United States Department of Agriculture

Soil Conservation Service

Northeast NTC
160 East 7th Street
Chester, PA 19013
215-499-3960

Subject: Ground-penetrating radar technical assistance; Vermont, 20-27 May 1989

Date: June 12, 1989

To: John C. Tichner
State Conservationist
SCS, Winooski, VT

File code: 430

Purpose:

To provide archaeological, engineering, and soil site assessments with ground-penetrating radar (GPR) techniques in Orleans and Franklin Counties.

Participants:

Patrick V. Barry, Soil Scientist, SCS, Newport, VT
James A. Doolittle, Soil Specialist (GPR), SCS, Chester, PA
Richard A. Fischer, Civil Engineer, SCS, Winooski, VT
Kathryn M. Hakey, Engineering Tech., SCS, Essex Junction, VT
Martha J. Haynes, Soil Scientist, SCS, Woodstock, VT
Robert F. Long, Soil Survey Project Leader, SCS, Newport, VT
James W. Monahan, District Conservationist, SCS, St. Albans, VT
Gregg W. Schellentrager, Asst. State Soil Scientist, SCS, Winooski, VT

Activities:

Survey sites were selected prior to the arrival of the GPR unit. The unit arrived in the Burlington area during the afternoon of 20 May. On May 21, task force charges for the National Soil Survey Workshop were reviewed and summarized. The task force is addressing problems concerning the "accuracy and reliability of soil survey information." On 22 and 23 May, field studies were conducted with soil scientists in Orleans County. During the afternoon of 23 May and the morning of 25 May the GPR unit was used to provided stratigraphic information at several proposed animal waste holding ponds in Franklin County.

The GPR's graphic recorder became inoperative during the afternoon of 23 May. In order to fulfill an archaeological site investigation and commitment with the state of Vermont, Steve Hundley (State Soil Scientist of Massachusetts) was contacted during the evening of 23 May and arrangements were made to borrow Massachusetts GPR unit. This unit was picked up in southwestern Vermont (Springfield) on the following morning. The archaeological site investigation was completed at Highgate during the afternoon of 24 May.

The GPR unit departed Vermont for the manufacturers office in Hudson, New Hampshire on 25 May. The graphic recorder was taken to GSSI for repairs. Vehicle problems delayed the units return to Chester, Pennsylvania, until the morning of 27 May.

Equipment:

The unit is the SIR System-8 which consists of the model 4800 control unit, the ADTEK SR-8004H graphic recorder, and the ADTEK DT-6000 tape recorder. The PR-8304 profiling recorder was borrowed from Massachusetts. The 200 MHz and the 120 MHz antennas were used.

Results:

Soils

Tunbridge and Lyman Soils:

A 140 by 90 foot, gently sloping area of Tunbridge-Lyman fine sandy loam, 8 to 15 percent slopes, rocky, was gridded (at 10 foot intervals) and systematically sampled with the GPR in Orleans County. Tunbridge (coarse-loamy, mixed, frigid Typic Haplorthods) soils are moderately deep (20 to 40 inches), and Lyman (loamy, mixed, frigid Lithic Haplorthods) soils are shallow (10 t0 20 inches) to bedrock.

Within the study site, the taxonomic composition was: 52 percent a deep (40 to 60 inches) unnamed inclusion, 46 percent Tunbridge soils, and 2 percent Lyman soils. As in other areas of New England, soil scientists are consistently delineating similar interpretative areas on soil maps, however, they are also consistently underestimating the depth to bedrock. Underestimation of the depth to bedrock is due to the inherent limitation of conventional surveying tools to probe below depth of 40 inches in tills containing coarse fragments.

The data from this study will be plotted with the SURFER software program into two-dimensional contour plots and three-dimensional surface net block diagrams. These plots can be be incorporated into soil survey reports or used as instructional guides to soil scientist.

The purpose of this investigation is to compare the occurrence and spatial variability of Lyman and Tunbridge soils in similar mapped areas with the results of similar studies conducted in Maine and Massachusetts. These studies are being conducted to increase our understanding of soil-bedrock relationships and improve map unit design, descriptions, and interpretations.

Colton and Duxbury soils:

Two transects were conducted along a stream terrace composed of glacial fluvial deposits in Orleans County. The soils occurring on this terrace are predominantly Colton (sandy-skeletal, mixed, frigid Typic Haplorthods) and Duxbury (coarse-loamy over sandy or

sandy-skeletal, mixed, frigid Typic Haplorthods). These soils are distinguished on the basis of the thickness of a loamy cap which is < 16 inches for Colton and 16 to 24 inches for Duxbury. Transects are required to determine the relative proportion of each soil and to improve map unit interpretations.

The GPR transects revealed that the terrace has a loamy cap with an average thickness of 15.7 inches and a standard deviation of 4.4 inches. The average composition is 64 percent Colton soils and 36 percent Duxbury soils.

Site Investigations

Animal Waste Holding Pond Sites

Geophysical techniques are being applied to the mapping of subsurface geology. In areas of coarse and moderately coarse textured sediments, the GPR can provide continuous, high resolution data of subsurface conditions to depths of 20 to 40+ feet. GPR techniques are rapid, and provide greater areal and volumetric coverage than conventional soil boring techniques. However, GPR data always requires some ground-truth boring data to confirm interpretations.

Five proposed animal waste holding pond sites were investigated in Franklin County. The data obtained in these surveys suggest that in areas of coarse and moderately-coarse textured sediments, GPR techniques can be very useful for characterizing sites (determining the presence, lateral extent and depth to subsurface strata, bedrock, or water table) and locating areas of subsurface seepage from animal waste holding ponds. However, in areas of fine textured lacustrine deposits, GPR techniques are exceedingly depth restricted and should not be used. In areas of fine textured deposits, electromagnetic induction (EM) methods are the preferred geophysical technique for mapping the extent and magnitude of seepage from animal waste holding ponds.

All graphic profiles collected in these engineering site investigations were annotated and turned over to Dick Fischer.

Archaeological Site Investigation

The archaeological site investigation of an Abenaki Indian burial site near Highgate, Vermont was highly successful and a "media event" which provided the Soil Conservation Service with positive coverage. Several papers and television stations covered the event. The two enclosed news articles summarize this activity. All graphic profiles collected at the Highgate site were turned over to Vermont's Division of Historic Preservation.

Recommendations:

This field trip has established the suitability of coarse and moderately-coarse textured deposits in Vermont for GPR applications. The GPR is a very rapid reconnaissance and investigatory tool which can provide detailed soil and site information for soil scientists, engineers, and cultural

resources specialists. The radars continued testing and use in Vermont is encouraged. For many site investigations, the use of Massachusetts' GPR unit may be warranted and prove, as this study has demonstrated, beneficial and cost effective.

James A. Doolittle
Soil Scientist (GPR)

cc:
A. J. Dornbusch, Jr., Director, MNTC, SCS, Lincoln, NE
E. G. Knox, Head, NSSL, NSSC, SCS, Lincoln, NE
D. G. Van Houten, State Soil Scientist, SCS, Winooski, VT
C. G. Olson, Head, Field Investigations Staff, NSSL, NSSC, SCS, Lincoln, NE

The Burlington Free Press

Vermont

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SECTION B

Thursday, May 25, 1989 •
City Editor, Sam Hemingway
Phone: 865-0940, ext. 2017

State notes

St. Albans arms firm destroyed by blaze

ST. ALBANS — A fire Wednesday night destroyed the Century Arms building on Federal Street and forced the evacuation of other nearby businesses, which suffered extensive smoke and water damage.

No one was inside the two-story, brick Century Arms building when the fire broke out about 8 p.m. There was no early indication on the cause of the fire, which still was being fought late Wednesday by several neighboring fire departments.

St. Albans City Fire Department Lt. Leslie Langlais received a leg injury. The fire blocked traffic in the area and drew scores of onlookers.

George Samson, warehouse manager for the firm, estimated that there were 500,000 to 700,000 rounds of small arms ammunition on the first floor of the building and between 3,000 and 5,000 small firearms. Records were kept on the second floor.

About 20 people worked in the Federal Street building and an additional 25 at the firm's warehouse on Lower Welden Street.

Utilities ask to use natural gas as fuel

MONTPELIER — Burlington Electric Department and Vermont Gas Systems on Wednesday asked for state permission to use natural gas to fuel an electric generating station.

A hearing officer of the Vermont Public Service Board should have a preliminary decision on the request to build and use a gas pipeline at the McNeil Generating Station in the next two to three weeks.

Those involved then may comment again before the board makes a final ruling.

The McNeil station uses wood chips as its primary fuel. Burlington Electric Department officials hope to use natural gas to power the generating station during the summer, when wood chips are more difficult to get.

Protesters to start vigil at firing range

UNDERHILL — General Electric Co.'s gun manufacturing operation comes under fire today as protesters from around New England start a weeklong vigil at Ethan Allen Firing Range, where the weapon is tested.

Organizers of the demonstration, coordinated by Vermont-based Stop the Slaughter Coalition, say they object to the United States' spending $1.5 million a day to help the government of El Salvador kill its own citizens while funding for human needs in the United States is inadequate.

The gun used to killed Salvadorans, protesters say, is the Gatling gun produced at the GE plant in Burlington.

Demonstrators are expected to enter the range to try to stop test-firings of the gun.

Between 25 and 30 Vermont State Police troopers will cover the site. Among them will be a crowd control unit of about 20 troopers, said Sgt. William O'Leary of the Colchester barracks.

GE's own security staff at the range will remain the same, said spokesman Jack Waller.

Statewide coalition tells Vermonters to buckle up

With Memorial Day weekend just around the corner, Buckle Up Vermont, a

Two vie for environmental

By James E. Brassor
Free Press Staff Writer

MONTPELIER — Two legislators from southeastern Vermont are early candidates for commissioner of the Department of Environmental Conservation.

Rep. Timothy Burke, D-Putney, chairman of the House Natural Resources Committee, and Sen. Stephen Reynes, D-Windsor, a former chairman of the same committee, are both seeking the job soon to be vacated by Patrick Parenteau, who is leaving Vermont to join a Seattle law firm.

Parenteau will step down next month.

In addition, a third lawmaker from the southeastern corner of the state, Rep. Timothy Van Zandt, D-Springfield, is a candidate to become commissioner of the Fish and Wildlife Department. The current commissioner, Steve Wright, is leaving state government to return to head Sterling College in Craftsbury.

Reynes, 43, a Pomfret resident, served in the Vermont House for three terms before winning election to the Senate in November. He chaired the House Natural Resources Committee in both the 1985-86 and 1987-88 bienniums.

"I've been involved in helping make a lot of the laws the department is now working with. The opportunity to work with these laws on a year-round basis rather than a part-time basis is really appealing," Reynes said. He was actively involved in writing the solid waste bill passed by the Legislature in 1987 and Act 200, the state's growth-control law, approved in 1988.

Reynes said he will have an interview with Gov. Madeleine Kunin Friday.

Burke, 41, is in his third term as a member of the Vermont House. He succeeded Reynes as chairman of the Natural Resources Committee this year and was one of the architects of the landmark legislation to ban the use of ozone-destroying chlorofluorocarbons in car air conditioners.

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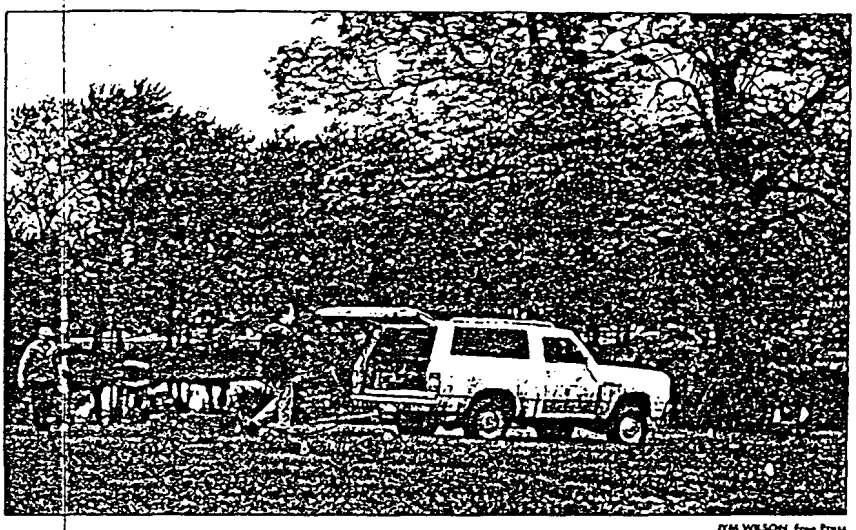

JIM WILSON, Free Press

Indian burial grounds

Soil conservationists Greg Schellentrager, left, and Jim Monahan follow a sonar device being used to search for remains in an Abenaki burial ground near the Missisquoi River in Highgate. Story, Page 10B.

4 nursing homes to seek state aid

Reimbursement rates are blamed for money woes

By Susan Allen
Free Press Staff Writer

At least four nursing homes are poised to seek financial help from the state following last week's veto by Gov. Madeleine Kunin of a bill that would have adjusted Medicaid reimbursement rates for struggling facilities.

Andy Girouard, owner of the St. Jude Nursing Home in Barre Town, said Tuesday he will seek assistance from the state. Girouard's accountant, Dana Kittell, who also represents 19 other homes, said one other facility is set to seek state aid.

Kittell said he is awaiting notification from the state of the guidelines for such assistance.

Bethany Carleton, executive director of the Vermont Health Care Association, said two other non-profit homes wrote to Human Services Agency officials Wednesday requesting assistance. Those homes will be identified when the letters are received, she said.

Kittell said another 18 homes also may look to the state for financial assistance if the reimbursement rates are not adjusted in the next year.

Kunin vetoed the bill, which would have adjusted the Medicaid rate paid to nursing homes to reflect regional expenses — such as the high cost of staffing caused by Vermont's low unemployment rate. About 70 percent of nursing home patients in the state are covered by

Turn to FOUR, 8B

Mall developer: Economic study loaded with 'scare

By Kevin Ellis
Free Press Staff Writer

A study of the economic impact of the proposed Maple Tree Place shopping mall is loaded with "scare tactics" and is biased against the project because one of its authors opposes the mall, local developer Ben Frank said Wednesday.

The study released this week contends the 477,000-square-foot mall will lure department stores critical to the economic health of Burlington away from downtown. Stores in other Chittenden County communities also would head for the mall, leaving behind vacant buildings to be rented by lower quality establishments, the study said.

Frank said the study was another attempt by anti-mall forces to discredit the project, and he singled out Arthur Hogan, executive director of the Chittenden County Regional Planning Commission, which commissioned the study.

"This is the kind of stuff we expect out of that crowd," said Frank, who wants to build the mall at Williston's Taft Corners with the Syracuse, N.Y.-based Pyramid Cos.

"That study is nothing but scare tactics and speculation."

The study was a virtual replay of the analysis done in 1978 on another Pyramid mall proposa
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Burlington's home program gets boost from private loan

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By Ian Polum
Free Press S

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Scientists study Indian burial site

By Eloise Hedbor
and Richard Cowperthwait
Free Press Correspondents

HIGHGATE — It didn't look much like an archaeological exploration.

The four-wheel drive truck, crowded with electronic equipment, pulled a small flat wooden sled containing an instrument package back and forth across a field, guided by day-glow orange surveyor's flags.

The results were reminiscent of a seismographic chart, but to the trained eye these readings, produced by a sophisticated ground-penetrating radar unit, revealed traces of what is thought to be an Indian burial site.

After the first run, Greg Schellentrager, assistant soil scientist with the Soil Conservation Service, and James Monahan, SCS district conservationist, examined a long sheet of graph paper, covered with wavy, gray lines of varying widths.

"There," said Schellentrager, pointing to a sharper spike near the top of the paper. Spikes — "anomalies" — represent something besides the ordinary soil structure. "It's like a fish finder," he explained. "You can see something there but you don't know whether it's a bass or a flounder. It could be a DeSoto hub cap."

The surveyors are searching for anything but a used car part. Instead, they are seeking to determine the size of a once-threatened ancient Abenaki Indian burial ground along the Missisquoi River.

The survey provides clues, but "digging a hole tells what's going on," said Schellentrager, and excavation is required "to determine what's significant and what's not significant."

The ultimate goal is not to dig up the burial ground, though.

"With these advances in technology, we'll be able to study the site without disturbing it," said David Skinas, a survey archaeologist with the Vermont Division for Historic Preservation. "We're not in the business of excavating burials. We wish to protect them."

The state does plan to stabilize the river bank on the roughly one-acre site to prevent more remains from being carried down the river through erosion. "That's (stabilization-related work) going to be the only excavation conducted there," he said.

Homer St. Francis, chief of the Abenakis, who was on hand to watch the process, said finding the anomalies proved Abenakis were the original owners of this land. But he said he opposed any excavation.

"They should rest in peace," St. Francis said.

But peace has not been the pattern here. "There was a looter here this morning," said Skinas. He said the man, who apparently was looking for artifacts where some of the river bank had recently collapsed, fled when Skinas tried to approach him.

Skinas said this burial ground is thought to have been used as early as 2,000 years ago up to about 1600 A.D. Much of it probably already has been lost to the river which, according to St. Francis, has moved about 45 feet since 1927.

The site had been threatened by a housing development until it was purchased last fall by the Vermont Nature Conservancy. The state, which in turn leased the site from the organization for a nominal fee, will purchase it this summer, Skinas said. "I see it as a very important site, one of the most important sites," he said.

Charting the depths of the land *MESSENGER / DAVID GOSS*

Gregg Schellentrager, state soil scientist, studies a radar print-out that represents the contents of soil at a Highgate site. The high-tech procedure allows Schellentrager and archaeologists, such as Douglas Frink (at right), to get the low down on a site without digging. Below, James Monahan assists as radar readings are taken by equipment that is pulled along the ground.

Archaeology gets a high-tech boost at Highgate site

by DAVID GOSS

HIGHGATE — A state soil scientist attracted a small audience Wednesday when he dragged a radar unit across an Indian burial site.

State officials gathered around the radar equipment to learn more about the site, that may have been used as long as 2,000 years ago. For others, including reporters, Abenakis, local officials and archaeologists, the event sparked curiosity, as well as ideas for others ways to use the technology.

"That could be a DeSoto hub cap," said Gregg Schellentrager, state soil scientist, pointing to a shaded area on a graph. The graph came off of a printer was housed in a truck. The truck pulled a radar antenna, via sled, along a course marked off by bright flags.

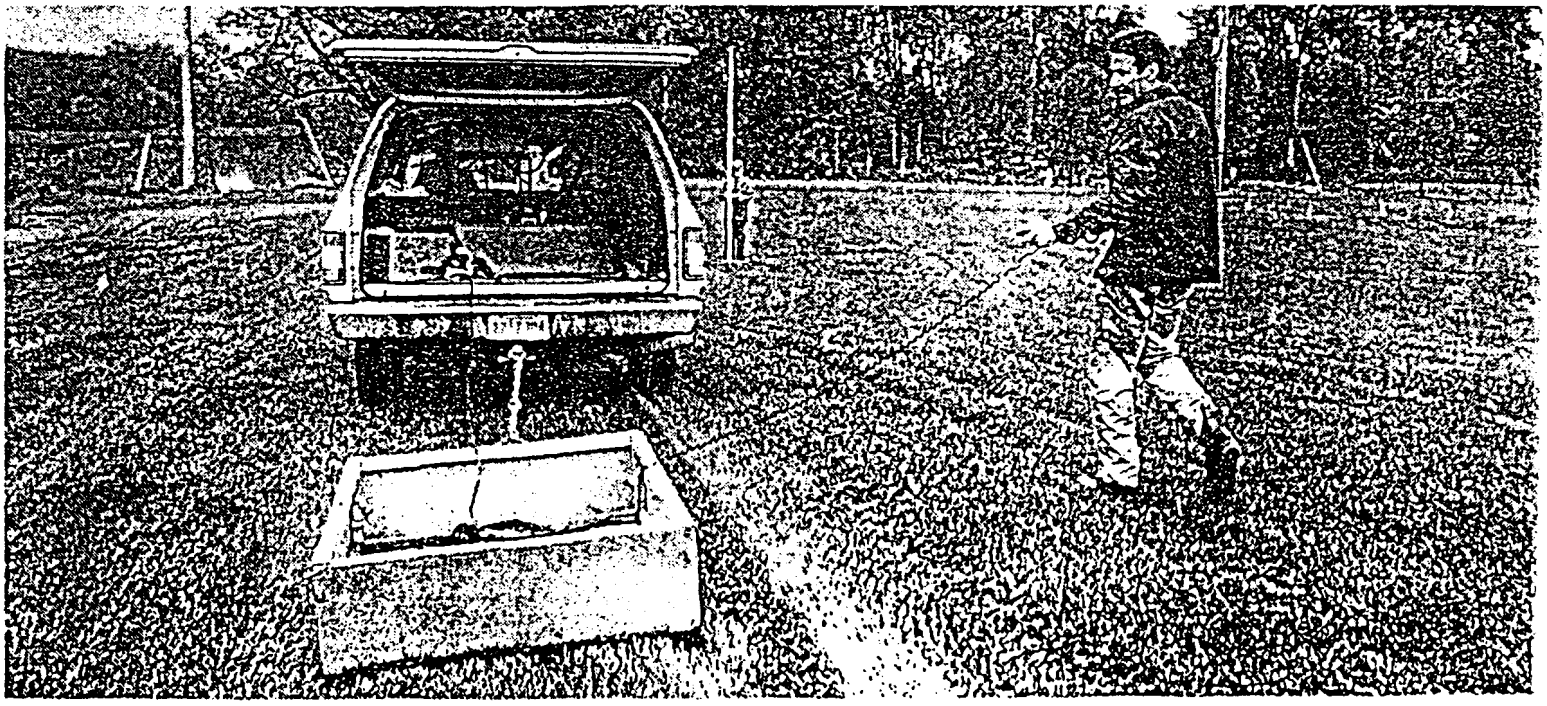
The radar shoots electromagnetic waves into the ground that bounce off objects, and produces a picture of the features underground.

Although Schellentrager cannot tell right away whether a certain object is a root, an artifact or human remains, he can tell what is not a normal soil condition.

On this day, he found about six such abnormal sections in the soil. The data will later be analyzed and plotted on a map to help state officials determine the location of objects and how significant such objects may be.

The state Division of Historic Preservation has been in the process of purchasing the about two-acre site to preserve it from development. They wish to keep its exact location a secret, because the river bank at the site, is filled with artifacts. The soil surround them has been eroding into the Missisquoi River and people have been tampering with the site,

(See RADAR, p. 10)



Radar: *continued from Page 1*

something the state is also addressing.

During the process of stabilizing the river bank, state officials may be able to do excavation along it, as some sections will be lost in stabilization anyway. With the information from that study, and the information from the radar, officials hope to be able to piece the site together without digging up human remains. In addition to human remains, there may also be cooking utensils or hearths at the site.

The U.S. Department of Agriculture has about five ground radar devices nation-wide. The machines usually reach between 70 and 100 feet into the soil. The unit used Wednesday costs about $75,000, although more modern ones use computer chips to make them less expensive.

Schellentrager said there are many uses for the radar, such as investigating sites for waste disposal. Private companies, many being developers, use the devices in their studies. Such uses for the technology were what brought Douglas Frink here Wednesday.

"I'm doing my homework," said Frink, of Archaeology Consulting Team, Inc., a private archaeological firm. Such firms sometimes become necessary for developers when they are going through a state or federal permit process. If it becomes apparent that a site to be developed has land which may need to be preserved, a private archeologist is hired to do a site assessment — to see if the land is worth preserving or to determine where developers can build on the site.

The assessment could be made easier with radar, said Frink, who Wednesday came to see how the device worked.

The radar may present "more affordable ways to do our work," said Frink. The radar's biggest advantage is to see "where to avoid," he said. Archaeologists, about to dig at a site, might save time if the radar tells them they need to move several feet in another direction to find artifacts. For developers, radar may simply say the project should not be built on one particular section of the property or should not be built on the site at all.

Frink was also interested in Wednesday's events as he feels the public is not aware that "Vermont has a wealth of archeological resources."

At one time, the state also seemed unaware of the Abenaki people here. With all of the high-tech equipment being used Wednesday, Abenaki Chief Homer St. Francis said now "... there's no way they can say we're not here."

Indians then, and now

Abenaki Chief Homer St. Francis (left) and Indian storyteller and author Joe B when state officials did radar chartings of a Highgate Indian burial site.

Wright: *continued from Page 1*

lick. House rules prohibit gifts

Wright, who has vowed to

Bush: *continued from Page 1*

pinnings is the message I now take to Europe."

Bush, upon arriving at the first stop of his trip in Rome

times, the saying goes, "All roads lead to Rome" and it's still true. It is fitting that here I begin my first trip to Europe

States."

Bush praised U.S.-Italy of friendship and said United States welcome