoma, TN 37388
 Phone: 931-393-7286
 FAX: 931-455-7266

Fax Transmission

TO: Jean Heidel 1/2 Mail Boxes Express

FAX #: 615-230-5599

FROM Dr. Joel Muehlhauser / Madge Gibson

RE:

PAGES: 12 including cover

DATE:

COMMENTS

If I can help let me know. I could give you Dr. Shahrokhi's address and phone number if you need it -

I don't know how much help he'd be -

Madge Gibson
 931-393-7284 phone

From
TVA
preliminary
statement

Beech
Grove
lineament

PRELIMINARY ASSESSMENT OF A TENNESSEE LINEAMENT¹

E. F. Hollyday², G. K. Moore³, and C. R. Burchett²

U.S. Geological Survey

1.0 ABSTRACT

Existing ground truth has been used to examine the possible significance of a lineament (herein named the Beech Grove lineament), which was seen for the first time on ERTS-1 imagery.

Geologic evidence indicates a genetic relationship to forces that produced the Nashville dome. A curious but probably coincidental relationship exists between the trends of the Beech Grove lineament and the axes of the Mississippi embayment and the Appalachian Mountains.

Several occurrences of sphalerite within the lineament indicate a belt about 4 miles wide and 90 miles long that is a prospect for commercial concentrations of zinc ore.

The hydrologic significance of the lineament is not completely clear at present. An uncommon number of caves and sinkholes occur near the lineament, and large variations in flow occur in streams that either follow or cross the lineament. Well yields near the axis of the lineament range from more than 100 gallons per minute to less than 1 gallon per minute.

2.0 INTRODUCTION

The National Aeronautics and Space Administration placed

¹Publication authorized by Director, U.S. Geological Survey.

²Hydrologists, 144 Federal Office Bldg., Nashville, Tenn., 37203.

³Research Hydrologist, Gulf Coast Hydroscience Center/MTF, Bay St. Louis, Miss., 39520.

the first experimental Earth Resources Technology Satellite into near-polar, near-circular orbit at an altitude of approximately 570 miles on July 23, 1972. Since then ERTS-1 has been returning data from which more than 34,000 black and white images have been made, each image covering 13,000 square miles of the Earth's surface.

Examination of a color composite image of central Tennessee (frame number 1086-15544) revealed a lineament (Fig. 1, reduced to black and white). This feature extends from Lincoln to Smith Counties, Tennessee (fig. 2), a distance of about 90 miles, and may have considerable geologic, hydrologic, and economic importance. The purpose of this paper is to point out the possible significance of the lineament, based on existing ground truth. Additional future studies, consisting of field mapping, seismic surveys, and test drilling will be needed to determine the true significance of the feature.

The lineament is defined mainly by the alignment of nine separate stream valleys, in which there is extensive agricultural land use. In this area of Tennessee, hills are steep and are commonly left in dense woods. The woods, like areas of open water, show up as dark areas on the ERTS image. The relatively flat stream valleys, however, have been cleared of woods and have been made into either open pasture or cultivated fields wherever the soil is thick enough to maintain agricultural land use. The cultivated fields and pasture, like highways, show up as light areas on the ERTS image. The extensive agricultural land use along the lineament suggests uncommonly thick soils and broken ground in this area of Tennessee where the average soil thickness commonly is only 4 feet. Along most of its length, the lineament is about 1 mile wide. In a few areas, however, closely spaced parallel lineations indicate a fracture zone as much as 4 miles wide.

3.0 GEOLOGY

The surface geology of central Tennessee consists of dense, nearly flat-lying limestones and impure, limy sediments of Ordovician and Mississippian ages. The Chattanooga Shale separates these systems and is an important marked bed.

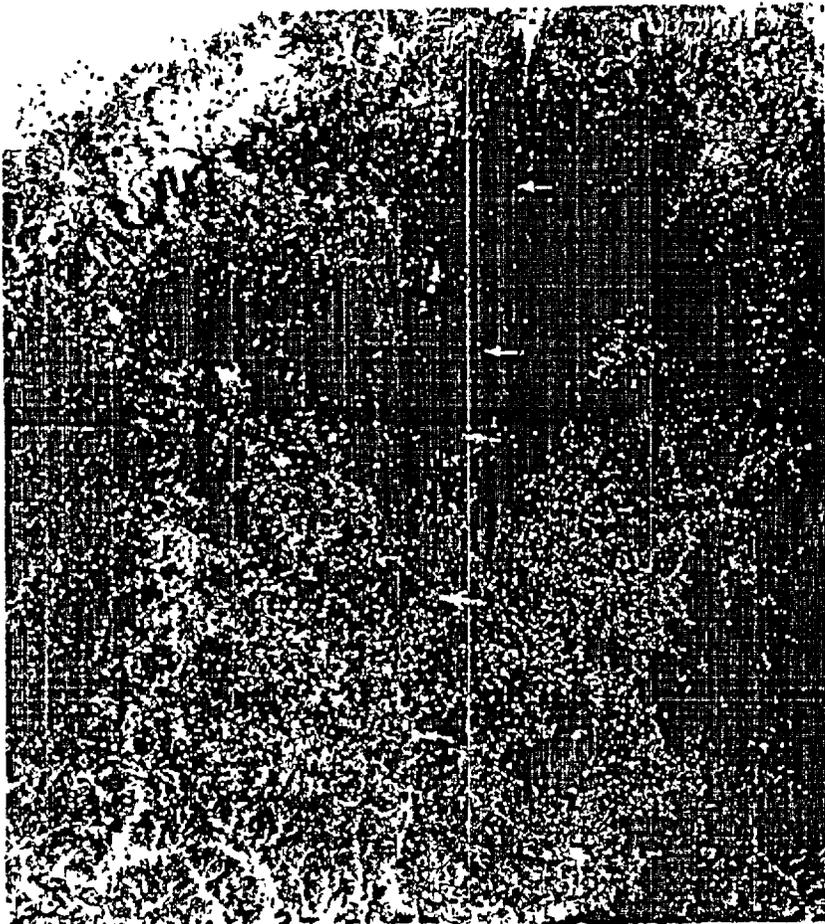
The middle one-third of the lineament approximates the boundary between the Central Basin to the west and the Highland Rim to the east. Because of this location, it is possible to speculate that the lineament could be a fault that



10 5
CENT

Figure 1. ERTS location of below center interstate

PRELIMINARY ASSESSMENT OF A TENNESSEE LINEAMENT



10 5 0 10 20 Statute Miles

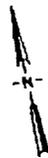
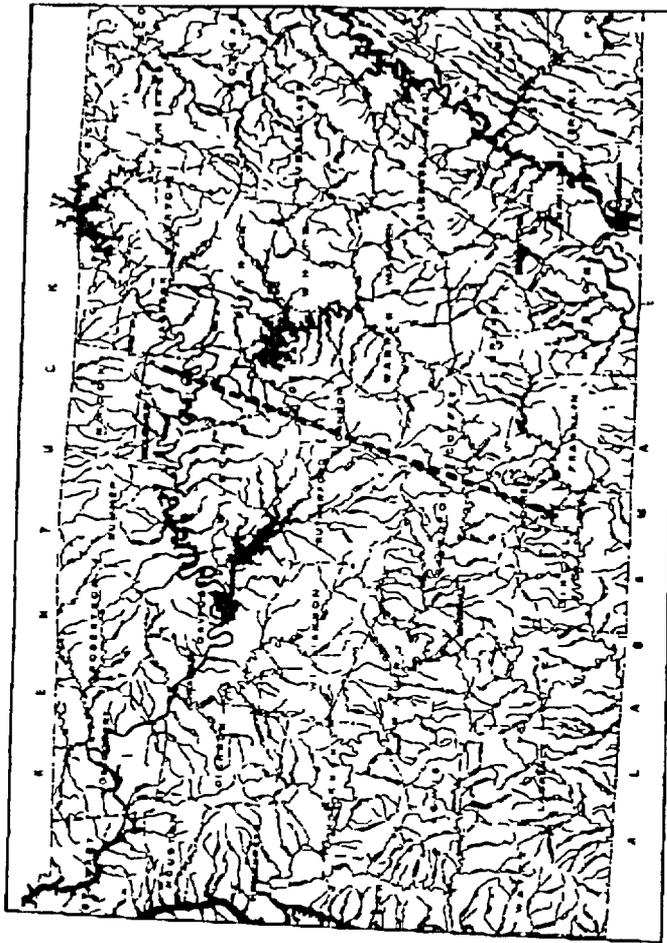
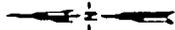


Figure 1. ERTS-1 image of central Tennessee, showing the location of the Beech Grove lineament. The large arrow below center shows the point where the lineament crosses interstate highway 24.



Base from U. S. Geol. Survey map



Figure 2. Location of the Beech Grove lineament on a map of central Tennessee.

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PRELIMINARY ASSESSMENT OF A TENNESSEE LINEAMENT

served to release stress resulting from uplifting and subsequent settling of the Nashville dome, during Paleozoic time. It also could have been significant in beginning the erosion that formed a topographic basin around the Nashville dome.

The lineament trends $N20^{\circ}E$, whereas the common directions of jointing and faulting in central Tennessee are about $N45^{\circ}E$ and $N45^{\circ}W$. A few other directions of jointing (probably resulting from underground solution and subsidence--see Moore and others, 1969, p. 13) trend north and east. From a regional viewpoint the trend of the lineament is not unique because it is parallel to the axis of the Mississippi embayment as well as to the trend of structures in the Valley and Ridge Province in southeastern Tennessee. The alignment of the lineament parallel to these regional structures is believed by the authors to be coincidental, however, because of considerable differences in the geologic time of occurrence of maximum development of these structures. In this regard, the stratigraphic evidence would indicate (Wilson, 1949, p. 328) that the Nashville dome probably was most active during early and middle Paleozoic time. It is generally recognized that structures in the Valley and Ridge Province in southeastern Tennessee were undergoing maximum development during the end of Paleozoic time and the beginning of Mesozoic time. The Mississippi embayment has undergone maximum development during late Mesozoic time and Cenozoic time.

Interstate highway 24 crosses the lineament at Beech Grove, Tennessee, near the common corner of Rutherford, Bedford, and Coffee Counties. Examination of rock exposures in several roadcuts at this location revealed that much of the rock is broken or brecciated, and zones of extensive deep weathering are common compared to other exposures a short distance away along the highway. In the Beech Grove exposures, large blocks of Chattanooga Shale are within the weathered zone at four different horizons. The geologic structure here resembles a graben with a small central horst that has net downthrown displacement. This structure could result either from complex, normal faulting or from solution collapse. Other evidence, as described later, indicates that the most probable cause is faulting.

The lineament is herein named the Beech Grove lineament because of (1) the excellent definition of this lineament on ERTS imagery near the town of Beech Grove, Tennessee, and (2) the good exposures of broken and displaced rock along interstate highway 24 in the same area.

In the subsurface, an important marker is the top of the Knox Dolomite, about 700 feet below land surface. Contours on the top of the Knox (Newcome and Smith, 1962, fig. 3) show pronounced irregularities (on an otherwise relatively smooth surface) about 2 miles west of the Beech Grove lineament. If these irregularities were explained by a normal fault, the displacement would range from about 50 to 150 feet with the eastern block having moved up relative to the western block.

4.0 ZINC MINERALIZATION

Four small zinc bearing veins at the land surface in Rutherford and Cannon Counties are located within 4 miles of each other but all four veins are within 2 miles of the axis of the lineament. All deposits are associated with broken and brecciated rocks (Jewell, 1947). In the veins, the most common mineral of economic value is sphalerite. The sphalerite is associated with lesser amount of galena, barite, and fluorite. There are occasional occurrences of pyrite and greenockite. Hemimorphite, locally termed calimine, often occurs where the zinc bearing veins intersect the surface of the ground.

Thirty miles north of these four veins, the new Elmwood mine of the New Jersey Zinc Company in Smith County is 2 miles east of the axis of the lineament. The zinc ore at this location occurs in brecciated Knox Dolomite of Early Ordovician age. Present thinking is that the upper Knox is an areally extensive, paleo-karst aquifer (Hoagland and others, 1965). According to this theory, cavernous porosity (which presently is filled by sphalerite ore) was created by subsurface solution at the end of Early Ordovician time. This period is represented in the geologic section by an erosional unconformity at the top of the Knox.

Ore in the Elmwood mine is associated with brecciated rock (Fischer and Hoagland, 1970, p. 99), but no evidence of faulting has been found in the vicinity of the mine. Several "normal faults of relatively modest displacement" are known to occur in the general area (Fischer and Hoagland, 1970, p. 97). The present authors suggest that the lineament may have permitted locally intense ground-water solution in nearby areas (creating large openings in the rock) and also may have permitted access to the mineralized solutions that formed the ore. Thus, the Beech Grove lineament represents a prospect for other concentrations of sphalerite.

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PRELIMINARY ASSESSMENT OF A TENNESSEE LINEAMENT

5.0 HYDROLOGY

Several important hydrologic features occur along the Beech Grove lineament. An unusually large sinkhole at Hilltop in Lincoln County is 0.7 mile wide and 60 feet deep. Other large sinkholes and bands of small sinkholes occur near the lineament, either on the uplands or at the base of the hills. Also, a large number of caves occur at the boundary between the Highland Rim and the Central Basin. Among the 27 caves that have been reported within 3 miles of the lineament axis, 3 caves locally are well known: Jarnigan Cave, Motlow Cave and Jack Daniel Cave.

Several of the small streams that trend along the lineament are named Dry Fork. In contrast to these dry streams, in other areas, there are numerous springs, both large and small, and a few wells with uncommonly large yields of water. These facts suggest that water in some stream valleys is seeping into broken rock along the lineament and is reappearing elsewhere in springs. In the intervening area, large supplies of ground water may be available to wells.

Specific examples can be cited of differences in streamflow near the lineament. Two of these are Garrison Fork at Beech Grove and Brawleys Fork near Readyville. Both streams follow the lineament, but they flow in opposite directions. These two streams show large differences in their low flow characteristics. The 7-day, 2-year low flow of Brawleys Fork is 0.1 cfs (cubic feet of water per second per square mile of drainage area), but it is only 0.04 cfs in Garrison Fork (Burchett and Moore, 1971, p. 38). Although both streams follow the lineament the stream channel of Brawleys Fork is at a lower altitude than that of Garrison Fork. This fact that the lower stream valley has the greater flow suggests that Brawleys Fork is capturing some of the water that normally would go to Garrison Fork if broken rock were not present in the topographic divide between the two streams. A third stream, Carson Fork in Cannon County, is a tributary to Brawleys Fork but it is located away from the axis of the lineament. The 7-day, 2-year low flow of Carson Fork at Burt is only 0.03 cfs (Burchett and Moore, 1971, p. 38). It appears that Brawleys Fork derives substantially all of its unusually large low flow from that part of its drainage basin that overlies the Beech Grove lineament.

The Beech Grove lineament crosses seven streams, which are tributaries of Caney Fork, in Wilson, Cannon, DeKalb, and Smith Counties. The average flows and 7-day, 2-year low flows

of these streams are shown in table 1. Although most of the average flows are very similar, the two exceptions are among the highest and lowest average flows for 27 tributaries of Caney Fork (Moore and Wilson, 1972, p. 19). The difference between the highest and lowest 7-day, 2-year low flows is a factor of 22. Thus, the presence of the lineament traversing only 7 tributaries of Caney Fork might account for the extremes in flow observed in all 27 tributaries of Caney Fork.

Table 1. Average flow and 7-day, 2-year low flow, in cfs_m, for seven tributaries to Caney Fork (after Moore and Wilson, 1972, fig. 9).

Station Name	Average flow	7-d, 2-yr flow
Melton Creek near Temperance Hall	1.7	0.002
Hickman Creek at Carthage Junction	1.6	0.0040
Hickman Creek at Alexandria	2.5	0.0083
Hurricane Creek near Auburntown	0.97	0.044
Mulherrin Creek near Gordonsville	1.6	0.010
Saunders Fork near Auburntown	1.6	0.043
Smith Fork near Auburntown	1.5	0.012

Smith & DeKalb Co.

The yields of domestic wells on and near the lineament range from less than 1 gpm (gallon per minute) to more than 100 gpm. A test well near the axis of the lineament in DeKalb County was drilled to a depth of 300 feet (by Tennessee Department of Conservation, Division of Water Resources), but produced only 3 gpm. Additional test wells in several lines traversing the lineament will be needed to determine whether well yields along the lineament are larger than average.

6.0 CONCLUSIONS

1. The Beech Grove lineament is defined on ERTS imagery by the alignment of cultivated stream valleys. Large scale maps show a concentration of karst features near the axis of the lineament.

2. The uncommon trend of the lineament compared to local joints and faults, its length of 90 miles, the occurrence of brecciated rock at several localities, and irregularities in subsurface contour maps indicate a fault. The throw is small at the surface but may reach 150 feet at depth. This fault probably has not been active since the end of Paleozoic time, and most movement probably occurred in Ordovician time.

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PRELIMINARY ASSESSMENT OF A TENNESSEE LINEAMENT

3. Several occurrences of sphalerite in veins within the lineament indicate a belt about 4 miles wide and 90 miles long that is a prospect for commercial concentrations of zinc ore.

4. The Beach Grove lineament appears to be associated with the occurrence of extremes in hydrologic data sets. Well yields near the lineament range from less than 1 gpm to more than 100 gpm. Losing stream reaches and uncommonly low flows in some streams are matched by large flows and numerous springs in other areas. Some movement of ground water from one stream basin to another apparently occurs along the lineament. However, the amount and significance of this flow is not completely clear at present. Additional hydrologic investigations that include test drilling are needed.

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HOLLYDAY, MOORE, AND BURCHETT

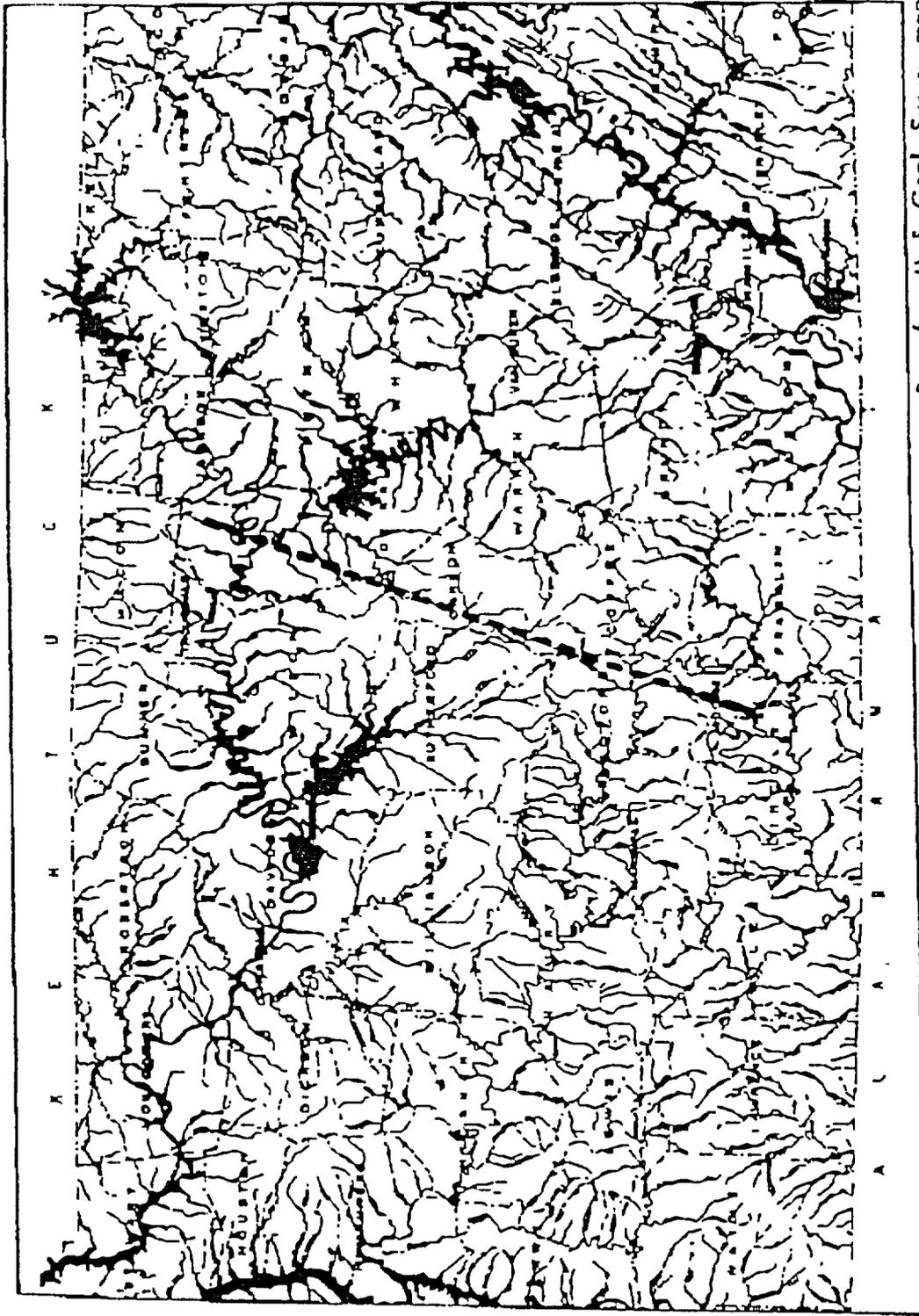
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Lloy

The purpose of the February 1973 experiments to evaluate multispectral water pollution radar) measurements

NASA has been involved in studies of the Earth from space. One of the major goals of this program is to provide environmental data for use in solving existing environmental problems. This report is to report the results of a sponsored development project for pollution monitoring.

Six air pollution sensors will be used in the experiments and the results will be reported in a future publication.



Base from U. S. Geol. Survey map



Figure 2. Location of the Beech Grove lineament on a map of central Tennessee.

(5)

TVA ignored the faults (now there has been quakes on near the lineament)

From: Final impact Statement TVA

RESPONSES TO STATE OF TENNESSEE
OFFICE OF URBAN AND FEDERAL AFFAIRS

1. The State of Tennessee was consulted after the completion of preliminary engineering feasibility studies that were conducted in the Middle Tennessee area over a 2-year study period concluded in July 1972. References to 1971 work or study dates were associated with the initial studies of several sites in the area. During this time period studies were being conducted at several locations and in July 1972 TVA screened the number of sites down to the four potential candidates identified in Chapter 9. In February 1973 TVA issued a press release which identified the Hartsville site as being authorized for purchase. In December 1972 TVA awarded contracts for nuclear steam supply systems and nuclear fuel to the General Electric Company. The February press release noted that the Hartsville site was being considered as a location for nuclear steam generating equipment on order by TVA.

In a May 1973 press release TVA announced that the Old Hickory (Hartsville) site had been selected as the tentative location for nuclear steam supply systems mentioned in the February release. TVA had the benefit of several inputs and comments from the State of Tennessee concerning the four candidate sites.

2. Earthquake discussions are more appropriate to the safety review for the project than in the environmental review. The epicentral locations of three small earthquakes (MM III) within a 60-mile radius of the Hartsville site are indicated on Figure 2.5-483(T) of the PSAR.

3. Section 2.5.2.9 of the PSAR clearly defines the Safe Shutdown Earthquake for the Hartsville plant as an MM VIII. This is the intensity that is used for safe design of the plant structures.

4. The TVA geologic staff has reviewed the article "Preliminary Assessment of a Tennessee Lineament," by Hollyday, Moore and Burchett as well as the satellite photo series NASA, ERTS, E-1086-15544. In addition, topographic and geologic maps of the area were examined. TVA does not question the apparent existence of a lineament between Lincoln County and Smith County. It does not appear that the feature relates to a fault.

The probability of a fracture zone is acceptable, but fracture zones can also be caused by concentrated jointing. In this instance, the probability of tension jointing from settlement of the Nashville Dome should be considered.

In discussing exposures of broken and displaced rock, such as the outcrop near Beech Grove, the authors use terms related to faulting such as graben and horst, but still admit that an alternative cause could have been solution collapse.

The authors imply that mineralization observed along the lineament is related to faulting, yet point out that at the only mine in the area (the Elmwood Mine) "no evidence of faulting has been found in the vicinity of the mine."

Their discussion of solution features implies heavier than normal concentrations of large and small sinkholes and one very large sinkhole "at Hilltop in Lincoln County" (actually Bedford County) are due primarily to the lineament. If a reviewer will examine the Vine Quadrangle (314 SE) some 10 miles west of the lineament, or the Verora Quadrangle (64 SE) some 25 miles west of the lineament, or the Monterey Lake Quadrangle (331 SE) some 40 miles east of the lineament, it will become immediately apparent that a lineament is not required for sinkhole development. Further, most areas of concentrated sinkholes produce unusual hydrologic conditions for obvious reasons.

The statement that the structure "...served to release stress resulting from uplifting and subsequent settling of the Nashville Dome during Paleozoic time" is acceptable. The statement that "It also could have been significant in beginning the erosion that formed a topographic basin around the Nashville Dome" is questionable. If the lineament represents extensively fractured and faulted rock through its entire length as implied, and was "significant in beginning the erosion that formed a topographic basin," then why do all major streams cross the lineament instead of flowing parallel with the lineament? The fact that the Elk River is presently draining only about one-sixth of the southern end of the lineament does not correlate well with the supposition that the structure represents a weak, soluble zone of rock. In addition, it should be pointed out that the drainage patterns of the Cumberland River, the East Fork Stone River and the headwaters of the Duck River are not affected as they cross the lineation.

As to the age of the structure and the probability of additional movement, the authors state: "This fault probably has not been active since the end of Paleozoic time, and most probably occurred in Ordovician time." Almost the entire area along and adjacent to the lineation has been mapped geologically at a scale of one inch equals 2,000 feet. Most of this mapping was done by Dr. C. W. Wilson of Vanderbilt University and the maps were published by the Tennessee Division of Geology. Only one of these detailed maps (Woodbury Quadrangle, 319-SE) indicate any faulting along or adjacent to the trend of the structure. In this one instance a fault 1,000 feet in length with a strike diverging 50 degrees from the trend of the lineation is mapped.

In summary, TVA believes that the term "fault" cannot be justifiably applied to the origin of the lineament; and that there is no evidence of continued movement along the structure since its origin. It is concluded, therefore, that the structure does not represent an earthquake hazard to the proposed location of the Hartsville Nuclear Plants.

5. The minimum daily Cumberland River discharge at the Carthage, Tennessee, USGS gage was 366 cubic feet per second, occurring on October 29, 1940. The natural minimum flow at this location has been estimated at 100 cubic feet per second. This would have occurred during an extreme drought in 1925 without the stream regulation in effect at that time.

Both of the above conditions occurred before closure of the major U.S. Army Corps of Engineers projects on the Cumberland River, including the dams bracketing the Hartsville site, Old Hickory, and Cordell Hull on the Cumberland and Center Hill on the Caney Fork. The Cumberland River at Hartsville is now an impounded and regulated stream. It has been converted into a 420,000-acre-foot (18,295,200,000-cubic-foot) impoundment. Flow is no longer the important factor in evaluating the quantity of water present at Hartsville, since this large volume of water has transitory storage within the impoundment.

The water elevation within Old Hickory Reservoir normally varies from elevation 442 in the winter to 445 in the summer. Water levels at the Hartsville site depend on the operation of the Cumberland River basin reservoir system. The system is operated for navigation, power, and flood-control purposes; and water levels may have little or no relation to flow in the river. Since the initial impoundment of Old Hickory Reservoir, minimum reservoir elevation at the Hartsville site is estimated at 442 feet, occurring on October 22, 1957, and October 28, 1969. The maximum reservoir elevation is estimated at 463 feet, occurring March 1, 1962.

Therefore, when examining the consumptive use of the Cumberland River at the Hartsville site, low-flow conditions are irrelevant. Only the relationship between the consumptive use and the average daily discharge (17,220 cubic feet per second at Carthage) need to be addressed.

The average consumptive use at the Hartsville Nuclear Plants would be 111 cubic feet per second, or 0.64 percent of the mean daily streamflow. This compares to an average evaporation rate of approximately 53 million gallons per day (83 cubic feet per second, or 0.48 percent of the average daily discharge) for Old Hickory Reservoir. Evaporation rates, like streamflows, are highly variable, and records indicate that daily evaporative rates as high as 205 million gallons per day have occurred. Water losses of this magnitude have caused no problem known to TVA. Water intakes have not been exposed, navigation has not been impeded, and water quality has not been impaired.

To provide an estimate of the quantitative effect of the change in average daily discharge from 17,220 to 17,109 cubic feet per second on the dissolved oxygen resource, an evaluation was made to determine the overall effects of this reduction on the assimilative capacity of the Cumberland River near Hartsville, Tennessee. This evaluation was based on the Streeter-Phelps equation, using conservative assumptions (high deoxygenation rate, low reaeration rate, and maximum stream temperature). The results of this evaluation show that there is no discernible effect on the dissolved oxygen concentration at the low point of the dissolved oxygen sag below the Hartsville site resulting from the consumptive use of 0.64 percent of the mean daily streamflow.

6. The discharge of 50,000 gallons of water vapor per minute (72,000,000 gallons per day) into the atmosphere from cooling tower operation represents only a small percentage (0.1%) of the total atmospheric moisture which is present in the Hartsville site area (10 mile radius) over any particular time period. The further the evaporative plume travels downwind from the plant, the more diluted it becomes as it is mixed with greater volumes of ambient air, thus yielding even smaller percentage contributions to the total moisture content of the atmosphere. This relatively small addition to the available atmospheric moisture is expected to have very little effect on the long-term average climatology of the region. However, since the use of large evaporative cooling towers in conjunction with nuclear power plants is a relatively recent development and no major study documenting the possible long-term effects on local and/or regional climatology has been completed, it is difficult to quantify any such small effects. (See also response No. 5)
7. See response No. 5.

Travel time of water from ground surface at the plant island to the underlying water table would be less than one day, based on many observations of water-table response to recharge in this region. The water table normally rises within a few hours after onset of precipitation. It is assumed that the volume of water released to ground surface at the plant site would be sufficiently large to reach the water table.

The calculation of mean travel time of ground water from the Hartsville plant site to Old Hickory Lake is intended to indicate that water velocity is low because of the low permeability of the rock underlying the area. Results of the pumping test in the Mt. Juliet, Tennessee, area, described by Stearns are not believed to represent tremendously rapid water movement but a rapid response to change in pressure head caused by drawdown in the pumped well.

A map (Figure 1) of the water table in the vicinity of the site indicates that directions of water movement are controlled by the hydraulic gradient of the water table, which is closely related to surface topography. The site is bounded on the west, south, and east by surface-water bodies which are effluent streams; that is, they receive ground-water discharge and thus form hydraulic boundaries to the site flow system. Offsite water-supply wells should not develop cones of depression that would cross these boundaries. In the northern part of the area, the direction of water movement is generally southward, and the water table north of the site boundary is up to 150 feet higher than that at the plant island. Domestic wells, such as those to the north of the plant area, are pumped only intermittently for very short periods, so that extensive cones of depression do not develop.

For these reasons--hydraulic boundaries on three sides of the plant area, natural southward movement of ground water, difference in elevation of the water table between private wells to the north and that at the plant site, and the low use rate of water from domestic wells--it is not considered possible that offsite wells can be affected by contamination of ground water at the site.

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From Around The County

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Vandalism intended to derail train with passengers

By Eddie West

Staff Writer

Law enforcement authorities are investigating an attempt to derail a passenger train carrying more than 400 tourists and crew members along Nashville & Eastern railroad track in Smith County.

Multiple law enforcement agencies, including the TBI, are investigating the case and the newly established Tennessee Office of Homeland Security has been notified of the incident.

"None of the investigating agencies have given us any indication that this is a terrorist-related incident, rather more likely an act of vandalism," said Rick Shipkowski, director of weapons of mass destruction and preparedness. "We are not an investigative division. Our job is to coordinate the authorities at the state, federal and local level."

The Homeland Security Director, Wendell Gilbert, was out of the office Monday and unavailable for comment on the incident.

TBI Director Larry Wallace was notified of the incident and has spoken with Gilbert about the case.

The national office of Homeland

Security was also notified of the incident Shipkowski said.

A total of 390 passengers and 20 crew members on a sightseeing tour, were aboard the train when it was stopped by its conductor at a bridge approach in an area of the county known as Seabowisha.

A once thriving area, in the heydays of the railroad industry, Seabowisha is in the Lancaster community.

Buildings which once housed a hotel, tavern and other businesses have long since deteriorated.

Although property surrounding the bridge, with the exception of the Caney Fork River and Dry Fork Creek, is privately owned, the area is a popular fishing destination.

Railroad officials say there is no doubt the vandalism was a deliberate attempt to derail the passenger train, dismissing the idea the incident was a simple prank.

Whether the act was maliciously targeting the railroad or passengers aboard the train is not known.

The track was vandalized so that the train would plunge an estimated 60 to 70 feet into the mouth of Dry Fork Creek where it enters the Caney Fork River according to an offense report filed by

Detective Debra Locum

Listed as aggravated vandalism on the report, the incident took place at one of the more isolated areas of the track which runs from Nashville to Cookeville.

If the attempt to derail the train had been successful it would have for certain resulted in multiple deaths and numerous injuries, overwhelming the county's emergency services.

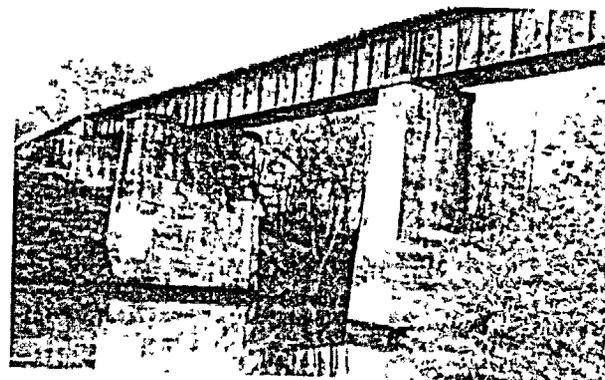
In the event an incident of this nature occurs, a plan is in place to contact neighboring counties and air ambulances for assistance, said Emergency Management Director Jacky Carver.

The incident may have been a deliberate attempt to derail a train with passengers aboard because cargo is shipped along the track Monday through Friday, railroad officials agree.

Passenger trains run only on weekends and rarely run between Nashville and Cookeville, while cargo is shipped Monday through Friday.

The excursion train left Nashville for Cookeville the morning of October 26, a Saturday.

Around 3 p.m. the excursion train, returning from Cookeville, approached the bridge traveling approximately 30 miles



EDDIE WEST/COURIER

per hour according to Locum's report. The train struck the first spike before the locomotive was stopped by the rail, the detective's report reads.

The plates and spikes had been driven in joint bars, leaving them rising above the rails, the detective's report reads.

■ Please see page 9

Derail

From page 1

conductor

Had the train been traveling much faster it would have derailed for certain, said Craig Wade, vice president and general manager of the railroad.

Because of safety precautions, trains are allowed only to travel certain speeds based on track conditions. Track speeds are federally regulated.

Once stopped, the rails were cleared by the conductor and crew members and the train proceeded on to Nashville, Wade said.

The general manager estimated it took approximately 15 minutes to clear the vandalism and proceed onward.

While attempts to derail cargo trains in metropolitan areas may not be that unusual, this was the first time it has occurred in a rural area along the Nashville & Eastern track, according to Wade.

Wade rules out this was a planned terrorist act, saying that "if it was a terrorist act they would have gotten the job done", but said the individual or individuals obviously knew what they were doing.

While the vandalism was not a well planned terrorist act, the possibility the incident could have been carried out by an individual or individuals sympathetic to the 9/11 cause is not unrealistic.

Because of Tennessee Tech University, neighboring Putnam County is the temporary, and in some cases permanent, home of a number of residents of different nationalities.

Shortly after photos of those involved in the 9/11 attack appeared in newspapers and on television last fall, a Cookeville motel manager said that he recognized one of the individuals involved in the highjackings as staying in Cookeville.

The Cookeville *Herald-Citizen* ran a front page story on the manager's claim.

The manager recalled the individual specifically asking where he could find a place in town to work out on weights.

Also, a man in rural southeastern Tennessee claimed he recognized one of the individuals being in a rural community outside of Chattanooga, which was reported by Associated Press.

There are a number of factors which make this deliberate attempt to derail a train suspicious in nature.

Individuals used a specific and more than routine method to derail the train.

In many cases, vandals simply throw items onto a track in an attempt to derail a train.

Also, the location of the vandalism is unusual.

The bridge crossing Dry Fork is one of the most secluded locations on the track and it would take rescue workers hours to retrieve the injured because of the rugged terrain.

Only Moss Bend, still in Smith County and a few miles east of the site, comes to the mind of the railroad's general manager as being as isolated or even more isolated.

The track from Nashville to Cookeville is examined by a crew for safety inspection twice each week and was okay as the train was traveling to Cookeville earlier in the day, according to Wade.

The vandalism was investigated by sheriff's department Locum on Monday of last week after she was contacted by officials from the railroad.

Asked why the incident was not reported sooner, Wade said the conductor was a substitute and did not realize the severity of the situation.

Nashville & Eastern is a publicly owned shortline track operated by a private firm.

For nostalgic reasons, excursion trains have become increasingly popular in recent years.

A number of excursion trains run annually along the track from Nashville to Watertown or Lebanon where special events take place on the city square.